ISSN - 2320-6039 (Print) ● ISSN - 2320-608X (Electronic)

Volume 7 / Number 3 / July-September 2019

INTERNATIONAL JOURNAL OF PHYSIOLOGY

Website: www.ijop.net

International Journal of Physiology

Print-ISSN: 2320-6039 Electronic-ISSN: 2320-608X Frequency: Quarterly

Website:www.ijop.net

Editor

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Printed, published and owned by

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Published at

Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

International Journal of Physiology is a double blind peer reviewed international journal which has commenced its publication from January 2013. The journal is half yearly in frequency. The journal covers all aspects of physiology. The journal has been assigned ISSN 2320-6039 (Print Version) and ISSN 2320-608X (Online Version). The journal is covered by Index Copernicus, Poland and many other international data bases.

International Journal of Physiology

www.ijop.net

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Volume 7, Number 3 **July-September 2019**

DOI Number: 10.5958/2320-608X.2019.00075.1

A Study of Autonomic Function in Newly Diagnosed Rheumatoid Arthritis Individuals Using Heart Rate Variability as a Tool

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Abstract

Background: Rheumatoid Arthritis (RA) is the most common chronic systemic inflammatory polyarthritis. The most common extra articular complication is the cardiovascular system involvement. Heart Rate Variability (HRV) is a noninvasive tool for assessing cardiovascular autonomic function. In our study, we assessed the cardiovascular autonomic function in newly diagnosed rheumatoid arthritis individuals by using short term Heart Rate Variability (HRV) analysis.

Method: It was a cross sectional study. Study group consisted of 40 newly diagnosed rheumatoid arthritis individuals from Rheumatology outpatient department, Stanley Medical College. Age and sex matched 40 healthy subjects were selected as controls. HRV parameters were recorded by using RMS polyrite version 2.2 D hardware.

Statistical Analysis: Statistical analysis was done by using SPSS version 17. Independent t test was done to compare the groups.

Result: The comparison of the mean Heart Rate (HR) showed a statistically significant increase in the study group (79.55±7.78) than the control group (70.83±7.52). The systolic blood pressure (SBP)was significantly increased in the study group (118.3± 7.1) than the control group (108.3 ± 10.1).There was a significant reduction of SDNN in the study group (24.97±8.9) than the control group (51.64± 25.35). There was a significant reduction in RMSSD in the study group (22.92±12.77) than the control group(55.73± 33.44). The LF power(64.74± 20.87) and the LF/HF ratio (2.79± 2.33) were increased in the study group than the control group (52.02± 14.68), (1.04±0.66). The HF power was decreased in the study group (34.39±19.38) than the controlgroup (45.94± 14.68).

Conclusion: We observed that there was sympathetic overactivity and reduced parasympathetic activity in newly diagnosed rheumatoid arthritis individuals. Thus assessment of autonomic functions by HRV analysis helps in early diagnosis and prompt intervention of cardiovascular complication in RA patients.

Keywords: *Rheumatoid arthritis, Autonomic function, Heart rate variability.*

Introduction

Rheumatoid Arthritis (RA) is the most common chronic systemic inflammatory polyarthritis of varying extent and severity. About 0.5-1%of adult population is affected by rheumatoid arthritis worldwide.In India the prevalence rate is 0.2-0.4%[1]. To diagnose Rheumatoid Arthritis, the revised criteria of AmericanCollege of Rheumatology (ACR) and European League against Rheumatism(EULAR) 2010 is in widespread use nowadays[2]. The most common extra articular complication of rheumatoid arthritis is the cardiovascular system involvement which may lead to sudden cardiac

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death[3].

Cardiovascular autonomic functions can be evaluated by both invasive and noninvasive tests. Non invasive tests can be readily performed and used to confirm the diagnosis of autonomic imbalance. Heart Rate Variability (HRV) is a simple, non invasive and easy to perform method for analyzing cardiovascular autonomic functions. HRV evaluates the balance between sympathetic and parasympathetic activity of the heart[4].It detects the early impairment of the autonomic balance while the other physiological parameters are still in normal accepted range.

Heart rate variability is the cardiac beat –to-beat variation, which is a physiological phenomenon. The beat-to-beat variation in the heart is dependent on the rate of discharge of SA node, which is influenced by autonomic activities. The HRV is assessed by calculating the indices -Time domain analysis and Frequency domain analysis. The accurate timing of Rwaves is calculated by ECG recording. The five minutes ECG recording is called short term HRV.

In western countries there are many studies related to cardiovascular complications of rheumatoid arthritis. But in India, studies are scanty and data available are differing[5].Cardiovascular autonomic dysfunctions are more pronounced in chronic rheumatoid arthritis patients. In our study,we planned to assess the cardiovascular autonomic function in newly diagnosed rheumatoid arthritis individuals by using short term Heart Rate Variability (HRV) analysis.

Materials and Method

It was a cross sectional study. The institutional ethical committee approval was obtained. Sample size of 80 was taken as convenience sampling and the study duration was 6 months period. 40 newly diagnosed rheumatoid arthritis patients by using EULAR criteria were selected from the Rheumatology outpatient department, Government Stanley Medical College and Hospital, Chennai. Age and sex matched40 healthy individuals were selected as controls from the hospital, college staffs and the healthy persons who accompanied the patients.

Inclusion Criteria

- Newly diagnosed Rheumatoid arthritis patients not yet started treatment
- Age group of 20-60 years of both genders.

Exclusion Criteria

- Smokers and Alcoholics
- Known case of diabetes and hypertension
- Individuals suffering from renal failure, cardiovascular disorders, Endocrine disorders and other chronic diseases
- Pregnancy
- Subjects taking drugs which are known to affect autonomic nervous system

After giving a complete instruction about the study, informed and written consent was obtained from the subjects. The study was performed between 10 am and 1 pm in the neurophysiology laboratory, Department of Physiology, Government Stanley Medical College, Chennai. The lab was kept calm and the temperature was maintained at 25-28 ^{o}C with minimal lighting. A 2 hour of fasting was ensured prior to recording.

A brief preliminary general and clinical examination was made. Blood pressure, heart rate and respiratory rate were recordedafter 10-15 minutes of rest in supine position. The electrodes were placed in Right forearm, Left forearm and Right leg after cleaning the area with spirit.

The continuous lead II Electrocardiography was recorded for 10 minutes by using RMS polyrite version 2.2D hardware. The ECG recordings with normal sinus rhythm for 5 minutes were taken for analysis. The following parameters of HRV were assessed.

HR-Heart Rate

SDNN- The standard deviation of all NN intervals. It indicates the parasympathetic activity.

RMSSD- The square root of the mean of the sum of the squares of differences between adjacent NN intervals.

High Frequency band (HF)-It is contributed mainly by vagal activity

Low Frequency band (LF) -It is considered as a sympathetic marker

LF/HF Ratio-The ratio of low to high frequency

spectral power has been used as an index of sympathetic to parasympathetic balance of heart rate fluctuation.

Statistical Analysis

The acquired data were analyzed by using Statistical Package for Social Sciences (SPSS) version 17. Independent student t test was applied to find out the significant difference between the two groups and p value < 0.05 was taken as significant and p< 0.01 was taken as highly significant.

Results

Baseline characteristics such as Age and Body Mass index (BMI) in the study group (41.57± 7.82), (24.48± 3.19) and the control group (41.25± 7.88), (24.43± 2.79) did not show any statistically significant difference (p=0.767, p=0.934). Hence both the study and the control groups were comparable.

Table 1 shows the comparison of the mean Heart Rate (HR) between the study group (79.55±7.78) and the control group (70.83±7.52) and there was a statistically significant increase in the study group. The systolic blood pressure (SBP) was significantly increased in the study group (118.3± 7.1) than the control group (108.3 ± 10.1). There was no significant difference in diastolic blood pressure (DBP) between the study and the control groups.

Table 2 shows the comparison of time domain measures between the study and the control groups. There was a significant reduction of SDNN in the study group (24.97±8.9) than the control group (51.64± 25.35). There was a significant reduction in RMSSD in the study group (22.92±12.77) than the control group(55.73± 33.44).

Table 3 shows thecomparison of frequency domain measures between the study and the control groups. LF power in normalized units (nu) (64.74± 20.87) and the LF/HF ratio (2.79± 2.33) were increased in the study group than the control group (52.02± 14.68),(1.04±0.66). The HF power in nu was decreased in the study group (34.39±19.38) than the control group (45.94± 14.68).

TABLE 1 : Comparison of mean HR, SBP and DBP in the study and the control groups

	Group n=40	**Mean ± SD**	**P value**
Mean HR(bpm)	Study	79.55 ± 7.78	0.000**
	Control	70.83 ± 7.52	
SBP(mmHg)	Study	118.3 ± 7.1	0.001**
	Control	108.3 ± 10.1	
DBP(mmHg)	Study	71.6 ± 6.03	0.931
	Control	71.1 ± 4.08	

**p< 0.01 Highly significant

HR-Heart Rate, SBP-Systolic Blood Pressure, DBP-Diastolic Blood Pressure

TABLE 2: Comparison of time domain measures between the study and the control groups

Parameter	**Study group n=40**	**Control groupn=40**	**Independent t value**	**P value**
	Mean ± SD	Mean±SD		
Mean HR(bpm)	79.55 ± 7.78	70.83±7.52	5.09	0.000**
SDNN(ms)	24.97 ± 8.9	51.64 ± 25.35	6.27	0.000**
RMSSD(ms)	22.92 ± 12.77	55.73 ± 33.44	5.79	0.000**

** p< 0.01 Highly significant

SDNN-Standard Deviation of average Normal to Normal RR intervals

RMSSD-Root Mean of the Sum of Squares of Difference between adjacent NN intervals

TABLE 3: Comparison of frequency domain measures between the study and the control groups

Parameter	Study groupn=40	Control groupn=40	Independent t value	P value
	Mean ± SD	Mean ± SD		
LF nu	64.74 ± 20.87	52.02 ± 14.63	4.98	0.000**
HF nu	34.39 ± 19.38	45.94±14.68	5.91	0.000**
LF/HF Ratio	2.79 ± 2.33	1.04 ± 0.66	5.83	0.000**

** p<0.01 Highly significant

LF-Low Frequency, HF-High Frequency

Discussion

We planned to assess the cardiovascular autonomic functions in the newly diagnosed RA individuals by using HRV and to compare with the healthy individuals. HRV is a noninvasive technique to assess the autonomic function in both normal and diseased subjects.The main findings of our study were increase in Heart rate, Systolic blood pressure and Frequency measures such as LF nu and LF/HF Ratio, decrease in Time domain measures such as SDNN and RMSSD in the study group when compared with that of the control group.

Both the groups were Age, BMI and Gender matched. The resting heart rate and the systolic blood pressure were found to be significantly increased in the study group than the control group. The diastolic blood pressure did not show any significant variation.These findings were in accordance with the findings of Laden et al[6]and Piha et al[7] studies. Sandhu et al in their study proved that increased heart rate observed in rheumatoid arthritis individuals may be due to increased sympathetic activity and decreased parasympathetic activity[8].Ewing et al observed in their study that increased heart rate was due to parasympathetic efferent vagal damage[9].

The time domain parameters RMSSD and SDNN were found to be significantly reduced in the study group than the control group. It indicates the reduced parasympathetic activity in the RA individuals. Similar findings were observed in Evrengul et al[10],Maule S et al[11],Louthrenoo W[12] and Yadav[13] studies.

The frequency domain parameter, LF power in normalized unit was increased in the study group than the control group. The HF power in normalized unit was significantly lower in the study group than the control group. The LF/HF ratio was significantly increased in the study group than the control group. These findings indicate the sympathetic over activity and the sympathovagal imbalance in the RA patients. Similar findings were observed by Evrengul et al[10] in their study.Geneon et al in their study found that there was a decreased autonomic system function in patients of rheumatoid arthritis with duration of the illness less than one year[14].

The accelerated atherogenesis and myocardial microvascular abnormalities independent of narrowed coronary vessels are involved in the pathogenesis of cardiovascular complications. Raza and Colleagues reported that systemic inflammation driven myocardial microvascular abnormalities may be as important to the pathogenesis of ischemic heart disease in RA as atherosclerotic narrowing.[15]Median life expectancy is shortened by an average of 7 years for men and 3 years for women compared to healthy population[16]. Rheumatoid arthritis patients tend to experience less angina, but may experience more sudden deaths and unrecognized myocardial infarctions.

The pathogenesis of autonomic dysfunction in rheumatoid arthritis is mediated by the involvement of inflammatory mediators, auto- antibodies and endocrine abnormalities.The presence of auto antibodies against nerve growth factor, superior cervical ganglion and

vagus nerve will affect the autonomic nervous system[17]. In chronic arthritis the hypothalamic-pituitary-adrenal axis will be altered. Thus the endocrine abnormality and increased inflammatory mediators like circulating cytokines also produce autonomic system damage in rheumatoid arthritis[18].

The findings observed in our study indicate altered sympathovagal balance in early diagnosed RA patients. Hence the early diagnosed RA individuals are prone for developing cardiovascular complications.

Conclusion

From our study, we observed that there is sympathetic over activity and reduced parasympathetic activity in newly diagnosed rheumatoid arthritis individuals. Thus periodical assessment of autonomic functions by HRV analysis helps in early diagnosis and prompt intervention of cardiovascular complication in RA patients.

Conflict of Interest: None declared.

Source of Support: Nil

Ethical Clearance: Permission got from Institutional Ethical Committee, Government Stanley Medical College, and Chennai.

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DOI Number: 10.5958/2320-608X.2019.00076.3

Evaluation of Static Pupil Size Using Digital Web Camera through Image Analysis

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Abstract

Introduction: Pupillometry is the measurement of pupil area or diameter which is a key parameter of routine clinical examination in wide variety of diseases. Pupillometer is a self-contained camera that objectively measures pupil diameter. Measurement of pupil area/ diameter is known as pupillometry. Manual assessment can be done using pen torch which is subjective and qualitative measure. So the present study was aimed to measure the pupil size by infrared based web camera which is more accurate, repeatable and cost effective.

Materials and Method: A simple web camera was used where the infrared light filter was removed from the optics so as to get image under infrared light. This camera was mounted on a stand in front of the eye at a distance of 5 cm. The recordings were done in twenty normal subjects in the age group of 18 – 30 years. The captured pictures were analyzed for minimum and maximum diameter of the pupil by using the ImageJ software. One time calibration for spatial measure was done prior to measurements. This was achieved by using an image of the ruler scale kept at 5 cm.

Results: Mean dilated pupil diameter was 7.17 mm ± 1.38, Constricted mean diameter was 3.34mm ± 0.56.

Conclusion: We have developed technique to measure the pupil diameter which is cost effective. By capturing the static pictures with help of modified web camera, it can be used to identify various clinical abnormalities reflected in pupils.

Keywords: *Pupillometry, Infrared videography, ANS activity, Image analysis*

Introduction

Pupil is the central aperture of iris which allows the light rays in to the inner retinal part of eye ball[(1)]. Pupil is surrounded by two muscles that controls diameter of pupil and intensity of light rays. Sphincter pupillae is the inner circular muscle supplied by III cranial nerve (Parasympathetic stimulation) leads to constriction of pupil. Dilator pupillae is outer radial muscle innervated by sympathetic fibers from cervical ganglion causes pupillary dilation[(2)]. Thus pupillary response is involuntary and it is influenced by multiple factors like illumination, accommodation of eye, stress and cognitive load[(3–5)]. The intensity and reactivity of Pupil response alters in various clinical conditions and it act as early predictor of neuronal derangement[(6)]. The traditional method of determining pupil response is swinging flash light test where light is thrown in to eye to find out the pupil response. It is a qualitative measurement which does

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not provide much information about pupil[7]. Therefore Dynamic Pupillometry is the quantitative measurement of pupil diameter and reactivity that act as a surrogate method for various diseases and psychological status of an individual[8].

The pupillometer is the self-contained camera that measures static and dynamic responses of pupil[9]. It records the pupil response in total darkness followed by a flash of white light. The pupil dilation cannot be captured under darkness. To achieve this the eye exposed to Infrared light with wavelength of >700nm above the visual spectrum which does not elicit a pupillary light reflex. Thus Infrared illumination helps to acquire the dilated responses of pupil[10]. This measurement of pupil size in relation to time can be a vital index to know the status of Autonomic derangement, neuronal integrity in head injuries and brain tumors. It can also be used for the control of retinal illumination in visual field, electroretinography and to control pupil size under low illumination in cataract and refractive surgery[11,12]. Though Infrared light digital videography is highly advanced, still it is least used in the field of medicine as it is too expensive[13]. Therefore the present study was focused to capture static pupil diameter with the help of image analysis using Infrared video.

Material and Method

Design of Pupillometer: The Infrared based web camera was used in which Infrared filter removed from optics to get images under Infrared illumination. This camera was mounted to a stand. The subjects chin was rested on a chin rest which had the facility to change the height as per the individual subjects need. It was fixed with a micro controller based electronic circuitory to control standard intensity of Infrared and white light. The system was calibrated by fixing a normal centimeter scale at fixed distance. Later these images were taken to confirm the accuracy and reliability of the system for the measurements. Then it is proceeded with real time pupil capture and analysis[14].

Fig. 1 shows the position of camera and the subject

Study design: A cross sectional study was undertaken in which 20 healthy volunteer subjects in the age group of 18-30 years were recruited. Institutional Ethical clearance was obtained for this study from Narayana Medical College, Nellore. Entire pupillometry procedure was explained to the each subject and informed written consent was taken as per the declaration of Helsinki. All the subjects were instructed to maintain their normal sleep pattern, not to ingest beverages with caffeine or alcohol, and not to perform physical exercise before the evaluations. This test was conducted in morning after 2 hours of light breakfast. Subjects were encouraged to void urine before commence of recording. In all the procedures were done in a dark room after adapting for 5 minutes with a controlled breathing. In this method static images were taken in total darkness under infrared illumination which provides maximum dilated pupil followed by a flash of white light for 2 seconds which leads to maximum constriction of pupil. These pictures were taken by modified web camera which could capture 30 frames/sec with a resolution of 33.3 msec. / frame. These frames were subjected to Image analysis software (ImageJ ver.1.43u National Institute of Health, USA). The result was given as maximum diameter, and minimum diameter of the pupil. It is a Java-based image processing software developed at the National Institutes of Health (NIH). ImageJ was designed with an open architecture that provides extensibility via Java plugins and recordable macros. Custom acquisition, analysis and processing plugins can be developed using a built-in editor and a Java compiler. Image J built-in development environment has made it a popular platform for processing of images. The authors of current paper were established the analysis of pupil for diameter using image analysis[15].

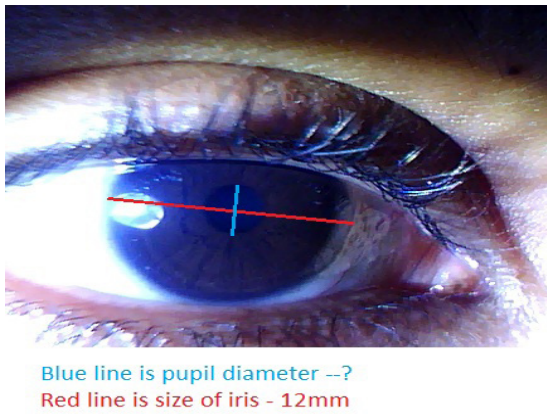


Fig. 2 shows the captured picture of pupil (Blue line) with in the iris (Red line)

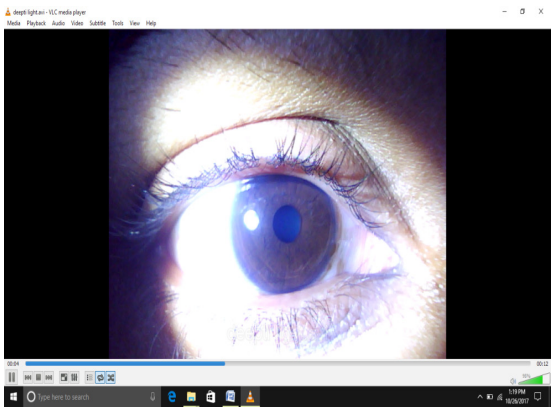


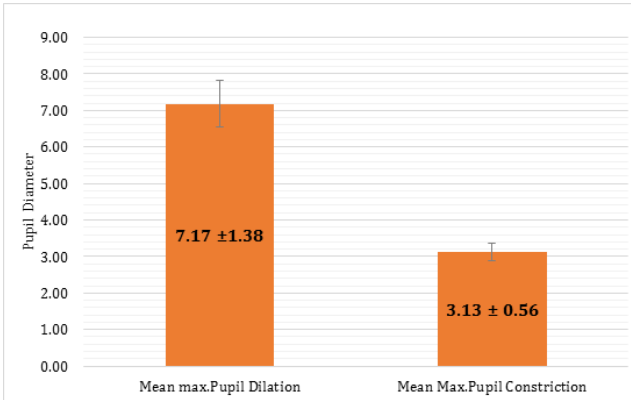
Fig. 3 shows minimum pupil diameter captured under bright light illumination

Fig. 4 shows maximum pupil diameter captured under infrared light illumination

Statistical analysis: Statistical analysis was done by SPSS 17.0 software. All data were reported as mean ± standard deviation (SD).

Results

The data obtained from the protocol were analyzed and descripted as maximum and minimum pupil diameter. Values are expressed as mean ± SD in the tables. The mean max. pupil diameter is 7.17 ±1.38 mm and mean min. pupil diameter is 3.13 ± 0.56mm. However we did not measure dynamic responses (velocities) of the pupil for constriction and dilation in different illuminations.



Graph -1 shows mean max. and min. pupil diameters

Discussion

The current study was aimed to develop a novel technique to quantify the pupil dimensions using a simple web camera. The images were captured with the help of modified web camera in different illuminations. The maximum dilated pupil was seen and captured under infrared illumination and minimum pupil was taken when the eye is exposed to flash light. These values of pupil in both types of illuminations were measured by processing the images through Image J software. The obtained results are promising and favorable to improve the quantitative pupil measurements using digital image analysis.

Pupillary examination varies with the skill of the examiner and can result in errors. Determination of pupil diameter is the vital diagnostic tool, especially in brain injuries[16]. Litvan et.al had administered an objective scale that gives inter-rater variability of pupil measurement[17]. This method is useful only in the visible light which is difficult to find out especially when the illumination is minimal. The complete dilated pupil can be captured under infrared illumination, which increases accuracy of pupil determination and does not initiate pupillary light reflex. Quantitative infrared based pupillometry can produce reliable, accurate pupil size values which provides more information than pupillary measures obtained through the direct clinical examination by the physician[18]. The relative weakness of the dilator muscle in patients with a Horner is expected to cause 'dark miosis', i.e. the pupil should remain small in complete darkness and this can be measured straightforwardly

using infra-red techniques for pupillometry. However there are a number of confounding influences that limit the usefulness of this measure as a test of sympathetic integrity[19].Kostas N. Fountas et.al and Rose Du et.al introduced the automated pupillometer (NeurOptics, Inc.,Irvine, CA) which is a hand-held, portable device with liquid crystal display screen and has an option of video recording for pupillary measurements. The accuracy and precision of the device are much higher compared to the manual examination[20–22]. Elizabeth L. Johnson et.al also used a camera that automatically captures the pupil at 7 cms. distance, with a temporal resolution of 120Hz, to evaluate task-evoked pupil dilation among children who were subjected to short term memory tasks [23]. However, these automated pupillometers are highly expensive. Pupillometry is a low-cost, noninvasive technique that may be useful for monitoring cholinergic deficits which generally lead to memory and cognitive disorders. Pupillometry demonstrates potential as an adjunct(possibly together with blood or other biomarkers) for accurate diagnosis of Alzheimer's Disease and monitoring of disease progress and response to therapy and for low-cost and noninvasive detection of preclinical, recruitment into preclinical Alzheimer's Disease therapeutic trials and also monitoring response in these trials[24].

It's a newer approach to quantify the pupil dimensions which has a modified web camera and can capture the images of pupil in different illuminations. The captured images were analyzed using Image J software which provides static dimensions of pupil accurately. We have done preliminary study to prove the concept of quantitative pupil determination which will be preceded with measurement of various parameters of pupillary light reflex.

Limitations: The interpretation of the obtained measurements requires a thorough knowledge of all the limiting factors, which could potentially alter these measurements. The time related parameters could not be analyzed at this point of time, which can be more useful in the clinical setups.

Conclusion: We have developed technique to measure the pupil diameter which is cost effective. It can be used to identify various clinical abnormalities reflected in pupils. It is also possible to get dynamic changes of pupillary responses by analyzing individual frames. In future we are planning to measure the time characteristics of pupillary responses.

Conflict of Interest: On behalf of all authors, the corresponding author states that, there is no conflict of interest.

Funding: There is no financial support for this research work and publication of the article.

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DOI Number: 10.5958/2320-608X.2019.00077.5

Assessment of Hand Grip Strength & Fine Motor Skills in Skilled & Non Skilled Persons

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Abstract

Introduction: Hand and finger strength is important as it is required for day to day activities. One of the most common methods of measuring muscle strength is by using a handgrip dynamometer. Hand grip strength is an indicator of muscle power. Pin dexterity & finger taping is a term used to explain a range of different hand abilities and performances.

Aim: To compare the Maximum Voluntary Contraction (MVC), Pin Dexterity test (PDT) and Finger tapping (FT) in skilled and non skilled persons.

Methodology: 50 skilled persons (computer operator) & 50 non skilled persons aged between 18 - 40yr in Narayana Medical Collage & Hospital were selected.

Informed consent was taken. All the subjects underwent a detailed clinical examination before being included in the study as per the study protocol. Institutional ethical clearance was taken.

MVC, PDT & FT were measured in skilled and non skilled persons (50 in each group) by using digital hand grip dynamometer, computerized finger tap recorder and modified O'Connor finger dexterity device which was in house built and calibrated.

Results: MVC values were 22Kg ± 9.2 and 26 Kg ± 12.6, PDT scores were 67± 7.9, & 66 ± 9.1 FT count was 111 ± 29.8 and 108 ± 29.2 in skilled non skilled persons. In both the groups there was -ve correlation between MVC & PDT & +ve correlation between MVC & FT. Whereas -ve correlation between MVC & PDT among 50 skilled persons.

Conclusion: Fine motor skill such as FT & PDT improves by decreasing the muscle strength in skilled persons when compared to non skilled persons.

Key words: *Maximum Voluntary Contraction, Finger Tapping, Pin Dexterity Test.*

Introduction

Muscle strength is the maximum force that can be generated by a specific muscle or muscle group. It is an index of body strength. Hand grip or grip strength means forceful flexion of all finger joints with the maximum voluntary force that the subject is able to exert under normal condition[1]. One of the most common method of measuring grip strength is by using a handgrip dynamometer. It is the only technique to asses muscle strength and a simplest method for assessment of muscle function in clinical practice[2].

Motor performance and motor skills are essential and important in various daily activities constituting a substantial part of human life, and their meaning is especially great in traffic, sports and unexpected situations. There are several motor performance such as reaction time, speed of movement, tapping speed, multi-limb coordination, complex coordination and eye - hand coordination[3] It helps in knowing the cerebellar dysfunctions. Dexterity is one of the fine motor coordination test & finger-tapping test gives information about the control and coordination of distal muscle groups in the upper limbs.

Aim : To compare the Maximum Voluntary Contraction (MVC), Pin Dexterity test (PDT) and Finger tapping (FT) in skilled and non skilled persons.

Participants

Case - 50 skilled persons (computer operator), aged between 18 - 40yr who are working in Narayana Medical Collage & Hospital were selected.

Control - 50 non skilled persons aged between 18 - 40yr who were attending outpatient department were selected.

Methodology

After getting clearance from ethics committee, informed consent was taken from all the participants and detailed clinical examination was done as per study protocol. All experiments were performed in the Department of Physiology, Narayana medical College, Nellore.

Inclusion criteria

- Males & Females
- Subjects aged 18 – 40 yrs
- Computer operators
- No History of systemic disorders
- No History of medication

Exclusion criteria

- Subjects aged < 18 and > 40 yrs
- Non computer operators
- Other systemic disorders
- History of medication
- Parameters recorded

Height & Weight

r• Height & Weight

- recorded by using Stadiometer & Digital weighing balance.

- Body Mass Index

- calculated by using a formula Weight in Kgs / Height in meter square.

- Maximum Voluntary Contraction
  - recorded by using Hand grip dynamometer.
- Finger Tapping
  - recorded by using Computerized finger tap recorder.
- Pin Dexterity Test
  - recorded by using Modified O'Connor dexterity apparatus (in house built and calibrated)

Methodology

Figure 1showing hand grip dynamometer to measure MVC

Subjects were asked to extend their arm horizontally parallel to the ground, without support and grip the dynamometer using maximum strength. 3 readings were taken, with 10 Sec gap between trials highest value was selected for analysis.

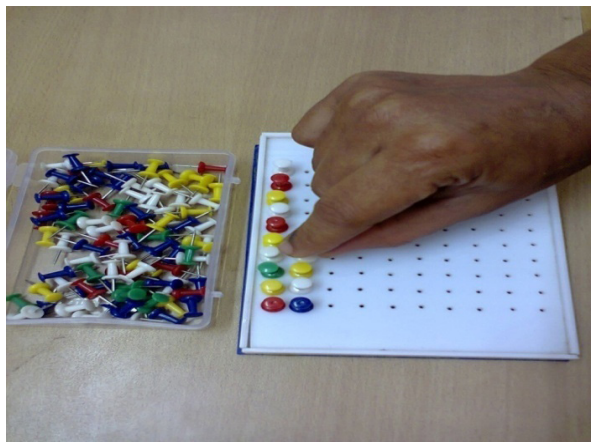

Figure 2 showing Acrylic rectangular plate with pins do Pin dexterity test

Acrylic rectangular plate which has 100 holes. Subjects should pick one pin at a time and place them

in the holes as quickly as possible. The number of pins placed within 180 sec was noted as score.

Results

Table- 1 Shows general characteristics of skilled and non skilled person

Parameters Subjects (Total=100)	Non skilled person (n=50) Mean ± SD	Skilled person (n=50) Mean ± SD
Age (yrs)	23.06 ± 2.6	25.6 ± 3.1
Height (Ft.)	5.4 ± 0.3	5.3 ±0.2
Weight (Kgs)	57.9 ± 9.9	61.9 ± 12.7
BMI	21.8 ± 3.5	23.3 ± 4.5

Results

Table – 2 Shows MVC, PDT, FT values in skilled and non skilled person

Parameters Subjects (Total=100)	Non Skilled person (n=50) Mean ± SD	Skilled person (n=50) Mean ± SD
MVC (Kgs)	26.8 ± 12.6	22 ± 9.2 *
PDT (Score)	66 ± 9.1	67.1 ± 7.9
FT (count)	108.8 ± 29.2	111.6 ± 29.8

FT & PDT improves by relative decrease in MVC in skilled person when compared to non skilled person

MVC values were 22 ± 9.2 Kg in non-skilled persons and 26 ± 12.6 Kg in skilled persons which was statistically significant. PDT scores were 67± 7.9, & 66 ± 9.1 FT count was 111 ± 29.8 and 108 ± 29.2 in skilled non skilled persons. In both the groups there was -ve correlation between MVC & PDT & +ve correlation between MVC & FT.

Whereas -ve correlation between MVC & PDT among 50 skilled persons.

Our study showed there was a decreased muscle strength and fine voluntary skilled movements were better in skilled persons when compared to nonskilled persons.

Discussion

Maximum Voluntary Contraction helps in assessing muscle strength. Finger-tapping test gives information about the control and coordination of distal muscle groups in the upper limbs. Dexterity is the "manual ability that requires rapid coordination of gross or fine voluntary movements, based on a certain number of capacities, which are developed through learning, training and experience"

Conclusion

So FT & PDT might be used as a tool to assess the motor functions and co-ordination in patients with Neurological disorders. Measurement of MVC by using hand grip dynamometer helps in assessment of muscle strength in neuromuscular disorder.

Conflict of Interest :- Nil

Source of Funding:- Self

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DOI Number: 10.5958/2320-608X.2019.00078.7

Effect of Obesity on Electrocardiographic P-Wave Dispersion among Healthy Adults

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Abstract

Background: Obesity has a strong impact on cardiovascular changes which is manifested in electrocardiogram (ECG). P-wave dispersion (Pd or PWD) is a non-invasive ECG marker for atrial remodelling and predictor of atrial fibrillation (AF). PWD is defined as the difference between the maximum and minimum P-wave duration recorded from the 12 ECG leads.

Aims and Objectives: To study the variations in electrocardiographic P–wave duration and dispersion in relation to obesity and to find out significance of these variations.

Materials and Method: A comparative cross-sectional study were conducted among 80 healthy adults of 18 to 40 years age groups. These adults were further divided into two group non–obese and obese according to their BMI. ECG recording was done for each subject and P-wave duration and dispersion were calculated in the department of physiology I.G.I.M.S, Patna.

Results: Statistically parameters were analysed by independent samples test. We found significantly higher P-wave dispersion in obese group in comparison to non- obese group ($p<0.001$).

Conclusion: Obesity lead to prolongation of P –wave duration even in younger healthy adults. This prolongation of the P-wave duration increases the possibility of left atrial enlargement and atrial fibrillation. Hence the present study helps in creating awareness among obese so that they can change their lifestyle in order to prevent the onset of the deleterious effects of obesity on their health.

Keywords: *Obesity, BMI, ECG, P-wave, P-wave dispersion, Atrial fibrillation*

Introduction

Obesity is defined as a disease process in which excess body fat has accumulated to an extent that health may be adversely affected. According to WHO classification of body mass index (BMI) a person whose BMI is more than or equal to 30 Kg/m^2 is obese and when BMI is between 18.5 to 24.99 then the person is considered normal[1]. Obesity is the first wave of a defined cluster of non-communicable diseases called 'New World Syndrome's creating an enormous socioeconomic and public health burden[2]. It has a strong impact on cardiovascular changes which is manifested in electrocardiogram (ECG)[3]. Currently it is a serious public health problem with established cardiovascular co-morbidities and a major cause of sudden death in developed as well as developing countries[4]. According to the National Family Health Survey-4 (NFHS-4) in 2015-16 conducted by Ministry of Health and Family Welfare (MOHFW) in India, the percentage of men and women aged 15–49 years who are obese are 19% and 21% respectively[5]. In a large prospective study 'Framingham Heart study' there is evidence for inclusion of obesity as a major modifiable cardiovascular risk factor by American Heart Association and also sudden cardiac death has been reported 40 times higher in obese men and women[6]. Wang et al[7] and Seyfeli et al[8] have showed that obesity as

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a potential risk factor for atrial fibrillation (AF) and P–wave dispersion is highly specific in screening healthy obese individuals for the risk of cardiovascular diseases.

It has been observed for more than last fifty years that obesity induces changes in the normal ECG pattern in young healthy adults[9]. Pd is a measure of heterogeneity of atrial refractoriness and prolongation of Pd shows the intraatrial and interatrial non–uniform conduction. Studies have shown that Pd prolongation is an independent risk factor for development of atrial fibrillation[10]. Few studies have been conducted on effect of obesity on the duration and dispersion of P–wave and it is non-invasive and cost effective tool for early detection of patients who are at risk of cardiac arrhythmias and it is also important for developing country like India. Therefore, this study was undertaken to investigate the dispersion of P–wave in healthy young adults in order to prevent them for the risk of cardiovascular disease in future.

Materials and Method

The study was conducted in the Department of Physiology, Indira Gandhi Institute of Medical Science, Patna. Design of the study was cross - sectional observational and a total 80 young healthy adults both male and female aged between 18 to 40 years participated voluntarily in the study. The study protocol was approved by the Institutional ethical committee. Written informed consents were taken from all the participants after explaining the study protocol.

Subjects were divided into two groups based on the BMI:

Group A – Normal/Non-obese (BMI: 18.5 – 24.99kg/m^2) =40 (20 males and 20 females)

Group B– Obese (BMI $\geq$ 30kg/m^2) =40 (20 males and 20 females)

Subjects with history of cardiovascular disease, respiratory disease, thyroid disorder, diabetes, smoking, neuropsychiatric disorder, menstrual abnormality etc were excluded from study.

Methods of collection of data:

Measurement of BMI:

Body weight was measured on portable weighing machine without shoes and lightly clothed, and height was measured in barefoot using stadiometer. The subject stood against a standard meter scale, ears and the infra–orbital margins lay in one horizontal plane. Body weight was recorded in kilograms on an empty bladder and before lunch. BMI was calculated as body weight in kilogram divided by the square of the body height in meters.

[BMI = Weight (kg) / Height (m^2)]

Measurement of Blood Pressure

Blood pressure (systolic blood pressure and diastolic blood pressure) was recorded in supine position in the right upper arm after the subject had rested for at least 5 minutes with standard mercury sphygmomanometer to the nearest 2 mmHg.

Electrocardiographic recording

The electrocardiographic recording was done by using 3– channel ECG machine by Medicaid India. To avoid from diurnal variations, we took ECG recordings of all subjects at the same time interval (10:00 am - 12 noon)[11]. The speed of ECG paper was 25 mm/sec and the voltage was 1mv/cm. A resting ECG was recorded in lying posture after duly assuring them the non-invasive nature of the procedure and after resting of 10 min in a well – ventilated quiet room. The subject's chest, forearms and legs were uncovered. Objects such as electronic gadgets, metallic ornaments etc. were removed to avoid interference. Location for placing electrodes on arms and legs was selected by choosing a place where there was minimum movement. Sufficient quantity of ECG gel was applied approximately 2cm on the skin at the chosen location to ensure good electrical contacts. Limb electrodes were clipped to subject's skin to give proper contact. Chest leads were placed over six different locations. Care was taken so that gel does not smear between the chest electrode sites.

Measurement of P-wave dispersion (Pd)

All ECG papers were scanned and digital files were created. Then after doing 200% magnification P-wave duration was measured using Adobe Photoshop-7 software. Pd was derived by subtracting the minimum P-wave duration from the maximum in any of the 12 ECG leads. P-wave onset was determined as the initial deflection from the isoelectric baseline defined by the T-P segment and the P-wave offset was defined as the junction of the end of the P wave and its return to

baseline[12].

Statistical analysis:

The data was compiled in Microsoft excel and analysed using SPSS (Statistical Package for Social Sciences) version 20. The variables were expressed as mean and standard deviation, and P value <0.05 was considered statistically significant. Independent sample t-test was used to compare the results of obese to non-obese control group subjects.

Results

The results were expressed as mean± standard deviation. There was no significant difference in age, sex and height between obese and non –obese group but a significant difference were found in weight and BMI between groups (Table 1)

Table1: Comparison of baseline anthropometric data between non-obese and obese group.

Parameters	Group A (Non-obese) (N=40)	Group B (Obese) (N=40)	p – value
Age (Years)	23.10±4.67	28.80±3.38	NS
Weight (Kg)	57.57±7.88	81.27±7.67	<0.001
Height (meter)	1.61±0.08	1.57±0.06	NS
BMI(Kg/m^2)	22.11±1.88	32.71±2.07	<0.001

Obese group had higher SBP, DBP, HR, maximum P-wave duration, minimum P-wave duration and P-wave dispersion compared to non-obese and statistical significant (p<0.001) was found (Table 2).

Table 2: Baseline assessment of cardiovascular parameters (Blood pressure, Heart rate and P-wave duration and dispersion)

Variables	Group A (Non-obese)	Group B (Obese)	p- value
SBP (mm of Hg)	113.30±7.86	128.15±6.03	<0.001
DBP (mm of Hg)	75.60±5.03	84.20±3.64	<0.001
HR (b/m)	78.55±4.17	87.50±8.98	<0.001
Pmax (ms)	88.60±13.75	116.10±6.29	<0.001
Pmin (ms)	54.75±10.57	70.10±7.37	<0.001
Pd (ms)	34.15±5.96	46.15±5.48	<0.001

SBP- Systolic blood pressure, DBP – Diastolic blood pressure, HR- Heart Rate, Pmax- P wave maximum, Pmin- P wave minimum, Pd- P wave dispersion.

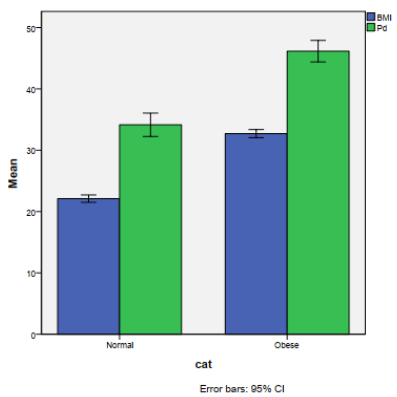

Figure 1: Showing mean values P-wave dispersion in non-obese (normal) and obese groups.

Discussion

The resting ECG has proved its value as a diagnostic tool for detecting "silent" heart disease[13,14]. Apart from its use in the clinical context, the ECG has been employed as a prognostic tool in apparently healthy subjects. An increase in body fat significantly alters the autonomic functioning of an individual, cardiovascular functions being one of them. An obese individual has altered cardiovascular parameters which get reflected in various ECG variables.

P wave dispersion is an easy, simple, and non-invasive electrocardiographic marker to predict atrial

arrhythmias such as AF[15] and its maximum duration represents atrial activation time. The clinical significance of P-wave duration has been demonstrated in many conditions such as paroxysmal AF, obesity, hypertension and coronary artery disease etc[16,17,18].

In our study, statistically significant increase in heart rate, systolic blood pressure and diastolic blood pressure was found in obese when compared to non-obese individuals. Similar findings were reported by Alberto Salvadori et al.[19], Hugh R. Peterson et al.[20], Narkiewicz et al.[21] and Gilles Paradis et al.[22]. Activation of the sympathetic nervous system occurs early in the course of obesity and it is an important contributor to the regulation of both the cardiovascular system and energy expenditure[23]. Studies showed that heart rate increases with increase in percentage of body fat. A 10% increase in body weight is associated with a decline in parasympathetic tone accompanied by a rise in heart rate and conversely, heart rate declines during weight reduction. This is of importance because higher heart rate is associated with increased mortality rates. Julius S et al. reported a positive relationship between heart rate and development of hypertension in adolescents[24].

In our study, obese subjects had significantly higher P- wave maximum duration, minimum P–wave duration and P-wave dispersion compared with non-obese. Thus, it can be said that P wave duration is longer in obese individuals. Left atrial enlargement leads to atrial fibrillation which contributes to increase in the P wave duration. In obese individuals, left atrial enlargement and electrical instability may be caused by elevated plasma volume, ventricular diastolic dysfunction and enhanced neurohormonal activity. In addition, the autonomic control of the heart is abnormal in obese subjects due to prevalence of sympathetic over parasympathetic limb of the autonomic balance. This affects intraatrial and interatrial conduction times and leave them prone to develop atrial arrhythmias, such as atrial fibrillation. Duru and his colleagues noted that P wave duration and dispersion significantly decreased after substantial (10%) weight loss and the decrease in the level of P wave dispersion clearly correlated with the percentage of weight loss[25]. The present study is concurrent with Kosar F et al[26]. and Liu T et al[27]. who have reported that left atrial enlargement may influence the P-wave duration.

Therefore, structural and eletrophysiological changes in the atrial myocardium caused by weight gain play a role in the prolongation of P-wave. Furthermore, interstitial fibrosis of myocardium can cause prolongation of PD by forming heterogeneity in atrial conduction velocity and atrial refractoriness in obese subjects.

Limitations:

1. We did not classify whether obesity in our participants was central or visceral.

2. We did not measure neurohumoral parameters and did not perform echocardiography to measure left atrial size.

Conclusions

Obesity leads to significant increase in systolic blood pressure, diastolic blood pressure and heart rate, thus increasing the risk of coronary heart disease and hypertension in these subjects. Prolongation of the P-wave duration increases the possibility of left atrial enlargement and atrial fibrillation.

Thus, it can be concluded that apparently healthy obese individuals may have higher anthropometric values and abnormal P–wave findings. Hence the present study gives an insight on the variations in P-wave in healthy adults who are obese and thereby helps in creating awareness so that; they can change their lifestyle in order to prevent the onset of the deleterious effects of obesity on their health.

Acknowledgement: We would like to thank Prof. (Dr.) Ashok Sharan, our Head of Department and mentor who helped to conduct this study, and to the participants without whom this study could not be performed.

Conflicts of Interest: There are no conflict of interest in this work.

Source of Funding - Self

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DOI Number: 10.5958/2320-608X.2019.00079.9

Effect of Controlled Breathing on Heart Rate Variability in Newly Diagnosed Hypertensive Individuals

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Abstract

Introduction: Hypertension represents a multifactorial disease of blood pressure (BP) regulation with persistently elevated systolic and/or diastolic BP over 140/90mmHg.Autonomic dysfunction and metabolic disorders lead to Hypertension. The Heart Rate Variability Analysis (HRV) is a powerful tool in the assessment of the cardiac autonomic nerve function. It is a non-invasive, reliable, reproducible procedure, simple to measure and process and is indicative of the autonomic status of an individual.

Aim and Objective: 1. To assess the Cardiovascular Autonomic Function in Newly diagnosed Hypertensive individuals using HRV as a tool. 2. To study the effect of one minute controlled deep breathing on HRV among newly diagnosed hypertensives.

Materials and Method: A cross-sectional study was conducted on 30 newly diagnosed primary hypertension subjects and 30 age matched healthy controls of age between 35 - 50 years. The study was conducted after getting Institutional Ethical Committee clearance and Informed Written Consent from all the participants. RMS Polyrite D Hardware 2.2 system was used to assess the autonomic status of the subjects.

Results: The results obtained were statistically analyzed using SPSS software version 21.0. The mean values of all the time domain parameters were found to be significantly reduced in hypertensives when compared with the controls. In frequency domain analysis LF/HF was significantly increased in hypertension subjects. A significant increase ($p<0.05$)in time domain parameters was seen in hypertensive subjects after one minute controlled deep breathing. The LF/HF was also reduced following controlled deep breathing.

Conclusion: Autonomic dysfunction may contribute to the development of many cardiovascular complications in Hypertension, which can be detected by HRV. Reduced HRV after controlled breathing in hypertensives signifies the role of Life style modifications like Yoga, meditation and exercise in reducing the Cardiovascular risk.

***Keywords**: Hypertension, Heart Rate Variability, Controlled Deep Breathing, Autonomic dysfunction.*

Introduction

Hypertension is defined as a blood pressure of ≥140/90mmHg (JNC criteria 7th Report)[1] Hypertension is an increasingly important medical and public health issue. Increasing age, body mass index, smoking, diabetes, extra salt intake and genetics are common risk factors. Hypertension (HTN) is a modifiable and major risk factor for coronary artery disease, heart failure, cerebrovascular disease and chronic renal failure. Overall prevalence for hypertension in India is 29.8% (95% confidence interval: 26.7–33.0). [2] Hypertension is attributable to 10.8% of all deaths in India.[3] HTN is directly responsible for 57% of all stroke deaths and

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24% of all coronary heart disease (CHD) deaths in India.[4] NNMB tribal survey (2008-09) estimated the prevalence of hypertension among men and women was 25% and 23% respectively[5].

The mechanisms involved in regulation of BP are mainly neural, hormonal and renal control. Among them, neural control by ANS is the most important regulatory mechanism of short term regulation of blood pressure. ANS dysfunction is an important factor in the onset and progression of hypertension.[6]

HRV can be used as a investigative tool to assess the Cardiovascular Autonomic Function.HRV refers to the beat to beat alteration in heart rate i.e. the oscillation in the interval between consecutive heart beats as well as the oscillation between consecutive instantaneous heart rate. A reduction in HRV is associated with increased risk of cardiac mortality.[7] These autonomic changes occurring in the pathogenesis of essential Hypertension can be best studied by using HRV analysis.HRV deep breathing is a reliable and sensitive clinical test for early detection of cardio-vagal dysfunction in a wide range of autonomic disorders.[8]

Aim and Objective

To assess the cardiovascular autonomic function in newly diagnosed hypertensive individuals using HRV as a tool.

To study the effect of one minute controlled deep breathing on HRV among newly diagnosed hypertensives.

Methodology

This is a cross sectional Study. The study consisted of two groups: 30 Newly diagnosed hypertensive patients, between the age group of 35-50 yrs, of both genders as cases and 30 age and gender matched normal healthy individuals as Controls. The cases were recruited from the Medicine OPD of Stanley Medical College & Hospital. The Patients with hypertension on medications, and those with symptoms of acute target organ damage viz angina, dyspnoea, orthopnoea,or with evidence of co-morbid cardiovascular disease (Myocardial infarction, Symptomatic heart failure) were excluded from the study. Subjects with history of Diabetes Mellitus, COPD, renal failure, cerebrovascular disease were also excluded. The study was conducted after getting clearance from the Institutional Ethical Committee. All the participants gave their written & informed consent for the study.

The tests were performed in the AFT lab of the Department of Physiology, Stanley Medical College, between 10 AM and 1 PM. The lab environment was quiet, the temperature was maintained between 25 to 28˚C and the lighting subdued. Subjects were asked to empty their bladder before the tests.

All the subjects underwent detailed clinical examination. Anthropometric measurements height and weight were recorded. Subjects were seated quietly for at least 5 minutes in a chair, with feet on the floor, and arm supported at heart level BLOOD PRESSURE was recorded using JNC 7 standard protocol.

HRV

The recommendations of the Task Force 1996 were followed for HRV. ECG was acquired using RMS Polyrite D Hardware 2.2(India) An RR series was extracted from ECG using maximum amplitude and sharpness for the peaks for R wave detection, these are RMS proprietary algorithms and validated with Fluke biomedical, USA. After exclusion of artifacts and ectopics a stationary 256s RR series was chosen and analyzed using RMS 2.5.2 software on a window based PC. Respiratory movements were recorded using respiratory belt which analyses inspiration and expiration. Time domain analysis was used for long term HRV changes and frequency analysis was used for short term HRV changes

In our study, ECG was first recorded for 5 minutes with the eyes closed and with normal quiet respiratory movement for both case and control group to determine the HRV at supine rest. The case group was then instructed to breathe slowly and deeply at the rate of 6 breaths per minute in such a way that they take 5 seconds for inspiration and 5 seconds for expiration and ECG was recorded to determine HRV on one minute Controlled deep breathing

Results

The data collected were statistically analyzed using SPSS-21.0 version. Independent T test was used to compare between cases (newly diagnosed HTN) and controls (healthy individuals). ANOVA test was used to compare between three groups followed by POST HOC

TUKEY test. P value <0.05 was considered as statistically significant.

Table 1: Comparison of general parameters between controls & cases

	Controls	**Cases**	**p-value**
	Mean ± SD	**Mean ± SD**	
Age in Yrs	44.06 ± 5.45	44.06 ± 5.48	1.00
Ht cm	163.86 ± 6.85	163.76 ± 6.75	0.96
Wt kg	64.16 ± 10.30	63.90 ± 10.93	0.92
BMI kg/m^2	24.02 ± 4.52	23.81 ± 3.72	0.84
RHR beats/min	68.40 ± 8.6	78.00 ± 11.31	< 0.01**
SBP mmHg	113.00 ± 18.03	158.00 ±17.72	< 0.01**
DBP mmHg	75.86 ± 9.49	99.53 ± 10.01	< 0.01**

Table 2: Comparison of HRV parameters between controls and in cases before & after 1 minute controlled deep breathing – ANOVA test

HRV parameters	**Controls**	**Cases**	**Cases – Post Controlled Breathing**	**P –value**
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	
Mean RR sec	0.891 ± 0.10	0.788 ± 0.12	0.837 ± 0.11	<0.01**
SDNN ms	49.79 ± 12.21	26.58 ± 15.81	41.72 ± 13.15	<0.001***
RMSSD ms	42.19 ± 10.21	16.30 ± 5.59	35.19 ± 13.73	<0.001***
pNN50 %	25.52 ± 7.57	6.98 ± 3.77	15.70 ± 8.69	<0.001***
LFnu	55.79 ± 15.35	71.12 ± 6.49	65.53 ± 6.00	<0.001***
HFnu	44.27 ± 15.27	30.03 ± 6.74	34.47 ± 6.00	<0.001***
LF/HF	1.49 ± 0.73	2.56 ± 0.88	1.99 ± 0.57	<0.001***

Table 3: Comparison of HRV parameters between control and cases – Post Hoc - Tukey test

HRV parameters	**Controls**	**Cases**	**P –value**
	Mean ± SD	**Mean ± SD**	
Mean RR sec	0.891 ± 0.10	0.788 ± 0.12	<0.001***
SDNN ms	49.79 ± 12.21	26.58 ± 15.81	<0.001***
RMSSD ms	42.19 ± 10.21	16.30 ± 5.59	<0.001***
pNN50 %	25.52 ± 7.57	6.98 ± 3.77	<0.001***
LFnu	55.79 ± 15.35	71.12 ± 6.49	<0.001***
HFnu	44.27 ± 15.27	30.03 ± 6.74	<0.001***
LF/HF	1.49 ± 0.73	2.56 ± 0.88	<0.001***

Table 4: Comparison of HRV parameters between control and in cases after controlled breathing – Post Hoc - Tukey test

HRV parameters	Controls	Cases – Post Controlled Breathing	P –value
	Mean ± SD	Mean ± SD	
Mean RR sec	0.891 ± 0.10	0.837 ± 0.11	0.15
SDNN ms	49.79 ± 12.21	41.72 ± 13.15	<0.05*
RMSSD ms	42.19 ± 10.21	35.19 ± 13.73	<0.05*
pNN50 %	25.52 ± 7.57	15.70 ± 8.69	<0.001***
LFnu	55.79 ± 15.35	65.53 ± 6.00	<0.01**
HFnu	44.27 ± 15.27	34.47 ± 6.00	<0.01**
LF/HF	1.49 ± 0.73	1.99 ± 0.57	<0.01**

Table 5: Comparison of HRV parameters in cases before and after controlled breathing – Post Hoc - Tukey test

HRV parameters	Cases	Cases – Post Controlled Breathing	P –value
	Mean ± SD	Mean ± SD	
Mean RR sec	0.788 ± 0.12	0.837 ± 0.11	<0.05*
SDNN ms	26.58 ± 15.81	41.72 ± 13.15	<0.001***
RMSSD ms	16.30 ± 5.59	35.19 ± 13.73	<0.001***
pNN50 %	6.98 ± 3.77	15.70 ± 8.69	<0.001***
LFnu	71.12 ± 6.49	65.53 ± 6.00	<0.01**
HFnu	30.03 ± 6.74	34.47 ± 6.00	<0.01**
LF/HF	2.56 ± 0.88	1.99 ± 0.57	<0.01**

Discussion

The Autonomic Nervous System influences blood pressure and heart rate through adjustments in parasympathetic and sympathetic activity. Parasympathetic and sympathetic activities are tightly regulated through baroreflex mechanisms. The arterial baroreflex is an important neural feedback mechanism by which blood pressure (BP) is regulated in humans. An acute rise in BP causes baroreceptor activation with afferent signaling to the Nucleus Tractus Solitarii, eliciting reflex parasympathetic activation and sympathetic inhibition. The subsequent decreases in heart rate, cardiac contractility, vascular resistance, and venous return help maintain systemic BP homeostasis. Therefore, baroreflexes have a pivotal role in short term cardiovascular regulation and buffer-excessive blood pressure swings.

The Resting heart rate was increased significantly in the hyperstensive subjects, which might be due to an increase in centrally originating oscillations in sympathetic drive to the heart. This is similar to the findings observed in Singh et al 1998. The SDNN was significantly decreased in the hypertensives ($p < 0.01$**). The findings are in accordance with Radaelli et al 1994: Huikuri et al 1996; Singh [7] et al 1998; E.S.Prakash[13] et al 2005. pNN 50 and RMSSD are measures of high frequency variations in HR and are highly correlated.[9] In our observations the RMSSD and pNN50 were significantly reduced ($p < 0.01$**) in the hypertensives. This is in accordance with Singh et

al 1998. All these observations are a pointer towards a reduced parasympathetic activity in the hypertensives.

In Frequency Domain the LF/HF ratio was significantly increased in the hypertensives. ($p < 0.05$*). LF n.u. is significantly increased in hypertensives, this finding is similar to that reported in ES Prakash et al 2005. HF n.u. is significantly decreased in hypertensives ($p < 0.05$*). The findings observed in frequency domain measures may be due to increased centrally originating oscillations in sympathetic drive to the heart and blood vessels.

Respiration has a significant effect on the HR oscillations and parasympathetic activity is very closely related to respiratory sinus rhythm. HRV during timed deep breathing is a major index of HR variation in the time domain because it has been shown to be one of the most reliable and reproducible markers of parasympathetic modulation of cardiac function.[10] The SDNN, RMSSD and pNN50% were significantly increased in the hypertensives after one minute controlled deep breathing($p < 0.001$*).This might be due to relative increase in vagal activity and a reduction in sympathetic activity observed during slow breathing. Slow breathing may reduce sympathetic activity by enhancing central inhibitory rhythms. The increase in tidal volume, which compensates for the reduced breathing rate in order to maintain minute ventilation[11] could be responsible for these autonomic changes through a reduction in sympathetic activity[12] The HFnu showed a significant increase, while LFnu and LF/HF were significantly decreased after one minute controlled deep breathing($p < 0.01$*).

Reduced HRV in Newly diagnosed hypertensives clearly indicates that cardiac vagal effects are diminished in this condition. This may possibly be due to diminished baroreflex sensitivity[(13)]. The HRV parameters significantly improved after one minute controlled deep breathing both in controls as well as newly diagnosed Hypertensives. The improvement was more significant in the newly diagnosed hypertensive group before and after controlled breathing. This might be attributed to the increased vagal activity and reduction in the sympathetic activity.

Conclusion

Our study has shown a significant reduction of HRV in Newly Diagnosed Hypertensives compared with controls which is highly suggestive of cardiovascular autonomic impairment.

HRV parameters showed a significant improvement after controlled breathing in hypertensives. Hence HRV may be used as a tool in addition to the blood pressure measurement to assess the underlying autonomic disturbances in newly diagnosed hypertensive individuals. Life style modifications like Yoga, meditation and exercise may improve the parasympathetic component of ANS which in turn will improve HRV and reduce cardiovascular risk.

Limitations of the Study:

1. Small sample size

2.This study would have been more effective had the Post controlled breathing HRV recordings, taken in control group and subsequently compared with post controlled breathing of Newly diagnosed Hypertensives.

Conflict of Interest :None

Source of Funding : None

Ethical Clearance: The study was approved by the Institutional Ethical Committee.

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DOI Number: 10.5958/2320-608X.2019.00080.5

Do Mental Arithmetic Tasks affect Visual Evoked Potential?

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Abstracts

Background & Objectives- VEP is used to evaluate functional integrity of visual pathway. Objective of study is to see that stimulus other then light, during recording of VEP, can change the result of VEP.

Method- 200 healthy candidates of age between 18yrs -22yrs of both sexes were enrolled. At first, recording of VEP was done without any disturbance. Candidates were asked few arithmetic tasks verbally while recording VEP for second time.

Results- Analysis of latency of N75, P100 and amplitude of N75-P100 was done. There was no statistical significant difference in latency of N75 and P100 but there was significant statistical difference in amplitude of N75-P100. The p-Value for right eye is 0.0031 and for left eye 0.0299 for amplitude of N75-P100.

Interpretation & conclusion-Arithmetic task makes mental processing very active and it affects the result of VEP thus it must be taken in to consideration while recording of VEP in any patient.

Keywords*: VEP, Latency N75, Latency P100, Amplitude of N75-P100 Arithmetic tasks.*

Introduction

Visual evoked potentials are visually evoked electrophysiological signals extracted from electroencephalographic activity in the visual cortex recorded from the overlying scalp. As visual cortex is activated primarily by the central visual field, VEPs depend on functional integrity of central vision at any level of the visual pathways including the eye, retina, the optic nerve, optic radiations and occipital cortex.[1]

Visual evoked potentials (VEPs) are used to interrogate the visual pathway from the retina up through high-level visual cortices.[2]

Preliminary experiments show that these fluctuations in evoked potentials depend on movement of the eye and eyelid, intensity of the flashes and mental state as indicated by flash counting (attention), conversation (distraction), and mental arithmetic (problem solving) among other factors.[3]

Attention to the evoking stimulus tends to result in increased amplitude and decreased latencies but while distraction due to assigned task or another stimulus produces the opposite results [4] Significant effects were seen with field strength and scalp topography when subjects were actively processed with stimuli. Processing anagrams was accompanied by larger field strength than mental arithmetic.[5]

During VEP recording with use of LED goggles patient is able to hear the various sounds around him along with visual stimulation. Objective of study is to evaluate the effect of auditory mental arithmetic task while recording VEP in healthy subjects. Stimulus other then light, during recording of VEP, can change the result of VEP.

Material and Method

A This study was carried out in the Department of Physiology (Neurophysiology laboratory) in L.N.Medical College and Research Center, Bhopal. 200

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healthy candidates of age between 18yrs -22yrs of both sexes were enrolled after fulfilling exclusion criteria, for study after approval from Institutional Ethical committee.

Exclusion criteria for selection of the candidates were:-

- H/O eye surgery
- Color-blindness.
- H/O seizures.
- Candidates on anti-depressants.

Pre-requisites –

- Candidates should make hairs oil free before test.
- To take good sleep and normal meal.
- To remove contact lenses during procedure.

Device used for recording of VEP -EMG Octopus by Clarity Medical Private Limited ISO9001 & ISO13485.

Technical setting for recording of VEP used was-

Channels –

- Active – Mid-Occiput - Oz.
- Reference – Mid Frontal - Fz.
- Ground – On hair line of fore-head - Cz.

Band Pass –

- Low filter = 2Hz.
- High Filter = 200 Hz.

Number of epochs given = 200.

Rate of stimulation was 2Hz.

After fulfilling exclusion criteria and history and he/she was asked to sit on a comfortable chair facing in opposite direction from the recording monitor. Candidate was well informed about the procedure. Electrodes were placed with the gel over the positions mentioned above as per 10-20 system after cleaning the area before hand.LED goggle has been worn to the candidate and impedence check was done which was maintained below 5KΩ. Collection of data done by stimulation the right eye first then left eye at above mentioned rate and epochs as basic recording with visual stimulus only. After half hour interval recordings for both eyes were repeated one by one. During this recording after 50 epochs arithmetic tasks ware asked to each candidate to solve along with the continuation of visual stimulus and it continued up to 200 epochs of visual stimuli. Analysis of recorded data has been done by using Graph Pad online calculator and tables and graph with help of Microsoft office and excel worksheet.

Various arithmetic tasks which were asked to the candidates are as follows –

12×8, 11 x7, 9x8, 17x6 ,19x5, 22x 4 etc

Result

Data collected and analysed for Latency of N75 and P100 and amplitude of N75-P100. Paired t-test applied for analysis. Results of all parameters are as tables given below.

Table no -1 Latency of N75 (ms)

(n=200)

	At rest		**During arithmetic task**		**p-value**
	Mean	**SD**	**Mean**	**SD**	
Right eye	63.851	11.915	63.739	10.616	0.9246
Left eye	66.9885	13.6046	67.3088	12.7705	0.7845

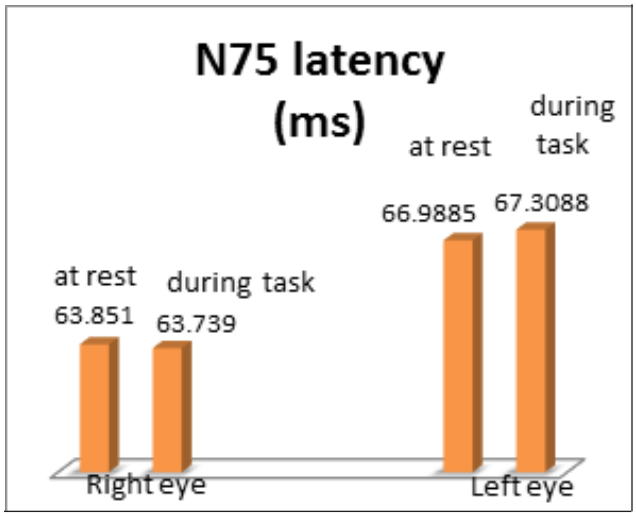
Table no -2 Latency of P100 (ms)

(n=200)

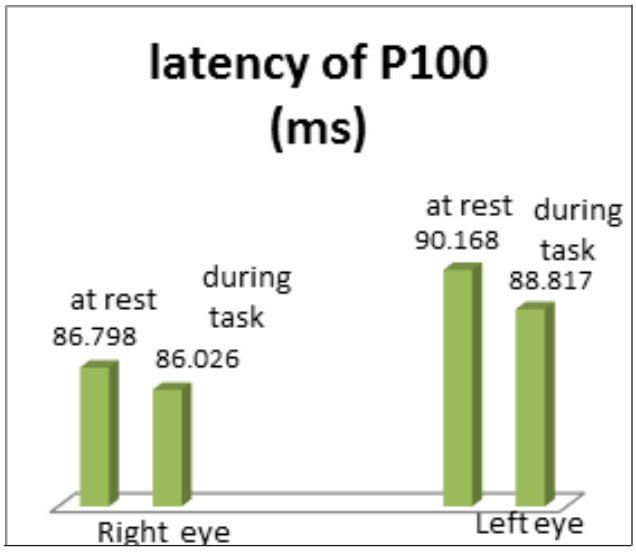
	At rest		**During arithmetic task**		**p-value**
	Mean	**SD**	**Mean**	**SD**	
Right eye	86.798	14.157	86.026	14.720	0.6024
Left eye	90.168	18.428	88.817	17.640	**0.4388**

Table no -3 Amplitude of N75-P100 (μV) (n=200)

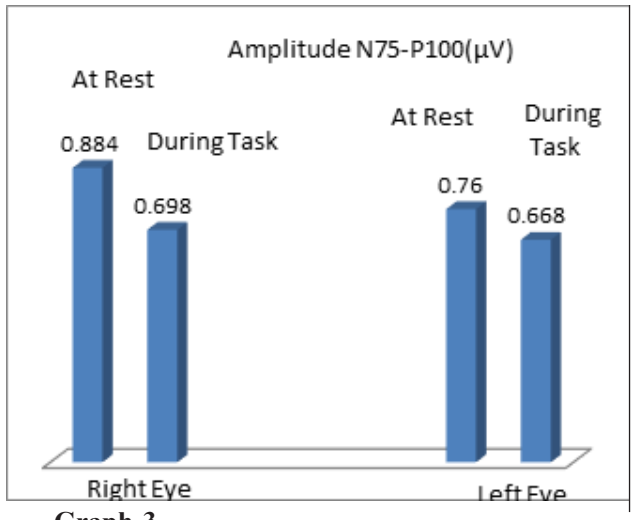
	At rest		During arithmetic task		p-value
	Mean	SD	Mean	SD	
Right eye	0.884	0.754	0.775	0.698	**0.0031**
Left eye	0.760	0.524	0.668	0.626	**0.0299**



Graph -1.



Graph-2



Graph-3

Discussion

Latencies of N75 and P100 for both eyes have not shown any statistical significant difference between the recordings, at rest and during auditory arithmetic task.

But in case of amplitude of N75-P100 has shown significant statistical difference comparing both recordings. During arithmetic task was amplitude decreased showing change in mental state and activation of area of brain related to this task and decreasing attention towards visual stimulus. This result also shows that in population right eye dominant persons are more thus p-value is giving more significant result for right eye then left eye. Charls T Ramussen et al has given the same finding while assessing cortical evoked potential as a function of arithmetic computation that there was no shift of latency while doing experiment. They had also shown that there were differences in amplitude while performing the task.[4] .

In a study of topography of evoked brain activity during mental arithmetic and language task has shown that there was difference in amplitude and latency[5]

Numerical working memory ability is proved to be associated with centro-parietal area of the brain and change in amplitude of the wave evoked from this area had shown while doing visual evoked relatedpotentials.[7]

Conclusion

Result of study had shown that active mental processing cannot change the latency significantly but there is significant change in amplitude of N75-P100 while ongoing task. Emphasis is done on that while

recording VEP subject or patient should be in complete mental and physical rest otherwise there may be wrong interpretation of VEP and it may give wrong diagnosis.

In future this type of studies can be done in different age group subjects as well as patients.

Acknowledgment: We are thankful to all the participants who were from staff of institution, attendants of patients and labourers from nearby construction sites. Thanks for cooperation of departmental seniors and juniors as well as lab technicians.

Source of funding: Self

Conflict of interest: Nil

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DOI Number: 10.5958/2320-608X.2019.00081.7

A Comparative Study of Systolic Blood Pressure, Diastolic Blood Pressure, Mean Arterial Pressure and Pulse Pressure between Urban and Rural Population

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Abstract

Hypertension is a commonest cardiovascular disorder affecting more than 30% of the adult population in many countries. It is considered to be one of the important risk factor for cardiovascular disease, diabetes , stroke and CKD. It is projected that by the year 2020 it will cause a global burden.[17] It is seen that death and disability from coronary heart disease and CKD are increasing so quickly that the public health authorities are facing a challenge in controlling it. New research has shown that the risk of brain lesions was higher in people with higher average systolic pressure. Researchers discovered increased biomarkers for Alzheimer's in the brains of older patients with high blood pressure. [21]. Obstructive sleep apnea [3] is also associated with hypertension. The M.A.P and P.P both are associated with ischemic stroke [4] . MAP is a critical hemodynamic factor in the regulation of blood pressure, an inadequate flow to organs may cause syncope and shock. It is seen that rise in blood pressure has become a major risk factor for premature disability and death worldwide. Taking into consideration all of the above factors and the different life styles of the urban and rural population this study was under taken . A total of 200 subjects were included in the present study. In this study we measured the S.B.P , D.B.P, M.A.P and P.P. It was noticed that there was a significant rise in systolic and diastolic blood pressure as well as the mean arterial pressure and the pulse pressure in the urban population compared to the rural population.

Key words: *SBP systolic blood pressure, DBP diastolic blood pressure, M.A.P mean arterial pressure. P.P pulse pressure, CKD chronic kidney disease*

Introduction

The National high blood pressure education program me (NHBPEP) showed that high blood pressure was a major unsolved but solvable mass public health problem. The new WHO-ISH classification [6] of hypertension is that between 130/80 -140/90 mm Hg. above is considered a high blood pressure. The increase in cardiac output increases the systolic pressure, where as an increase in the peripheral resistance increases the diastolic pressure. An important cause of the systolic pressure rise is the decreased distensibility of the arteries and at the same level the cardiac output. The positive association between the systolic and the diastolic pressure [7] and the risk of cardiovascular disease is a well established factor. The pulse pressure represents the blood pressure variation and is effected by large artery stiffness and left ventricular ejection which is estimated by mean arterial pressure [19]. There is a strong association between overweight and hypertension[9]. High fad diets leads to obesity [10, 12]. Men who have waist circumference more than 102 cm have a strong likelihood of developing several disorders, including hypertension.[14] In obese persons plasma insulin and leptin concentrations increase and insulin is a determinant of hypertension[11]. The polycystic ovarian syndrome is associated with hypertension, insulin resistance, and increased activity of the sympathetic nervous system[5]. Diabetic renal disease has the most important influence [20] on blood pressure. Taking into consideration the differences in the life

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styles of the urban and rural population it was found that the adoption of western lifestyle and quickening pace of change as well sedentary habits, less physical[2] exercise , unhealthy food habits like consumption of processed and junk food with less fiber, smoking, alcohol ,obesity and mental stress[1] which are important predisposing factors for hypertension are found to be more prevalent in the urban population.

Materials and Method

The study involves 200 subjects out of which there are fifty males and fifty females both from urban and rural areas .This study was done in Charminar area of Hyderabad and in the Jalpally village which is about 250 km from the Hyderabad city independently by the authors. After getting ethical clearance, the subjects were selected in the age group of 20 to 60 years [6] this was done in accordance to Joint National Committee guidelines . The subjects were supposed to be healthy with no history of any other relevant diseases and were not on any other therapy. The subjects whom we have selected are non- smokers , non-alcoholic and non-hypertensive. Data on demographic characteristics, medical history , and habits was obtained with the use of standard questionnaire administered by a trained technologist. The subjects were put on a questionnaire regarding their life style ,food habits, salt intake alcohol ,smoking, exercise, sleeping, drinking, education employment divorce was asked to each participant. The consent of the subjects was taken. The following parameters were measured; AGE, HEIGHT, WEIGHT ,SBP,DBP,M.A.P. and P.P. Measurements were done between 8-10 AM , and the blood pressure was recorded using Littman's stethoscope and mercury manometer in sitting posture. Measurements were taken three times . Care was taken to give five minutes rest to the subject prior to the first measurement .The second measurement was taken after 30 minutes. The average of the three readings was taken as the blood pressure of the individual. The PP is calculated as the difference of SBP and DBP. The MAP is calculated as DBP plus one third of PP. Statistical analysis was done and data obtained was analyzed for comparison of two groups urban and rural by using F test .

Results

1. In table no:1-the test parameters of all subjects are shown.

2. In table no:2-the systolic blood pressure of both rural and urban population is compared using F test and a p value of 0.42 is obtained.

3. In table no:3-the diastolic blood pressure of both rural and urban population is compared and analyzed by using F test and we got a p value of 0.0025

4. in table no:4-the pulse pressure of both rural and urban population is compared by F test which shows a p value of 0.037

5.In table no:5-the mean arterial pressure of both rural and urban population is compared by using F test where we got a p value of 0.0003

Table no:1

	RURAL SBP	URBAN SBP	RURAL DBP	URBAN DBP	RURAL PP	URBAN PP	RURAL MAP	URBAN MAP
N	60	100	60	100	60	100	60	100
MEAN	121.8	136.69	77.18	88.84	43.66	47.99	91.52	105.24
S D	101.12	9.93	5.67	7.99	8.61	8.31	6.41	9.72
S E	1.30	0.993	0.73	0.79	1.11	0.83	0.82	0.972
MAX	140	180	90	130	70	70	103.3	146.9
MIN	100	110	60	80	30	30	73.3	73.2
CL 95.0%	2.61	1.97	1.46	1.58	2.22	1.65		

Table No:2 F-Test Two-Sample for Variances (SBP)

	Rural	Urban
Mean	121.0833333	136.69
Variance	102.450565	98.66050505
Observations	60	100
Df	59	99
F	1.038415168	
P(F<=f) one-tail	0.428004279	
F Critical one-tail	1.454002295	

Table No:3: F-Test Two-Sample for Variances (DBP)

	Variable 1	Variable 2
Mean	77.18333333	88.84
Variance	32.2539548	63.91353535
Observations	60	100
Df	59	99
F	0.504649831	
P(F<=f) one-tail	0.002511158	
F Critical one-tail	0.672974585	

Table No. 4: F-Test Two-Sample for Variances (P.P)

	Rural	Urban
Mean	43.66666667	47.79
Variance	74.15819209	69.19787879
Observations	60	100
Df	59	99
F	1.071683025	
P(F<=f) one-tail	0.375552981	
F Critical one-tail	1.454002295	

Table No. 5: F-Test Two-Sample for Variances (MAP)

	R_MAP	U_MAP
Mean	91.52166667	105.2547
Variance	41.14511582	94.57648173
Observations	60	100
Df	59	99
F	0.435045955	
P(F<=f) one-tail	0.000355248	
F Critical one-tail	0.672974585	

Discussion

The Blood pressure problem involves most of the population. A greater potential exists for improved health and longevity through control of blood pressure .Its realization requires a strategy combining population wide and high risk approaches. Emotion for example, increases the cardiac output and it is difficult to obtain a truly resting blood pressure in an exited or tensed individual. In general, increase in cardiac output increases the systolic pressure where as an increase in the peripheral resistance increases the diastolic pressure. According to the WHO and ISH lifestyle measures for reducing hypertension include stopping of smoking [18],limiting alcohol consumption, reducing salt intake, eating healthier food ,taking more exercise, and maintaining normal bodyweight as larger weight losses are associated with larger blood pressure reductions[13] , and learning to cope with stress. Smoking cessation is single most powerful lifestyle measure for the prevention of cardiovascular diseases in hypertensive patients .Maintaining mental and functional abilities into older age is greatly facilitated by healthy habits. Active ageing is maintaining both health and creativity throughout the lifespan and especially into later years. Early detection and treatment will lead to a decrease in morbidity and mortality associated with hypertension [15].

Conclusion

Obese and overweight population is significantly more in the urban area compared to the Rural area. The urban population have a significantly higher S.B.P.,D.B.P, M.A.P and P.P than the rural population. There is increased incidence of hypertension in the urban males and females compared to rural males and females. This clearly indicates that the urban population are at increased risk of cardiovascular disease. This shows the effect of westernization16 of dietary habits and life style on the blood pressure of individuals. The diet of people living in metros has undergone a tremendous change. They have shifted from traditional food to fast food, which has excess salt and less fiber. The urban people have better socioeconomic status, which is also responsible for their affluent lifestyle. Compared to the urban population the rural population is more hard working doing more physical activity than the urban population who lead a sedentary life. The sleeping quality of the rural residents is better than the urban people. It is observed that the urban people are more stressed than the rural people.

There are numerous kinds of stressors found among the urban population like their work , travelling long distances to their work place ,traffic problems, long hours of work, due to which cordial relationship at home are suffering and leading to increase in the divorce rates among the urban population. As stress in any stimulus experienced consciously or unconsciously is potentially harmful or threatening to any individual, The stressors that are prevailing in urban population may be due to social, psychological, financial, cultural and physical conditions and they have a profound long term blood pressure elevating effect. Finding the cause based on multiple factors and treating hypertension with various options which include medications and adjustments in lifestyle , and proper counselling may solve this problem to a large extent.

Ethical Clearance: Taken from Institutional Ethical Committee, Dr. VRK Women's Medical College Teaching Hospital & Reasearch Centre.

Conflict of Interest- There is no conflict of interest by all the authors.

Source of Funding- Self

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DOI Number: 10.5958/2320-608X.2019.00082.9

Effect of Short Term Pranayama on Cardiovascular Autonomic Function in Hypothyroidism

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Abstract

Introduction: Hypothyroidism is defined as a clinical state resulting from insufficient secretion of thyroid hormone from thyroid gland due to some structural or functional impairment of thyroid hormone production. Since Pranayama have proven to have beneficial and therapeutic effects, in normal and diseased states alike, we plan to study the effects of short term (1 month) practice of pranayama on cardiovascular autonomic function in hypothyroid patients.

Materials and Method: The present study was conducted on 50 volunteers' in between 18-30yrs of age. After obtaining ethical clearance from the institutional Human Ethics Committee. Inclusion criteria consisting of 18-30 years of aged women, newly diagnosed hypothyroidism. Pregnant or breast-feeding, addicted to alcohol or drugs, those who are already practicing pranayama was the criteria to exclude the patients.

Results: Parasympathetic tests, the delta heart rate in deep breathing test and Valsalva ratio were increased in both groups however the increase in delta heart rate in deep breathing test in PG, CG were 31.13%, 16.39% and valsalva ratio in PG, CG were 8.11% and 4.23 respectively. The reduction diastolic blood pressure change in hand grip test was 19.52% in PG and 6.21% in CG. In cold pressor test, diastolic blood pressure was reduced by 12.34% in PG and 7.75% in CG.

Conclusion: The results of this study demonstrate that regular practice of pranayama in addition to standard medical therapy is more beneficial to improve cardiovascular autonomic function in hypothyroid patients.

Key words: *Pranayama, hypothyroidism, cardiac autonomic function.*

Introduction

Hypothyroidism is defined as a clinical state resulting from insufficient secretion of thyroid hormone from thyroid gland due to some structural or functional impairment of thyroid hormone production [(1)]. Hypothyroidism is among the common endocrine diseases accounting for 2-15% of diseases in the general population [(2)] In India, hypothyroidism is the second most metabolic disorder, next to diabetes mellitus [(3)]. Hypothyroidism in general is a prominent hypo metabolic state and sympathetic activities are anticipated to be less in this condition as sympathetic activation is a common manifestation of hyper metabolic state such as hyperthyroidism. However, Sympathovagal imbalance (SVI) due to increased sympathetic activity has been reported in hypothyroidism [(4,5)]. Studies have shown that SVI was associated with cardiovascular risk in hypothyroidism [(6)].

Yoga, an ancient Indian science, aims to bring about functional harmony between body and mind through three main practices: Asanas, pranayama and meditation.

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Pranayama means control of 'prana'. "Prana" in Indian philosophy, refers to all forms of energy in the universe. Life force in an individual is symbolized by breathing. Breath is a dynamic bridge between the body and mind [7]. Growing evidences have claimed that yoga practices has therapeutic effect [8]. The beneficial effects of six weeks practice of different type of pranayama are well reported and have sound scientific basis [9] Breathing exercises for three weeks are reported to influence cardio respiratory and autonomic functions [10]. Since Pranayama have proven to have beneficial and therapeutic effects, in normal and diseased states alike, we plan to study the effects of short term (1 month) practice of pranayama on cardiovascular autonomic function in hypothyroid patients.

Materials and Method

The present study was conducted on 50 volunteers' in between 18-30yrs of age. After obtaining ethical clearance from the institutional Human Ethics Committee. Inclusion criteria consisting of 18-30 years of aged women, newly diagnosed hypothyroidism. Pregnant or breast-feeding, addicted to alcohol or drugs, those who are already practicing pranayama was the criteria to exclude the patients.

All consenting subjects meeting inclusion and exclusion criteria of the study was selected and informed written consent was obtained after thoroughly explaining the procedure. They were randomly divided into two groups with 25 patients in each group.

Pranayama group (PG) (n=25) patients were diagnosed with hypothyroidism and given one month pranayama training in addition to standard medical treatment. The *Control group (CG) (n=25)* participants were also hypothyroid patients on standard medical treatment only.

All experiments were performed at the cardiac autonomic function research laboratory in Dept of Physiology, Narayana Medical College (NMC), Nellore. The patients were asked to refrain from heavy physical activity for 24 hours and from consumption of alcohol and caffeinated beverages for 12 hours prior to the measurements. The temperature of the laboratory was kept between 25^{o} C - 28^{o} C and lights subdued. The patients were asked to void urine before testing and made to sit in the lab comfortably to accustom to the new environment. Baseline and anthropometric parameters were recorded before undergoing assessment of cardiovascular autonomic function.

Tests for assessment of cardiovascular autonomic status: The tests for the assessment of cardiovascular autonomic status was done as per standard protocols published in the literature [11].

Deep breathing test: This is a test of parasympathetic reactivity [12]. The recording of heart rate was done from the ECG recordings on the ECG machine (Cardiowin system, PC based 12 channel simultaneous digital ECG, Genesis Media System Pvt. Ltd, India). A baseline recording of ECG was taken for 30 seconds. The subject was asked to take slow and deep inspiration followed by slow and deep expiration such that each breathing cycle lasted for 10 seconds. The calculation was done from the tracing of ECG. The changes in the heart rate between inspiration and expiration were averaged over 6 cycles.

Valsalva maneuver: This is a test of parasympathetic reactivity [12]. It was done in sitting position. The patient was instructed to blow into a mouthpiece attached to sphygmomanometer. The expiratory pressure was kept at 40 mmHg for 15 seconds. At the end of 15 seconds the subject was asked to release the pressure. Valsalva Ratio was calculated from the longest RR interval during phase IV and the shortest RR interval during phase II.

Handgrip test: This is a test of sympathetic reactivity [12]. The baseline blood pressure was recorded. The subject was asked to press a handgrip dynamometer at 30% of maximum voluntary contraction for 4 minutes. The blood pressure was recorded in 1st, 2nd and 4th minute of contraction. The rise in the diastolic pressure above the baseline was noted.

Cold pressor test: This is a test of sympathetic reactivity [12]. The baseline blood pressure was recorded. The subject was instructed to immerse the right hand in the cold water (8 degree Celsius) for 1 minute up - to the wrist. The blood pressure was measured at the end of one minute. The rise in the diastolic pressure over baseline was noted.

Intervention: After the pre-test, instructions were given to pranayamaa group about the practices. After the initial instructions they will be taught following practices

Loosening procedures : 5 min

Chandranadi pranayama : 2 min

Bhramari pranayama : 2 min

Nadishuddi pranayama : 2 min

Pranava pranayama : 2 min

havasana : 15 min

The pranayama group practiced the above schedule for 3 days a week under our direct supervision and remaining days at home practice. At the end of one month, all the parameters were recorded and the obtained data will be analyzed statistically.

Statistical analysis: Statistical analyses were conducted utilizing the R for windows. Descriptive statistics were expressed as means and standard deviations for continuous variables. After examining for normality, 2 tailed paired t - test for normally distributed data of within group difference, independent t test to test the % change in between group difference and Mann - Whitney U - test for skewed data for within group and between group was used. The null hypothesis was rejected at $p<0.05$.

Results

The baseline characteristics of the patients assigned to PG (n=22), CG (n=25) are given in Table 1.

Autonomic function tests: Within group differences of autonomic function tests were depicted in table 2. Parasympathetic tests, the delta heart rate in deep breathing test and Valsalva ratio were increased in both groups however the increase in delta heart rate in deep breathing test in PG, CG were 31.13%, 16.39% and valsalva ratio in PG, CG were 8.11% and 4.23 respectively. The reduction diastolic blood pressure change in hand grip test was 19.52% in PG and 6.21% in CG. In cold pressor test, diastolic blood pressure was reduced by 12.34% in PG and 7.75% in CG (Table 3).

Table 1. Patient's demographics and baseline characteristics.

Sl. no	Parameter	PG (n=22)	CG (n=25)
1	Age (years)	25.48 ± 5.61	28.65 ± 7.45
2	BMI (kg/m^2)	25.56 ± 3.25	26.45 ± 4.25
3	HR (bpm)	71.45 ± 7.81	73.37 ± 8.67
4	SBP (mmHg)	107.56 ± 35.98	112.34 ± 29.94
5	DBP (mmHg)	73.45 ± 25.56	75.56 ± 24.56
6	Free - T3 (pg/ml)	1.50 ± 0.48	1.62 ± 0.59
7	Free - T4 (ng/dl)	0.68 ± 0.18	0.72 ± 0.21
8	TSH (uIU/mL))	96.37 ± 21.34	112.63 ± 42.56

Data presented are mean ± SD; BMI=Body mass index; HR=Heart rate; SBP=systolic blood pressure; DBP=Diastolic blood pressure; TSH=Thyroid stimulating hormone.

Table 2. Within group differences of autonomic function tests.

Sl. No	Test	Parameter	PG (n=22)		CG (n=25)	
			Time = 0 month	Time = 1 month	Time = 0 month	Time = 1 month
1	DBT	Delta heart rate (bpm)	11.34 ± 2.43	14.87 ± 3.23***	12.87 ± 3.91	14.98 ± 5.45*
2	VM	Valsalva ratio	1.11 ± 0.35	1.20 ± 0.32**	1.18 ± 0.19	1.23 ± 0.22*
3	HT	Change in DBP (mmHg)	18.34 ± 5.39	14.76 ± 3.42***	17.54 ± 4.45	16.45 ± 4.98
4	CPT	Change in DBP (mmHg)	18.23 ± 2.90	15.98 ± 4.35***	17.28 ± 3.24	15.94 ± 6.34*

*p<0.05, **p<0.01, ***p<0.001.

Data presented are mean ± SD; p <0.05 were considered statistically significant. DBP=Diastolic blood pressure; DBT: Deep breathing test; VM=Valsalva maneuver; HT=Hand grip test; CPT=Cold pressor test.

Table 3. Between group differences of autonomic function tests.

Sl. No	Test	Parameter	Mean % change from baseline	
			PG (n=22)	CG (n=25)
1	DBT	Delta heart rate (bpm)	31.13 *** ⇧	16.39 ⇧
2	VM	Valsalva ratio	8.11* ⇧	4.23 ⇧
3	HT	Change in DBP (mmHg)	19.52 *** ⇩	6.21 ⇩
4	CPT	Change in DBP (mmHg)	12.34 ** ⇩	7.75 ⇩

*p<0.05, **p<0.01, ***p<0.001

*p<0.05, **p<0.01, ***p<0.001

Data presented are mean ± SD; p <0.05 were considered statistically significant. DBP=Diastolic blood pressure; DBT: Deep breathing test; VM=Valsalva maneuver; HT=Hand grip test; CPT=Cold pressor test.

Discussion

Yoga, an ancient culture of Indian heritage, when adopted as a way of life is claimed to bestow the practitioner with ideal physical, mental, intellectual, and spiritual health. As a result, yoga is fast emerging as a new discipline for integrating mind and body into harmony [13]. Asana (postures) and pranayama (breathing exercises) in the form of yoga may be beneficial in the rehabilitation of cardiovascular diseases [14]. Studies have demonstrated the effect of yoga on improvement of lipid profiles [15], blood pressure [16], psychological well-being, and even regression of atherosclerosis when combined with dietary and other lifestyle modifications [6,7], left ventricle ejection fraction in coronary heart patients [19], improves quality of life, functional capacity [20] cardiac function [21] heart rate, blood pressure, rate pressure product, cardiac autonomic function [22] oxidative stress and inflammation in heart failure [23]. Despite of the widespread appeal of yoga, data on effect pranayama practice on cardiovascular autonomic functions were limited.

Mechanisms by which yoga may have improved the parasympathetic dominance in PG in this study are speculative at this time. In addition to the proposed mechanism of yoga's ability to attenuate the derangement of autonomic nervous system, its effect on BP may be a benefit as well, yoga may also promote effective extraction of oxygen by peripheral tissues. When a muscle is stretched, the O_2 consumption increases. Studies that examined the health-related aspects of yoga found that 8 week yoga training increased muscular strength by 31%, increased muscular endurance by 57%, increased flexibility by 88%, increased oxygen uptake by 7% and reduced cardiovascular risk in healthy adults [24]. This reduces the stress of myocardium [21]. Further, Slow pranayama breathing generates inhibitory signals and hyperpolarizing current within neural and non-neural tissue by mechanically stretching tissues during breath inhalation and retention. It is likely that inhibitory impulses in cooperation with hyper polarization current initiates the synchronization of neural elements in the central nervous system, peripheral nervous system, and surrounding tissues ultimately causing shifts in the autonomic balance towards parasympathetic dominance[25].

Limitations of the study is Being a part of short term research project, time was the biggest limiting factor. Due to the shortage of time we were unable to study in more num ber of patients. Further, the autonomic activity measured in this may not be very accurate. Therefore, future studies should include more accurate methods of assessment of sympathetic activity such as estimation of plasma catecholamine or metabolites of catecholamine in urine like Vanillylmandelic acid (VMA), Metanephrine, and Normetanephrine.

Conclusion

The results of this study demonstrate that regular practice of pranayama in addition to standard medical

therapy is more beneficial to improve cardiovascular autonomic function in hypothyroid patients.

Conflicts of Interest: None.

Acknowledgement: As this paper is based on Short Term Studentship (STS) of Indian Council of Medical Research (ICMR), our sincere thanks to ICMR for supporting this project. We also acknowledge the entire department of Endocrinology, Narayana Medical College, Nellore, Andhra Pradesh, India.

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DOI Number: 10.5958/2320-608X.2019.00083.0

Knowledge, Attitude and Practice for Prevention and Treatment of Swine Flu in Population of Udaipur City

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Abstract

Background: Swine flu has become a very common seasonal respiratory disease having larger number of morbidities and mortalities. It has created panic situation among general public and health care workers just because of lack of awareness regarding the same.

Aims & Objectives: This study was carried out to reach general public of every class for their perception for this pandemic disease. Knowledge regarding measures for prevention and treatments available if it occurs was the objective of this study. Also to find out myths prevalent in them and to create awareness in proper direction was the objective of this study.

Material and Method: This study was carried out on 500 people chosen randomly from different places of Udaipur having different class and strata. Study was done by making pre-formed questionnaires. Data was analyzed by using SPSS.

Findings: Major part of study population gain information from news papers and TV channels. 76% of study population had heard about swine flu by different resources. Myths are prevalent in 37% of populations regarding causes and mode of occurring of swine flu. Only 23% of study population knows importance of hand-washing as measure for preventing swine flu.

Conclusion: Though large campaign carried out by government and media, people needs to be made aware for every aspects of swine flu through ground level awareness programmes.

Keywords: *Swine flu, knowledge, attitude, practice.*

Introduction

Swine influenza is an acute respiratory disease occurs due to different strains of influenza virus type A which is named globally as H1N1.[1] Initially virus outbreak was prevalent only in pigs but due to regular contacts between pigs and human, some strains had spread from pigs to human. In 21st century first outbreak of this H1N1 flu occurred in Maxico city in the month of March 2009, after that it spread within a very limited time to all over the world.[1] After that outbreak, World health organization (WHO) had declared it as pandemic as it had approached in more than two continents.[2] It was given a name 'swine flu' as during 2009 pandemic, the strain of H1N1 influenza showed very similar genes to the influenza virus affecting North American swine.[3,4]

Considering amongst the largest populist country, India is on 3rd rank according to the number of cases and total number of deaths because of swine flu.[5] Due to increasing numbers of morbidities and mortalities in subsequent years, swine flu is considered as global threat amongst emerging diseases. According to data of Ministry of health and family welfare, government of India, 6,804 cases and 542 deaths from swine flu has been registered up to October 2018.[6] Rajasthan reported 191 deaths from swine flu amongst 1912 cases with

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second most after Maharashtra in the year of 2018.[6]

Material & Method

This is a cross-sectional study carried out on general public of Udaipur city. For knowledge, attitude and practice study, sample size should be atleast 200.[7] In this study total 500 participants were included so as to achieve larger representation of population. Study was carried out during October-December 2018.

Study was approved by institutional ethical committee. Inclusion criteria for participants were minimum 15 years of age with at least primary education achieved. To make this study more representative of population, participants were selected from different parts of city having different economic status, different educational level and different occupations like some professional persons working as company executives, lawyer, bankers, and also some shopkeepers, street vendors, students, housewife etc. Random sampling was done for selection. Informed consent was taken from participants. None of the participant refused as they were assured for complete anonymous study.

Participants were approached personally for interview. Pre formed questionnaires were used which includes their demographic profile (sex, age, education, occupation), knowledge regarding swine flu (how it occurs, mode of spreading, signs and symptoms), attitude towards disease and practice they follow for prevention and treatment of disease.

Findings

In the present study 346 participants were male and 154 were female. Educational levels of participants were from primary to professional level with different job profile.

Table-1: Knowledge on symptoms of swine flu

Symptoms	No.	Percentage
Fever	390	89.1
Running nose	85	19.4
Cough	375	85.6
Headache	128	29.2
Body ache	143	32.6
Vomiting	76	17.3
Diarrhea	74	16.8

Amongst 500 participants, 438 (87.6%) had previously heard about swine flu so further interview was carried out for these 438 participants only. 190 (43.3%) knew that swine flu is caused by virus. The most common symptoms of swine flu like running nose was known to 85 participants (19.4%), fever to 390 (89.1%) and cough to 375 (85.6%) participants. (Table-1)

Table-2: How to prevent swine flu?

Preventive measures	No.	Percentage
Face mask	323	73.7
Frequent hand wash	157	35.8
Avoid crowded place	193	44.1
By home remedies	146	33.3
By homeopathic drugs	82	18.7
Avoiding animal contacts	107	24.4

Regarding preventive measures, use of mask or handkerchief was known to 323 (73.7%), frequent hand washing and personal hygiene 157 (35.8%) while 193 (44.1%) participants believe that avoid crowded place for prevention. (Table-2)

Table-3: How swine flu spread?

Mode of spread	No.	Percentage
Contact of patient	316	72.1
Non-vegetarian food	34	7.7
Bite of bugs	26	5.9
Blood contact of patient	43	9.8
Through water	21	4.7

Myths or misconception regarding swine flu are by eating non-vegetarian food 34 (7.7%), bite of some bugs 26 (5.9%), blood contact of infected patient 43 (9.8%), while majority of participants 316 (72.1%) were aware that swine flu spread by close contact with affected person and by inhalation through respiratory route when patient cough or sneeze. (Table-3)

Table-4: Sources of information

Sources	No.	Percentage
Television	196	44.7
News paper	180	41.1
Internet	88	20.1
Doctors	32	7.3
Social media	71	16.2
Hoardings and banners	60	13.6
Programmes by health department	19	4.3

Participants have different sources of information with telemedia is the highest 196 (44.7%). (Table-4)

Knowledge regarding vaccine available for swine flu was known to 171 (39.1%) participants and treatment availability was known to 236 (53.8%) but only 29 (6.6%) participants have heard the name of drug Tamiflu.

Discussion

Knowledge regarding infectious disease among community people is the benchmark of incidence and prevalence of that disease. Right attitude and practice towards the disease make them less vulnerable and ultimately it decides well being of any community. This study is based on knowledge, attitude and practice for prevention and treatment of swine flu (H1N1) amongst urban community of Udaipur city which may help local authorities related to health sectors for planning and implementing programme for awareness regarding swine flu. Some misconceptions must be removed from general public like swine flu is always deadly disease and no any treatment available.

In this study 87.6% participants have heard about swine flu which is lower than study done by Chaudhary V et al[8] and Rathi S et al[9] while it is higher than study done by Singh S et al[10] which may be due to different educational level of participants and awareness programmes by local authorities at different places. Study population represents all aspects of community with wide variety of demographic profiles. Male participants are more in numbers which is similar to study done by Singh S et al[10] while in study of Latiff et al[11] female participants are more.

Knowledge on clinical features of swine flu amongst participants of this study is found to be similar to study done by Farhat et al[12] with fever is known to be the most common symptoms while another common symptom of running nose is not much known amongst participants.

Prevention is always considered as more important tool than treatment. In this study 73.7% participants consider use of face mask as the best method for prevention but another much important measure of frequent hand washing is known only to 35.8% which is contrast to study done by Rubin et al.[13] This is because lack of interest and lazy attitude towards disease and awareness programmes run by authorities.

Myths also prevalent amongst participants like eating of non vegetarian food specially pork, bite of mosquito or other bugs or by taking contaminated food or water which contradict to study done by Shilpa K et al[14] in Karnataka having very low 2.4% prevalence of myths . This may be due to failure of health workers and authorities in making ground level efforts for spreading awareness regarding actual cause and mode of disease.

Telemedia and newspapers are major source of information as better availability of these resources in urban population similar to findings of other studies.[5,12,15] Health education is very important measure for increase well being of community by reducing prevalence of disease. Mass media including social media is considered best in current scenario to approach every individual of society.

Conclusion

If *knowledge* regarding swine flu is increased, it definitely changes *attitude* of community towards disease and *practice* of preventive measures to be taken. These are three pillars of health system as it directly affects health programmes implemented by government. Focal points regarding swine flu like running nose as important symptoms, frequent hand washing as important practice and removing all myths for disease are key areas to be considered and mass media can help during epidemic of swine flu for creating awareness of these key areas instead of creating panics and blaming health authorities. Also role of health workers and concerned authorities is important as early detection and timely notification of disease can help to break chain of spreading of

disease. This study conclude that there is either lack of knowledge or incomplete knowledge regarding swine flu in general public which is to be rectified by paying immediate attention

Conflict of Interest: None

Source of Funding: None

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DOI Number: 10.5958/2320-608X.2019.00084.2

Effect of Vitamin A Supplements with Iron Therapy among Adolescent Girls

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Abstract

Background: Despite of extensive management programmes for iron deficiency anaemia, it remains a challenge for healthcare professionals. So, there is a requirement of supplementing the conventional therapy with some micronutrients which have a possible role in combating the problems of anaemia. Vitamin A is one of those possible micronutrients.

Material and Method: Adolescent girl students from a school who were diagnosed as anaemia were categorised randomly into two interventional groups. Those who were not diagnosed as anaemia formed the third group. In group A, Vitamin A supplementation (2, 00,000 IU single dose) along with Iron in the form of $FeSO_4$ was given for 100 days. Group B students received only Iron supplementation for the same period. Only placebo was given to the students of group C.

Results: In group A the mean value for blood haemoglobin improved from 10.128$\pm$0.196 gm/dL to 12.216$\pm$0.215 gm/dL. The improvement was extremely significant ($p<0.0001$). In group B mean value for blood haemoglobin improved from 10.141$\pm$0.210 gm/dL to 11.766$\pm$0.218 gm/dL and was very significant ($p<0.0001$). In group C, the mean value for blood haemoglobin was 12.809$\pm$0.099, which significantly improved to 13.018$\pm$0.119 gm/dL. ($p=0.008$). The %age change over baseline was more in group A (20.39%) than group B (12.38%) as compared to group C (2.77%).

Conclusion: This study concluded that vitamin A supplementation helps to restore the blood haemoglobin level along with iron therapy and helps to improve the status of anaemia. Further studies involving large population are required to establish the definitive role of vitamin A supplementation in anaemia and to recommend it as a standard additive therapeutic agent.

Keywords: *Iron deficiency anaemia, Vitamin A, Haemoglobin, Adolescence*

Introduction

Anaemia is most common form of malnutrition globally and is the eighth leading cause of disease in girls and pregnant women in developing countries,[1] where the prevalence ranges from 40-60% as per WHO.[2] Half of those are supposed to be suffering from iron deficiency anemia.[3,4] The risk factors for iron deficiency anaemia includes low intake, malabsorption of iron from diets and periods of life when iron requirements are especially high (growth and pregnancy).[5,6] Anaemia retards physiological growth in adolescent girls.[7,8] There are micronutrients other than Iron, such as vitamin A, play important role in prevention and treatment of anaemia. Vitamin A and iron (Fe) deficiencies are two challenging public health problems in adolescent girls also due to

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nutritional imbalance despite of increasing dietary requirement and additional blood loss via menstruation.[9] Vitamin A can affect several stages of Fe metabolism, which include erythropoiesis and the release of Fe from ferritin stores.[10] Since the study of Findlay and Mackenzie[11] in 1922, several studies have suggested the interrelation between vitamin A and iron metabolism.[12,13] These studies demonstrated a reduction of hematopoietic cells in the bone marrow and also hemosiderosis in the liver and spleen in vitamin A-deficient subjects.[14] Many epidemiological studies indicated that vitamin A deficiency and anaemia often coexist and that there are significant associations between serum retinol and biochemical indicators of the Fe status.[15,16]

Strong correlations between vitamin A status and haemoglobin levels have been demonstrated.[17] Prolonged vitamin A deficiency in animals negatively affects haematopoiesis, with a gradual replacement of the bone marrow by fibrous tissue.[18] A depression of iron uptake by the bone marrow was postulated to be one of the mechanisms in these studies.[19,20] Some recent studies have shown that vitamin A deficiency leads to ineffective erythropoiesis by the down-regulation of renal erythropoietin expression in the kidney, resulting in erythrocyte malformation and the consequent accumulation of the heme group in the spleen.[21] Vitamin A deficiency indirectly modulates systemic iron homeostasis by enhancing erythrophagocytosis of undifferentiated erythrocytes.[22]

In India, despite intensive efforts, several studies showed that anaemia and vitamin A deficiency are highly prevalent, particularly among adolescent girls.[23] Thatswhy the aim of the present study was to investigate the effects of vitamin A supplementation on iron therapy in anaemic adolescent girls in an Indian city.

Material and Method

It was a Prospective study conducted in a school in urban Agra within a period of 1 year. The study population were school going young girls of age 13-16 years. Using the average prevalence rate of anaemia in young adolescent girls as 53.9 % according to NFHS -3 the sample size was calculated as 86 and then rounded to 100. One intermediate college was chosen which admitted lower & middle class students. The students of classes 8th, 9th and 10th, aged from 13 to 16 years, were included in the study.

Inclusion criteria: Students who were willing to participate in the study voluntarily after being informed in details about the study procedure and providing consent were included in the study.

Exclusion criteria: Students having following clinical features were excluded from the study. 1. Irregular menstrual bleeding. 2. Severe malnourishment. 3. Known haemolytic disease like sickle cell anaemia, thalassemia. 4. Haematuria. 5. Any other bleeding disorders. 6. Any chronic disease. 7. Features of vitamin A deficiency.

Written consent of the parents was taken before the study. De-worming of all the girl students was done. After obtaining relevant clinical history, blood samples of the participants were collected, for determining haemoglobin level. The level of haemoglobin was estimated by using Cyan-meth-haemoglobin method using Drabkin's solution. Universal precautions were followed for the collection of sample and for discarding the biomedical waste.

Students who were diagnosed as Anaemia on the basis of investigation were categorised randomly into two interventional groups. Students diagnosed non-anaemic formed the third group. Vitamin A supplementation (2,00,000 IU single dose) along with Iron in the form of $FeSO_4$ was given for 100 days to the students of group A. Only Iron supplementation was given twice a week for a period of same 100 days to group B. Group C students were given only placebo in the form of white coloured candies. Vitamin A was given in the form of red coloured oil-based gelatinous capsule, obtained from medical college OPD. Both iron and Vitamin A supplementation were given to the participants under direct observation.

Haemoglobin level of each participant was measured twice during the study: Before the initiation of the intervention and on the completion of the intervention i.e. 100 days. The cut-off level for haemoglobin concentration to be diagnosed as anaemia is 12 gm/dL for this concerned age group of 13 to 16 years in adolescent girls and were categorized as mild (11-11.9 gm/dL), moderate (8-10.9 gm/dL) and severe (<8gm/dL) according to WHO criteria (2001).

Results

Out of 100 girls screened for anaemia who were willing to participate in the study, 66 girls (66%)

were diagnosed as anaemic and 34 girls (34%) were diagnosed non-anaemic. Out of 66 girls those were diagnosed as anaemic, 21 were mild anaemic(21%), 43 were moderately anaemic(43%) and 2 girls(2%) were diagnosed as severely anaemic (Fig. 1). Severely anaemic students were excluded from the study and referred to medicine and gynaecology OPD for active therapy. Prevalence of anaemia before the study was 66 % and after the study, it was 37.76 %. Before the study, prevalence of moderate anaemia was 43 % and that of mild anaemia was 21%. After the study prevalence of moderate anaemia was 16.33 % and that of mild anaemia, it was 21.43 % (Fig. 2)(Table 1).

In group A, average age of students was 14.313 ± 0.198 years, which was comparable to group B (14.688 ± 0.188 years) and group C (14.5 ± 0.180 years). In group A out of 32 girls, 11 were mild and 21 were moderate anaemic. In group B out of 32 girls, 10 were mild and 22 were moderate anaemic. Group C contains 34 girl students, all of whom were non anaemic. In group A the mean baseline value for blood haemoglobin was 10.128±0.196 gm/dL and after intervention value was 12.216±0.215 gm/dL. The difference between before and after intervention was extremely significant ($p<0.0001$) (Fig. 3). In group B mean baseline value for blood haemoglobin was 10.141±0.210 gm/dL and after intervention value was 11.766±0.218 gm/dL (Fig. 4). This difference was very significant. In group C, the mean baseline value for blood haemoglobin was 12.809±0.099 gm/dL and after the study duration it was 13.018±0.119 gm/dL. This difference was significant (Table 2). Out of total 98 girl students included in the study 61 were diagnosed as non-anaemic after the intervention, whereas 37 were still having anaemia. Out of 37 anaemic girls 21 were mildly anaemic and 16 were diagnosed as moderately anaemic.

Statistical Analysis

The data was analyzed using SPSS version 20. Normality of the scalar data was tested using *Shapiro–Wilk test.* Distribution of grading of anaemia was compared using Chi-Square test. The comparison of the distribution of grading of anaemia in various groups before and after intervention was done using McNemar-Bowker test. Comparision of pre and post intervention haemoglobin paramters among different groups was studied using Wilcoxon Signed Ranks Test. Significant level was set at p-value of <0.05.

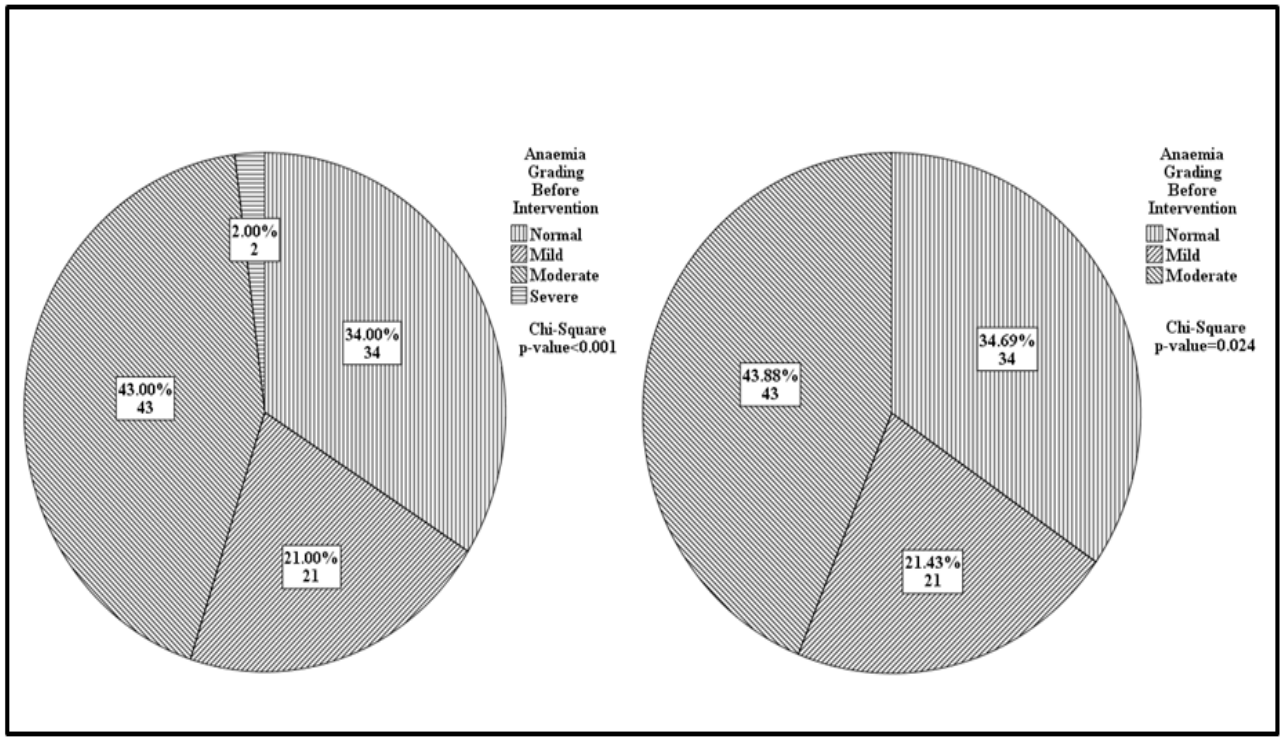

Fig.1. Distribution of grading of anaemia before the intervention (before and after removing those with severe anaemia).

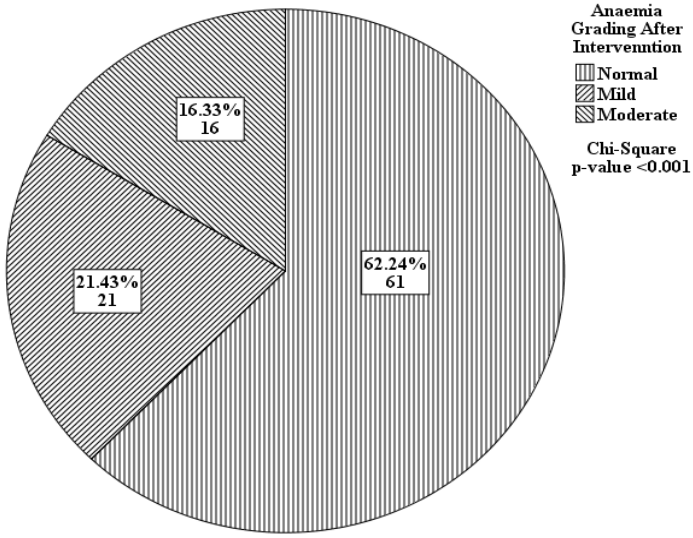

Fig.2. Distribution of grading of anaemia after the intervention

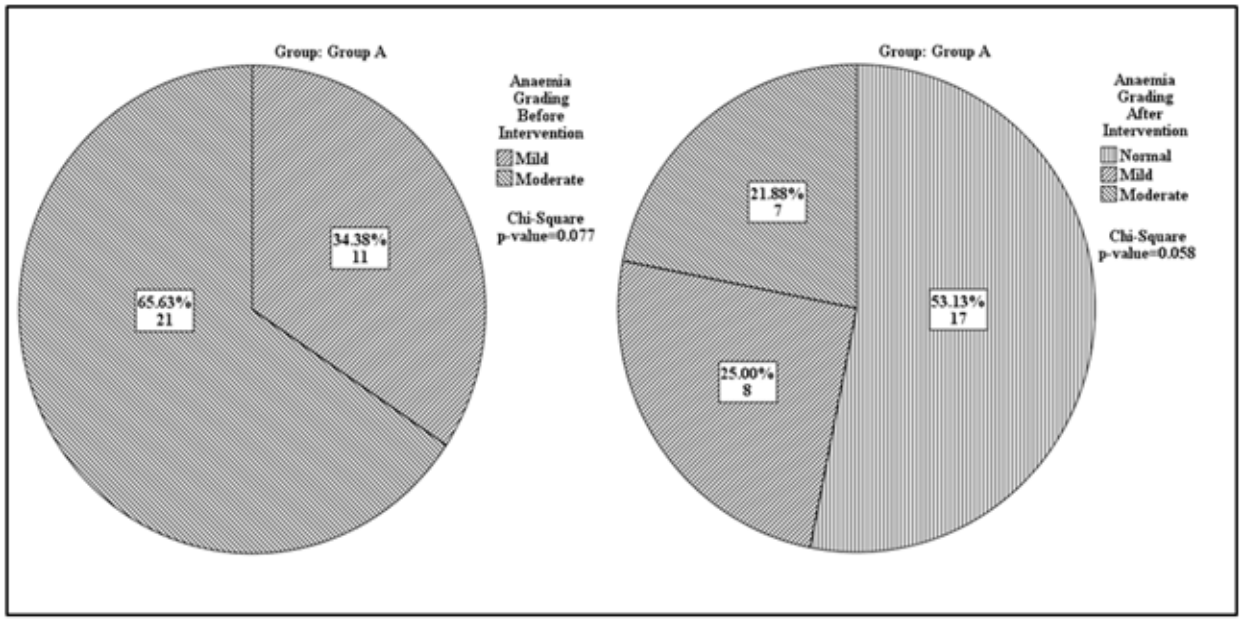

Fig.3. Distribution of grading of anaemia in group A before and after the intervention

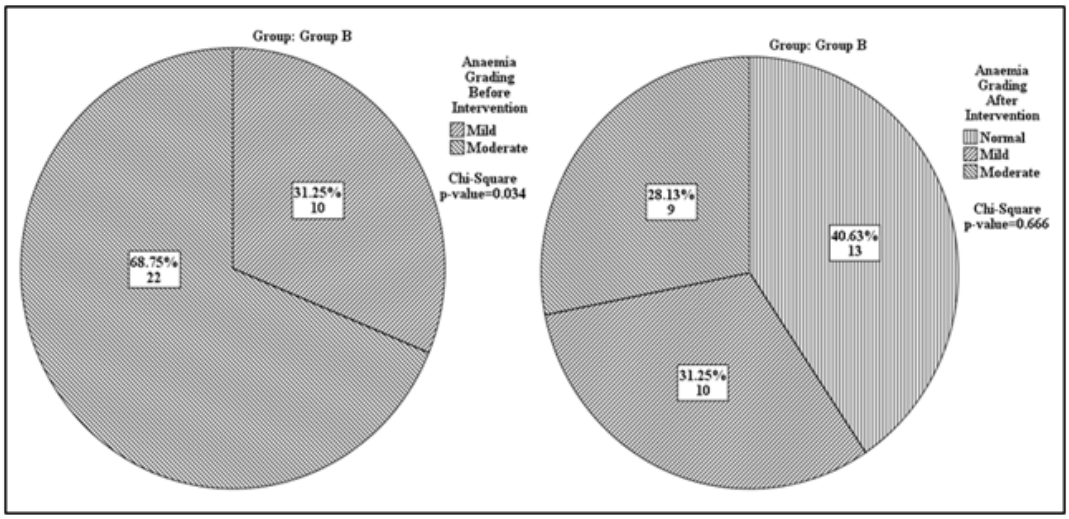

Fig.4. Distribution of grading of anaemia in group B before and after the intervention

Table 1. Comparison of the distribution of grading of anaemia in various groups before and after intervention.

Anaemia Grading Normal Mild			Before			Total	p-value
			Moderate				
After	Normal	Count	31 (50.8%, 91.2%)	19 (31.1%, 90.5%)	11 (18.0%, 25.6%)	61 (100.0%, 62.2%)	<0.001
		% of Total	31.6%	19.4%	11.2%	62.2%	
	Mild	Count	3 (14.3%, 8.8%)	2 (9.5%, 9.5%)	16 (76.2%, 37.2%)	21 (100.0%, 21.4%)	
		% of Total	3.1%	2.0%	16.3%	21.4%	
	Moderate	Count	0 (0.0%, 0.0%)	0 (0.0%, 0.0%)	16 (100.0%, 37.2%)	16 (100.0%, 16.3%)	
		% of Total	0.0%	0.0%	16.3%	16.3%	
Total		Count	34 (34.7%, 100.0%)	21 (21.4%, 100.0%)	43 (43.9%, 100.0%)	98 (100.0%, 100.0%)	
% of Total			34.7%	21.4%	43.9%	100.0%	

McNemar-Bowker test

Table 2. Comparison of the Haemoglobin level in various groups before and after intervention

Group	Intervention	Haemoglobin concentration (g/dl)		Median (Mean)Δ%	p-value
		Median (Mean)	QD (SD)		
Group A (n=32)	Before	10.300 (10.128)	1.000 (1.109)	20.388 (20.616)	<0.001
	After	12.400 (12.216)	0.950 (1.213)		
Group B (n=32)	Before	10.500 (10.141)	1.100 (1.187)	12.381 (16.024)	<.0.001
	After	11.800 (11.766)	1.075 (1.235)		
Group C (n=34)	Before	12.650 (12.809)	0.400 (.576)	2.767 (1.632)	0.008
	After	13.000 (13.018)	0.400 (.695)		

Wilcoxon Signed Ranks Test. QD=Quartile deviation, SD=Standard deviation, Δ% = percentage of difference (post-pre) relatively to pre.

Discussion

According to WHO (2001), up to 88% of pregnant and 74% of non-pregnant women are anaemic in India. Anand K et al[24] in 1998 found the prevalence of anaemia was 51 % among school going adolescent girl students. Sheshadri S (1997) studied[1] 1,500 rural girls (10-19 yrs), and the prevalence of anemia was reported to be 60%. Out of 66% prevalence of anaemia in our study, severe

anaemia, mild anemia and moderate anemia were 2%, 21% and 43% respectively. In a study of Deshpande et al (2013)[3], among 1000 adolescent girls, 60 percent found to be anaemic, 18.4 percent as mild, 41.3 percent as moderate, and 0.4 percent as severe anaemia.

Effect of vitamin A supplementation on haemoglobin levels

In this study, in Group A, the difference between mean haemoglobin before and after intervention was 2.088 gm/dL and it was extremely significant ($p<0.0001$). In Group B, the difference in mean was 1.625 gm/dL and it was very significant ($p<0.0001$). In Group C, the difference in mean was 0.209 gm/dL and it was significant ($p=0.0063$).

Mwanri Lillium et al (2000) found similar results[20] in a randomized controlled trial of the effects of dietary supplements on anemia in anemic school children. The supplements were vitamin A alone, iron and vitamin A, iron alone or placebo in four sample groups respectively, administered in a double-blinded design for 3 months. Vitamin A supplementation increased the mean hemoglobin concentration by 13.5 g/L compared with 3.5 g/L for placebo ($P<0.0001$). However, the group of children who received combined vitamin A and iron supplementation had the greatest improvements as compared with placebo (18.5 g/L, $P<0.0001$).

The influence of vitamin A and iron supplementation was studied by Suharno D et al (1993) in anaemic pregnant women.[15] Maximum haemoglobin was achieved with both vitamin A and iron supplementation, with one-third of the response attributable to vitamin A and two-thirds to iron. They concluded that improvement in vitamin A status may contribute to the control of anaemic pregnant women.

Conclusions

Present study was conducted to evaluate whether vitamin A supplementation helps to restore the blood haemoglobin level along with iron therapy and helps to improve the status of anaemia. A major limitation of our study was relatively small sample size with anaemia in the concerned age and sex group. So, further studies involving large population need to be done to establish the definitive role of vitamin A supplementation in anaemia and to recommend it as a standard additive therapeutic agent.

Acknowledgement: Authors would like to thank the authorities of the participating school as well as the participating students and their parents for co-operation.

Funding*:* No funding sources

Conflict of Interest: None declared

Informed Consent: Informed consents were obtained from all the participants and their parents.

Human and Animal Rights: Procedures followed were in accordance with the ethical standards of institutional and national committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000.

Ethical Approval: The study was approved by the Institutional Ethics Committee

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DOI Number: 10.5958/2320-608X.2019.00085.4

Significance of Dietary Pattern in Oxidative Stress among Newly Diagnosed Essential Hypertension

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Abstract

Background: Hypertension is a significant global public health problem and it is associated with increased oxidative stress. Oxidative stress is disequilibrium between tissue oxidants (free radicals or reactive oxygen species ROS) and antioxidants and may be an integrative mechanism in the progress of cardiovascular diseases (CVD).

Aims & Objectives: To study the impact of dietary pattern on oxidative stress markers in newly diagnosed essential hypertension.

Material and Method: The study was conducted on 75 cases of essential hypertension (HT), 75 prehypertensives (preHT) and 50 control subjects for 15 months. After screening, serum uric acid (SUA) and serum malondialdehyde (S.MDA) level were investigated in both vegetarians (V) and nonvegetarians (NV) in all groups.

Findings: The difference in mean ± SD of SUA and S. MDA level between control, preHT and HT group were found to be highly significant ($p<0.0001$). SUA and S. MDA level was higher in NV as compared to vegetarians in all groups but significant results were found in case of SUA ($p<0.001$).

Conclusion: Long-term vegetarians have improved antioxidant status and coronary heart disease risk profile than do apparently healthy omnivores.

Keywords: *Hypertension, prehypertension, oxidative stress, serum uric acid, serum malondialdehyde, vegetarians, nonvegetarians, systolic blood pressure (SBP), diastolic blood pressure (DBP) .*

Introduction

Hypertension is one of the most important public health challenge world-wide because of its high incidence and associated risks of cardiovascular disease for instance stroke, myocardial infarction and heart failure. Although it has frequently been indicated that the causes of essential hypertension are not known, this is only partially true. Essential hypertension is a heterogeneous disorder, with different patients having different causal factors that lead to high blood pressure. Vascular oxidative stress has been shown in genetic and experimental models of hypertension.[1] In search for a causative factor for essential hypertension, uric acid and lipid peroxidation due to increased oxidative stress are considered.

Although serum uric acid is regarded to be an antioxidant within its normal physiological conditions, it might be accountable for production of free radicals directly or indirectly in hypertensive. Hyperuricaemia (plasma uric acid level more than 6.8 mg/dl at

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physiological temperature (37°C) and neutral pH)[2] has been found to be associated with subsequent morbidity and mortality in the general population among patients with congestive heart failure, diabetics and hypertensive patients. Moreover, hyperuricaemia has also been linked to multiple proatherogenic processes, including increased oxidative stress. In recent years, oxidative stress due to ROS is implicated in the pathogenesis of ample variety of diseases like cancer, cataract, diabetes mellitus, rheumatoid arthritis, atherosclerosis, hypertension.[3] In addition the reasons for augmented rate of hypertension include life style changes, sugar rich diet, high fat processed foods and sedentary behavior.[4]

Rapid changes in diets and lifestyles that have took place with urbanization, industrialization and economic advancement have intensified over the past decade. Because of these changes, chronic diseases like hypertension are becoming increasingly significant cause of impairment and premature death.

Material & Method

A hospital based case control study was conducted among 200 subjects of age group between 20–50 years, irrespective of sex in the department of Physiology, Geetanjali medical college & hospital (GMCH), Udaipur.

Inclusion criteria: All the subjects were chosen randomly and following groups were made according to JNC7 criteria

Control group: 75 normotensive subjects

PreHT group: 75 cases of prehypertension

HT group: 75 cases of newly diagnosed cases of essential hypertension with SBP= 140-159 mmHg, DBP= 90-99 mmHg.

Exclusion criteria:

Patients with secondary hypertension, gout, diabetes mellitus, gestational hypertension, and patients taking antihypertensive, smokers and alcohol consumers were excluded from the study.

After obtaining ethical approval (Ref. No. GU/UCE/EC/2013/299 dated 15/05/2013), a written voluntary informed consent was obtained from all the subjects. Then all the subjects were screened as per the detailed history, routine physical examination and appropriate tests. After screening, blood sample (5 ml) was drawn in to a plain vial after an overnight fast (12 hrs) by antecubital venous puncture from all the subjects. Then serum was separated by a centrifugation at 3000rpm for 10 minutes. After that serum sample was used for following biochemical analysis.

Serum Uric Acid: By Modified Trinder Method.[5]

Serum Malondialdehyde (MDA): Thiobarbituric acid (TBA) assay method.[6]

Statistical Analysis: The data were analyzed by using Statistical Package for the Social Sciences (SPSS) Version 16.0. Difference between the groups was analyzed by Analysis of variance test (ANOVA). Diet wise comparison of oxidative stress parameters were tested by Student t-test with p value <0.05 is considered as statistically significant.

Findings

Table: 1 Characteristics of study population among different groups (Mean ±SD)

Variables	Control	Pre HT Group	HT Group	Anova P Value
Age (Yrs.)	37.46 ± **8.09**	35.84 ± **6.5**	40.25 ± 7.71	<0.001
Veg./ Nonveg.	68/32	51/49	40/60	-
SBP (mmHg)	114.06 ± **16.77**	134.00 ± **5.1**	160.04 ± **11.49**	<0.0001
DBP (mmHg)	74.66 ± **6.23**	86.45 ± **2.93**	92.00 ± **10.15**	<0.0001

The difference in mean ± SD of SBP & DBP between three groups were highly significant (p<0.0001).

Table: 2 Diet wise variation of SBP among different groups (Mean ± SD)

	Control			PreHT			HT		
Diet	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**
Non Veg	114.62 ± 6.37		16	134.38 ± 5.01		37	161.82 ± 12.52		45
Veg	112.88 ± 5.84		34	133.63 ± 5.24		38	157.37 ± 9.33		30
T value	0.92			0.63			1.76		
P value	NS			NS			NS		

Table: 3 Diet wise variation of DBP among different groups (Mean ± SD)

	Control			PreHT			HT		
Diet	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**
Nonveg	75.21 ± 6.75		16	87.27 ± 2.83		37	92.44 ± 11.17		45
Veg	73.50 ± 5.99		34	86.63 ± 3.05		38	91.33 ± 9.68		30
T value	0.87			0.94			0.46		
P value	NS			NS			NS		

The table no. 2 & 3 showed that mean ± SD value of both SBP and DBP were higher in NV as compared to V among all three groups but the results were not significant (p>0.05)

Table: 4 Comparison of SUA and S. MDA level among different groups (Mean ± SD)

Variables	Control	Pre HT Group	HT Group	Anova P Value
S. Uric acid (mg/dL)	4.91 ± 0.97	5.90 ± 0.97	6.56 ± 0.76	<0.0001
S. MDA (nmol/mL)	1.30 ± 0.20	1.63 ± 0.28	2.14 ± 0.42	<0.0001

The difference in mean ± SD of SUA and S. MDA level between control, preHT and HT group were found to be highly significant (p<0.0001).

Table: 5 Diet wise variation of SUA level among different groups (Mean ± SD)

Diet	**Control**			**Pre HT group**			**HT Group**		
	Mean	**SD**	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**
Non veg	5.65 ± 0.77		16	6.55 ± 0.80		37	6.77 ± 0.59		45
Veg.	4.56 ± 0.69		34	5.24 ± 0.53		38	6.19 ± 0.56		30
T value	4.82			8.34			4.25		
P value	<0.0001			<0.0001			<0.001		

Mean ± SD of SUA was significantly higher in NV as compared to vegetarians in all groups (p<0.001).

Table: 6 Diet wise variation of S. MDA level among different groups (Mean ±SD)

Diet	Control			Pre HT group			HT Group		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
Non veg	1.33 ± 0.19		16	1.68 ± 0.27		37	2.20 ± 0.43		45
Veg.	1.28 ± 0.21		34	1.57 ± 0.27		38	2.04 ± 0.39		30
T value	0.84			1.76			1.67		
P value	NS			NS			NS		

Mean ± SD of S.MDA level was higher in NV as compared to V among HT, preHT and control group but this difference was not statistically significant ($p>0.05$).

Discussion

There is a close relationship between the diet and chronic degenerative diseases such as obesity, hypercholesterolemia and hypertension. Our study showed that NV had higher mean SBP and DBP than V in HT, preHT and control group but the results were not significant ($p>0.05$). Our results were similar to the study of Nande PJ et al.[7] but they found significant results in case of DBP ($0.01<p<0.05$). These findings are steady with the results of the DASH (Dietary Approaches to Stopping Hypertension) trial, that a dietary pattern plenteous in fruits, vegetables, low fat dairy products and with abbreviated total and saturated fat can be efficient in the suppression of hypertension.[8] Diet represents a significant role in the primary suppression of hypertension. It is a conception that the non vegetarian diet comprises cholesterol and saturated fatty acids and these are the root cause of problems like coronary heart diseases and hypertension. Vegetarian diets are normally ample in carbohydrates, n-6 fatty acids and dietary fiber and are more helpful in preventing, treating or reversing heart disease. Lifestyle adjustments in diet are playing important role in determining the outcome for people with hypertension.[9]

In the present study serum uric acid level was found to be significantly high in NV as compared to vegetarians among HT, preHT and control group ($p<0.001$). Choi HK et al.[10] also noticed that SUA level enhanced with increasing total meat or sea food intake and diminished with increasing dairy intake. Similarly Schmidt JA et al.[11] found that vagan had the highest concentration followed by meat eaters and vegetarians. This might be due to their lack of ingestion of dairy foodstuffs, which are believed to lower UA concentrations.[12].

In humans yield of UA relies on purine uptake[13] and a purine-ample diet (such as veal, bacon, kid meat, mutton, turkey, pork, duck, goose, etc) would be responsible for rising only 1 to 2 mg/dL of uric acid[14] whereas diary foodstuff intake has a reciprocal relation with uric acid.[15,10] Since dairy products are low in purine content and it may perform its urate-lowering effect by increasing the elimination of uric acid and its precursor xanthine.[12]

The results of our study also presented that the oxidative stress marker, serum MDA level was high in NV compared to V among HT, preHT and control group but this difference was not statistically significant ($p>0.05$). This is in accordance with the findings of Somannavari MS & Kodliwadmath MV[16] but they found that the difference was significant. Whereas Szeto et al.[17]shown that there was no significant change of MDA level between V and NV. The increased oxidative stress and associated oxidative damage are mediators of renovascular injury in cardiovascular pathologies.[18] Dierckx et al.[19] concluded that serum MDA level (a marker of lipid peroxidation) was significantly increased in NV, as their diet is good resource of iron and copper and these transitional metals in the diet have important role in the initiation and progression of lipid peroxidation. Further these findings were confirmed by Sagare SM et al.[20] This may be due to higher and habitual consumption of fruit and vegetables, dark and whole grain products, grain sprouts, plant oils and oil seeds plentiful in trace elements like zinc, copper and selenium, mono and polyunsaturated fatty acids, antioxidant vitamins, fibers, complex carbohydrates and flavonoids by vegetarians.

The diminished risk of diseases found among vegetarians suggests that biological processes are molded by diet.[21] Therefore, much attention is currently focused on the beneficial effect of vegetarian versus non-vegetarian diet.[22,23] Efficient lifestyle modification may reduce blood pressure as much as a single antihypertensive drug. Combinations of two or more lifestyle alterations can accomplish even better results.[24]

Conclusion

The present study indicates that vegetarian nutrition provides sufficient antioxidants which efficaciously prevent the free radical generation and thus responsible for better antioxidant status and decreased oxidative stress. Maintenance of the oxidative balance in hypertensive patients would be helpful in preventing the CVD and other diseases associated with hypertension. Therefore, our study emphasizes the monitoring of the blood pressure, oxidative stress parameters (SUA and serum MDA level) at regular interval for therapeutic interventions. Moreover, the progress of disease could be prevented by giving proper education to the patient about healthy lifestyle and also advising them to practice yoga, aerobics, walk etc.

Conflict of Interest: None

Source of Funding: Self

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DOI Number: 10.5958/2320-608X.2019.00086.6

A Study of Magnesium Supplementation on Amplitudes of Sensory and Motor Nerves in Patients of Diabetic Neuropathy

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Abstract

To Study the effect of magnesium supplementation on amplitudes of sensory and motor nerves in patients of diabetic neuropathy.

This study was conducted on 60 diabetic neuropathy patients attending the neurology o.p.d between february 2009 to august 2010. These patients were segregated into two groups. group I (n=30) receiving magnesium and metformin therapy for a period of 16 weeks. Group II (n=30) receiving only metformin therapy.

The blood samples were collected and analyzed for s. magnesium and fasting blood glucose at 0,4,8,16 weeks, respectively. Measurement of amplitudes of sural and common peroneal nerves were done at 0,4,8,16 weeks, respectively.

Average age of males in group I was 54.36±1.18yrs and of females was 53.09±1.47yrs and in group II was 55.94±1.62yrs and of females was 52.83±1.58yrs.

Mean baseline value for amplitude of sural nerve in group I was 4.90±0.34uV and after treatment values at 4, 8 and 16 weeks were 6.19±0.29, 7.56±0.34 and 9.64±0.59uV respectively. In Group II mean baseline value for amplitude of sural nerve was 5.13±0.50uV and after treatment values at 4, 8 and 16 weeks were 4.97+0.48, 4.85±0.51, 4.86+0.49uV respectively. Mean baseline value amplitude of common peroneal nerve in group I was 2.49±0.21mV and after treatment values at 4, 8 and 16 weeks were 3.31±0.23, 3.91+0.19 and 4.24±0.19mV respectively. In group II, mean baseline value for amplitude of common peroneal nerve was 2.58±0.25mV and after treatment values at 4, 8 and 16 weeks were 2.61±0.24, 2.64±0.24 and 2.77±0.24mV respectively.

Statistically significant difference was observed in group I, patients' amplitudes of sural and common peroneal nerves, before and after treatment values at 16 weeks ($p<0.05$). Statistically insignificant difference was observed in group II patients before and after treatment values at 16 weeks ($p>0.05$). This study thus concludes that anti-diabetic therapy when combined with magnesium supplementation shows improvement in amplitudes of sensory and motor nerves.

Keywords: *Diabetic neuropathy, magnesium supplementation, amplitude (sural and common peroneal nerve).*

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Introduction

Globally, an estimated 422 million people are suffering from diabetes in 2014. Separate data for type 1 and type 2 diabetes mellitus doesn't exist but the majority of these adults are affected by type 2 DM.[1] Majority of people with diabetes will eventually

develop peripheral neuropathy, making it the leading known cause of neuropathy. Diabetic neuropathy is one of its most common complication and great source of morbidity and mortality. Hyperglycemia being the major causative factor leading to neuropathy.

Magnesium is known to be necessary for nerve conduction; deficiency is known to cause peripheral neuropathy symptoms and studies suggest that a deficiency in magnesium may worsen blood glucose control in type 2 diabetes.

Chu C et al (2016) suggested that serum magnesium levels were significantly lower in type 2 DM patients with abnormal nerve conduction studies, and significantly associated with lower amplitude, furthermore indicating the possible affect of magnesium on axonal degeneration.[2] Amighi j.et.al (2004) stated that magnesium is known to be necessary for nerve conduction.[3] Engelen w et.al (2000) substantiated that under unchanged metabolic control supplementation with could improve nerve conduction.[4]

Material and Method

This study was carried out in the Department of Physiology and Department of Neurology, S.N. Medical College and Associated Hospitals, Agra, over a period of 18 months in Diabetic neuropathy patients who were attending neurology O.P.D of S.N Medical college, Agra from February 2009 to august 2010.

All participants were subjected to detailed history taking and thorough clinical examination after obtaining their consent. Special focus was given to neurological examination and detailed examination of both the upper and lower extremities were done. Patients with at least two of the followings were included in the study:

1. Symptoms of paraesthesia or dysesthesia.
2. Diminished vibratory sense below the knee.
3. Decreased ankle jerk compared to knee jerk.
4. Reduced discrimination and light touch sense distally in the legs.

After examination, participants were investigated for fasting blood sugar, S. magnesium, blood urea and serum creatinine at first visit (0 weeks) and subsequently these tests were repeated at 4, 8,16 weeks respectively.

A nerve conduction study (NCS) is a test commonly used to evaluate the latency, amplitude, duration and conduction velocity of electrical impulses from the motor and sensory nerves of the human body. The amplitude, i.e. the size of the response, represents the number of axons that are conducting action potentials. Thus, decrease in amplitude depicts axonal degeneration.

Sensory NCS was performed by electrical stimulation of a peripheral nerve and recording from a purely-sensory portion of the nerve. Sensory amplitudes are much smaller than the motor amplitudes and measured in the microvolts (uV) range. *Motor NCS* was performed by electrical stimulation of a peripheral nerve and recording from the muscle supplied by this nerve. Motor amplitudes were measured in millivolts (mV).

In all the participants, nerve conduction study of lower limb was carried out - amplitudes of sural nerve (sensory nerve) and common peroneal nerve (motor nerve) of right leg were measured on DOS-based two channel NCV/EMG machine (M/S Recorders & Medicare System, Chandigarh, India). For evaluating the level of improvements in the peripheral neuropathy, the type II Diabetic neuropathy patients (n=60) who were attending O.P.D of neurology clinic S.N Medical college, Agra were segregated into two groups:

Group-I: was given 300 mg/day of magnesium supplementation (magnesium chloride sustained release tablets) along with metformin for a period of 16 weeks. Average dose of metformin was 1.5 g/day.

Group-II: was given only metformin for a period of 16 weeks. Group II patients were of comparable ages, of normal weight for height, on usual diet with no drugs taken at the time of examination.

Electrophysiological examination of the tested nerves (i.e. sural nerve and common peroneal nerve of right leg) was carried out four times, for patients of both the groups, at first visit and then subsequent examinations at the end of 4, 8 and 16 weeks.

Inclusion Criteria:

1. Known case of diabetes mellitus.
2. Probable case of diabetes mellitus after being investigated for fasting and postprandial blood sugar.
3. Patients with signs/symptoms suggestive of

diabetic poly neuropathy.

Exclusion Criteria:

1. Those with altered sensorium or disturbed mental state.

2. Those having any other diseases known to cause peripheral neuropathy like chronic renal failure, liver failure, hypothyroidism, leprosy, porphyria etc.

3. Patients on drugs that are known to cause peripheral neuropathy like isoniazid, phenytoin or those who are chronic alcoholics.

4. Patients showing abnormal levels of blood urea, S. creatinine, abnormal liver function tests.

Observation

Table no. L: Age and Sex Distribution of Diabetic Neuropathy Patients

Age	Group-I (n=30)				Group II (n=30)				Total I±II (n=60)			
	M	F	Total	%	M	F	Total	%	M	F	Total	%
41-50	4	3	7	23.3	4	5	9	30	8	8	16	26.7
51-60	13	7	20	66.7	9	5	14	46.6	22	12	34	56.7
61-70	2	1	3	10.00	4	2	6	20	6	3	9	15.0
>70	0	0	0	0	1	0	1	3.4	1	0	1	1.6
	19 63.3%	11 36.7%	30	100	18 60%	12 40%	30	100	37	23	60	100

Table No.l depicts the age and sex wise distribution of Diabetic neuropathy patients.

In Group I - Percentages of neuropathy patients belonging to 41-50, 51-60, 61-70 and >70 years age groups were 23%, 66.7%, 10% and 0%, respectively. Number of males in aforementioned age groups were 4, 13, 2 and 0, respectively. Number of females were 3, 7, 1 and 0, respectively. Out of 30, 19 Males(63.3%) and 11 females(36.7%) were present.

In Group II- Percentages of neuropathy patients belonging to 41-50, 51-60, 61-70 and >70 years age groups were 30, 46.6, 20 and 3.4%, respectively. Number of males in aforementioned age groups were 4, 9, 4 and 1, respectively. Number of females were 5, 5, 2 and 1, respectively. Out of 30, 18 males(60%) and 12 females(40%) were present.

In TOTAL-out of 60 diabetic patients 37 were males (61.7%), 23 were females (38.4%).

Table No. 2: Average Age (in **Year** Mean **± S.e.m) in Both Gender in Different Groups**

GENDER	GROUP-I	GROUP-II
MALE	54.36±1.18 (n=19) S.D = 5.155	55.94±1.62 (n=18) S.D = 6.881
FEMALE	53.09±1.47 (n=11) S.D = 4.888	52.83±1.58 (n=12) S.D = 5.491
TOTAL	53.90±0.9152 (n=30) S.D = 5.013	54.7±1.178 (n=30) S.D = 6.450

Table no.2 depicts the average age of males and females in both the groups.

In the present study, In group I, average age of males was 54.36±1.18 years and of females was 53.09±1.47 years.

In group II, males were of 55.94±1.62 years and females were of 52.83±1.58 years.

In group I, Average age of was 53.90±0.9152 years and in group II, it was 54.7±1.178 years.

TABLE NO. 3: AMPLITUDE OF SURAL NERVE (microvolts) BEFORE AND AFTER TREATMENT

	GROUP I (n=30)				GROUP II (n=30)			
	Before treatment	After Treatment			Before treatment	After Treatment		
		4 weeks	8 weeks	16 weeks		4 weeks	8 weeks	16 weeks
Mean	4.90	6.19	7.56	9.64	5.13	4.97	4.85	4.86
S.D	1.86	1.59	1.84	3.22	2.73	2.61	2.77	2.66
S.E.M	0.34	0.29	0.34	0.59	0.50	0.48	0.51	0.49
% Change Over Baseline				96.7%				5.3%
p Value				p<0.05				p>0.05

Table No. 3 depicts the baseline values (before treatment) of amplitude (microvolts) of Sural N. and after treatment values for group I and group II at 4, 8 and 16 weeks, respectively.

In group I, mean baseline value for amplitude of sural nerve was 4.90±0.34 and after treatment values at 4, 8 and 16 weeks were 6.19±0.29, 7.56±0.34 and 9.64±0.59, respectively. Differences in values of amplitude of sural nerve before and after treatment with magnesium and metformin were considered extremely significant (p<0.05).

In group II, mean baseline value for amplitude of sural nerve was 5.13±0.50 and after treatment values at 4, 8 and 16 weeks were 4.97+0.48, 4.85±0.51 and 4.86±0.49 respectively. These differences in values of amplitude of sural nerve before and after treatment with metformin for 16 weeks were not significant (p>0.05).

Table No. 4: Amplitude of C.P.N (Millivolts) Before and After Treatment

	GROUP I (n=30)				GROUP II (n=30)			
	Before treatment	After Treatment			Before treatment	After Treatment		
		4 weeks	8 weeks	16 weeks		4 weeks	8 weeks	16 weeks
Mean	2.49	3.31	3.91	4.24	2.58	2.61	2.64	2.77

Cont... **Table No. 4: Amplitude of C.P.N (Millivolts) Before and After Treatment**

S.D	1.15	1.27	1.02	1.02	1.34	1.30	1.30	1.32
S.E.M	0.21	0.23	0.19	0.19	0.25	0.24	0.24	0.24
% Change Over Baseline				70.3%				7.4%
p Value				P<0.05				p>0.05

Table No. 4 depicts the baseline values (before treatment) of amplitude (millivolts) of C.P.N and after treatment values for Group I and GROUP II at 4, 8 and 16 weeks respectively.

In group I, before treatment value for amplitude of common peroneal N. was 2.49±0.21 and after treatment values at 4, 8 and 16 weeks were 3.31±0.23, 3.91+0.19 and 4.24±0.19 respectively. In this group we observed that increase in the amplitude of common peroneal N. values before and after 16 weeks of magnesium supplementation were considered extremely significant ($p<0.05$).

In group II, before treatment value for amplitude of C.P.N was 2.58±0.25 and after treatment values at 4, 8 and 16 weeks were 2.61±0.24, 2.64±0.24 and 2.77±0.24, respectively. In this group we observed that amplitude of C.P.N values before and after 16 weeks of treatment were not statistically significant.

Discussion

Average age of males was 54.36±1.18 years and of females was 53.09±1.47 years in group I. In group II, average age of males was 55.94±1.62 years and of females was 52.83+1.58 years. Mean duration of diabetes in group I was 15.516±1.066 as compared to 15.290±1.237 in group II.

In present study, mean value for amplitude of sural nerve in group I before treatment was 4.90±0.34uV as compared to 9.64±0.59uV after 16 weeks of treatment. This difference was considered extremely significant ($p<0.05$).

In group II before treatment mean value for amplitude of sural nerve was 5.13±0.50uV as compared to 4.86±0.49uV after treatment (i.e after 16 weeks). This difference was considered statistically insignificant ($p>0.05$).

In present study, mean value for amplitude of common peroneal nerve in group I before treatment was 2.49±0.21mV and after 16 weeks was 4.24±0.19mV. This difference was found to be statistically significant ($p<0.05$).

In group II, before treatment mean value for amplitude of common peroneal nerve was 2.58±0.25mV and after treatment was 2.77±0.24mV. This difference was statistically insignificant ($p>0.05$).

Almost similar results were obtained by the following studies:

Ivo De Leeuw *et al.* (2004) observed that in Mg depleted type 1 diabetic patients, long term magnesium supplementation is a favourable influencer in the natural evolution of neuropathy. They also noticed that chronic Mg depletion in Tldm has been associated with Polyneuropathy (PNP).[5]

Engelen W *et al.* (2000) observed that Mg supplementation increasing Mg RBC, in younger patients with a short duration of diabetes and presenting with early signs of the neurological complication, might improve nerve conduction and amplitude measured by electromyography.[4]

Sophie Begon *et al.* (2000) observed that magnesium could be an alternative for the treatment of neuropathic pain in patients of diabetic neuropathy.[6]

Elamin A *et al.* (1990) observed that appropriate magnesium supplementation might prove beneficial in normalizing the low plasma and tissue magnesium levels and prevent or retard the development of vascular & neural complications in diabetic patients.[7]

Conclusion

This study concludes that anti-diabetic therapy when combined with magnesium supplementation shows improvement in amplitudes of sensory and motor nerves and hence improves the symptoms of diabetic neuropathy patients. Limitation of our study was its small sample size.

Conflict of Interest: None

Source of Funding: self-funded study

Ethical Clearance: Approval of institutional ethical committee was taken for this study.

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DOI Number: 10.5958/2320-608X.2019.00087.8

Original Research Article

Prevalence of Poor Sleep Quality and its Association with Body Mass Index among Medical Students in Puducherry

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Abstract

Introduction: Increase in the incidence of obesity globally is leading to several public health concerns. Poor sleep quality among obese and overweight individuals was reported by several large population studies. Altered sleep pattern was reported among medical students due to several factors such as high academic demands, social obligations, mobile usage and watching television. Studies assessing the sleep quality and its association with body mass index were not studied in the recent times. In this study we intend to assess the prevalence of poor sleep quality and its association with BMI among medical students in Puducherry.

Methodology: Sleep quality was assessed using the Pittsburg Sleep Quality Index. 125 students consented and participated in the study by submitting the questionnaire and volunteering for anthropometric measurements. PSQI questionnaire was analyzed and a total score of 5 or more was considered as poor sleep quality. BMI was calculated by Quetelet's index and Body fat percentage was calculated from the skinfold thickness measured.

Results: 52 % of the students were found to have poor sleep quality. There were no significant differences in mean PSQI values between male and female students. 43% of the students were found to have high BMI. There was no association between PSQI and BMI among the medical students.

Conclusion: There is a high prevalence of poor sleep quality among the medical students. Prevalence of high BMI is also seen in the study population indicating a risk for the development of obesity. Poor sleep quality and hence sleep deprivation may lead to poor academic performance.

Keywords: *Pittsburg Sleep Quality Index; Poor sleepers; Body fat percentage.*

Introduction

An alarming increase in the incidence of obesity is seen worldwide**.** Obesity and overweight have been known to cause many public health problems including cardiovascular and endocrine disorders. Large population studies in the US has linked obesity and overweight to an increase in the incidence of sleep disturbances among the students[1]. Prevalence of sleep disorders among the general population is found to be increased globally in the recent times [2]. Sleep-wake cycle is influenced by several factors such as physiological functions and work schedules. The sleep-wake cycle of medical students was influenced by insufficient sleep duration, delayed sleep onset and occurrence of napping episodes during the day[3]. Several studies have assessed the sleep behavior among the students and reported that students alter their sleeping pattern due to academic and social obligations

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[4]. Academic demands [5], prolonged exposure to light by mobile, computers and televisions, social interaction with peers, etc., are found to be the factors which disturb the sleeping habits among the students [6]. Excessive daytime sleepiness seems to be prevalent among students who have reduced sleep durations of 1-2 hours a day. Reduced daytime alertness, impaired cognitive performances and thereby diminished academic performance were found to occur among the students due to sleep deprivation [7]. Medical students are more vulnerable to sleep-related problems due to tough syllabus and heavy workload because of clinical postings [8].

Sleep quality can be assessed subjectively by recalling over the previous month by Pittsburg sleep quality index (PSQI) which is a 19-item self-rated questionnaire. The 19 questions are combined into 7 clinically-derived component scores, each weighted equally from 0-3. The 7 component scores are added to obtain a global score ranging from 0-21. PSQI score $\geq$ 5 indicates poor sleep quality [9,10]. Several studies have validated the questionnaire on their clinical and psychometric properties on different study populations [11,12]. Keeping the PSQI cut off score as 5 to identify the sleep disorder, sensitivity and specificity were found to be 89.6% and 86.5% respectively [10]. Screening for the poor quality of sleep among the medical students would help us to reduce the health-related issues among the medical students and improve their academic performance. Most of the studies have assessed the association between sleep quality and academic performance. Studies assessing the quality of sleep among the medical students and the association of body mass index (BMI) on sleep quality has not been studied among the medical students in Puducherry. The objective of this study is to assess the prevalence of poor sleep quality and its association with BMI among medical students.

Materials and Method

The study complied with the ethical standards of the declaration of Helsinki. The institutional ethical committee approval was obtained before the commencement of the study. Written informed consent was obtained from medical students after explaining the study procedure. Students with a known history of sleep disorders with or without medications and known case of any endocrine disorders were excluded from the study.

A sample size of 125 was calculated by using 'n Master 2.0" software taking an average proportion of sleep disturbances of 32% in the general population [13] and 19 % among medical students [14]. The sample size was calculated by keeping the precision at 5% and confidence interval at 95%.

125 students (75 male and 50 female) students were recruited in the study. They submitted their questionnaires and volunteered for the measurement of anthropometric parameters. For assessing the sleep quality, PSQI was used which constitutes a total of 19 self-rated questions and another 5 questions rated by a roommate or a bed partner if available. All questions are provided with responses ranging from 0 to 3. For final scoring only self-rated questions are used which together makes seven components with a range of 0 to 3 points. All the seven component score are finally added to obtain the global score of PSQI which ranges from 0-21 points where 0 indicate no difficulty in sleep and 21 indicate severe sleep difficulty. A total score of 5 or more is suggestive of poor sleep quality.

Anthropometric parameters such as height, weight, Waist circumference, hip circumference and skinfold thickness (pectoral, axillary, subscapular, triceps, abdominal, suprailiac and quadriceps) were recorded in the obesity research laboratory of Department of Physiology. The skinfold thickness was measured using a Harpenden skinfold caliper following the guidelines of the International Society of Advancement of Kinanthropometry (ISAK) [15]. Body fat percentage (PBF) was calculated as per the equation by Jackson and Pollock [16]. The PBF of 25% or more in males and 32% or more in females are considered to be abnormal. BMI was calculated using Quetelet's index and students with BMI $\geq$ 23 Kg/m^2 were considered to be at high risk [17].

Statistical Analysis

Statistical analysis was done using SPSS software (Version 8). Descriptive results were represented as frequency, percentage, mean and standard deviation. Independent't' test was used to test for the differences for Age, BMI, WHR, PBF and PSQI global score between genders. Pearson's Chi-square test was done to assess the differences in frequency distributions between variables. Univariate logistic regression analysis was used to find the association of PSQI with BMI and PBF. A p-value <0.05 was considered significant.

Results

The study participants were between 18 and 20 years of age. There was no significant difference in mean values of age, BMI and PSQI score between male and female participants. PBF and WHR were significantly higher among female participants compared to male participants. There was no significant difference between the mean values of PSQI between male and female participants (Table1)

Table 2 shows that 43 % of the study population was found to have high BMI (BMI ≥ 23 Kg/m^2) out which 32% were males and 11 % were females. 79 % of participants had increased WHR out of which 59% were males and 20 % were female participants. 11 % of the participants had high PBF out of which 4 % were males and 7 % were female participants.

Sleep Quality: As measured by PSQI (table 2), 52% of the students were poor sleepers out of which 33% were males and 19 % were females. Table 3 shows that 25 % of the poor sleepers had high BMI. There was no association of sleep quality with BMI or PBF. 61 % of the students reported that they go to bed after 12 am. 22% of the students reported having a sleep latency of ≥ 30 minutes with a mean sleep latency of 17.3 ± 18.7 minutes. 56 % of the students reported having slept for less than 7 hours per night with mean sleep duration of 6.28 ± 1.03 hours ranging from 2 to 8 hours per night. 26 % of the students reported < 85 % sleep efficiency. During daytime while performing activities, 30% of students had trouble staying awake less than once a week, 24% once or twice a week and 5 % three or more times a week.

Discussion

The current study provides evidence for high prevalence of poor sleep quality (52 %) among medical students. The prevalence of poor sleep quality among medical students is comparable with other studies which assessed the sleep quality among medical students. In an international survey on general population conducted by Leger et al, 32.6 % of the population was affected from insomnia [13]. Feng et al assessed the quality of sleep among the medical students in China and reported that 19.17 % of the students were poor sleepers [14]. Almojali et al reported 76 % poor sleepers among medical students and also reported that poor sleep quality is three times higher among students with higher stress and also affected the academic performance of the students [18]. Usage of mobiles, computers and watching televisions at night increases the poor quality of sleep among students [6]. A higher number of male students (32.8 %) were found to have poor sleep quality which was also consistent with findings by Almojali et al. Several studies reported that perceived stress and high academic demands were found to be the reasons for poor sleep quality and hence leading to sleep deprivation [19]. Sleep deprivation has been found to affect the architecture of sleep and circadian rhythm [20]. Sleep duration of at least 7 hours a day is optimal for an adult to maintain a good health [21]. Majority of students were found to have reduced sleep duration in this study. Medical students sleep for short duration due to increased academic demands and they tend to utilize the time for reading [22]. Reduced sleep duration in the night causes sleep debt which further leads to excessive daytime sleepiness [23,24]. There was also an increase in the prevalence of high BMI among the students which may be attributed to sedentary lifestyle and poor dietary habits. However, there was no association between sleep quality and BMI in this study. Vargas et al assessed the sleep quality among 515 college students and reported that 51 % of them were poor sleepers. There was an association between sleep quality and BMI with increased odds ratio which contradicts with our results.

We conclude that there is a high prevalence of poor sleep quality among medical students. BMI, PBF and sleep quality could not be associated in our study. Prevalence of high BMI is also seen in the study population indicating a risk for the development of obesity. Poor sleep quality and hence sleep deprivation may lead to poor academic performance. There is a need to educate the students to maintain proper sleep hygiene and also to perform a regular physical activity to reduce the risk of obesity. The limitation of this study is that assessment of body composition by methods such as Dual X-Ray Absorptiometry which would have given us more accurate values on PBF was not done. Recruitment of more sample size could have helped us to elicit the association of sleep quality with BMI and PBF.

Conflict of Interest: No conflict of interest

Source of Funding: This study was approved and funded by ICMR short term studentship program (Reference ID: 2015-04787)

Ethical Clearance: This study was approved by the institutional ethics committee (Human studies) of

JIPMER, Puducherry.

Table 1: Baseline characteristics of the study population

Parameters	Male (75)	Female (50)	Total (125)
Age	18.9 ± 0.7	18.8 ± 0.7	18.84 ± 0.69
BMI	22.9 ± 3.5	21.8 ± 3.7	22.6 ± 4.21
Waist Hip Ratio (WHR)	0.99 ± 0.03	0.81 ± .0.07*	0.99 ± 0.02
Body Fat percent (PBF)	17.38 ± 4.3	26.74 ± 4.9*	21.12 ± 6.5
PSQI score	4.96 ± 2.25 (74)	4.67 ± 1.9 (48)	4.84 ± 2.14 (122)

Data are represented as mean ± SD (number of students)

* P< 0.05. Independent t-test was done to find the gender difference between the mean values of WHR and PBF.

Table 2: Gender differences of study variables

	Male	Female	Total
Body Mass Index			
High BMI [BMI ≥ 23 Kg/m^2]	40 (32 %)	14 (11.2 %)	54 (43.2 %)
Normal BMI [BMI < 23 Kg/m^2]	35 (28%)	36 (28.8 %)	71 (56.8 %)
Waist Hip Ratio			
High Risk >0.89 for male >0.81 for female	74 (59.2 %)	25 (20%)	99 (79.2 %)
Low risk < 0.89 for male <0.81 for female	1 (0.8%)	25 (20%)	26 (20.8 %)
Body Fat Percentage			
High Risk > 25 % for male > 32 % for female	5 (4%)	9 (7.2 %)	14 (11.2 %)
Low Risk < 25 % for male < 32 % for female	70 (56 %)	41 (32.8 %)	111 (88.8 %)
PSQI			
Good sleeper (PSQI Score < 5)	34 (27.9 %)	25 (20.5%)	59 (48.7 %)
Poor sleeper (PSQI Score > 5)	40 (32.8 %)	23 (18.9 %)	63 (51.6 %)

Data represented as frequency (percentage)

Pearson's chi-square test was used to assess the association between PSQI and gender.

Table 3: Association between the quality of sleep and BMI.

PSQI and BMI	High BMI	Normal BMI	Total
Good sleeper (PSQI Score < 5)	22 (18.03 %)	37 (30.3 %)	59 (48.36%)
Poor sleeper (PSQI Score > 5)	31 (25.4 %)	32 (26.22 %)	63 (51.6%)

Data represented as frequency (percentage)

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DOI Number: 10.5958/2320-608X.2019.00088.X

Comparison of Heart Rate Variability in Newly Diagnosed Diabetic Patients with and without Autonomic Neuropathy

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Abstract

Background-Diabetic Autonomic Neuropathy is among the least recognized and understood complications of diabetes despite its significant negative impact on survival and quality of life in people with diabetes. **Objective**: to analyze short term frequency domain of Heart Rate Variability (HRV) in newly diagnosed diabetic patients with and without autonomic neuropathy and compare the results with controls. **Method-** The study was conducted in medical OPD of Bapuji Hospital and Chigateri General Hospital attached to J.J.M. Medical College, Davangere. 100 consecutive newly diagnosed type 2 diabetic patients age 35 to 50 years and 50 normal individuals formed the subjects of the study. **Results-** The age of subjects ranged from 30-60 years. The resting heart rate was significantly higher in diabetics than normal. When the blood pressure response to supine to standing was evaluated there was a significant decrease in systolic blood pressure among controls and cases. The Valsalva ratio was decreased in diabetics as compared to controls. No difference was observed in E/I ratio between control and diabetics. There was increase in systolic blood pressure during test as compared to rest. Ratio of heart rate on standing (30:15) decreased in cases as compared to controls.

Conclusion- Clinical observations should not be the sole basis for the diagnosis of cardiovascular autonomic dysfunction. Screening for abnormalities is infrequently done.

Keywords*: Resting heart rate, Valsalva ratio, Valsalva Maneuver, type-2 diabetic patients, E/I ratio, blood pressure*

Introduction

Prevalence of Diabetes is increasing globally and India is no exception. The concern is that India would be having the highest population of diabetes by 2025 and is all set to become the "Diabetic Capital" of world[1]. Though recognized as a major cause of death and disability, many who suffer from diabetes are unaware of that they are afflicted until they experience a debilitating side effect of this disease. Long term complications of diabetes includes neuropathies which affect upto 50% of patients[2-4]. Most common neuropathies are chronic sensorimotor distal symmetric polyneuropathy and autonomic neuropathy. Diabetic autonomic neuropathy can involve entire autonomic nervous system. It is manifested by involvement of one or more organ systems like Cardiovascular system, Gastro-intestinal tract, Genitourinary system, sudomotor and Ocular systems etc.

Clinical symptoms do not occur until long after the onset of diabetes. Sub clinical autonomic dysfunctions can however occur within a year of diagnosis of type II diabetic patients and within two years in type I diabetic patients.[5] Early recognition and treatment is important, as the autonomic complications of Diabetes are potentially treatable. It is possible that the patients develop subtle deficits in Heart Rate Variability much earlier and can be used as marker of cardiac autonomic neuropathy to

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study the benefits of therapeutic interventions.

The present study was taken up to analyze short term frequency domain of Heart Rate Variability in newly diagnosed diabetic patients with and without autonomic neuropathy and compare the results with controls.

Materials and Method

This cross sectional study was conducted in 100 consecutive newly diagnosed type 2 diabetic patients age 35 to 50 years and 50 normal individuals attending medical OPD of Bapuji Hospital and Chigateri General Hospital attached to J.J.M. Medical College.

Method of collection of data: A pre tested structured proforma were used to collect the relevant information regarding clinical findings, investigations and test results. These patients and normal individuals were subjected to 5 cardiovascular tests and heart rate variability after detail history regarding autonomic symptoms, peripheral neuritis and careful physical examinations.

The patients is placed supine on an examination table and allowed to rest for 5 minutes, they will be asked to breath regularly at 6 breaths per minute using Metronome and then they will be connected to ECG machine. The ECG recording is done and resting heart rate is calculated from this. Frequency Domain analysis is done by using NIVIQURE software.

Valsalva Maneuver: The patient is asked to perform the maneuver for a period of 15 seconds. With the patient still connected to the ECG machine, he is then asked to release the pressure and an ECG is recorded for a further period of 30 sec. The patient is then allowed to rest for one minute and the procedure is repeated once again. He will be then allowed to rest for a further period of 1 minute. The ratio of the longest R-R interval shortly after the maneuver (within about 20 beats) to the shorter R-R interval during the maneuver is measured and result is expressed as Valsalva ratio which will be taken as the mean.

Heart Rate response to standing: After completing the above procedure, the patient is allowed to rest for sometime, after which the ECG recording is done for about 30 second with patient still in the supine position. With ECG machine is running, patient is asked to stand up. After ECG baseline become normal, the 15^{th} beat and the 30^{th} beat after standing up is marked. The characteristic heart rate response can be expressed by the 30:15 ratio, which will be the ratio of the longest R-R interval around the 30^{th} beat after starting to stand up to the shortest R-R interval around the 15^{th} beat.

Heart Rate Response to Deep Breathing: At the end of one minute, with ECG running, the patient is asked to take deep breath at the rate of 6 breaths per minute and the E/I ratio is calculated.

Power spectral analysis of HRA: Analysis of HRV will also be assessed by spectral analysis of series of successive R-R interval on 5 min ECG Recordings. The heart rate power spectrum is typically divided into two frequency bands. Low and high frequency. The high frequency region will be generally considered a marker of vagal activity whereas the low frequency component influenced by both sympathetic and vagal activity.

Blood Pressure response to standing: Patient is again allowed to assume a supine position, and a recording of blood pressure is done in the supine position. Patient is then asked to stand up and blood pressure is recorded at 0 and 1 minute intervals.

Handgrip test: The baseline blood pressure is recorded in the subject. The subject is instructed about the test and demonstrated the procedure to use handgrip dynamometer. After the instruction the subject is asked to grip using maximum force with their dominant hand for a few seconds. The value is noted down and the procedure is repeated thrice. The maximum value of the three readings is considered as their Maximal Voluntary Contraction.

After the subject has started the contraction, the blood pressure is measured on the contra-lateral arm at 1^{st}, 2^{nd}, 4^{th}. One more reading is taken 2 minutes after the release of the grip.

Result

The age of subjects ranged from 30-60 years. Out of the 50 normal individuals, 29 subjects were in the age group of 30-39 years, 16 subjects were in the age group of 40-49 years, 3 subjects were in the age group of 50-59 years and 2 subjects were in the age group above 60 years.

Resting heart rate: the resting heart rate was significantly higher in diabetics than normal. ($p < 0.01$).

Blood pressure response to standing: When the BP response to supine to standing was evaluated there was a significant decrease in systolic blood pressure among controls and cases. But there was no significant change in diastolic blood pressure in supine position between cases and controls.

Valsalva ratio: The Valsalva ratio was decreased in diabetics as compared to controls ($p < 0.01$).

E/I ratio: No difference was observed in E/I ratio between control and diabetics.($p < 0.94$)

Blood pressure response to Hand grip test: In controls there was increase in SBP during test as compared to rest. There was increase in DBP during test when compared to rest. In cases there was increase in SBP during test as compared to rest. There was increase in DBP during test.

During hand grip test, when there was significant increase in the blood pressure during rest and the test ($p < 0.01$).

Heart rate response to standing (30:15): Ratio of heart rate on standing decreased in cases as compared to controls.

Table 1: Comparison of cardiovascular tests between controls and cases

Groups		Resting HR	Postural hypotension				Valsalva ratio	E/I ratio	Handgrip test				HR (30:15 ratio)
			SBP		DBP				SBP		DBP		
			Supine	Standing	Supine	Standing			Rest	Test	Rest	Test	
Controls (50)	Mean ± SD	76.5 ± 4.4	123.9 ± 7.2	114.4 ± 7.7	75.9 ± 4.8	80.5 ± 5.6	1.27 ± 0.02	1.24 ± 0.01	113.6 ± 7.1	134.8 ± 6.4	75.4 ± 4.6	94.2 ± 4.7	1.04 ± 0.06
Cases (100)	**Mean ± SD**	88.1 ± 4.3	120.6 ± 9.5	108.0 ± 11.1	75.1 ± 4.5	70.3 ± 5.1	1.24 ± 0.03	1.22 ± 0.02	111.9 ± 3.9	126.6 ± 5.8	74.6 ± 4.5	84.6 ± 4.5	1.06 ± 0.04
	P value	< 0.01	< 0.05	< 0.01	0.35	< 0.01		0.94	0.07	< 0.01			< 0.05

Heart rate variability: In relation to heart rate variability (LH, and LH/HF ratio), there was no significant change in the value among controls and cases.

Table 2: Comparison of HRV between cases and controls

Groups		LF	HF	LF/HF
Controls (50)	**Mean ± SD**	0.11 ± 0.09	0.28 ± 0.08	0.39 ± 0.30
Cases (100)	**Mean ± SD**	0.10 ± 0.07	0.27 ± 0.08	0.37 ± 0.23
	P-value	0.58	0.63	0.66

Resting heart rate (HR): The mean value of resting HR in group I, II and III was 76.5 ± 4.5, 86.8 ± 2.1 and 90.0 ± 5.7. there was a significant difference but in the normal range.

Blood pressure response to supine to standing: In comparison to in supine position in Group I, II & III the values ranged from 110-134, 116-132 and 100-120 respectively. The mean value was 123.9 ± 7.2, 127.5 ± 5.6 and 110.7 ± 5.9 in Group I, II and III respectively.

In standing position the SBP in Group I, II and III, the values ranged from 98-128, 106-124 and 90-108 respectively. The mean value was 114.4 ± 7.7, 116.3 ± 4.5 and 96.0 ± 4.9. There was slight fall in blood pressure, but in normal range.

The mean values were 75.9 ± 4.8, 73.7 ± 2.5 and 77.2 ± 5.7 in Group I, II and III respectively.

Similarly the DBP among Group I, II and III in standing position ranged from 72 to 92, 60 to 80, 60-84 and the mean values were 80.5 ± 5.6, 69.2 ± 5.2 and 72.0 ± 4.5 among Group I, II and III respectively. There was statistical significance. But in the normal range.

Valsalva ratio: The mean values among Group I, II and III were 1.27 ± 0.02, 1.25 ± 0.02 and 1.22 ± 0.01 respectively. The difference observed between the groups were statistically significant but in the normal range.

E.I. Ratio: The mean values among Group I, II and III were 1.24 ± 0.01, 1.25 ± 0.01 and 1.22 ± 0.01 respectively. The range was 1.22 to 1.26, 1.23 to 1.26 and 1.21 to 1.24 among Group I, II and III. ($P<0.05$)

Heart rate response to standing (30: 15): The values 30: 15 ratio ranged from 1.04 to 1.14, 1.00 to 1.13 and 1.04 to 1.07 among Group I, II and III respectively. The mean values were 1.06 ± 0.0, 1.05 ± 0.02 and 1.04 ± 0.02 respectively.

Handgrip test: The SBP at rest in Group I, II and III ranged from 100–124, 106–118 and 100–122 respectively. The mean values were 113.6 ± 7.1, 111 ± 2.3 and 112.1 ± 5.5 among Group I, II and III respectively.

The SBP during test in Group I, II and III ranged from 116 to 146, 110 to 138, 114–136 respectively.

At rest the DBP among Group I, II and III ranged from 70 to 84, 70 to 80 and 70 to 78 respectively. The mean values are 75.4 ± 4.6, 72.6 ± 2.4 and 77.5 ± 5.3 among Group I, II and III respectively. Table 3

During test the DBP among Group I, II and III ranged from 86–104, 70 to 80 and 80–98 respectively. The mean values were 94.2 ± 4.7, 81.6 ± 3.4 and 89.0 ± 5.3 among Group I, II and III. Table 3

Table 3: Comparison of cardiovascular test between Group I, II and III

Groups		Resting HR	Postural hypotension				Valsalva ratio	E/I ratio	Handgrip test				HR (30:15 Ratio)
			SBP		DBP				SBP		DBP		
			Supine	Standing	Supine	Standing			Rest	Test	Rest	Test	
Group I (50)	Mean ± SD	76.5 ± 4.4	123.9 ± 7.2	114.4 ± 7.7	75.9 ± 4.8	80.5 ± 5.6	1.27 ± 0.02	1.24 ± 0.01	113.6 ± 7.1	134.8 ± 6.4	75.4 ± 4.6	94.2 ± 4.7	1.06 ± 0.04
Group II (59)	Mean ± SD	86.8 ± 2.1	127.5 ± 3.6	116.3 ± 4.5	73.7 ± 2.5	69.2 ± 5.2	1.25 ± 0.02	1.25 ± 0.01	111.8 ± 2.3	127.6 ± 5.6	72.6 ± 2.4	81.6 ± 3.4	1.05 ± 0.02
Group III (41)	Mean ± SD	90.0 ± 5.7	110.7 ± 5.9	96.0 ± 4.9	77.2 ± 5.7	72.0 ± 4.5	1.22 ± 0.01	1.22 ± 0.01	112.1 ± 5.5	125.2 ± 5.8	77.5 ± 5.3	89.0 ± 5.3	1.04 ± 0.02

Discussion

In our study the resting heart rate was increased in Group II and III as compared to Group I. These findings are in concurrence with other studies. Many studies[6,7,8,] have suggested that increased resting heart rate in diabetics was mainly due to parasympathetic damage in early stage of cardiac autonomic involvement.

Blood pressure response to standing: Our study shows that there is fall in systolic and diastolic blood pressure on standing. there was a fall in blood pressure in Group II and III. Low PA[9] and Langer[10] have suggested that this may be because of damage to the efferent sympathetic vasomotor fibers particularly in the splanchnic vasculature.

Valsalva ratio: valsalva ratio decreased in Group II and III. American Diabetes Association[11] suggested that Valsalva maneuver is a much more complex reflex arc involving sympathetic and parasympathetic pathways to the heart, sympathetic pathways to the vascular tree, baroreceptors in the chest and lungs. The baroreflex system is impaired in diabetics. As a result the response is altered.

Handgrip test: There was decrease in diastolic blood pressure in Group II and III. Ewing DJ[12] suggested that when a normal person performs sustained isometric exercise, the heart rate and cardiac output increased to a modest degree while the blood pressure response is more marked. But in diabetics the blood pressure decreased due to decrease in the vascular resistance and impaired sympathetic activity.

E: I ratio: the E:I ratio was decreased in Group II and Group III. Rathmann[13] suggested that during inspiration the heart rate increases and on expiration the heart rate decreases. But in diabetics due to the impairment of parasympathetic system the ratio decreases.

HR response to standing (30:15): On comparing the HR response to standing the value decreased in Group II and III. Ewing DJ[14] observed that lying to standing test is mediated by sympathetic and parasympathetic reflex pathways.

Conclusion

Despite research evidence that clinical observations should not be the sole basis for the diagnosis of cardiovascular autonomic dysfunction. Screening for abnormalities is infrequently done. This is also despite the fact that office-based commercially available instrumentation for detection is readily available. Given the clinical and economical impact of this complication, testing of diabetic individuals for cardiovascular autonomic dysfunction should be part of their standard of care.

Conflict of Interest: None

Funding: None

Ethical Clearance: Permission for the study was obtained from the College authorities prior to commencement.

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DOI Number: 10.5958/2320-608X.2019.00089.1

Variations in PEFR among Sports Persons of Different Types of Sports Activities and their Relationship with BMI

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Abstract

Background: Physical activity is known to improve physical fitness and to reduce the incidence of Hypertension, Diabetes, Obesity etc. Regular exercise as in athletes produces a positive effect on the lung function by increasing vital capacity and make them more fit. The Pulmonary Function Capacities of sedentary individuals have been studied extensively in India but less in the context of an athletic population.

Objectives:

1. To study the variations in PEFR among sports persons and sedentary persons.
2. To study the variations in BMI of persons of different sports activities.
3. To study the variations in PEFR among persons of different sports activities.

Materials and Method: Sixty subjects comprising of 30 Male and 30 Female sports person were taken as the study group and 60 sedentary persons were taken as the control group. PEFR was measured using Mini Wright's peak flow meter. The height, weight and BMI of all subjects were recorded.

Results: Unpaired t test is used to find out the differences between sports persons and sedentary persons and male and female sports persons. Our study shows that height($p<0.0130$) and PEFR($p<0.0001$) was found to be significantly higher and BMI($p<0.0399$) was significantly lower among sports persons when compared with the sedentary persons. Height ($p < 0.0084$), weight($p<0.0248$) and PEFR ($p< 0.0078$) were significantly higher in male sports person when compared with the females. ANOVA test was used to find out the difference in height, weight, BMI and PEFR between different sports activities. Height and PEFR were found to be higher among football players and athletes and BMI was found to be lower in football players when compared to the other sports persons.

Conclusion : The results indicate that all the sportspersons had a higher value of lung function compared to the controls. PEFR was found to be high among persons with increased height. Among the various groups of players chosen for this study, the athletes and football players showed the maximum increase in their lung functions and BMI was found to be lower in football players when compared to the other sports persons. The fact that footballers and athletes had higher lung functions could be attributed to the fact that these games involves a lot of power in running at great speed. Compared to the other games included in this study more force has to be generated while running at great speed.

Keywords: *athletes, PEFR, sports person, sedentary person, Pulmonary Function Capacities, BMI.*

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Introduction

Every year about 2 million deaths are attributed to physical inactivity, prompting WHO to issue a forewarning that a sedentary lifestyle could be one among the leading causes of death and disability in the

world. Exercise has shown to increase the strength of the muscle, reduce body fat, decrease resting systolic and diastolic blood pressure, improve the function of heart and lungs, increase the cardiac output and blood volume, increase blood supply to muscles and their oxygen consumption.

Regular physical activity can prevent the disease or can be prescribed as an adjuvant to a patient during convalescence and rehabilitation. Lack of physical activity is linked to the increased incidence of cancer, diabetes and cardiovascular diseases thus increasing the rate of morbidity and mortality in these population. [1,2,3]

Impaired pulmonary functions are associated with increased mortality and morbidity. Physical activity is known to improve physical fitness and to reduce morbidity and mortality from numerous chronic ailments. In athletes, regular exercise tends to have an increase in the pulmonary capacity when compared to non-exercising individuals.[4,5]

The peak expiratory flow rate (PEFR) is a person's maximum speed of expiration. It measures the airflow through the bronchi and thus the degree of obstruction in the airways. Peak expiratory flow rate gives a reasonably accurate measurement of lung function.[6,7,8] The present study was undertaken to assess the variations in PEFR among sports persons and sedentary persons, to study the variations in BMI of persons of different sports activities and to study the variations in PEFR among sports persons of different sports activities.

Materials and Method

The study population comprised of 60 subjects comprising of 30 Male and 30 Female sports persons and 60 sedentary persons were taken as the control group. The subjects were carefully selected between the age group of 18-25 years who are willing to participate in the study. Study group includes person who takes part in competitive track and field events for 2-4 hours per day. The study population was selected randomly from Sri Ventakeshwara medical College campus with the help of Physical Education department. Control group comprised of subjects with leisure-time physical activity or activities done for less than 20 minutes or fewer than 3 times per week. Smokers (Cigarettes, Beedies etc), persons with acute respiratory disorders & chronic respiratory disorders like Bronchial Asthma and Obese persons were excluded from the study.

The study was conducted after obtaining the Institutional Ethical Committee Clearance. The experimental procedures were performed after receiving the informed written consent from the study population. Anthropometric measurements like height, weight and BMI of each subject was measured before the test procedure. Information regarding the personal history, family history of any bronchial asthma, about smoking, recent respiratory illness, medications used was obtained. After detailed explanation regarding the working of the instrument, Mini Wright's Peak Flow Meter and after proper demonstration PEFR was recorded. Measurements were taken with the patient sitting upright, and the value of three peak expiratory flow rate manoeuvres were recorded. Best of the three readings was taken for statistical analysis. The instrument was sterilized between uses by each subject using a dilute (10%) solution of Potassium Permanganate & Cotton Wool. Measurements were taken between 8 AM and 12 noon to avoid diurnal variations in lung functions.

Results

Unpaired t test is used to find out the differences between sports persons and sedentary persons and male and female sports persons. Table 1 shows that height($p<0.0130$) and PEFR($p<0.0001$) was found to be significantly higher and BMI($p<0.0399$) was significantly lower among sports persons when compared with the sedentary persons. Table 2 shows that height ($p < 0.0084$), weight($p<0.0248$) and PEFR ($p< 0.0078$) were significantly higher in male sports person when compared with the females.

Table 1: Height, Weight, BMI and PEFR between sports person and sedentary persons

Parameters	Sports Persons (N=60) mean± SD	Sedentary Persons(N=60) mean± SD	P value
Height(cm)	168.24±8.96	164.35±7.88	0.0130*
Weight (kg)	61.1±12.09	59.88±11.18	0.5658
BMI	21.51±3.41	22.70±2.80	0.0399*
PEFR(L/min)	459.83±83.797	340.33±85.38	0.0001 ***

Table 2: BMI and PEFR among male and female sports persons

Parameters	Male sports persons N=30 mean± SD	Female sports persons N=30 mean± SD	P value
Height(cm)	173.93±7.06	168.24±8.96	0.0084**
Weight(kg)	68.16±11.62	61.10±12.09	0.0248*
BMI	22.51±3.43	21.518±3.41	0.2631
PEFR(L/min)	517.33±77.59	459.83±83.79	0.0078**

Table 3: BMI & PEFR among persons of different sports activities.

Parameters	Type of sports	No of players (N)	Mean	Standard deviation	P value
Height (cm)	Badminton	8	159.90	6.54	
	Athlete	15	171.03	9.82	
	Football	11	173.59	4.97	0.001**
	Basket ball	13	170.15	6.55	
	Volley ball	13	163.72	9.24	
Weight(kg)	Badminton	8	54.12	6.44	
	Athlete	15	65.00	15.10	0.367
	Football	11	61.27	8.12	
	Basket ball	13	60.07	12.40	
	Volley ball	13	61.80	12.90	
BMI	Badminton	8	21.18	2.27	
	Athlete	15	22.11	4.21	
	Football	11	20.43	3.51	0.344
	Basket ball	13	20.61	3.37	
	Volley ball	13	22.85	2.73	
PEFR(L/min)	Badminton	8	383.75	41.03	
	Athlete	15	503.33	109.58	
	Football	11	505.45	53.91	0.001**
	Basket ball	13	459.23	60.34	
	Volley ball	13	418.46	58.99	

ANOVA test was used to find out the difference in Height, Weight, BMI and PEFR between different sports activities. Table 3 shows that height and PEFR was found to be significantly higher among football players and athletes and BMI was found to be lower in football players when compared to the other sports persons.

Discussion

Our study shows that height($p<0.0130$) and PEFR($p<0.0001$) was found to be significantly higher and BMI($p<0.0399$) was significantly lower among sports persons when compared with the sedentary persons. Height ($p < 0.0084$), weight($p<0.0248$) and PEFR ($p< 0.0078$) were significantly higher in male sports person when compared with the females. Height

and PEFR was found to be higher among football players and athletes and BMI was found to be lower in football players when compared to the other sports persons. The fact that footballers and athletes had higher lung functions could be attributed to the fact that these games involve a lot of power in running at great speed. Compared to the other games included in this study more force has to be generated while running at great speed. In a similar study conducted by PRATEEK et al. all the sportspersons had a higher values of lung functions compared to the controls. Among the various groups of players chosen, the swimmers showed the maximum increase in their lung functions. The respiratory muscles and the diaphragm of the swimmers are required to develop greater pressure as a consequence of immersion in water during the respiratory cycle, thus leading to functionally better respiratory muscles.[9]

A study done on the assessment of Pulmonary Function Parameters of Football Players and Age Matched Controls showed that football players had significantly greater height ($p<0.05$), body weight ($p<0.05$), body mass index ($p<0.05$), forced vital capacity ($p<0.05$), maximum voluntary ventilation ($p<0.05$) and peak expiratory flow rate ($p<0.05$) as compared to controls. It is concluded that the exercise has clear impact on pulmonary function variables.[10] A similar study conducted among the Athletic and Sedentary Population showed that FVC, FEV1, FEV3, PEFR and FEV1/FVC ratio were higher in athletes than in the normal sedentary control individuals.[11] This study suggests that regular exercise has an important role in determining and improving lung functions

Conclusion

The results indicate that all the sportspersons had a higher value of lung function compared to the controls. PEFR was found to be higher among persons with increased height. Among the various groups of players chosen for this study, the athletes and football players showed the maximum increase in their lung functions and BMI was found to be lower in football players when compared to the other sports persons. To explain the difference in the lung volumes in various categories of players, more extensive and detailed research with each group of players is required.

Conflict of Interest: There is no conflict of interest.

Source of Funding: Self

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DOI Number: 10.5958/2320-608X.2019.00090.8

Original Article

A Comparative Study of Physiological Variations in Pulmonary Function Tests during Pregnancy

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Abstract

Introduction: Pregnancy is principally a phenomenon of maternal adaptation to the increasing demands of the growing fetus. Pregnancy causes many visible and invisible changes in human body and it represents one of the best examples of selective adaptation in terms of respiratory. **Materials and Method***:* The study consists of recording the Pulmonary Function Tests of 4 groups of female subjects including pregnant women of various phases of gestational period i.e., 12 weeks (I trimester), 24 weeks (II trimester), 36 weeks (III trimester) and control group of non pregnant women. The different lung function parameters measured in this study were Expiratory Reserve Volume (ERV), Tidal Volume (TV), Vital Capacity (VC), Residual Volume (RV) & Minute Ventilation(MV), PEFR – Peak Expiratory Flow Rate, FVC – Forced Vital Capacity FEV1 – Forced Expiratory Volume in one second. **Results:** We observed a statistically significant decrease in Expiratory Reserve Volume, Residual Volume and a significant increase in Tidal Volume, Minute Volume & Vital Capacity remains unchanged in different trimesters of pregnancy. **Conclusion:** From the results of our study it can be concluded that significant changes in pulmonary physiology occur during pregnancy which are necessary to meet the increased metabolic demands of the mother and fetus.The changes in Pulmonary functions are helpful in the prevention of gestational complications associated with inadequate maternal respiratory adaptation pulmonary Function Tests.

Keywords: *Expiratory Reserve Volume , Tidal Volume , Vital Capacity, Peak expiratory flow rate.*

Introduction

During healthy pregnancy, pulmonary function, ventilatory pattern and gas exchange are affected through both biochemical and mechanical pathways. Progesterone acts as trigger of the primary respiratory centre by increasing the sensitivity of the respiratory centre to carbon dioxide and also alters the smooth muscle tone of the airways resulting in a bronchodilator effect. Progressive uterine distension and elevation of the diaphragm causes increase in negative pleural pressure leading to an earlier closure of the small airways with consequent reduction of functional residual capacity (FRC) and expiratory reserve volume (ERV). Secondly, the chest height becomes shorter, but transverse thoracic dimensions increase and the average subcostal angle of the ribs at the xiphoidal level increases from 68.5° at the beginning of pregnancy to 103.5° at term in order to maintain constant total lung capacity. With pregnancy progression, the resting position of the diaphragm moves 5 cm upward with the increasing uterus size.This causes its capability to generate tension increases secondary to muscle fibre lengthening; its area of opposition to the lower ribcage increases; and its radius of curvature increases, due to the progressive enlargement of the

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lower ribcage to give space to the lungs. In addition, the upward movement of the diaphragm causes FRC decrease. Following hyperventilation and reduced levels of *P*CO2, arterial oxygen tension increases, reaching 106–108 mmHg and 101–104 mmHg in the first and third trimesters, respectively. Lung volumes undergo major changes are ERV gradually decreases during the second half of pregnancy (reduction of 8–40% at term) because residual volume reduces (by 7–22%). FRC then decreases (by 9.5–25%) while inspiratory capacity increases at the same rate in order to maintain stable TLC. Pulmonary static and dynamic compliance, diffusing capacity and static lung recoil pressure do not change during pregnancy[1]. Pulmonary function tests (PFTS) permit an accurate and reproducible assessment of the functional state of respiratory system and allow quantification of the severity of disease. Various investigators have studied pulmonary function tests (PFTS) during normal pregnancy but their results were conflicting[2]. Based on these considerations, we endeavored to perform a more extensive study with repeated measures of healthy pregnant women in order to provide pertinent data on the physiological changes in lung function during pregnancy.

Material & Method

The study was conducted on pregnant and nonpregnant individuals (N=100). The case group includes pregnant women of various phases of gestation periods of 1st trimester (12 weeks), 2nd trimester (24 weeks) and 3rd trimester and on control group of non-pregnant women of child bearing age (20-35years). Case group involves 75 pregnant individuals of all the three trimesters and 25 nulliparous women of same age group were randomly selected by open invitatation

Inclusion Criteria- Age group-16-30 yrs primigravida or multigravida. The criteria for selection of study were uncomplicated pregnant women, physically and mentally capable of adequate co-operation during the performance of the tests.

Exclusion Criteria- Respiratory, cardiovascular diseases or hypertension anemia, multiple pregnancy, smoking hydramnios & those on chronic therapy for any other aliment were excluded from the study tests were performed under calm conditions with the subject in a sitting position according to American Thoracic Society (ATS) guidelines.

Recording of PFTs:

Prior to the study each subject was informed in details of its objectives and the aim of the research protocol and methods to be used. Their consent was obtained. The equipment used is Computerized data logging Spirometer for recording the pulmonary function tests (UNI-EM Spiromin 6.24.9 Ink). All the subjects were called for spirometric tracings in the afternoon between 3 to 5pm. (3-4 hrs after meal) in the post absorption stage in order to keep uniform conditions for recording the tests. When the subject was confident and familiar with the procedure, she was asked first to perform maximal inspiration after a deep expiration. The subject was then instructed to expire with maximal effort (maximal expiration). The mouth piece was then removed and the actual, predicted and percentage of predicted values were printed for analysis. The tracings in the spirograph were taken after being fully satisfied. Each subject (test or control), was asked to repeat the maximum forced expiratory effort three times, each time with adequate rest in between, and the best reading of the three was considered for analysis.

Statistical Analysis: Data were reported as mean and standard deviation (mean+SD), mean were compared between two groups by unpaired ‘t’ test. A ‘p’value of less than 0.05 was considered statistically significant. Descriptive statistical analysis was carried out in the present study. Result on continuous measurements were presented on (Mean±SD). Student ‘t’ test was used to find the significance of study parameters between two groups

Statistical software: The statistical software SPSS 10.0 was used for the analysis of the data and Microsoft word and excel have been used to generate tables. The study was approved by the institutional ethical committee clearance.

Results

TABLE 1: Comparision of spirometric variables between nulliparous and first trimester pregnant women

P.F.T	Nonpregnant mean ± SD	Ist Trimeter Pregnant Women	Unpaired t Value	P value
ERV	1144.80±95.44	996.00±124.10	4.752	0.0001
T.V	472.00±67.45	546.00±84.06	3.432	0.0012
R.V	1129.60±73.74	1008.00±111.50	4.548	0.0001
MV	5309.92±316.42	5967.60±335.77	7.127	0.0001
V.C	3880.00±462.17	4816.00±398.62	7.602	0.0001
PEFR	390.40±116.03	334.40±40.93	2.275	0.027
FVC	3912.00±307.03	4029.60±436.70	1.101	0.276
FEV1	2824.00±281.78	2447.20±351.18	4.184	0.0001

According to the present study as depicted in the Table.1, The mean ERV of 1st trimester pregnant women was increased compared to controlled group which was also found to be statistically significant. The mean (TV) of 1st trimester pregnancy individuals was higher than control group the difference was found to be statistically highly significant. The mean RV of 1st trimester pregnant individual was lower than mean RV of controlled group the difference was found to be statistically significant. The mean MV was found to be increased in 1st trimester pregnant women compared to controlled group which was statistically significant. The mean VC of 1st trimester pregnant women increased compared to controlled group which statistically significant. The mean PEFR of 1st trimester pregnant individual was lower than mean PEFR of controlled group the difference was not found to be statistically significant. The mean FVC was found to be increased in 1st trimester pregnant women compared to controlled group which was statistically significant. The mean FEV1 of 1st trimester pregnant women decreased compared to controlled group which statistically significant.

TABLE 2: Comparision of spirometric variables between nulliparous and second trimester pregnant women

P.F.T	Nonpregnant mean ± SD	2nd Trimeter Pregnant Women	Unpaired t Value	P value
ERV	1144.80±95.44	975.20±96.79	6.2385	0.0001
T.V	472.00±67.45	604.00±87.70	5.965	0.0001
R.V	1129.60±73.74	1004.00±101.98	4.990	0.0001
MV	5309.92±316.42	6008.33±369.39	7.117	0.0001
V.C	3880.00±462.17	4704.00±457.78	6.272	0.0001
PEFR	390.40±116.03	314.80±59.52	2.898	0.005
FVC	3912.00±307.03	3480.00±518.81	3.582	0.008
FEV1	2824.00±281.78	2584.00±420.00	2.37	0.02

According to the present study as depicted in the Table 2, The mean ERV of 1st trimester pregnant women was increased compared to controlled group which was also found to be statistically significant. The mean (TV) of 1st trimester pregnancy individuals was higher than control group the difference was found to be statistically highly significant. The mean RV of 1st trimester pregnant individual was lower than mean RV of controlled group the difference was found to be statistically significant. The mean MV was found to be increased in 1st trimester pregnant women compared to controlled group which was statistically significant. The mean VC of 1st trimester pregnant women increased compared to controlled group which statistically significant.

The mean PEFR of 1sttrimester pregnant individual was lower than mean PEFR in controlled group the difference was found to be statistically significant. The mean FVC was found to be increased in 1st trimester pregnant women compared to controlled group which was statistically significant. The mean FEV1 of 1st trimester pregnant women decreased compared to controlled group which statistically significant.

TABLE 3: Comparision of spirometric variables between nulliparous and third trimester pregnant women

P.F.T	Nonpregnant mean ±SD	3rd Trimeter Pregnant Women	Unpaired t Value	P value
ERV	1144.80±95.44	868.00±85.24	10.815	0.0001
T.V	472.00±67.45	652.40±58.11	10.13	0.0001
R.V	1129.60±73.74	909.20±59.58	11.624	0.0001
MV	5309.92±316.42	5817.60±503.53	4.268	0.0001
V.C	3880.00±462.17	5208.33±776.79	7.265	0.0001
PEFR	390.40±116.03	206.40±90.69	6.247	0.0001
FVC	3912.00±307.03	3480.00±518.81	3.582	0.008
FEV1	2824.00±281.78	2453.76±371.01	3.97	0.0002

According to the present study as depicted in the Table.1, The mean ERV of 1st trimester pregnant women was increased compared to controlled group which was also found to be statistically significant. The mean (TV) of 1st trimester pregnancy individuals was higher than control group the difference was found to be statistically highly significant. The mean RV of 1st trimester pregnant individual was lower than mean RV of controlled group the difference was found to be statistically significant. The mean MV was found to be increased in 1st trimester pregnant women compared to controlled group which was statistically significant. The mean VC of 1st trimester pregnant women increased compared to controlled group which is statistically significant.

The mean PEFR of 1st trimester pregnant individual was lower than mean PEFR of controlled group the difference was found to be statistically significant. The mean FVC was found to be increased in 1st trimester pregnant women compared to controlled group which was statistically significant. The mean FEV1 of 1st trimester pregnant women decreased compared to controlled group which is statistically significant.

Discussion

In our study the pulmonary para-meters were found to be statistically significant. Our findings confirmed that increase in TV compared with non-pregnant individuals was highly significant and also decrease RV, ERV was highly significant in all the trimesters of pregnant women compared with non-pregnant women and found results were coincides the findings of dudhamal, shailaja,et. Al[3,4,5]. Increase in MV andVC in all trimesters of pregnant women are compared to non-pregnant individuals was also statistically significant and our findings are found to be same as that ofSroczyński

T, Chhbraa S et al[6,7]. Decrese in PEFR, FVC, FEV1 in all trimesters of pregnancy were found to be statistically significant when compared with non pregnant women and our findings are found to be same as that of Sunyal DK et. al.[8,2,9,10]

Conclusion

The present study concluded there is gradually fall in all pulmonary function tests values. The enlarging uterus, alter the resting position of diaphragm. It is important for clinician to be aware of the normal physiological changes in pregnancy. FEV1, FVC decrease in pregnant case group providing that pregnancy is a restrictive condition and not obstructive condition. Understanding. these changes are critical in distinguishing common dyspnea that occurring during pregnancy from physiological state associated with cardiopulmonary disease seen in pregnancy. By means of continuous antenatal surveillance disease can be identified early and its deterioration can be prevented by proper managment. The accurate information of the respiratory status of the pregnant individual to the clinician, obstetrician anaesthetist to help in managing respiratory complications of the pregnancy.

Conflict of Interest: None declared.

Source of Funding: Self

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DOI Number: 10.5958/2320-608X.2019.00091.X

Original Article

Diabetes Mellitus and Cognition- A Non Invasive Study

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Abstract

Background: Diabetes mellitus is increasing worldwide due to improved lifestyle modifications. Particularly more common in developing countries. Peripheral, central and autonomic neuropathy are the most common complications of diabetes mellitus, which if not detected early can lead to early disability. Event related potential P_{300} is a non invasive test to detect one of the higher functions of brain namely cognition. The present study was conducted to evaluate impact of diabetes mellitus and its duration on cognition.

Aims & Objectives: To investigate neurophysiological alterations of higher brain functions in patients with diabetes mellitus.

Materials & Method: Auditory P_{300} event related potentials were recorded in 60 diabetic patients (NIDDM & IDDM) attending medical out patient department of Bapuji & Chigateri hospital, Davangere, who had no evidence of stroke, dementia, or any other neurological illness. The P_{300} wave latencies in diabetic patients were compared with those in neurologically healthy control subjects, with consideration of duration of diabetes and analyzed by using unpaired student T test for comparison between cases and controls and one way ANOVA for multiple group comparisons within diabetics based on duration of diabetes.

Results: Diabetics had significantly longer P_{300} latencies and reduced P_{300} amplitudes than control subjects. There was a positive correlation between prolongation of latencies and duration of diabetes mellitus.

Conclusion: The present study suggests that diabetes does relate significantly to cognitive decline. ERP P300 can be a useful neurophysiological test to detect cognitive decline early in diabetics and also beneficial to the clinician for further management of the patient.

Keywords: *Cognition; Cognitive impairment Diabetes mellitus; Duration of diabetes mellitus & ERP P_{300};; Event related potential (ERP) P_{300}.*

Introduction

Diabetes mellitus is a complex metabolic disease that can have devastating effects on organs in the body. It is associated with slowly progressive end organ damage in the brain. Mild to moderate impairments of cognitive functioning has been reported both in type I diabetes mellitus and in patients with type II diabetes mellitus. Abnormalities in cognitive function mediated by frontal lobe (executive functions), including a number of complex behaviours such as problem solving, planning, organization, insight, reasoning and attention are noted in patients with diabetes[(1)]. Glucose is the primary substrate for brain energy metabolism. When diabetes strikes and insulin signal is ignored by cells, the brain may not get large amount of glucose energy it needs especially for memory. Loss of brain cells and memory

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function result especially in hippocampal region of brain which involves learning and memory.

Brain tissue contains high levels of polyunsaturated fatty acids (PUFA) making it more vulnerable to oxidative insult [(1)]. Morphological and clinical studies have amply documented that diabetes can alter the peripheral nervous system and the CNS. Electrophysiological studies have objectified the peripheral nervous system and more recently the CNS damage caused by diabetes both in diabetic patients and experimental models. The use of electrophysiological methods (multimodal evoked potentials) has also shown that distribution of such abnormalities in diabetic patients is rather patchy, confirming a frequent multifocal CNS involvement and that they can appear at an early stage of the disease and tend to persist over time[(2)].

Chronic hyperglycemia is known to have serious adverse effects on many tissues and organs. Cognitive function has been examined in people with type 2 diabetes in a small number of studies with variable results. The most consistent finding was that verbal memory appears to be impaired in groups with type 2 diabetes when compared with non diabetic controls[3]. Learning and memory dysfunction is widely believed to be a consequence of type 2 diabetes. Case control studies have demonstrated repeatedly that, as a group, older adults with type 2 diabetes remember word lists and stories less efficiently than their nondiabetic peers and large community based epidemiological studies have identified type 2 diabetes as a strong independent predictor of poorer performance on learning and memory tasks[4]. Since the prevalence of type 2 diabetes mellitus increases with age and normal aging is associated with mild deterioration in cognition, the interplay between the aging process and duration and magnitude of hyperglycemia is expected to result in an accelerated cognitive decline[5]. Several reports have indicated that diabetes may cause cognitive dysfunction or alter brain signals related to cognitive function[6].

With the advent and wide application of non invasive, more objective and quantitative evoked potential testing procedure, now it is possible to investigate, quantitatively assessing higher cognitive human brain functions, using endogenous event related evoked potentials[7]. ERP is the external recording of the endogenous electrical activity of the underlying brain structure resulting from a stimulus bound activity. P_{300} is recorded using oddball paradigm, in which subject is attentive and consciously distinguish an acoustic stimulus (target/rare) from a group of other acoustic (nontarget/frequent) stimuli. It consists of a series of positive and negative waves that are generated above the brainstem. P_3 (P_{300}) component of this response has latency of nearly 300- 350ms following the onset of rare stimuli and is of positive polarity. P_{300} latency is an index of processing time required before response generation, so it is a sensitive temporal measure of neural activity underlying the process of attention allocation and immediate memory. P_{300} amplitude vary from 5-20 microvolt but may reach upto 40 microvolts. It is proportional to attention given to a task and high amplitude is associated with superior memory performance P_{300} amplitude can be viewed as measure of CNS activity that reflects the processing of incoming information when it is incorporated into memory representation of stimulus and the context in which the stimulus occurs[8].

Aims & Objectives

To analyse event related potential P300 using odd ball paradigm and compare the response between diabetics and age matched controls for latencies of P2, N2, P3 and amplitude of P_{300}. To compare ERP P_{300} parameters between diabetics of different duration.

Materials & Method

The study was conducted in the department of Physiology, J.J.M. medical college, Davangere. In this study, diabetics (total 60) between 25 to 55years attending medical outpatient department of Bapuji hospital and Chigateri General hospital attached to J.J.M. medical college were selected and 60 normal age matched subjects were selected randomly from the general population. Inclusion criteria: Patients who are biochemically proved diabetes mellitus. Patients of type I and type II diabetes mellitus. Normal healthy age matched controls between 25-55 years. Subjects were divided into 4 groups: Group 1→ 60 controls, age matched healthy individuals, Group 2→ 20 diabetics with duration less than 10 years, Group 3→ 20 diabetics with duration 10-15 years, Group 4→ 20 diabetics with duration more than 15 years. Age group below 25 years and above 55 years, Patients with acute complication of diabetes like, diabetic ketoacidosis, recurrent ketonuria ,non ketotic hyper- osmolar coma and hypoglycaemia, Patients taking psychoactive drugs

or drug addiction, H/O Hypertension, anaemia, stroke, dementia, Smokers, Alcoholics, H/O cardiovascular or neurological disorders were excluded from the study. Written and informed consent were taken for the study after explaining the procedure and its significance in their vernacular language. The ethical committee clearance was taken. A brief personal history was taken and a clinical examination of all the systems was done to exclude medical problems and to prevent confounding of results. ERP P_{300} was recorded using PC based, 2 channel, RMS EMG. EP MARK II machine manufactured by RMS RECORDERS and MEDICARE SYSTEM, Chandigarh. Procedure in brief: Recording was carried out in a quiet and dimly lit room. Subjects were asked to come without applying oil to scalp and to shampoo hair and make it dry.

The subject was made to lie down comfortably and relaxed in a soundproof room with closed eyes. Rare tone (2KHz) and frequent tone (1KHz) were applied on both ears together in 20% and 80% in frequency in random through headphones. Total 300 stimuli were applied at the rate of 1stimuli/second. Band pass filter was 0.2-100Hz to filter out undesirable frequencies in the surroundings. The volume conducted evoked responses (Bioelectric signals) were picked up from the scalp using silver-silver chloride electrodes. The recording sites on the scalp were cleaned with spirit swab. After applying electrode paste on the recording surface of electrodes, one active electrode was placed on the vertex (Cz), one as ground electrode to forehead (Fz) and two reference electrodes to right and left mastoid (A1 and A2). All electrodes were plugged to a junction box keeping skin to electrode impedance below 5KΩ. Subjects were asked to avoid sleep and identify the rare stimulus, counting mentally. The signals picked up by electrodes, were filtered, amplified, averaged and displayed on the screen. Parameter studied: Latencies of waves P_2, N_2, P_3 in milliseconds (ms) and amplitude of P_{300} in microvolts (μv) were measured from the recording for comparison among diabetics and controls as well as diabetics with different duration.

Results

TABLE 1: COMPARISON OF ERP P_{300} PARAMETERS BETWEEN DIABETICS AND HEALTHY CONTROLS.

ERP P_{300}(ms)	Cases (N=60)		Controls (N=60)		Unpaired t Test	
	Mean	Std. Deviation	Mean	Std. Deviation	t Value	P Value
P_2	170.60	10.19	169.36	10.07	0.67	0.53, NS
N_2	249.79	11.83	225.06	29.03	6.11	P<0.001
P_3	370.33	21.50	339.98	13.72	9.22	P<0.001
Amplitude P_{300}(μv)	3.61	1.49	7.88	1.33	-16.53	P<0.001

ERP P300: Event related potential P300. Analysis done by student's unpaired t- test. Values are expressed as mean±SD. P<0.05, **P<0.01, ***P<0.001

TABLE 2: COMPARISON OF ERP P_{300} PARAMETERS AND DURATION OF DIABETES MELLITUS.

ERP P_{300}(ms)	DURATION			ANOVA	
	<10 (N =20)	10-15 (N=20)	>15 (N=20)	F Value	P Value
P_2	172.9± 9.8	169.0 ± 10.26	169.89 ±10.5	0.79	0.45
N_2	238.69 ±9.03	250.77 ± 8.22	260.39± 6.4	36.19	P<0.001
P_3	349.3 ±14.7	373.36 ± 14.3	388.97 ± 13.7	38.24	P<0.001
Amplitude P_{300}(μv)	5.17 ± 0.79	3.46 ±0.96	2.12 ±0.74	63.8	P<0.001

Cont... **TABLE 2: COMPARISON OF ERP P_{300} PARAMETERS AND DURATION OF DIABETES MELLITUS.**

Tukey's Post Hoc multiple Comparison			
LATENCIES(ms)	< 10 vs 10-15	< 10 Vs > 15	10-15 vs > 15
N_2	P<0.001	P<0.001	P<0.001
P_3	P<0.001	P<0.001	P<0.001
AMPLITUDE(μv) P_{300}	P<0.001	P<0.001	P<0.001

ERP P300: Event related potential P300. Analysis done using one way ANOVA for multiple group comparison; Post Hoc Tukey's test for subgroup comparison. Values are expressed as mean±SD. P<0.05, **P<0.01, ***P<0.001

Discussion

Averaged evoked potentials have been widely used to record the changes in electrical potential that occur within nervous system in response to an external stimulus. A distinct class of evoked potential: the "endogenous" or "event related" potentials (ERPs) that can be recorded in response to an external stimulus or event. These potential changes occur only when the subject is selectively attentive to the stimulus and elicited only in circumstances in which the subject is required to distinguish one stimulus (target) from a group of other stimuli (the nontargets). ERPs seem to be related to some aspect of cognitive events associated with distinction of target from nontarget stimuli[9]. The response to frequent stimulus consists of a series of waves (the stimulus related components) that relates to sensory modality stimulated. The neural generators of long latency (greater than 50msec) responses are uncertain, although probably reflect overlapping neural activity from multiple neocortical and limbic regions. The long latency response to the rare auditory stimulus is considerably different and consists of a negative (N1)- positive (apparent P2)- negative (N2)- positive (P3) complex. The neural generators of this P3 response are unknown, although, some evidence has suggested multiple neocortical and subcortical locations[9] .Long latency evoked potentials (Eps) are related to cognitive processing and are referred to as cognitive evoked potentials, event related potential (ERP), P3, P_{300} and endogenous EP[10].

In our study, we found prolongation of N2, P3 latencies and reduced amplitude of P300 in diabetics compared to controls. The N2 component is related to unexpectedness of the stimulus and is regarded as a measure of the time of early stimulus processing, engaging orientation and attention. P_{300} is considered as reflection of memory storage operations that are initiated in the hippocampus, claimed to be the P_{300} generator. P_{300} latency is regarded as measure of stimulus classification speed, reflecting the allocation of attentional resources for memory operations, P_{300} amplitude represents on line updating of working memory and attentional processes involved in working memory. Therefore, prolongation of N_{200} latency might be associated with decline in attention and early stimulus processing and P_{300} abnormalities with difficulties in stimulus classification speed and working memory[5] . Similar findings were reported in Singh M et al[8], Kvizom et al[11]. P2 did not show any significant difference in diabetics compared to controls.

The latencies of N_2 and P_3 were significantly prolonged in diabetics with duration of illness between 10-15years and more than 15 years compared to duration of less than 10 years (p<0.001, p<0.001) and there was a significant reduction in amplitude of P_{300} in diabetics of longer duration (p<0.001) respectively. Similar findings were reported in Mohammadkhani G et al[6]. Diabetes mellitus duration is important in pathogenesis of cognitive impairment. It is possible that metabolic imbalances and other factors could interact, either directly or indirectly and result in altered central nervous system function and impaired cognition. The deleterious effects of chronic hyperglycemia are mediated through the polyol pathway forming sorbitol and fructose, oxidative stress and non enzymatic glycation of biomolecules[12]. Both chronic hyperglycemia and consequent occurrence of diabetes complications as well as recurrent episodes of severe hypoglycaemia are thought to be associated with cognitive dysfunction in patients with type I diabetes[13].

Intensified insulin therapy which can achieve strict glycemic control is associated with a threefold higher incidence of severe hypoglycaemia. Protracted severe hypoglycaemia is uncommon but may cause permanent neurological and cognitive deficits. Long duration of type I diabetes complicated by retinopathy has been shown to be associated with impaired cerebrovascular responsiveness[14]. Subtle but definite differences in brain structure and modest differences in specific intellectual and information processing abilities are common in adults who develop type I diabetes before their seventh birthday[15].

Conclusion

The study was conducted to investigate cognitive impairment in diabetes mellitus and evaluate the role of relevant factor i.e., duration of diabetes mellitus. The following conclusions can be drawn from the study: Latencies of N2, P3 were prolonged and amplitude of P300 was reduced in diabetics with duration of illness 10-15years and more than 15 years when compared to duration of illness less than 10 years. Latencies of N2, P3 were delayed and amplitude of P_{300} was reduced in diabetics when compared to controls.

Cognitive impairment can be considered as one of the complications of diabetes with neuropathy, retinopathy and nephropathy. ERP P_{300} is a non invasive test which has to be performed along with other tests on a regular basis in diabetics for early detection of cognitive deterioration which could help the physician to update record of cognitive status of the patients and also use the results to give necessary guidance in control of diabetes and its related complications.

Limitations:

For better interpretation of results number of cases and controls included could have been more.

Conflict of Interest: NIL

Source of Funding: Self

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DOI Number: 10.5958/2320-608X.2019.00092.1

Effect of Obesity on Blood Pressure

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Background: Obesity is a huge problem because it leads to so many complications such as accelerated atherosclerosis, increased incidence of gallbladder disease, type-2 diabetes mellitus, insulin resistance and many carcinomas. One of the major causes for obesity is excess energy intake in food over energy expenditure. Excess weight gain is an important risk factor for hypertension. Hypertension target major organs of the body leading to coronary heart disease, cerebrovascular disease, kidney damage etc.The aim of the study was to investigate the effect of obesity (Body Mass Index(BMI) and Waist Circumference(WC)) on Blood pressure. **Materials & Method:** Ethical committee approval was obtained before starting the study.For this study clinical history was recorded and physical examination including body weight, height,waist&hip circumferences were measured.Waist hip ratio(WHR)was calculated. Blood Pressure was recorded. **Results:** Obesity was statistically associated with increase in both systolic & diastolic blood pressure. **Conclusion:** This study revealed that abdominal obesity &increase in BMI were significantly associated with increase in blood pressure.

Keywords : *Body Mass Index , Waist Circumference, WHR, Hypertension.*

Introduction

Obesity is one of the most commonest physical abnormality and a serious health hazard found all over the world in people of all races and all age groups irrespective of any barriers.It lies in the twilight zone between health and diseases. Marked obesity is essentially a repulsive phenomenon.There are so many causes for obesity but basic cause of the obesity is still excess energy intake in food over energy expenditure.(1) Obesity results from interaction of environmental and genetic factors. Hypothalamus and related parts of brain play major role in the regulation of food intake. Hypothalamus has lateral "feeding center" in the median forebrain bundle and a medial "satiety center"in the ventromedian nucleus.(2,3)A major regulator is the adipocyte derived hormone "leptin". Decreased physical activity and reduction in leptin receptor sensitivity play major roles. Leptin's chronic effects to elevate the bloodpressure are mostly mediated through the sympathetic nervous system which is again mediated via hypothalamic pro-opiomelanocartin(POMC).(1,4)

Various studies suggested that excess weight gain is an important risk factor for hypertension.(5,6,7,8) INTERSALT study explained that for every 10 Kg in body weight there was 3 mmHg rise in systolic bloodpressure and 2.3 mmHg rise in diastolic bloodpressure (DBP).(3) WC,BMI,WHR are strongly related to blood pressure. (6,9)Various studies suggested that decline in weight leads to blood pressure reduction.(2,10-13)

There are three important anthropometric measurements such as weight, height, waist circumference (WC) in the evaluation of obesity degree. (2,3)Body Mass Index(Quetelet Number or Quetelet Index) is calculated from weight and height, BMI = Wt (Kg) / Ht (m^2),which estimates body fat.BMI is also calculated as weight in lbs / height in $inches^2 \times 703$. BMI cannot differentiate between fat mass and lean body mass or muscle mass. Excess abdominal fat is measured by WC and waist hip ratio (WHR).(3)Excess accumulation of abdominal or visceral adipose tissue is associated with high apo-lipoprotein B concentration and reduced plasma HDL level. Visceral fat accumulation causes Insulin resistance and adipokinesdisorders. This leads to increase in reabsorption of renal sodium,

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overactivity of sympathetic nervous system, vascular smooth muscle proliferation, atherosclerosis.Augmented renal tubular sodium reabsorption and impaired pressure natriuresis play significant role in initiating hypertension associated with weight gain. Increased adrenergic activity plays major role in the development and maintenance of obesity hypertension in experimental animals and in humans. The renal sympathetic nerve mediates most of the chronic effects of sympathetic nervous system (SNS) activation on blood pressure in obesity.Weight loss is effective in the prevention of elevated bloodpressure .[2,3,14,15] Even 5–10 % weight loss reduces the bloodpressure in normotensive as well as in hypertensive obese individuals.**Ohnishi et al**[16] studied that individuals with Abdominal Obesity(AO) showed increased incidence of hypertension than non-AO.Hypertension is one of the most important reasonfor renal, cardiovascular and cerebrovascular impairment.

Materials and Method

This case-control study was conducted in the Department of Physiology,Thanjavur Medical College Hospital, Thanjavur.Forty normal healthy subjects and forty obese individuals were recruited from Thanjavur Medical College Hospital, Thanjavur, in the age group of between > 18 years and < 50 years.Before starting our study, we obtained ethical committee approval and clearance from the college.Informed written consent was obtained from all the subjects who were participating in this study. The purpose of this study was explained clearly in their regional language. The history of the subjects was obtained and noted in a separate pro-forma.Subjects with history of malignancies, or with inflammatory disorders, patients with the presence of major cardiovascular events during last 3 months prior to study, Diabetes Mellitus, heart failure and hereditary renal diseases were excluded from this study. Anthropometric measures like height (meters), weight (kilograms),waist circumference (centimeters) and hip circumference (in centimeters) were measured.The optimal waist circumference for males is < 90 cm and for females is< 80 cm . WC is an important measurement of central obesity.Normal BMI is 18.5 – 24.9Kg/m^2.[17]The blood pressure was measured in a quiet and relaxed setting after five minutes of rest. Joint National Committee VII (JNC VII) defined Hypertension as SBP ≥ 140 mmHg and DBP ≥ 90 mmHg.

Results

Statistical analysis was done by using the Statistical Package for Social Sciences (SPSS) X version. The results were analyzed by using student 't' test and ANOVA study.Datas are expressed in mean with standard deviation.P< 0.05 was considered as statistically significant.

Table-1 shows the comparison of all the parameters in the study and the control groups. Mean SBP, mean DBP,meanweight(Kg),waist circumference(cm),hip circumference(cm),waist hip ratio between study and control groups were statistically more significant.

TABLE-1. DESCRIPTIVE ANALYSIS OF WEIGHT,BMI,WC,HC,SBP&DBP IN STUDY &CONTROL GROUPS

Parameters	Mean	S.D	T	Df	Statistical inference
WEIGHT(Kg)					
Study group (N=40)	59.95	5.383	4.241	78	.0001<0.05 Significant
Control group(N=40)	55.82	2.978			
BMI(Kg/m^2)					
Study group (N=40)	23.7600	2.30549	4.066	78	.00009<0.05 Significant
Control group(N=40)	21.1358	3.36847			
WC(cm)					

Cont... **TABLE-1. DESCRIPTIVE ANALYSIS OF WEIGHT,BMI,WC,HC,SBP&DBP IN STUDY &CONTROL GROUPS**

Study group (N=40)	88.95	8.750	4.780	78	.00001<0.05 Significant
Control group(N=40)	82.10	2.362			
HC(cm)					
Study group (N=40)	96.58	5.509	10.030	78	.0001<0.05 Significant
Control group(N=40)	85.03	4.764			
SBP(mmHg)					
Study group (N=40)	141.90	4.199	19.075	78	.0001<0.05 Significant
Control group(N=40)	117.05	7.089			
DBP(mmHg)					
Study group (N=40)	89.95	2.660	16.331	78	.0001<0.05 Significant
Control group(N=40)	78.95	3.328			

Discussion

Obesity is a risk factor for cardiovascular diseases, hypertension, diabetes mellitus.But awareness of obesity associated diseases is less.Prevalence of obesity is rapidly increasing now a days. Obesity is a chronic disorder that should be treated in a long term basis.The main function of adipose tissue is the storage of triglyceride. Triglyceride is continuously redistributed in the adipose tissue and other parts of the body. Regional distribution of adipose tissue is important than the absolute amount of excess accumulation of adipose tissue.

Excess body fat accumulation accounts for 65 % - 75 % of essential hypertension.In obesity there is increased sympathetic nervous system activity, Renin-Angiotensin-Aldosterone-System(R-A-A-S)activation,renal compression by accumulation of fat around the kidney. Increased adrenergic activity plays major role in the development of hypertension in obesity. Many factors are released by adipocytes such as,hormones-adipon ectin,resistin,leptin,cytokines-TNF-α,IL-6,substrates-FFA,glycerol,enzymes-aromatase,complement factors-Factor-D,adipsin and also other Substances like PAI-1, angiotensinogen, RBP-4.These substances damage the peripheral tissues.

Ohnishi et al[16] in their study observed that abdominal obesity was associated with increased incidence of hypertension, **Albert et al**[18], in their study they induced weight gain in dogs and suggested that increase in weight was associated with increase in heart rate, BP, cardiac output, plasma volume and fasting insulin concentration.Various other studies suggested prolonged high fat diet induced weight gain increased the bloodpressure.[19,20]Various studies reported BP is associated with obesity indices BMI,WC,WHR .[6,9] **Janssen et al**[21]in their study observed BMI coupled with WC does not predict an increased obesity related health risk better than WC alone..**Haynes et al**[22] and **Jones et al** [9] studiedWeight loss is associated with decrease in bloodpressure

Conclusion

In our study, we found that obesity wassignificantly correlated with increase in bloodpressure.

Abdominal obesity can be easily measured by simple methods like waist circumference, hip circumference and waist hip ratio with easily available instrument such as inch-tape.The physicians can advice the obese patients to reduce the weight and suggest the patients that weight reduction can reduce the incidence of hypertension and their complications. Although weight loss is helpful in managing hypertension,many obese patients are unable to sustain adequate weight loss through lifestyle modifications and there are few

available drugs that safely and effectively produce adequate long-term weight loss. Specific guidelinesare needed for treating obesity-associated hypertension, in addition to the recommendation of reducing weight. The most important therapeutic goal for obese hypertensive patients should be to treat their underlying causes of obesity.Further study is required to measure central obesity accurately.

Conflict of Interest : Nil

Source of Funding : Self

Ethical Committee approval : Obtained

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DOI Number: 10.5958/2320-608X.2019.00093.3

Original Article

Visual Evoked Potential in Patients of Type 2 Diabetes Mellitus with and without Diabetic Retinopathy

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Abstract

Introduction: Diabetes mellitus is a leading public health care problem, with increasing incidence and its long term complications. Diabetic retinopathy is a common complication of DM that affects retinal blood vessels. Unfortunately, in many cases the patient is asymptomatic until it is too late for effective treatment. VEPs are produced by electrical activity of the visual cortex in response to light or pattern stimulation of the eye. It can detect functional loss in the visual pathway from retina to the visual cortex.

Aims and Objectives: The aim of the study is to compare latencies and amplitudes of P100 waveform of VEP in diabetic and control subjects and to determine whether changes in VEP response occur before clinically evident diabetic retinopathy on fundus examination.

Method: PRVEP was recorded in 60 diabetic patients including 30 patients without any retinopathy and 30 others with non- proliferative diabetic retinopathy(NPDR), and compared to 60 age and sex matched normal non diabetic healthy controls. VEP was recorded using pattern reversal stimulation with RMS EMG MARK II machine. P100 wave latencies and amplitudes were obtained in all the subjects.

Results: Our results show significantly prolonged P100 latencies of VEP' s in Type 2 DM patients and DR patients when compared to controls. The difference between diabetics with retinopathy and controls were significant in terms of P100 amplitude. However, there was no significant difference observed in the P100 amplitudes of VEP' s in Type 2 DM patients without retinopathy when compared to controls.

Conclusion: The present study clearly shows that changes in VEP may be detected in diabetics before the onset of retinopathy. Thus, a routine VEP assessment should be recommended to all the diabetic patients, for the early identification of visual defects and for early and proper management of the disease.

Keywords: *Visual Evoked Potential, Type 2 Diabetes mellitus, Diabetic retinopathy*

Introduction

Diabetes mellitus is a leading public health care problem, with increasing incidence and its long term complications.[1] Chronic hyperglycemia of diabetes is associated with dysfunction and failure of various organs, especially the eyes, kidneys, neves, heart and blood vessels.[2]

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It is well known that patients with diabetes over a course of time, develop peripheral and autonomic neuropathy. Studies have suggested that they may also suffer from central neuropathy or the degeneration of higher nervous system. The advent of advanced electro neurophysiological techniques to assess cerebral functions such as the measurement of electrical evoked potential like the visual evoked potential (VEP), have increased our understanding of the normal visual function and the possible effects that diabetes may exert.[3] VEP's are electrical potential differences occurring in the visual areas of the occipital cortex, in response to visual stimuli

and are recorded from the scalp.[4]

Diabetic retinopathy is a common complication of DM that affects retinal blood vessels.[5] Growth of new blood vessels, known as proliferative retinopathy, may lead to blindness through hemorrhage and scarring.[6] One of the primary goals of management in diabetic patients is to avoid the risk of diabetic retinopathy and early diagnosis and management. Before the onset of microvascular lesions, the neural retina of diabetic eye undergoes subtle functional changes that are not detectable by fundus examination.[7]

The present study includes evaluation of VEP waveforms, such as latency and amplitude of P100 , occurring in patients of type 2 diabetes mellitus , and in patients with Diabetic retinopathy. This study was aims to determine whether changes in VEP response occur before clinically evident diabetic retinopathy by fundus examination.

Materials and Method

***Study design*:** A Hospital based case control study.

***Study setting*:** The study was carried out in the Neurophysiology lab of Department of Physiology, Gandhi Medical College, Bhopal.

The study was approved by the Ethical Committee of Gandhi Medical College, Bhopal. Informed consent was taken from all the participants before enrolling in the study. Patient was provided the information about the procedure of test to be performed on him with plausible adverse effect in detail before performing the test.

Sample size:

The study was carried out on 120 subjects, 60 Type 2 diabetes mellitus patients and 60 non diabetic healthy subjects.

Test group : Diabetes mellitus type 2 patients were grouped as follows:

Group 1: Included 30 cases of type 2 diabetes mellitus without diabetic retinopathy.

Group 2: Included of 30 cases of type 2 diabetes mellitus with non proliferative diabetic retinopathy (NPDR).

Control group:

Group 3: 60 non diabetic healthy volunteers matched for age and gender were included in the study to serve as control.

Inclusion criterion:

The study included following type 2 diabetes mellitus patients within age group of 40-60 years.

- Type 2 DM patients without retinopathy with duration of DM <10 years.
- Type 2 DM patients with non proliferative diabetic retinopathy (NPDR) with duration of DM <10 years.

Exclusion criterion:

Following patients were excluded from the study:

- Type 2 diabetes mellitus patients with proliferative retinopathy.
- Patients with significant occular disorders including cataract, glaucoma, optic nerve disease, best corrected visual acuity <6/9 for distance, amblyopia, vitreous opacities.
- Patients with prior history of head injury, cerebrovascular accident, h/o migraine, epilepsy.
- Medical conditions such as multiple sclerosis and other demyelinating disorders led to exclusion from the study.
- Subjects with history of smoking, alcoholism, chronic drug intake.

A complete clinical examination of each subject was done after obtaining a written informed consent and detailed clinical history. Occular examination findings were noted which include determination of visual acuity by Snellen's chart and near vision chart, ocular movements, pupil reactions, confrontational visual field screening. Direct ophthalmoscopy was done for the initial evaluation of fundus.

Visual Evoked Potential (VEP) Test -

Patients were subjected to VEP test on RMS EMG EP MK-II machine in the Neurophysiology unit of Department of Physiology, Gandhi Medical College,

Bhopal.

Pre test evaluation - Participant preparation for PRVEP test

1. The subjects were advised to come without oil or any hair chemical to the scalp.
2. They were instructed to have an adequate sleep the previous night to prevent the effect of drowsiness on the responses.
3. Subjects were explained about the procedure in detail to ensure full co-operation and avoid apprehension

Electrodes and Electrode Placement -

Standard surface electrodes were placed according to the international 10/20 system of electrode placement **(ISCEV standards, 2009).**[8]

This system specifies the position of scalp electrodes as percentage of distances between definitive landmarks such as nasion, inion and ear tragus (Figure 1).

The recording electrodes were placed on the scalp at the following reference points:

- Oz (Occipital region) = Active or recording electrode
- Cz (Vertex) = Ground electrode
- Fz (Frontal region or forehead) = Reference electrode

VEP Recording-

A montage consisting of one channel (Oz-Fz) was used for VEP recording. The video- monitor presented a black and white checkerboard pattern with a fixation spot in the centre of the screen (mean luminance 50 candela/ m2 and contrast 70%). At the viewing distance of 100 cm, the check edges subtend a visual angle of 15 minutes with video monitor screen subtending an angle of 12.5°. The checks / pattern elements reversed alternately at a rate of twice per second. The bioelectric signal was amplied (gain 20,000), filltered (band-pass, 1-100 Hz), and 150 events free from artifacts were averaged for every trial. Subjects were instructed to fix the gaze on a small red coloured block at the centre of the screen of video monitor (Figure 2). Monocular stimulation was done with an eye- patch covering the other eye.

PVEP waveform and markings --PVEP recording parameters

The waveforms were labeled for the peaks N75, P100 and N145. The first major positive peak (P100) was measured after stimulation of each eye.The parameters taken for the study were P100 latency of the waveform measured in milliseconds (ms), and N75-P100 amplitude measured in microvolts (μV) in both eyes.

Statistical Analysis

The parameters for the study were peak P100 latencies, N75- P100 amplitudes. All the data was expressed as mean $\pm$ S.D.

The significance of difference between groups was calculated using one way ANOVA and multiple comparisons were done using post hoc Tukey multiple comparison tests to compare variables between the three study groups. The analysis was done at 5% level of significance.

Results

PRVEP was recorded in the diabetic groups as well as the control group and P100 latency and N75-P10 amplitude were analysed.

Mean values of PRVEP parameters (P100 latency and N75-P100) were obtained for both right and left eyes in all the subjects. As there was no significant difference in the mean values of both the parameters between the right and left eyes, hence, for comparison between different groups, mean values of both eyes was obtained in both controls and diabetics. There was no statistically significant difference between age in different study groups.

The results are shown in Table 1. There was significant difference between different groups in terms of P100 latency ($p<0.01$) by using one-way ANOVA. Significant differences between each paired groups were then evaluated by post hoc Tukey test. Differences between diabetics with and without retinopathy was statistically significant in terms of P100 latency and amplitude ($p<0.01$). Differences between diabetics without retinopathy and controls were also significant regarding P100 latency but there was no significant difference regarding P100 amplitude. The difference

between diabetics with retinopathy and controls were significant in terms of P100 latency and amplitude.

TABLE 1: COMPARISON OF VEP TEST (MEAN P 100 LATENCY AND AMPLITUDE) BETWEEN DIFFERENT GROUPS. (Mean ± SD)

Test parameter	*No Ret (1)*	*NPDR (2)*	*Control (3)*	P value	Inter group comparison*
P100 latency (ms)	112.09±5.709	116.43±7.12	98.79±5.75	<0.01	(1,2) (1,3) (2,3)
P100 amplitude(μV)	6.94±0.92	4.648±0.75	7.45±1.142	<0.01	(1,2) (2,3)

*shows that significant p value is contributed by the pairs mentioned in the column.

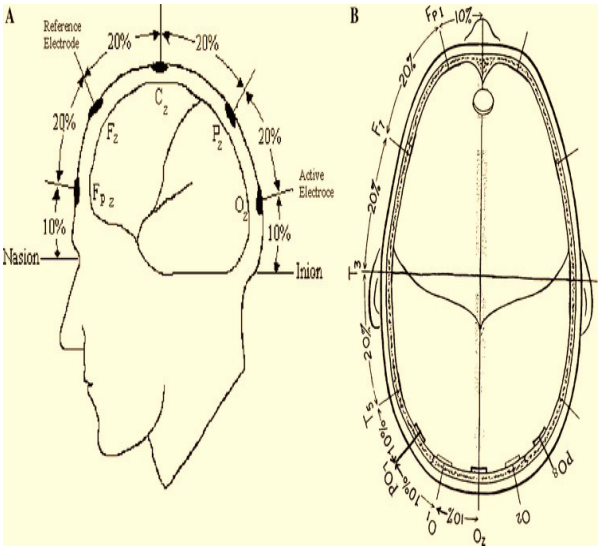

Fig. 1 : electrode placement

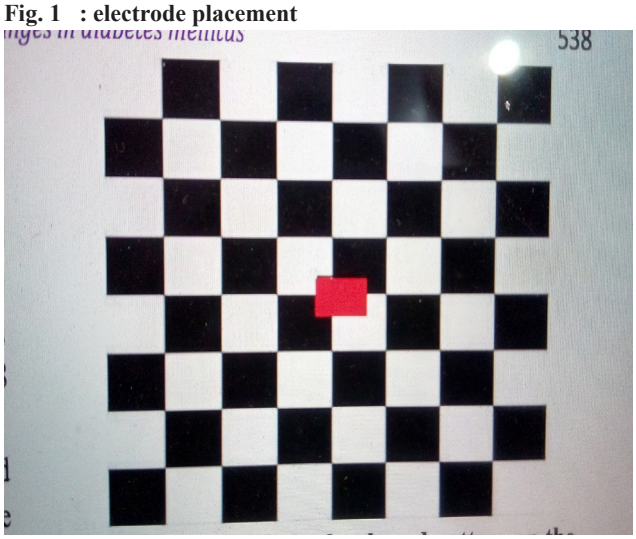

Fig. 2 : Checkerboard pattern for PR – VEP

Discussion

In the present study, mean P100 latency of diabetics was found to be significantly prolonged (p<0.01) when compared with those of controls. These findings are consistent with the observations of Gayathri V et al. (2012)[9], Heravian J et al (2012),[10] Szabela DA et al. (2005)[11] , Varkonyi TT et al. (2002)[12], and Azal O et al. (1998).[13] Mean P100 latency delay was more in group 2 followed by group 1. On comparing mean P100 latency between different groups, statistically significant delay was noted between the two diabetic groups ($p < 0.01$) and also between diabetic groups and controls ($p < 0.01$).

The result of the present study are consistent with earlier studies that have shown abnormalities as an increase in latencies of P100 in patients with Type 2 DM with and without retinopathy. Algan M et al. (1989)[14] reported prolonged P100 latency in 50 DM patients, six of whom had diabetic retinopathy. MarianiE et al.(1990)[15] observed prolongation of P100 latency in 35 diabetic patients who did not have retinopathy. YaltkayaK et al. (1988)[16] found increased P100 latency. They explained these findings by the presence of retrochiasmal involvement.Millinger KS et al. (1987)[17] reported similar findings. They reported that abnormal VEP could reflect papillomacular bundle or optic nerve involvement. Bortek L et al. (1989)[18] found PVEP abnormalities in diabetic patients and reported that abnormalities did not correlate with level of retinopathy.

While majority of the published studies have reported prolongation of P100 latency, few studies show no significant prolongation. (Collier A et al., 1988 ; Ismail GM , 2014). [19, 20]

In the present study, we found significantly longer P100 wave latencies in diabetic patients as compared to controls. Two factors may contribute to the delay in P100 latency: the first related to the innermost retinal layers and the second related to an impairment of the neural conduction at post retinal level. Both these factors may

contribute in parallel to increased P100 latency. (Parisi V et al., 1997)[21]. In diabetes mellitus, damage occurs to ganglion cell layer which can be due to extracellular glutamate accumulation, leading to functional and anatomical changes, which rise even before the vascular damage. Oxidative stress, besides micro vascular abnormalities and consequences of glucose metabolism, play a great role in the pathological progress of diabetic retinopathy. That might be due to either an increase in free radical and oxidant production or reduced activity of anti-oxidative mechanisms, considered as a sign of preclinical diabetic retinopathy. (Karlica D et al., 2010)[22].

The VEP P100 amplitudes were reduced in diabetics. The mean amplitudes show greater reduction in group 2 as compared to controls. The difference in decrease in amplitude was significant between group 1& 2 ($p < 0.01$) and also between group 2 and group 3 ($p < 0.01$).However, difference between group 1 & 3 was not significant ($p > 0.05$). Heravian J et al. (2012)[10] studied VEP in diabetic patients with NPDR and without any retinopathy and found significant difference between diabetics with retinopathy and controls in terms of P100 amplitude. Differences in P100 amplitude was also statistically significant between diabetics with and without retinopathy. Decrease in amplitude of P100 in diabetics was observed by Chopra D et al (2011)[23]. No significant difference in amplitude variation was reported by Parisi V et al. (1997)[21], Raman PG et al. (1997)[24], Verrotti A et al. (2000)[25]. The findings of the present study are in accordance with the observations of Ismail GM et al. (2014).[20] They reported that amplitudes of the VEP are affected in the presence of diabetic retinopathy.

Conclusion

It is evident that diabetes has an effect on visual functions. The present study has highlighted the importance of VEP as a valuable non-invasive test to detect early neuronal changes in the pre-retinopathy stage. It can be proposed that the impairment of Visual Evoked Potential should be regarded as early central manifestation of diabetic neuropathy. Thus, a routine VEP assessment should be recommended to all the diabetic patients, for the early identification of visual defects.

Ethical Clearance: The study was approved by the Ethical Committee of Gandhi Medical College, Bhopal

Source of Funding: None

Conflicts of Interest: Nil

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DOI Number: 10.5958/2320-608X.2019.00094.5

Menstrual Problems among Adolescent School Children at International Indian School, Buraidah

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Abstract

Background: Menstrual hygiene is an issue that is very important among adolescent females and mother is the best teacher and also school teachers play an important role in the menstrual hygiene practices and it is also important aspect of Millennium Development Goals (MDGs). **Objectives:** To identify the socio demographic profile factors and to know the menstrual problems among the study population. **Materials & Method:** A cross sectional institutional based study was conducted at International Indian School, Buraidah from January 2014 to May 2014 among the school children from 5th Class to 9th class. A total of 240 children data collected and classes selected randomly from the female sections. Data was entered in MS excel and necessary statistical tests were applied. **Results:** Out 240 adolescents, about 207 (86.2%) children are attained menarche. Out of 207 adolescent students, about 29% were attained menarche at 10 years of age group and 16.6% of female students at 13 years of age group. There was statistically significant association was found between literacy of the mother and menstruation in the female school children. Out of 207 adolescents, about 45.8% were having pre menstrual syndrome symptoms. about 73.4% (152/207) were having normal BMI and 26.6% were having abnormal BMI. **Conclusions:** The pre-menstrual symptoms and the menstrual problems were quite commonly prevailing in this age group and as it is Indian school and students from different geographical, socioeconomic background and different cultures and ethnic. Proper awareness programme has to be implemented periodically to address for the common menstrual problems which occurs in adolescent age group.

Keywords: *Age, Adolescent girls, Menstrual problems, Pre menstrual syndrome, Body mass index.*

Introduction

Menstrual hygiene management (MHM), practices related to menstrual hygiene during periods is a serious problem for adolescent girls in low and middle income countries (LMICs). The sustainable development goals (3,4,5,6) are influenced directly or indirectly by poor menstrual hygiene, the achievement of the same is indeed very crucial for the overall development of these young adolescents and the nation at large.[1] Human puberty is accompanied by major physical growth and substantial brain maturational changes, features that are unique in the animal world [5]. Beginning of menstruation which is called as menarche, marks the most important step in the pubertal growth of a female. The age of menarche is generally between 10-16 years; however it may vary depending on geographic variation, environmental condition and nutritional status. To understand the health consequences and importance of menstrual hygiene practices among adolescent girls, it is important to study the current practices about the same so that future interventions can be planned accordingly [5-7].

In India, MHM is a serious problem for school going adolescents due to limited or lack of access to products (absorbents) for sanitary hygiene, and lack of safe sanitary facilities. This leads to girls dropping out of school as there is a lack of these basic facilities provided which makes it difficult to manage their menstruation.[2] Some of the common traditional and unhygienic practices includes use of old clothes as pads after recycling and use of ash or straw endangering menstrual hygiene which has long term implications for their reproductive health. Maintaining good hygiene of women during

menstruation is of considerable importance, especially in terms of increased vulnerability to reproductive tract infection.

After menarche, common menstrual abnormalities that the female adolescent usually would encounter are dysmenorrhea, irregularities in menstrual blood flow and the premenstrual symptoms. More than 75% of the adolescent girls experience some problems associated with menstruation, which might indirectly have an impact in their academic excellence, sports activities and their self-esteem. Studies have suggested that menstrual disorder at the age of 15 or 16 act as a marker for hyperandrogenemia and hyperlipidemia in their later life [3].

In today's world the life style changes particularly consumption of lot of junk foods and lack of physical activity and the amount of stress put up by the students in the school life were considered to be some of the major factors for menstrual disturbances in the adolescent girls. The awareness level about menstruation prior to menarche was found to be very much low among the rural adolescents in the developing countries like India. Better knowledge and practices on menstrual hygiene reduce the risk of acquiring reproductive tract infections.

In view of the above, to understand the consequences and importance of menstrual hygiene practices among adolescent girls between the age from 10-15 years individuals were included in the study, it is important to study the current practices about the same serves for the future interventions.

Objective:

To identify the demographic characters of adolescent girls and menstrual problems among Indian School in Buraidah, Saudi Arabia.

Materials & Method

A institutional based cross sectional study was undertaken among 240 adolescent girl students in the age group of 10 – 15 years who had attained menarche. In the Buraidah city only one international Indian school functioning under the administrative control of Indian Embassy and in coordination with Saudi Arabia Ministry of Education. There was about 2600 students are studying from 1st class to 12th standard at two different places. All the students in that school in the above said age group were included in the study. It comprises of 240 girl students, among them 207 students attained menarche and their data collected from the students with direct interview with the help of class teachers and also with Head master and Principal for the administrative control. All the required classes were selected randomly and 10th class sections were exempted as they are involving in the busy class schedules and board examinations. Those who are willing to participate in the study, data collected and those were absent during the study period were excluded from the study. Finally 207 students had participated in the study. The study was conducted for a period of 5 months between Jan 2014 to May 2014. The study was carried out after getting the approval and clearance from the Principal. The student's data was collected by personal interviews by using a pre tested and a structured questionnaire. Data was entered in MS Excel and necessary statistical tests like simple proportions and chi square test were applied.

Results

Table: 1- Age wise distribution of study population (n-240):

Age	Number of students	Percentage
10	32	13.3%
11	38	15.9%
12	40	16.7%
13	56	23.3%
14	50	20.8%
15	24	10%
Total	240	100%

Out of 240 adolescent female children, majority from 13 years age group and accounts 23.3%. Very less proportion of children at 10 years of age. Out 240 adolescents, about 207 (86.2%) children are attained menarche.

Table: 2 - Age at menarche (n-207)

Age	Number of students	Percentage
10 yrs	60	29%
11 yrs	57	27.5%
12 yrs	50	24.1%
13 yrs	40	16.6%
Total	207	100%

Out of 207 adolescent students, about 29% were attained menarche at 10 years of age group and 16.6% of female students at 13 years of age group.

3. Literacy of the mother in relation to menstruation in study population (n-207):

Literacy of mother	Normal Menstruation	Abnormal menstruation	Total
Upto 5th Standard	22 (46.8%)	25 (53.2%)	47 (100%)
6th - 10th standard	52 (52.5%)	47 (47.5%)	99 (100%)
Upto Degree	28 (68.3%	13 (31.7%)	41 (100%)
Post Graduation	18 (90%	02 (10%)	20 (100%)
Total	120 (57.9%)	87 (42.1%)	207 (100%)

X^2 - 13.8, 3df, P-0.003.

In the study population, there was about 53.2% were having abnormal menstruation from 5th standard studied mothers. As this school in international and literacy of mothers was 100%. Only 10% of children were having abnormal menstruation problems from post graduation studied mothers family.

There was statistically significant association was found between low literacy of the mother and menstruation in the female school children ($P<0.05$). This could be due to small sample and there will be some information bias from the students itself and hence we cannot generalise the findings to common population.

4. Pre menstrual status in study population (n-207):

Pre menstrual syndrome	Number of students	Percentage
Yes	95	45.8%
No	112	54.2%
Total	207	207 (100%)

Out of 240 school children, 86.2% (207/240) having regular menstruation and attained menarche and remaining yet to get menarche. Out of 207 adolescents, about 45.8% were having pre menstrual syndrome symptoms.

5. Menstrual problems in study population (n-207):

Type of Menstrual problem	Number of students	Percentage
Oligomenorrhoea	25	28.7%
Menorrhagia	62	71.3%
Total	87	100%

Out of 87 abnormal menstruation students, about 71.3% were having menorrhagia problems and 28.7% were having oligomenorrhoea.

6. Duration of Menstrual problems(n-207):

Menstrual problem duration	Number of students	Percentage
< or = 3 months	12	13.7%
3-6 months	22	25.3%
6-12 months	42	48.3%
> 1 year	13	14.7%
Total	87	100%

Out of 87 abnormal menstruation students, about 48.3% were having menstrual problems and suffering for the last 6-12 months. only 13.7% were having menstrual problems less than 3 months duration.

7. Body mass index (BMI) status versus Pre menstrual syndrome (n-207):

BMI	Premenstrual syndrome present	Premenstrual syndrome absent	Total
Normal BMI	61 (40.1%)	91 (59.9%)	152 (100%)
Abnormal BMI	34 (61.8%)	21 (38.2%)	55 (100%)
Total	95 (45.8%)	112 (54.2%)	207 (100%)

X^2 - 7.65, 1df, P-0.008.

Out of 207 students, about 73.4% (152/207 were having normal BMI and 26.6% were having abnormal BMI. There was statistically significant association was found between body mass index and pre menstrual syndrome (P<0.05).

Discussion

The present study was conducted to study the menstrual problems among the adolescent school children and to suggest remedial suggestions and measures to the required students. In the present study, out of 207 adolescent students, about 29% were attained menarche at 10 years of age group, at 11 years 27.5%, at 12 years 24.1% and 16.6% of female students at 13 years of age group. The mean age of menarche in the present study was 11.10 years. The results are almost in par with the study done by Singh M.M. et al [8], in which he quoted that the mean age of menarche was 13.6 years and in another study done in rural Orissa, the mean age of menarche was found to be 12.97 years [9]. A study done by Zegeye DT et.al in Ethiopia had found the mean age of menarche was 14.7 years and this difference might be due to the varied geographic location and the very poor socio –economic status may affect there [10]. In a study conducted in Rajasthan in 2005 [11] the mean age at menarche was found to be 13.2 years. Unfortunately, 58% girls were ignorant about menstruation before menarche in this study. But, each and every girl child should be aware about menstruation, ideally a mother should be the main informant at this tender age. In a study conducted among 664 schoolgirls aged 14-18 in Mansoura, Egypt by El-Gilany et al [12].

In the study population, there was about 53.2% were having abnormal menstruation from 5th standard studied mothers. As this school in international and literacy of mothers was 100%. Only 10% of children were having abnormal menstruation problems from post graduation studied mothers family. In the current study revealed that out of 207 adolescents, about 45.8% were having pre menstrual syndrome symptoms. this can be due to information bias from the students as their not understood the real problem or may not reveal properly due to their age itself. This study has revealed that 46.52% girls complain of premenstrual syndrome. More or less similar observations were also reported by M. Kulkarni [14] as 41.52% girls in their study have presented with premenstrual syndrome. In the present study, menorrhagia was found in 17.82% girls. M. Kulkarni [14] and K. Jogdand [13] have also observed similar findings as 16.07% and 15.96% girls with menorrhagia. Low level of blood hemoglobin concentration and nutritional status is often associated with irregularities of menstrual and reproductive problems among the women in reproductive age groups.

In the present study, out of 87 abnormal menstruation students, about 71.3% were having menorrhagia problems and 28.7% were having oligomenorrhoea. The results were similar to a study by Juyal R et al [16] conducted in Dehradun in 2014 among unmarried adolescent girls in which 74.6% girls reported having an average flow of 3-5 days and around two third having normal bleeding. The present study highlighted the medical problems faced by adolescent girls during menstruation. It was observed that dysmenorrhea was experienced by 53.5% of the girls. But other studies have reported higher prevalence of dysmenorrhea among adolescent girls. In a study by Juyal R et al it was observed among 64.9 % girls whereas 63.75% prevalence was reported in a study by Nair et al among rural unmarried adolescent girls in East Delhi.[15,16]. Out of 207 students, about 73.4% (152/207 were having normal BMI and 26.6% were having abnormal BMI. There was statistically significant association was found between body mass index and pre

menstrual syndrome. similar finding was observed with body mass index versus sanitary napkin. The factors for the same were significantly associated with the area of residence, geographic region, linguistic groups, educational attainment, wealth status, among Indian women. Various mechanisms have been explained like role of obesity among girls especially in urban areas which leads to altered levels of leptin, Insulin like Growth Factor-1, ghrelin and most importantly insulin which are related to energy availability and body size which have a permissive role in the initiation of puberty[17].

Conclusions

The present study revealed that majority of the adolescent girls had attained the menarche at the early age that was 10 years (29%). The pre-menstrual symptoms and the menstrual problems were quite commonly prevailing in this age group, which make themselves feel weak and refrain them from doing their routine work. There was statistically significant association was found between low literacy of the mother, abnormal BMI with menstruation in the female school children. As the sample size is less and information collected from the adolescent school children may have some information bias as they are not majors in age and findings cannot be generalised to common population. Need large sample similar studies are required.

Acknowledgement: My special gratitude to principal Indian International school for his special care towards study and their children health.

Ethical Clearance: Taken from Institutional ethical Committee

Source of Funding: None

Conflict of Interest: None

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DOI Number: 10.5958/2320-608X.2019.00095.7

HLA Antigens and Haplotype Frequencies among Renal Transplant Recipients and Donors Presenting to a Tertiary Care Hospital in Hyderabad, Telangana, South India

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Abstract

Histocompatibility testing of HLA-A, HLA-B and HLA-DRB1 antigens has great importance in the selection of kidney recipient candidates and donors for transplantation. DNA typing of HLA Loci HLA-A,B and DRB1 loci was performed using the SSO typing kit (Luminex) for 2000 renal transplant recipients and donor who presented to our tertiary care centre .There was male preponderance among recipients and female preponderance among donors.The antigen frequency of HLA A*33:01,B*44:03, B*15:18, B*57:03 were significantly higher in donors suggesting that these antigens may have protective influence on the kidney, while antigen frequency of B*57:01was significantly higher in recipients. Two locus haplotypes of HLA A-B,A-DRB1,B-DRB1 documented among recipients was A*24:02,B*51:01, A*01:01-B*52:01, A*68:01-DRB1*14:01,B*49:01-DRB1*13:02 and among donors was A*68:01-DRB1*13:01, A*03:01-B*35:01,B*44:03-DRB1*15:02,B*13:01-DRB1*07:01.Three locus HLA A- B-DRB1 haplotypes documented among recipients were A*24:02-B*40:06-DRB1*15:01 and A*01:01-B*57:01-DRB1*07:01, suggesting that these antigens may be risk factor for renal failure. Two locus and three locus haplotypes reported in our study are not reported from other parts of India. The HLA antigens and haplotypes reported in our study will help in understanding the Indian population genetics and help the organ transplant team to find suitable matched donors for transplant recipients.

Keywords: *HLA antigens , Haplotype, Luminex –SSOP, Renaltransplantation.*

Introduction

Histocompatibility testing of Human leukocyte antigen (HLA), HLA-A, HLA-B and HLA-DRB1 antigens has great importance in the selection of kidney recipient candidates and donors for transplantation [1]. HLA- A,-B and –DR mismatch plays a major role in graft loss [2].

HLA typing was previously performed by serological method by using HLA antiserum [3,4] but this procedure is now considered to be cumbersome and lacks the resolving power. With the advent of molecular typing using polymerase chain reaction (PCR) and sequence specific oligonucleotide probes (SSOPs), it has become possible to further define HLA polymorphism at the DNA level [5]. Recently, PCR and the Luminex microbead system for the simultaneous multiplex assay of amplicons hybridized to SSOP in a single detection solution have been described for high-throughput single nucleotide polymorphism (SNP) typing of HLA [6,7] Information of HLA antigens is helpful in identifying differences that may lead to a better understanding of disease mechanisms [8] and also useful in determining the origin, migration and relationships between populations[9].

Not much documented studies have been reported currently on frequency distribution of HLA antigens among renal transplant recipients and donors from Telangana region of South Indian population.With

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this background, the present study was undertaken to establish HLA class I and class II antigens and haplotype frequencies by Lifecodes ® HLA –SSO typing kits which combines the PCR amplification–SSO protocol with xMAP technology developed by Luminex Corporation as the analytical technique in 2000 live renal transplant recipients and donors , presented to tertiary care centre from Hyderabad, Telangana, South India.

Materials and Method

A total of 2000 renal transplant recipients and donors who presented to our tertiary care centre were retrospectively included in the study. For each recipient and donor ,5 ml whole blood was collected in *BD Vacutainer® EDTA* blood collection tubes. DNA was extracted from the blood samples by using the Wizard genomic *DNA purification* kit from *Promega* Madison WI as per manufacturer's protocol. DNA typing of HLA Loci HLA-A, HLA-B and HLA- DRB1 loci was performed on a Multi-Analyte Profiling system (xMAP) (Luminex HLA-SSO) using Lifecodes ® HLA –SSO typing kit (Immucor, Stamford, CT, USA) as per the manufacturers protocol.

The significance of the distribution of antigens between the recipient and donor was analyzed by Fisher's exact probability test (two tailed). $P<0.05$ was considered statistically significant between the frequencies of Recipient Vs Donor for single locus antigens. P=0.00001, statistically significant between the frequencies of Recipient Vs Donor used by χ^2 –test for two locus and three locus haplotypes. Haplotype frequencies were calculated by SPSS version 2.4. Two sided significant values were calculated by Chi Square test.

Results

Out of 2000 live recipients and donors, 825 males and 175 females were recipients, 330 males and 670 females were donors. Majority of recipients were between age group of 21- 40 years and the donors were between age group of 31-50 years.

Antigens with the frequency of 5% or more among recipients and donors for HLA A locus were A*01 :01,A*11:01,A*24:02,A*02:01,A*02:11,A*03:01, A*33:01. The frequency of HLA A*33:01 was high in donors compared to recipients (P value equals 0.0250 - statistically significant), as shown in Table.1.

Table 1. HLA A locus antigen frequencies among recipients and donors

HLA A LOCUS	Recipient			Donor		P Value
	N	%		N	%	
A*02:01	145	7.20%		40	10%	0.185
A*02:11	125	6.20%		32	8%	0.3909
A*02:03	55	2.70%		7	1.75	0.4704
A*02:06	15	0.70%		4	1%	1
A*01:01	375	18.75%		67	16.75%	0.4646
A*11:01	325	16.20%		52	13%	0.1871
A*24:02	310	15.50%		68	17%	0.5936
A*24:07	25	1.20%		NIL	NIL	0.0609
A*33:01	90	4.50%		34	8.50%	0.025
A*33:03	70	3.50%		15	3.75%	1
A*03:01	100	5%		23	5.75%	0.7472

Antigens with the frequency of 5% or more in recipients for HLA-B locus - B*40:06 ,B*51:01,B*52:01,B*35:0 3,B*35:01, B*57:01 , and among donors - B44*03:01,B*57:03, B*15:18, as shown in Table.2.

Table 2. HLA B locus antigen frequencies among recipients and donors

HLA B LOCUS	Recipient		Donor		P Value
	N	%	N	%	
B*40:06	230	11.50%	43	10.75%	0.8101
B*40:01	60	3%	7	1.75	0.3475
B*51:01	225	11.25%	49	12.25%	0.7236
B*51:06	35	1.75%	3	0.75%	0.3375
B*35:03	125	6.25%	21	5.25%	0.6386
B*35:01	125	6.25%	23	5.75%	0.8779
B*52:01	165	8.20%	26	6.50%	0.3977
B*44	145	7.25%	35	8.75%	0.4955
B*44:03:01	75	3.75%	31	7.75%	0.018
B*44:03:02	25	1.25%	NIL	NIL	0.0609
B*44:03:03	20	1%	NIL	nil	0.1231
B*15:18	20	1%	21	5.25%	0.0006
B*15:01	20	1%	8	2%	0.3803
B*15:17	20	1%	6	1.50%	0.7508
B*15:25	10	0.50%	NIL	nil	0.4987
B*57:01	100	5%	6	1.5 %	0.0073
B*57:03	35	1.75%	26	6.5%	0.0008
B*07:02	85	4.20%	20	5%	0.7304

The frequencies of B*44:03(pvalue-0.018), B*15:18(pvalue-0.0006), B*57:03(pvalue-0.0008) were significantly high in donors, while frequency of B*57:01 (pvalue-0.0073) was significantly high among the recipients. Antigens with the frequency of 5% or more in recipients and donors for HLA-DRB1 locus included DRB1*15:01, DRB1*15:02, DRB1*07:01, DRB1*13:01,DRB1*04:03,DRB1*14:04,DRB1*04:03,DRB1*12:02,DRB1*11:01, DRB1*14:04.There were no significant differences in frequencies of HLA DRB1 locus antigens among the recipients and donors as shown in Table.3.

Table 3. HLA- DRB1 locus antigens frequencies among recipients and donors

HLA DRB1 LOCUS	Recipient		Donor		P Value
	N	%	N	%	
DRB1*15:01	205	12.50%	46	11.50%	0.628
DRB1*15:02	195	7.50%	37	9.25%	0.8987
DRB1*07:01	270	13.50%	70	17.50%	0.1047
DRB1*13:01	150	7.50%	29	7.25%	1
DRB1*04:03	140	7%	22	5.50%	0.45
DRB1*04:01	25	1.25%	3	0.70%	0.7238
DRB1*04:05	35	1.75%	7	1.75%	1
DRB1*14:04	125	6.25%	20	5%	0.5272
DRB1*14:01	30	1.50%	5	1.25%	1
DRB1*10:01	95	4.75%	17	4.25%	0.8616
DRB1*12:02	95	4.75%	23	5.75%	0.6251
DRB1*11:01	70	3.50%	21	5.25%	0.2883

Two locus HLA A-B haplotypes A*24:02- B*51:01 and A*01:01- B*52:01 were present among recipients and absent among the donors as shown in Table.4.

Table-4: Most common HLA-A-B haplotypes of renal transplant Recipients & donors

Antigen	Recipient		Donor		P-value
	N	%	N	%	
A*01-B*15	5	6.8	7	10.4	0.041
A*01-B*35	9	12.3	6	9	0.0535
A*01-B*37	12	16.4	6	9	0.0321
A*01-B*40	7	9.6	10	14.9	0.0413
A*01-B*51	8	11	6	9	0.061
A*01-B*52	5	6.8	0	0	0.00001
A*01-B*57	6	8.2	11	16.4	0.0023
A*02-B*07	5	6.5	7	8.4	0.081
A*02-B*51	10	13	9	10.8	0.0625
A*03-B*35	6	30	6	23.1	0.031
A*11-B*35	10	15.4	7	13.5	0.0624
A*11-B*40	12	18.5	6	11.5	0.009
A*24-B*35	10	14.9	5	7.2	0.0026
A*24-B*40	14	20.9	13	18.8	0.091
A*24-B*51	9	13.4	0	0	0.00001

Two locus HLA A-DRB1 haplotypes A*02:01-DRB1*12:02, A*02:01-DRB1*14:04,A*03:01-DRB1*13:01,A*11:01-DRB1*04:03,A*11:01-DRB1*14:04,A*24:02-DRB1*04:01,A*68:01- DRB1*14:01 were present among recipients(Pvalue=0.00001),andA*01:01-DRB1*10:01,A*02:11-DRB1*11:01,A*11:01-DRB1*11:02,A*11:01-DRB1*12:02,A*68:01-DRB1*13:01 were present among donors (P value=0.00001) as shown in Table.5.

Table-5: Most common HLA-A-DR B1 haplotypes of renal transplant Recipients & donors .

Antigen	Recipient		Donor		P-value
	N	%	N	%	
A*01-DRB1*04	45	12.3	6	9	0.042
A*01-DRB1*07	90	24.7	20	29.9	0.037
A*01-DRB1*10	0	0	5	7.5	0.00001
A*01-DRB1*15	30	8.2	8	11.9	0.041
A*02-DRB1*11	0	0	7	8.4	0.00001
A*02-DRB1*12	30	7.8	0	0	0.00001
A*02-DRB1*13	50	13	6	7.2	0.0324
A*02-DRB1*14	25	6.5	0	0	0.00001
A*02-DRB1*15	90	23.4	28	33.7	0.008
A*03-DRB1*13	25	25	0	0	0.00001
A*11-DRB1*04	50	15.4	0	0	0.00001
A*11-DRB1*07	35	10.8	7	13.5	0.0513

Cont... **Table-5: Most common HLA-A-DR B1 haplotypes of renal transplant Recipients & donors .**

A*11-DRB1*11	0	0	7	13.5	0.00001
A*11-DRB1*12	0	0	5	9.6	0.00001
A*11-DRB1*14	30	9.2	0	0	0.00001
A*11-DRB1*15	90	27.7	10	19.2	0.02
A*24-DRB1*04	35	10.4	0	0	0.00001
A*24-DRB1*07	30	9	9	13	0.044
A*24-DRB1*15	85	25.4	15	21.7	0.0461
A*26-DRB1*07	25	33.3	5	31.3	0.059
A*68-DRB1*13	0	0	7	28	0.00001
A*68-DRB1*14	40	42.1	0	0	0.00001

Two locus HLA B-DR haplotypes B*35:03-DRB1*04:03,B*35:01-DRB1*13:01,B*40:06-DRB1*04:03,B*40:06-DRB1*07:01,B*40:01-DRB1*13:01,B*40:06-DRB1*14:04,B*49:01-DRB1*13:02, B*52:01-DRB1*04:03 were present among recipients (P value = 0.00001).Two locus HLA B-DR haplotypes B*13:01-DRB1*07:01,B*44:03-DRB1*15:01, B*51:01-DRB1*04:03, B*51:01-DRB1*07:01 were present among donors (P value = .00001) as shown in Table.6.

Table-6: Most common HLA-B-DR B1 haplotypes of renal transplant Recipients & donors.

Allele	Recipient		Donor		P-value
	N	%	N	%	
B*07-DRB1*13	25	18.5	5	15.6	0.042
B*07-DRB1*15	50	37	10	31.3	0.03
B*08-DRB1*03	25	50	7	77.8	0.0002
B*13-DRB1*07	0	0	6	11.1	0.00001
B*15-DRB1*04	25	17.2	6	14.6	0.052
B*15-DRB1*07	25	17.2	5	12.2	0.037
B*15-DRB1*12	25	17.2	9	22	0.04
B*15-DRB1*15	30	20.7	5	12.2	0.0009
B*35-DRB1*04	25	10	0	0	0.00001
B*35-DRB1*13	25	10	0	0	0.00001
B*37-DRB1*10	25	35.7	5	41.7	0.02
B*40-DRB1*04	35	12.1	0	0	0.00001
B*40-DRB1*07	40	13.8	0	0	0.00001
B*40-DRB1*13	30	10.3	0	0	0.00001
B*40-DRB1*14	30	10.3	0	0	0.00001
B*40-DRB1*15	75	25.9	19	37.3	0.00219
B*44-DRB1*07	50	34.5	17	47.2	0.0022
B*44-DRB1*15	0	0	5	13.9	0.00001
B*49-DRB1*13	35	87.5	0	0	0.00001
B*51-DRB1*04	0	0	7	13.5	0.00001
B*51-DRB1*07	0	0	7	13.5	0.00001
B*51-DRB1*15	50	18.9	8	15.4	0.0523
B*52-DRB1*04	30	18.2	0	0	0.00001
B*52-DRB1*15	55	33.3	11	42.3	0.0059

Three locus HLA A- B-DRB1 haplotypes most common among recipients were A*24:02-B*40:06-DRB1*15:01(P value= 0.00001) and among donors included A*01:01-B*57:01-DRB1*07:01, A*02:11-B*35:03-DRB1*15:01, A*33:01-B*44:03-DRB1*07:01 (P value= 0.00001) . A*02:01-B*51:01-DRB1*15:01 was common among both donors and recipients .

Discussion

It was observed in our study that majority of the donors were females (67.5%) and males outnumbered females in recipients (82.5%), this is in concordance to the study done from various parts of India and Nepal [10,11,12]. Among 2000 live donor and recipient , parents Vs. offspring were 42%, offspring Vs. parents were 7% , spousal donors were 17.5% , siblings were 15.5% ,this is in concordance to study done from North India and Nepal [12,13].

Studies from North India [13] Western India [14], Karnataka, South India [10] and West Central India [15] showed that there was no significant difference of antigens in recipients and donors and in these studies HLA typing was performed by CDC NIH protocol and PCR-SSP method. HLA typing in our study was done by t*he luminex based PCR SSOP method which* enable HLA genotyping on intermediate or in parts high resolution level and *enables a high-throughput typing of HLA antigens* without ambiguity by MatchIT DNA program based on the CWD HLA alleles[16].The HLA antigen frequencies among recipients and donors reported in our study is different from studies done from other parts of India [10,15,17,18,19]. Different subtypes within the same antigens of HLA-A,B,DRB1 loci were also documented in our study and this was possible by Luminex PCR-SSO typing .*From our results we can infer that B*57:01 antigen may be a risk factor for renal failure and* HLA A*33:01, B*44:03, B*15:18, B*57:03 antigens may have protective influence on the kidney. Two locus haplotypes A*24:02-B*51:01, A*01:01- B*52:01, A*68:01-DRB1*14:01, B4*9:01-DRB1*13:02 were significantly high among recipients and absent in donors indicating that this haplotype may be a risk factor for renal failure, while A*68:01-DRB1*13:01,B*44:03-DRB1*15:01 were significantly high among donors indicating that this haplotype may have protective influence on kidney,these haplotypes are not documented from other parts of India [10,13,15,16,17]. Three locus haplotypes among donors was A*02:01-B*51:01-DRB1*15:01 and this haplotype is not reported from other parts of India ,followed by A*33:01:01-B*44:03:02-DRB1*07:01:01 which is similar to the study done from North India [17] and A*02:11-B*35:01-DRB1*15:01,from South India[21] , these haplotypes may have protective influence on kidney. Three locus haplotype reported among the recipients in our study was A*01:01-B*57:01-DRB1*07:01, this haplotype is not reported from other parts of India.The present study is the first investigation of HLA typing by PCR-SSOP method, for live related renal transplant recipients and donors from Telangana state of South India.

Conclusion

The knowledge of HLA allele and haplotype frequencies will help in understanding the Indian population genetics and help the organ transplant team to find suitable matched donors for transplant recipients.

Conflict of Interest: No

Funding: None

Acknowledgment: We would like to thank Mr.Jayakrishna Gatadi and team for providing us with all associated documents related to clinical history and data of recipients and donors.

Ethics approval: The study is a retrospective data analysis and no human interventions are involved ethical approval is not applicable.

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DOI Number: 10.5958/2320-608X.2019.00096.9

Correlation between Non-High-Density Lipoprotein-Cholesterol and Hba1c Levels in Patients with Type 2 Diabetes Mellitus of Bengaluru City

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Abstract

Background: The common macrovascular complications of diabetes are heart disease and stroke, which accounts for about 50% of death in diabetic patients.[1, 2] Diabetes mellitus (DM) is a common secondary cause of hyperlipidemia, particularly, if glycaemic control is poor. [3] Non-high-density lipoprotein-cholesterol (non-HDL-C) is a better measure of cardiovascular disease prediction in contrast with glycosylated hemoglobin (HbA1c) in type 2 diabetic patients.

Objectives: In the present study, the correlation of non-HDL-C with HbA1c were examined and evaluated in patients with type 2 diabetes mellitus.

Materials and Method: A total of 50 type 2 diabetics were included in the study with a mean age of 55.78(SD:13.77)years of both gender previously diagnosed regardless of their sociodemographic characteristics and were invited for the assessment of lipid profile and HbA1c levels in Infilife healthcare private limited of Bengaluru city.

Results: Mean (SD) Hba1c levels and Non-HDL levels were 7.60% (2.01) & 159.32(95.60) mg/dL respectively. The study revealed a significant correlation between Hba1c levels and Non-HDL levels with a correlation coefficient(r) of 0.29[$p<0.05$].

Conclusion: The present study showed that non-HDL-C positively correlates with HbA1c indicating better predictor of glycemic control among Type 2 Diabetes

***Keywords**: Glycosylated hemoglobin, non-high-density lipoprotein, type 2 diabetes mellitus*

Introduction

In type 2 diabetic patients, dyslipidemia is depicted by raised triglyceride and triglyceride-rich lipoproteins, including very low-density lipoprotein (VLDL) and intermediate-density lipoprotein (IDL), decreased high-density lipoprotein cholesterol (HDL-C), and small dense LDL particles. [4]Usually, patients with type 2 diabetes have atherogenic lipid profile increasing the risk of coronary vascular disease compared to people without DM. It has been confirmed that an early intervention to normalize circulating lipids enables to decrease the cardiovascular-related complications and mortality. [5]

Non-HDL-C calculating through total cholesterol (TC) minus HDL-C is an appropriate indicator for the cholesterol content of all atherogenic lipoproteins. Hence, elevated levels of atherogenic triglyceride-rich remnants add a potential risk related with LDL-cholesterol (LDL-C). [6]

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It has been shown that non-HDL-C is a strong predictor for future cardiovascular risk in patients with or without exhibiting symptoms of vascular diseases. Furthermore, it has been suggested as a secondary therapeutic target following LDL-C among patients with raised Triglyceride (TG) by the National Cholesterol Education Program Adult Treatment Panel III [7] owing to its proatherogenic, apo-B-containing lipoprotein fraction of circulating lipid. [8] Type 2 diabetic patients have significantly elevated levels of non-HDL-C compared to controls; therefore, it can be used as a dyslipidemia marker and a predictor for CVD [9,10] and vascular inflammation [11] in type 2 diabetic patients.

Non-HDL-C level measurement in type 2 diabetic patients is simple, cost-effective, and appropriate as it does not need 12-h fasting giving an opportunity to clinicians to use it as a routine measurement criterion in clinical settings. [12]

Therefore, the level of non-HDL in patients with type 2 diabetic patients in correlation with HbA1c levels was examined in the present study.

Materials and Method

In the current, cross-sectional investigation, a total of 50 patients with mean age of 55.78(SD:13.77)years of both gender and previously diagnosed with type 2 diabetes recorded in their medical records and confirmed by the study author in Infilife healthcare private limited, Bengaluru, were invited for the study purposes between December 2017 and April 2018.

The patients met eligibility criteria if they were male or female, on insulin, oral anti-diabetic agents, or its combination regardless of their sociodemographic aspects. The patients with pregnancy, Type 1, or gestational diabetes and those with acute conditions such as acute myocardial infarction, acute diabetic ketoacidosis, acute pulmonary embolism, acute pulmonary edema, and acute chest infection were not included in the study. Laboratory investigations of 50 patients were used for the study analysis.

Diagnosis and measurement criteria

The diagnosis of type 2 diabetes was established in the time, and HbA1c was ≥6.5% according to the American Diabetes Association. [13]

Biochemical measurements

For the biochemical measurements purposes, the venous blood samples were collected from all patients after at least 8 h fasting in Medical Laboratory of Infilife healthcare private limited by an experienced technician in Bengaluru city after taking their informed written consents. The serum obtained from the blood samples were used to calculate the lipid profile parameters, including HDL-C, serum TC, TG, LDL-C, and HbA1c by Roche autoanalyzer 6000 Cobas (Roche Diagnostics, Mannheim, Germany). Non-HDL-C was calculated through subtracting HDL-C from the TC.

Results

A total of 50 diabetics were included in the study with a mean (SD) age of 55.78(13.77) years.

Table 1

AGE (YEARS)	MALE	FEMALE	TOTAL(%)
25-45	10(34.48%)	3(14.29%)	**13(26%)**
46-65	10(34.48%)	9(42.86%)	**19(38%)**
>65	09(31.03%)	9(42.86%)	18(36%)
TOTAL	29(100%)	21(100%)	50(100%)

Among 50, 29(58%) were males with a mean (SD) age of 53.20(14.29) years and the rest 21(42%) were females with a mean (SD) age of 59.33(12.48) years

Table 2:

VARIABLE	Mean	SD
HbA1c(%)	7.6	2.0021
FBS (Mg/dl)	144.04	70.572
PPBS(Mg/dl)	202.64	100.5353
Non HDL(Mg/dl)	159.32	95.6047

There was no significant difference between Males and Females in the levels of Hba1c, Non-HDL, FBS, PPBS levels There was a statistically significant correlation between Hba1c levels and FBS (r=0.87,

p<0.05), PPBS (r=0.87, p<0.05).

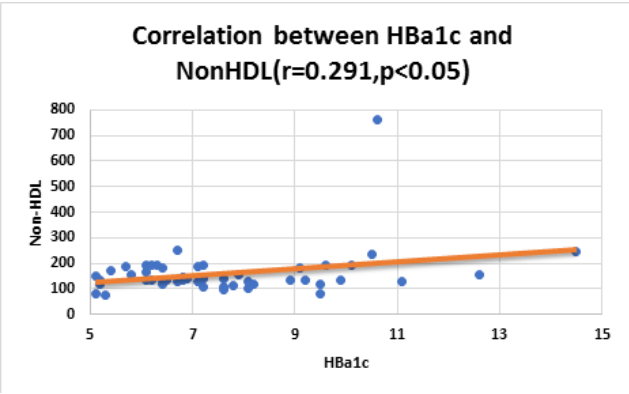

Figure 1

Mean (SD) Hba1c levels and Non-HDL levels were 7.60% (2.01) & 159.32(95.60) mg/dL respectively. There was a significant correlation between Hba1c levels and Non-HDL levels with a correlation coefficient(r) of 0.29[p<0.05].The minimum and maximum Hba1c levels among study participants were 5.1% and 14.5% respectively

Discussion

The current study showed a significant positive correlation of HbA1c level with non-HDL-C in type 2 diabetic patients. A few studies have attempted to examine and evaluate the correlation of HbA1c levels with non-HDL-C in type 2 diabetic patients. For example, a recent study conducted by Senghor and William [14] revealed that the comparison of lipid profiles parameters was performed between 60 patients with controlled DM (HbA1c <6.5%) and 60 patients with uncontrolled DM (HbA1c ≥6.5%) with disease duration between 1 and 5 years. In agreement with the current study, a positive correlation was found between non-HDL-C and HbA1c ($r = 0.49$, $P < 0.05$). The positive correlation was found by Hammed et al. [15] between HbA1c and non-HDL ($P < 0.001$) among 450 patients with type 2 diabetes with a mean age of 55.5 (9.35) years.

LDL-C is being used as the primary therapeutic target to lower lipids for primary and secondary prevention of CVDs. [16, 17] However, still, the patients have a risk of recurrent coronary artery disease despite achievement in LDL goal. [18] The possible analysis for this residual risk could be a high level of non-HDL-C in these kinds of patients. Therefore, the particular importance must be given to measuring non-HDL-C in type 2 diabetes patients in routine clinical practices as it has been shown to be a superior predictor for risk of CVD. [18,19,20,21,22] In addition, it has all cholesterol contents for atherogenic particles, including LDL, VLDL, lipoprotein A, VLDL remnant, and IDL. [23,24,25]

It is recommended to involve the non-HDL-C lipid plan parameters in routine clinical practice as it has been shown to improve the goal achievement. [26] Importantly, although HbA1c has been considered to be a reliable measure for chronic hyperglycemia and is associated with risk of long-term diabetes complications, HbA1c single test has not been mentioned to be used a reliable biomarker for diabetes diagnosis and prognosis and some testing strategies and cutoffs are still being discussed and debated. [27]

T2DM patients are at a much higher risk of cardiovascular complications than the non-diabetics. Thus, the risk of cardiovascular events in diabetics can be reduced by improving the glycemic control. [28] Hence it is important to focus on HbA1c control and targeting lipids to avoid morbidity and mortality in diabetic patients. HbA1c measurement helps to control DM and helps identify dyslipidemias. [29]

Limitations of the present study was small sample size; further large sample size prospective studies are required in this direction.

Conclusions

The current study showed that non-HDL-C is above the optimal line and has positive correlation with HbA1c in type 2 diabetic patients. It is recommended to use non-HDL-C level for routine clinical purposes to type 2 diabetic patients as it is a simple, cost-effective tool and has better representation for diabetic dyslipidemia.

Conflict of Interests: This study authors declare that there is no conflict of interests regarding the publication of this article.

Acknowledgement: The authors are very grateful to all the participants who participated in this study and to the technical personals of Infilife healthcare private limited for conducting the laboratory investigations.

Source of Funding- Self

Ethical Clearance: Taken

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DOI Number: 10.5958/2320-608X.2019.00097.0

Heart Rate Variability Analysis in Young Obese Individuals

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Abstract

Introduction: Obesity is associated with marked cardiorespiratory changes. In obese individuals there occurs an increase in heart rate, systolic blood pressure and cardiac output up to 15%. These changes are thought to occur as a result of changes in autonomic activity. Among the available noninvasive techniques for assessing autonomic status, heart rate variability has emerged as a simple non-invasive method to evaluate sympatho-vagal balance.

Materials and Method: Heart Rate Variability analysis was done in 30 young obese individuals and compared with 30 age and gender matched individuals with normal BMI

Results: In obese individuals, the SDNN was significantly higher than in controls. LF and LF/HF values of obese individuals were significantly higher than those of controls but their HF values were lower.

Conclusion: HRV analysis shows sympathetic overactivity and parasympathetic blunting in young obese individuals.

Keywords: *Obesity, Autonomic neuropathy, Heart rate variability*

Introduction

Obesity is associated with marked cardiorespiratory changes. In obese individuals there occurs an increase in heart rate, systolic blood pressure and cardiac output up to 15%. These changes which are most likely marked in extreme degree of obesity are thought to occur as a result of changes in autonomic activity. Data on autonomic function in obese people have revealed that they have an increased sympathetic discharge. It is possible that this higher level of sympathetic activity and cardiovascular load is associated with increased platelet aggregation, plaque rupture, coronary vasospasm and explains why the incidence of myocardial infarction and ischaemic strokes is higher in the obese individuals. Patients with increased body mass index are exposed to recurrent episodes of tachycardia, hypooxemia and acute haemodynamic stress and it would seem plausible that these factors are instrumental in the development of essential hypertension or other cardiovascular diseases from clinical study. There is nevertheless mounting experimental evidence that patients with obesity have higher level of autonomic activity especially of the sympathetic pattern. Juan Sztajzel et.al., (2004) stated that among the different available noninvasive techniques for assessing autonomic status, heart rate variability has emerged as a simple non-invasive method to evaluate sympatho-vagal balance at the sino atrial node.

Aim of the Study: To evaluate Cardiovascular Autonomic Functions in obese individuals using Heart rate variability analysis

Materials and Method

CASES: 30 obese individuals in the age group of 18 to 25 years, without co-morbid conditions like Diabetes, Hypertension, Smoking, Alcoholism, Thyroid disorders

WHO criteria was applied to categorize the subjects; Controls – subjects with BMI 18.5 – 24.9 and Obese when their BMI is more than 25

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Controls

30 age and gender matched healthy, non-obese subjects attending the Master health check up programme, Madras Medical College & Government General hospital, Chennai.

The study protocol was approved by the Ethical committee of Madras Medical College. Informed and written consent was obtained from the subjects.

The subjects were instructed to lie down in supine posture and relax for 5 minutes. Resting Heart rate and blood pressure were recorded. By applying 3 electrodes, in the standard positions, HRV was recorded in the supine posture using ECG recorder. The leads were connected to the ECG recorder which in turn was connected by signal processing unit to the computer. The recording was made for 5 minutes. After screening the data for artifacts and properly editing it the data was opened through HRV analysis software version 1.1 to obtain converted ECG signal. The analog to digital conversion of the resting ECG signal was done using AD converter with sampling frequency of 1024/sec. Power spectral analysis of the converted ECG signal was done using Fast Fourier transformation.

Mean RR, SDNN, Mean HR, Power, LF, HF and LF/HF were estimated.

Results

Statistical Package for Social Sciences (SPSS) software 11.5 version was used for statistical analysis.

The Student independent unpaired 't' test was used .

$p < 0.05$ is taken as significant ;

$p < 0.01$ is taken as highly significant

TABLE 1: Anthropometric measurements and HRV parameters

VARIABLES	CONTROLS	OBESE	p value
AGE in years	21.76 ± 4.25	19.37±3.99	0.13
BMI Kg/m²	22. 25 ± 1.09	35.23±5.36	< 0.001
HR	74.57 ± 5.78	116.87±4.21	< 0.001
MEAN RR	853.33± 70.54	841.53±50.17	0.45
SDNN	54.1 ± 19.65	85.4±8.05	< 0.001
LF	44.66 ± 8.13	60.71±9.93	< 0.001
HF	55.21 ± 8.22	19.47±2.37	< 0.001
LF/HF	0.86 ± 0.31	3.17±0.67	< 0.001

Discussion

The age group of controls and subjects were similar emphasising there were no age related differences in obese individuals and normal people.

The young obese individuals had a significantly higher body mass index, implying they were relatively obese compared to controls.

Robert Wolk et al [(1)]., suggested that there is a link between obesity and hypertension as well as cardiovascular associated mortality.. They postulated that obese individuals are predisposed to an increased risk of developing hypertension, and treatment of obesity lowers blood pressure and cardiac related morbidity . Possible mechanisms whereby obesity may contribute to hypertension in individuals include sympathetic activation, hyperleptinemia, insulin resistance, elevated angiotensin II and aldosterone levels, oxidative and

inflammatory stress, endothelial dysfunction, impaired baroreflex function, and perhaps by effects on renal function. The existence of high grades of obesity may have more widespread implications for cardiovascular control and dysfunction in these obese individuals and may contribute to some of the clustering of abnormalities broadly defined as the metabolic syndrome. From the clinical and therapeutic perspectives, the presence of resistant hypertension and the absence of a nocturnal decrease in blood pressure in obese individuals should prompt the clinician to consider the diagnosis of the individual suffering from high graded complication of obesity,.

Heart Rate Variability (HRV)

HRV is a very valuable tool by itself for risk stratification in cardio vascular diseases. It assesses the autonomic tone at rest.. HF component is generally defined as a marker of vagal modulation. This component is respiratory mediated and thus is determined by the frequency of breathing. The LF component is modulated by both sympathetic and parasympathetic activity. LF/HF ratio reflects global sympatho-vagal balance [(2)]

Heart rate variability (HRV) is mediated by at least three primary mechanisms:

Vagal feedback from Pulmonary Stretch Receptors (PSR),

Central medullary coupling between respiratory and cardiovagal neurons (RCC)

Arterial baroreflex (ABR)-induced fluctuations.

In our study there was significant increase in LF (P <0.001).whereas there was an equally siginificant drop in HF (P <0.001) suggesting a sympathetic over activity and parasympthetic blunting. The LF/HF ratio also showed a significant increase (P<0.001) indicating a strong sympathetic activity.

Robin Smith'et al.[(3)], has shown that patients with obesity have high levels of sympathetic activity during normal activities than the normal weight individuals in whom sympathetic activity generally found to be normal . Patho-logically high levels of sympathetic activity persist in these obese individuals . Because of these high sympathetic activity these people have more anxiety sweating , change in mood , depressive episodes etc when compared to normal individuals.,(Mcmaillan etal ..2001).. This sympathetic overactivity leads to increase . in blood pressure , injury to the major blood vessels of the heart and other organs which may lead to thrombosis and hypercoagulation. , damage to the nervous system may lead to disturbed autonomic functions there by poor regulation of blood pressure and heart rate .

Improper heart rate regulation

Persistent high blood pressure

Blunted cardiac autonomic responses.

Mustafa Aydin et. al.[(4)], in his study identified that in both mild and severe obesity , SDNN was significantly lower than in controls. LF and LF/HF values of obese individuals were significantly higher than those of controls. Their HF values were lower which was similar to our study.

Power spectrum analysis of heart rate variability in obese patients by Ferini-Strambi L et. al.[(5)] and Noda et. al.[(6)], have shown a significant decrease in mean HF and an equally significant increase in LF/HF ratio implying a parasympathetic blunting and an increased sympathetic activity as seen in our study.

HRV is altered in obesity. Respiration, heart rate, and blood pressure were monitored in eight normal subjects and nine increased BMI young adults. The findings of this study suggest that the adverse autonomic effects of obesity include impairment of baroreflex gain and central respiratory-cardiovascular coupling, but the component of respiratory sinus arrhythmia that is mediated by lung vagal feedback remains intact.

Cardiovascular variability is altered in patients with obesity. This alteration is evident even in the absence of hypertension, heart failure, or other disease states and may be linked to the severity of obesity. Abnormalities in cardiovascular variability may be implicated in the subsequent development of overt cardiovascular disease in patients with obesity..

Conclusion

From our study there is clear evidence of sympathetic overactivity and parasympathetic blunting in young obese individuals. Heart rate variability is a simple, non-invasive test to identify Cardiac autonomic dysfunction and it can be used as a screening test in these individuals.

Conflict of Interest: Nil

Sources of Funding: Nil

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DOI Number: 10.5958/2320-608X.2019.00098.2

Cardiovascular Reactivity Accompanying Voluntary Urine Retention in Normal Young Adults

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Abstract

Background: The purpose of the present study was to observe the effect of urinary bladder distension on cardiovascular reactivity in normal young adults

Method: Study was conducted in T.M.U Moradabad .Blood pressure and heart rate were recorded in 30 normal healthy young adults of 18-25 years of age group. Parameters were recorded in three stages (phase 1: empty bladder before drinking water, phase 2: after intake of water and with full urinary bladder, phase 3: immediately after emptying of bladder.

Results: Significant variation (<0.001) in BP and pulse rate in different phases were observed. Systolic BP and diastolic were in First stage 112.2 ± 5.54, 76.73 ± 4.50 Second stage 134.2 ± 4.12, 92.6 ± 3and Third stage 106.6 ± 4.58, 74.4 ± 4.279 respectively . Pulse rates were 70.2 ± 3.07 , 78 ± 3.64 , 71.8 ± 2.8935 in first , second and third stages respectively and differences were significant(p <0.001).Conclusion: Findings suggested that systolic and diastolic blood pressure were raised with full urinary bladder.

Conclusion: Subjects should be asked to empty bladder before measuring their blood pressure in practice to avoid erroneous recordings.

Keywords: *Young adults, Blood pressure, Hypertension, Heart rate*

Introduction

Blood pressure & heart rate are the markers for cardiac activity. Any change in blood pressure or heart rate shows the reaction of heart to any condition or stress and these vary in different subjects against the same stress either physical or mental. Subjects showing marked variation in blood pressure & heart rates are always susceptible for cardiovascular morbidity and magnitude of cardiovascular reactivity may distinguish those prone to develop cardiovascular disease [1]

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It has been postulated that in very early hypertension the peripheral resistance is not raised and the elevation of the blood pressure is caused by a raised cardiac output, which is related to sympathetic over activity. The subsequent rise in peripheral arteriolar resistance might therefore develop in a compensatory manner to prevent the raised pressure being transmitted to the capillary bed where it would substantially affect cell homeostasis[2].

In patients suffering from urinary syncope, straining to increase the flow of urine leads to stimulation of the vagus nerve, causing bradycardia and drop in blood pressure [3]

Scultety et al observed that elevated BPs was documented in ten healthy volunteers aged 21 to 56 years when their full bladders[4]. In study done by Szasz and Whyte, rise in diastolic and systolic blood pressure was reported after bladder distension in seven normal volunteers, and four patients[5]. It appears that the

distension of bladder might be a factor of recording of elevated BP and should be taken in consideration while measuring BP .

The American Heart Association 2017 guidelines for BP measurement state to have the patient relax, sitting in a chair (feet on floor, back supported) for >5 min and to make sure the patient avoids caffeine, exercise, and smoking for at least 30 min before the measurement but there is no any specific guideline about bladder distension.

This cross-sectional descriptive study was done to know the effect of voluntary acute urine retention on the cardiovascular reactivity in normal young adults.

Material and Method

1. Participants

Male and female (30) students of 18-25 years age group of T.M.U Moradabad volunteered for this descriptive cross sectional study. Subjects who were non-smokers and non- alcoholics and with Body mass index (BMI) between 17.0-23.0 kg/m^2 were included. Subjects with chronic or acute illness at the time of study, any medication , resting pulse rate more than 90 beats per minute, resting blood pressure lower than 100/60mmHg or higher than 140/90mmHg or history of fainting fits or orthostatic hypotension were excluded.

2. Measurements:

First stage: After explaining the study and taking their consent basal parameters like age, sex, height, and weight were recorded. Resting pulse rate and blood pressure were recorded after the participants seated relaxed and comfortably in chair chair be for at least 5 minutes, with his arm bared and well supported at heart level and their backs supported following recommendations of JNC VII in a quiet room maintained at 25-27^{0}C when the subject had not yet emptied the bladder and was also not feeling the micturition urge. Blood pressure (Systolic and Diastolic) was measured by auscultatory method with Sphygmomanometer (Nova Phone Pvt.Ltd) and Stethoscope (Microtone Pvt. Ltd) and Pulse was noted from radial pulse with the help of stop watch.

Second stage: Subjects were asked to drink 500ml of water and allowed to wait till she/he felt the first micturition urge. Pulse rate and blood pressure were recorded at this time. When the subject decided to stop tolerating the micturition urge, the blood pressure and pulse rate were recorded before allowing the subject to empty the bladder

Third stage: The final recording of pulse rate and blood pressure was made just after the micturition.

3. Statistical analysis:

Cardiovascular reactivity to voluntary acute urine retention were obtained by comparing the resting values of pulse rate and blood pressure with the values obtained just before micturition, using Student's t-test to determine if micturition urge is accompanied by changes in heart rate and blood pressure.

Observation and Results

Table 1 : Mean Difference in Systolic and Diastolic Blood Pressure between stage 1 and stage 2

Parameters	N0.	SBP (Satge 1)	SBP (Stage 2)	P value	DBP (stage 1)	DBP (stage2)	P value
Mean	30	112.2	134.2	<0.0001	76.73	92.6	<0.0001
SD	30	5.54	4.12		4.50	3.28	

Mean Systolic and Diastolic Blood Pressure (SBP :First stage 112.2 ± 5.54 and Second stage 134.2 ± 4.12 , DBP : first stage 76.73 ± 4.50 and Second stage 92.6 ± 3.28) were compared and found statistically significant (Degree of freedom: 29, Two tailed p value: <0.0001 , 95% confidence intervals)

Table 2 : Mean Difference in Systolic and Diastolic Blood Pressure between stage 2 and stage 3

Parameters	N0.	SBP (Stage.2)	SBP (Stage 3)	P value	Diastolic (stage 2)	Diastolic (stage 3)	P value
Mean	30	134.2	106.6	<0.0001	92.6	74.4	<0.0001
SD	30	4.12	4.58		3.28	4.27	

Values of Systolic and Diastolic Blood Pressure of Second (SBP mean 134.2 ± 4.126 mmHg, DBP 92.6 ± 3.2863)and Third stage (SBP 106.6 ± 4.5833 mmHg DBP 74.4 ± 4.279were compared and difference was statistically significant (Degree of freedom: 29, Two tailed p value: <0.0001 95% confidence intervals).

Table 3 : Mean Difference in Pulse rate in three stages

Parameters	Numbers	Pulse			P value
		Stage 1	Stage 2	Stage 3	
Mean	30	70.2	78.0	71.8	<0.0001
SD	30	3.07	3.64	2.89	

Mean of Pulse rate between First stage (70.2 ± 3.07) , Second stage (78 ± 3.64) and third stage (71.8 ± 2.89) were also significantly different (Degree of freedom: 29,Two tailed p value: <0.0001, 95% confidence intervals).

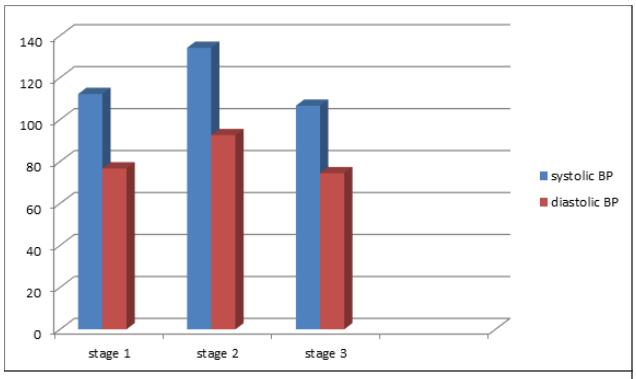

Figure 1: Changes in Systolic and Diastolic Blood Pressure

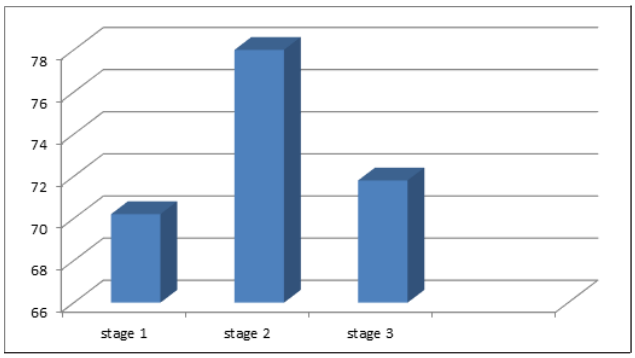

Figure 2 : Changes in pulse rate

Discussion

Measurement of blood pressure to diagnose hypertension is a important procedure done routinely as Hypertension is an important risk factor for development of coronary artery diseases and cerebrovascular accidents. There is rapid increase in incidence and prevalence of hypertension in India.

There are guidelines regarding measurement of blood pressure stating that subject should sitting on a chair with a back and arm should be placed on the same level as heart while BP is measured [6]. Factors affecting BP are caffeine, exercise, and smoking, alcohol , and must be avoided for at least 30 minutes before measurement. Variations are also seen with respiration, emotions, meals, temperature, bladder distension, pain. Bladder distension is also implicated as a factor to influence BP measurement [7,8].

In this study the changes of cardiac parameters and pulse caused by voluntary urine retention in the normal young adults were recorded. There was significant rise in systolic and diastolic blood pressure on holding urine similar to findings in study conducted by Jan

Fagius et al [9]. These changes in BP were accompanied by significantly raised heart rate in same subjects .

Post voiding there was significant decrease in heart rate , systolic and diastolic blood pressure which correlated with study by T Uchiyama et al[10].

Previous studies have suggested bladder distension is associated with various cardiovascular vasoactive hormones responses [9, 11, 12]. Findings regarding blood pressure and heart rate in this study were similar .

In this study impact of extent of bladder distension , duration of urine holding were not correlated with changes in parameters . Various mechanisms like rennin angiotensin has been proposed .Significant correlation between arterial blood pressure and plasma rennin in patients of chronic bladder distension has been observed by Funke et al [13]. In humans there seems to be a vesicovascular mechanism through which bladder distension causes sympathetic activity to contribute to elevation of blood pressure.

These mechanism can be possible explanation for changes observed in this study . White coat effect also could be a contributing factor in changes of blood pressure .

Conclusion and Recommendation

Along with other factors affecting blood pressure such as exercise, emotions etc urinary bladder distension must be included before measurement of BP. Subjects should always be instructed to empty the bladder before having measured their blood pressures to avoid erroneous diagnosis of hypertension.

Patient of retention of urine which could be due to prostate enlargement, stricture of urethra etc might have significant increase in blood pressure as well as in heart rate on long term and could cause hypertension and other cardiac complications.

Acknowledgement: We would like to thank Dr Manoj Kumar for his guidance and encouragement.

Conflict of Interest Statement: We certify that there is no conflict of interest.

Source of Funding: No funds were required in this study.

Ethical Clearance: The study was approved by ethical committee of Teerthanker Mahaveer Medical College & Research Centre Moradabad .

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DOI Number: 10.5958/2320-608X.2019.00099.4

Autonomic Function Tests in Young Obese Individuals

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Abstract

Obesity is a leading preventable cause of death worldwide, with increasing prevalence in adults and children. Obesity is a complex disorder characterized by autonomic dysfunction in addition to alteration in sympathetic and parasympathetic activity of the heart. It is being recognized that the autonomic nervous system derangement takes place in obese persons. With this background we studied cardiac autonomic function in young obese individuals. The study and control group were subjected to battery of autonomic function tests using standard techniques. The cardio vascular autonomic reflex tests (Orthostatic standing test, Deep Breathing, Valsalva Manoeuvre, Isometric Hand Grip Test and Cold Pressor Test) are considered to predict the autonomic dysfunction if three out of five tests are abnormal. Based on these criteria, our study was able to quantify the autonomic dysfunction in young obese individuals.

Key words: *Obesity, Valsalva Manoeuvre, Isometric Hand Grip, Cold Pressor Test.*

Introduction

Obesity is a leading preventable cause of death worldwide, with increasing prevalence in adults and children. Authorities view it as one of the most serious public health problems of 21st century. The increased prevalence of obesity parallels the increase in sedentary life style. The increased consumption of so called junk foods which include pizza, can drinks and other fast foods contribute to obesity in adults and children.

Obesity is a complex disorder characterized by autonomic dysfunction in addition to alteration in sympathetic and parasympathetic activity of the heart. It is being recognized that the autonomic nervous system derangement takes place in obese persons. Autonomic Nervous System has been focus of much research activity in recent years in the quest to improve and understand the early pathophysiological process underlying the cardiovascular changes associated with obesity. With this background we studied cardiac autonomic function in young obese individuals.

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Aim of the Study

To evaluate Cardiovascular Autonomic Dysfunction in obese subjects by adopting the standard Autonomic Nervous Function Tests.

Materials and Method

CASES: 30 obese individuals in the age group of 18 to 25 years, without co-morbid conditions like Diabetes, Hypertension, Smoking, Alcoholism, Thyroid disorders

WHO criteria was applied to categorize the subjects; Controls – subjects with BMI 18.5 – 24.9 and Obese when their BMI is more than 25

Controls

30 age and gender matched healthy, non-obese subjects attending the Master health check up programme, Madras Medical College & Government General hospital, Chennai.

The study protocol was approved by the Ethical committee of Madras Medical College. Informed and written consent was obtained from the subjects.

The study and control group were subjected to battery of autonomic function tests using standard techniques described by Ewing et-al.[1,2] It was ensured that the tests were carried out at optimal temperature.

Patients were instructed to empty their bladder before testing.

Orthostatic Standing Test: The subject was asked to stand up in 3 seconds and was allowed to stand for 5 minutes, without any support by putting equal weight on both the legs. Blood pressure and pulse rate was recorded after 1 minute, 2 minutes and 5 minutes. Continuous ECG monitoring was also done. The R-R interval is obtained from 15th beat and 30th beat. The maximum R-R interval at the 30th beat and the minimum R-R interval during 15th beat give the 30/15 ratio..

Deep Breathing:

After 15 minutes of rest in sitting position, the subject was asked to take deep breaths at a rate of 6 breaths / min. Inspiratory and expiratory periods were identified with the help of stethographic respiratory tracings recorded in the physiograph connected to polygraph compatible ECG recorder and ECG was also recorded continuously by connecting the ECG leads to the ECG recorder which in turn was connected by the signal processing unit to the computer. The average of longest R-R interval during expiration and shortest R-R interval during Inspiration for the 6 cycles is obtained and from this we calculate the E/I ratio.

$$\text{E/I ratio} = \frac{\text{Longest R-R interval in Expiration}}{\text{Shortest R-R interval in Inspiration}}$$

Valsalva Manoeuvre,

After 15 minutes of rest ,the subject was asked to increase the intrathoracic pressure after normal inspiration, by expiring forcefully into the mouthpiece connected to a mercury manometer, so as to raise the mercury level to 40mmHg and was instructed to maintain this for 15 seconds. After holding for 15 seconds, the pressure was released. During the whole procedure, the ECG and stethographic respiratory tracings were recorded continuously. The 4 phases of the test was identified by using respiratory tracings. The increase in Heart rate during Phase II and decrease in heart rate during Phase IV is noted.[3]

$$\text{Valsalva ratio} = \frac{\text{Max R-R interval during Phase IV}}{\text{Min R-R interval during Phase II}}$$

Isometric Hand Grip Test:

The baseline blood pressure and heart rate of the subject was recorded. The maximum voluntary contraction of each subject was determined by asking them to press the hand grip dynamometer with maximum force for few seconds and the process was repeated thrice. The maximum of the readings was taken as maximum voluntary contraction (MVC). The subject was asked to maintain 30% of his / her MVC for 3 to 5 minutes. Blood pressures and Heart rate was measured from the opposite limb during the procedure and after 5 min of cessation of the procedure.

Cold Pressor Test:

After 15 minutes of rest the base line blood pressure and heart rate was measured and the subject was asked to immerse his/her hand into water at 4 degrees Centigrade for one minute . The Blood pressure and Heart rate were measured from the opposite limb during the procedure.[4]

All the results obtained from the tests were analyzed statistically using unpaired t test (SPSS version 11 software)

Results

The data for the different variables were analyzed and the values were expressed as Mean ± SD.

'p', value < 0.05 was considered significant.

'p', value < 0.01 was considered highly significant,

'p' value < 0.001 was considered very highly significant.

The results and their significance are given in the following tables and charts.

TABLE 1: ANTHROPOMETRIC MEASUREMENTS OF SUBJECTS

VARIABLES	CONTROLS	OBESE	p value
AGE in years	21.76 ± 4.25	19.37±3.99	0.13
BMI Kg/m2	22. 25 ± 1.09	35.23±5.36	< 0.001

TABLE 2: AUTONOMIC FUNCTION TESTS

	CONTROLS	OBESE	'p' value
Orthostatic standing test [30:15]	1.17 ± 0.08	1.03 ± 0.109	<0.001 Very highly significant
Deep breathing [E:I]	1.20 ± 0.06	1.07 ± 0.067	<0.001 Very highly significant
Valsalva ratio	1.27 ± 0.05	1.19 ± 0.04	<0.001 Very highly significant
Isometric hand grip [DPd- 1min]	7.37 ± 1.97	10.20 ± 1.65	<0.001 Very highly significant
Isometric hand grip [DPd- 5min]	0.50 ± 1.83	1.00 ± 4.39	>0.05 Not significant
Cold pressor test [DPd – 1 min]	6.20 ± 1.35	9.17 ± 2.60	<0.001 Very highly significant
Cold pressor test [DPd – 5 min]	0.5 ± 1.74	0.53 ± 1.655	>0.05 Not significant

Discussion

The cardio vascular system response to different stimuli is assessed by using cardio vascular reflex tests to identify whether parasympathetic component attenuation underlies the sympathetic over activity.

Ortho Static Tests (OST)

Measuring the reflex autonomic responses on assuming of upright posture provides information on the integrity of afferent, central and efferent baroreflex pathways. The ANS responses to active standing and passive tilting are different. Standing produces immediate fall in cardiac output due to gravitational blood pooling.

This is accompanied by an increase in heart rate which is maximum at about 15th beat. Upon active standing, contraction of limbs and abdominal muscles produces a transient increase in venous return and a blood pressure overshoot which peaks at about the 30th heart beat and results in slowing of the heart rate. The ratio of maximum R-R interval to minimum R-R interval (30/15 ratio) is used as a measure of vagal function.

$$\text{30/15 th beat ratio} = \frac{\text{R-R interval between 30th - 31st beat}}{\text{R-R interval between 15th - 16th beat}}$$

If the 30:15 ratio (also called postural tachycardia index) was

- 1.04 and above - it was considered normal,
- 1.01 and 1.03 - as borderline and
- 1 or less - as an abnormal response.

In our study the orthostatic standing test showed a significant decrease ($p < 0.001$) in obese subjects (1.03±0.05) compared to the controls (1.17 ±0.08) indicating a poor parasympathetic response.

Deep Breathing (DB)

The presence of respiratory sinus arrhythmia depends on the integrity of efferent vagal neurons. Inspiration results in increased heart rate and expiration results in decreased heart rate. The E/I ratio is calculated as the ratio of longest R-R interval during expiration to the shortest R-R interval during inspiration when breathing at the rate of 6 breaths per minute. It has been widely accepted as a method to test efferent cardiac vagal function.

$$\text{E:I ratio} = \frac{\text{longest RR interval in expiration}}{\text{shortest RR interval in inspiration}}$$

An E:I ratio of > 1.10 was considered normal

< 1.10 - as an abnormal response.

E/I ratio showed a significant decrease in obesity subjects (1.07±0.067) compared to the controls (1.20±0.06) there by confirming a decreased parasympathetic activity.

E/I ratio showed a significant decrease in obesity subjects (1.07±0.067) compared to the controls (1.20±0.06) there by confirming a decreased parasympathetic activity.

Valsalva Ratio (VR)

The Valsalva Ratio is calculated as the ratio of longest R-R interval during phase IV (bradycardia due to vagal withdrawal) to the shortest R-R Interval during phase II (tachycardia due to sympathetic activation and vagal withdrawal). It measures both the afferent and the efferent vagal reflex arc.

$$\text{Valsalva Ratio} = \frac{\text{longest RR Interval during Phase IV}}{\text{shortest RR Interval during Phase II}}$$

A Valsalva Ratio of

- 1.21 and above - was considered normal
- 1.11 and 1.20 - as borderline
- 1.10 or less - as an abnormal response

Our study shows that the mean VR of obese subjects were of borderline significance (mean VR= 1.19±0.04). It showed a significant decrease when compared to controls (1.27±0.05) which also proves a decreased parasympathetic response. Though VR is a predictor of both sympathetic and para sympathetic dysfunction, we were not able to predict the sympathetic component as we did not have a beat to beat BP monitoring.

Isometric Hand Grip Test (IHGT)

The response to IHGT is reflex in nature. It is thought to be initiated by the stimulus from the exercising muscle. The strength of the muscle sympathetic activity depends on the baroreflex sensitivity. Hence increased sympathetic activity is needed to sensitize the baroreceptor to bring about the response.

The diastolic pressure difference at the end of one minute increased in the obese subjects (10.20±1.65) compared to the controls (7.37±1.97). This significant increase($p < 0.001$) suggests an increase in sympathetic activity in obesity subjects in our study, although there was no significant change for the same at the end of five minutes.

Cold Pressor Test (CPT)

This is one of the battery of tests which relates to sympathetic activity. In our study the diastolic pressure difference was significantly higher in the obesity subjects (9.17±2.60) compared to the controls (6.20±1.35). This increase in diastolic blood pressure response in obese patients has been stated to be because of increased vasomotor response. This is due to increased sympathetic outflow by activation of thermal and nociceptor afferents from the immersed hand.

To quantify the autonomic dysfunction, the cardio vascular autonomic reflex tests (DB, VM, OST, IHGT and CPT) are considered to predict the autonomic dysfunction if three out of five tests are abnormal. Based on these criteria, our study was able to quantify the autonomic dysfunction in young obese individuals. Most of the studies are done using a maximum of only three tests to predict the autonomic dysfunction. Therefore a battery of six tests mentioned in this study will definitely identify the autonomic dysfunction independent of severity of the disease.

By evaluating the subjects with a battery of other ANF tests we could identify an increased sympathetic activity by a significant rise in the values of isometric hand grip test and cold pressor test and a parasympathetic blunting as seen in the other tests namely orthostatic standing (30/15 ratio), deep breathing (E : I) and valsalva ratio.

Conclusion

Obesity provokes profound changes in the autonomic nervous system. The mechanism by which these changes occur is complex and is affected by number of different stimuli the most important of which appear to be the recurrent episodes of hypoxaemia, ventilator stress and cortical arousal,the key features of the Obesity syndrome[5,6]. These ANS changes are instrumental in mediating the characteristic acute haemodynamic changes of obesity and it is possible that this contributes to the high cardiovascular risk that sufferers carry. There is mounting evidence that individuals with obesity undergo complex readjustment of autonomic homeostatic mechanisms. They have impaired responses to autonomic stress tests and have high levels of baseline sympathetic activity[7], even at rest the obese people having increased heart rate when compared to normal individuals. Obesity of its own is associated with labile haemodynamic and autonomic activity. There is therefore strong circumstantial evidence of a causal relationship between obesity and cardiovascular diseases.

Recent advances in understanding the ANS function and its relationship to the pathophysiological events has lead to early recognition of obesity associated cardiovascular morbidity,. With the help of this specific battery of autonomic function tests, we can detect individuals who are prone to develop cardiovascular complications.

For diagnostic purposes, it is preferable to perform a battery of tests rather than to rely on a single test to determine if autonomic reflex function is intact. These tests are specific, sensitive safe and widely used for diagnosis and monitoring of autonomic neuropathies.

Conflict of Interest: Nil

Sources of Funding: Nil

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DOI Number: 10.5958/2320-608X.2019.00100.8

Assessment of Sympathetic Activity Using Hand Grip Test in Obese Type 2 Diabetes Mellitus Patients

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Abstract

Aim: The aim of the study is to assess sympathetic activity in Obese type 2 Diabetes mellitus patients

Objectives: To investigate any changes in sympathetic activity in obese type 2 diabetes mellitus patients using hand grip test

Methods: 50 subjects of both the genders with type 2 Diabetes mellitus of 10-15 years duration and BMI > 25kg/m^2 were selected as study group. In sitting posture the subject was asked to apply pressure on hand grip dynamometer at 30% of maximum voluntary contraction (MVC) for 1 minute. BP was recorded simultaneously from non-exercising arm. The procedure was repeated thrice with 5 minutes interval in between. The average increase in DBP was noted as the test response and comparison was made with readings of hand grip test from nonobese nondiabetic subjects which were selected as control group.

Results: Statistical analysis was done using unpaired t test.Increase in diastolic blood pressure with handgrip test in study group was significantly reduced compared to control group.

Conclusion: Sympathetic neuropathy is seen in obese diabetic patients. Obesity could be involved in the impairment of CAN function in type 2 diabetics and body weight control could provide an approach to reducing neuropathic complications.

Keywords: *Hand grip test, sympathetic activity, Obese, Type 2 diabetes mellitus.*

Introduction

Autonomic nervous system dysfunction is one of the significant complications of diabetes mellitus and this is generally associated with a poor prognosis[1]. The autonomic nervous system (ANS) has a role in the regulation of long and short term energy balance, and ANS deregulation is implicated in the pathogenesis of obesity and Type 2 Diabetic mellitus(T2DM)[2]. However, debate exists on the initiation of the pathogenic process: whether ANS deregulation is a pathogenic factor in the development of T2DM or whether, conversely, chronic hyperglycaemia and hyperinsulinaemia lead to ANS dysfunction.

Obesity and its early complications (i.e. insulin resistance and impaired fasting glucose) are associated with overstimulation of the sympathetic nervous system (SNS) and decreased tone of the parasympathetic nervous system (PNS)[3]. Once T2DM has developed, chronic hyperglycaemia and persistent increase in sympathetic activity downregulate peripheral β-adrenergic receptors[4] resulting in inability of the SNS to enhance energy expenditure[5].

The sympathetic nervous system modulates both hepatic glucose production and the glucose uptake in peripheral tissues[6]. some studies demonstrated that the increase of plasma insulin level was related to increased urinary[7] and plasma norepinephrine.

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Sympathetic activity was assessed using Hand grip test which causes Isometric exercise. Exercise, in which contraction principally causes a change in the tension of the muscle with little change in the length, is termed as isometric or static. Isometric muscle contraction evokes large increase in mean arterial pressure, heart rate and muscle sympathetic nerve activity(MSNA) with a minor rise in central hemodynamics.The increases in MSNA are thought to result, primarily from activation of the muscle metaboreflex or exercise pressor reflex in the exercising muscle.This reflex originates in sensory receptors which appear to be sensitive to ischemic metabolites generated during muscular contraction, via small myelinated or unmyelinated (group III or IV) afferent fibers, and elicits cardiovascular and vasomotor reflexes.

Materials and Method

The study was carried out in Mahavir institute of Medical sciences,Vikarabad.

Study group:

50 subjects of both the genders with type 2 Diabetes mellitus of 10-15 years duration and BMI > 25kg/m^2 were selected as study group

Control group:

50 Nonobese and Nondiabetic subjects of both the genders were selected as control group

Inclusion criteria for study group:

1. Diabetic for the past 10-15 years
2. BMI > 25Kg/m^2

Inclusion criteria for control group:

1. Nondiabetic
2. BMI between 18.5kg/m^2 and 25 kg/m^2

Exclusion criteria:

1. Any History of Asthma
2. Smokers
3. History of alcohol intake

All the subjects were explained about the test and an informed consent was taken.

Hand grip test:

The resting BP of the subject was recorded in sitting posture. Then the subject was asked to apply pressure on hand grip dynamometer at 30% of maximum voluntary contraction (MVC) for 1 minute. BP was recorded simultaneously from non-exercising arm. The procedure was repeated thrice with 5 minutes interval in between. The average increase in DBP was noted as the test response.

Statistical Analysis:

Statistical analysis was done using unpaired t test

P value < 0.05 was considered as statistically significant

The results were expressed as Mean ± standard deviation

Findings

Table 1. Comparison of Sympathetic activity in study and control group

Variable	Study group		Control group		P-Value
	Mean	SD	Mean	SD	
Increase In DBP(mmHg) with Hand grip test	2.7	8.4	8.1	10.1	**0.004**

On Analysis,

Increase in diastolic blood pressure with handgrip test in study group was significantly reduced compared to control group.

Discussion

In our study, we found that the Increase in diastolic blood pressure with handgrip test in obese diabetic subjects was significantly reduced compared to Nonobese nondiabetic subjects indication sympathetic neuropathy in obese diabetic subjects.

Diabetic neuropathy((DAN) is the main cause of neuropathy in the world[8]. The most common and studied manifestation of DAN is cardiovascular autonomic neuropathy (CAN), owing to its life-threatening

complications (arrhythmias, silent myocardial ischemia, and sudden death) and to its relation with other microangiopathic comorbidities. CAN is defined as the impairment of autonomic control of the cardiovascular system[9].

Cardiac alterations initially start with a relative increase of the sympathetic tone, since diabetic neuropathy firstly affects longest fibers as those of parasympathetic system (like the vagus nerve). Sympathetic denervation begins at the following stage, by affecting the heart from the apex toward the base, gradually impairing ventricle function and resulting in cardiomyopathy[10].

Conclusion

Sympathetic neuropathy is seen in obese diabetic patients. Obesity could be involved in the impairment of CAN function in type 2 diabetics and body weight control could provide an approach to reducing neuropathic complications.

Source of Funding: Self

Ethical Clearance: Taken from Scientific Ethical committee,Mahavir Institute of Medical Sciences,Vikarabad,Telangana.

Conflict of Interest – Nil

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DOI Number: 10.5958/2320-608X.2019.00101.X

Thrombocytopenia in Pregnancy Induced Hypertension

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Abstract

Introduction: Hypertension is a common clinical complication during pregnancy. About 18% of foetal deaths are associated with hypertensive disorders. Out of all the haematological changes that occur in Pregnancy Induced Hypertension (PIH), thrombocytopenia is the most common haematological abnormality found.

Material & Method: Study subjects include 70 women with diagnosed PIH (case) and 70 normotensive pregnant women (control). Platelet count was done.

Result: In PIH cases the low platelet count was seen as compared to normotensive pregnant women. In this study between mean blood pressure & platelet count no correlation was found in normotensive pregnant women but significant negative correlation was found in PIH.

Conclusion: We found significant negative correlation between mean blood pressure & platelet count in PIH.

Keywords: *PIH, Mean Blood Pressure, Platelet Count*

Introduction

Hypertension is a common clinical complication during pregnancy. The most widely used term at present for hypertensive disorder is Pregnancy induced hypertension(PIH)[1]. PIH is defined as hypertension that occurs in pregnancy for the first time after 20 weeks of gestation and disappears following delivery[2]. It affects approximately 6-8 % of all pregnancies, most often the primigravidas[3]. About 18% of foetal deaths are associated with hypertensive disorders[4]. Out of all the haematological changes that occur in PIH, thrombocytopenia is the most common haematological abnormality found[2]. Other tests fibronectin level, decrease antithrombin III level, decrease in α2 antitrypsin, increase in sFlt-1 (soluble Fms – like tyrosine kinase – 1) concentration, decrease in circulating free placental growth factor (PlGF) and vascular endothelial growth factor (VEGF) are though more sensitive but expensive, time consuming, require well equipped laboratory and not suitable for routine purpose[2]. Blood platelets are essential parameters used in assessing thrombosis[5]. This suggests the need for early intervention in hypertensive patients for appropriate management so as to avoid complications associated with coagulation and thrombosis. As such the present study has been undertaken to evaluate the relationship between platelet count in normal pregnancy (control) and PIH.

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Material & Method

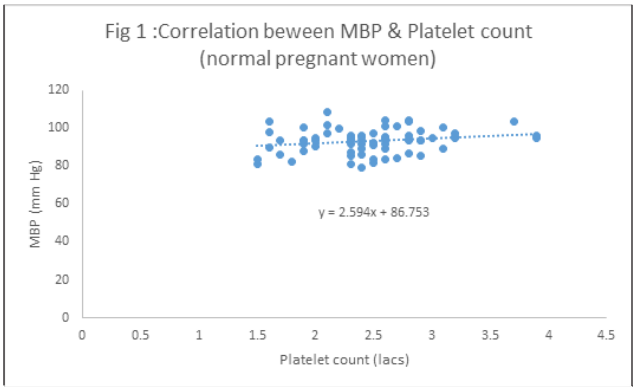
The study was carried out in department of Physiology in collaboration with the department of Obstetrics and Gynecology Rohilkhand Medical College & Hospital (RMCH), Bareilly, U.P., India.

The patient with pregnancy of more than 20 weeks reporting to Department of Obstetrics & Gynecology, OPD between the period from 1st Jan. 2014 to 31st Dec. 2014 were included in this study. Study subjects includes 70 women with diagnosed PIH and 70 normotensive pregnant women. Blood pressure was measured by sphygmomanometry. Patient of PIH have systolic blood pressure of at least 140 mmHg and/or diastolic blood pressure (DBP) of at least 90 mmHg. Mean Blood Pressure (MBP) of both normotensive and hypertensive pregnant women were calculated by using formula DBP+ 1/3Pulse Pressure.

Two ml of venous blood were obtained after 10-12 hours of fasting in EDTA vial. Platelet count was conducted by Bechman counter Hematology analyzer model LH 750 in the central research laboratory of RMCH, Bareilly. Statiscal analysis was done using SPSS(version17) for the determination of the correlation between MBP and platelet count of PIH and normal pregnancy. Scatterogram with regression line were drawn on Microsoft Excel 2010.

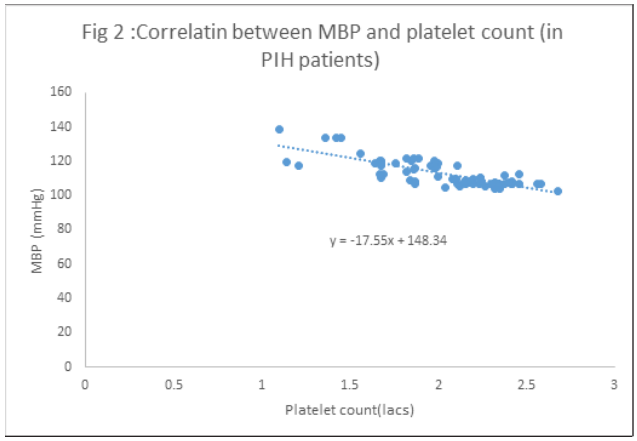
Result

In PIH the mean value of platelet count was 2.032 ± 0.354 ^{x} 10^5/cumm (mean ± standard deviation) and in normal pregnancy the value of platelet count was 2.46 ± 0.524 ^{x} 10^5/cumm. In this study no correlation (r = 0.03) between MBP and platelet count could be seen in control patient with normal pregnancy (fig 1). Where as in hypertensive patient with pregnancy (fig 2) a significant negative correlation (r = – 0.74) was observed between the variables correlated. This correlation is governed by the equation y = -17.55x + 148.34.



Discussion

In this study we attempted to establish correlation between MBP and platelet count in pregnant women with or without hypertension. In control patient no



significant correlation was seen where as a significant negative correlation was seen in PIH cases. In present study we have observed a significantly decreased platelet count in PIH patients as compared to control pregnant patients. Negative correlation between MBP and platelet count indicates involvement of one or more number of factors in the causation of decrease platelet count and MBP. Though exact cause of hypertension in pregnant women has not been fully understood, several factors like fetal hypoxia due to defective fetoplacental vasculature and resultant imbalance in release and metabolism of prostaglandins, endothelin, enhanced lipid peroxidation and nitric oxide by placental and extraplacental tissues have been implicated as the cause of the hypertension in this subset of patients.

Conflicting results have been reported regarding plate count in hypertensive patients of both sexes. Nwovu *et.al.*[6] have observed a significant increase in platelet count in hypertensive patient, whereas Benjamin *et.al.*[5] have reported a significant decrease in platelet count in hypertensive pregnant patients and Nadar *et.al.*[7] have found no change in platelet count in hypertensive patients of both sexes. S. Mohapatra *et.al*[2]. observed an inverse relationship between the severity of PIH and platelet numbers. Similar results have been found in our study as well wherein we also have established an inverse relation between blood pressure and platelet counts. The decrease in platelet count in this study and other studies has been attributed to endothelial damage and aggregation of platelets at these sites in cases of PIH with or without the features of preeclampsia. Magann EF *et.al.*[8] have suggested that the platelet count as the best tests for the determination of severity of PIH and progression/recovery of HELLP (Hemolysis, Elevated Liver Enzyme, Low Platelet Count) syndrome.

Conclusion

In present study we have observed a significantly decreased platelet count in PIH patients as compared to control pregnant patients. Whereas in control patient no correlation was seen, a significant negative correlation was seen between MBP and platelet count in PIH cases. The negative correlation indicates involvement of one or more number of factors reported the literature in the causation of decrease platelet count and MBP.

Conflict of Interest: Nil

Funding Agencies: Self

Ethical Clearance: Obtained

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DOI Number: 10.5958/2320-608X.2019.00102.1

A Study of Surgical Site Infections in Rural Hospital: Assessing Risk Factors, Outcomes and Antimicrobial Sensitivity Pattern

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Abstract

Aims and objectives: This study started to estimate the incidences of SSIs and various pathogen causing SSIs. Surgical site infections can sometimes be superficial involving only skin and other more serious infections can involve deeper tissue. We included infections within 30 days of an operative procedure. We analyzed the various aspects of SSI in our institution Rajshree Medical Research Institute Bareilly which is a tertiary care hospital in Uttar Pradesh.

Materials and Method: This prospective study was conducted in the department of general surgery RMRI Bareilly UP India. A total number of 245 patients were admitted for surgical procedures. All minor, elusive, emergency, laparoscopic procedure were included. Data is analyzed statistically. The center of disease control and prevention, USA criteria were used for defining the wound. Sample swabs were collected from the first dressing and up to 30 days postoperatively.

Results: This research showed that probability of nosocomial infections increased during hospitalization . The mean duration of hospital stay in patients with SSIs was 09 days.

Conclusion: SSIs have been major complications of surgeries. We observed comorbiality, prolonged hospital stay, drainage, all increases the probability of SSIs. Slightly low incidences of SSIs in our study are due to better setup and better infection control practices.

Keywords: *Centers for disease control and prevention criteria, surgical drains, surgical site infections.*

Introduction

According to NNIS (National nosocomial surveillance system) data SSIs are the third most common frequently reported nosocomial infections that are associated with substantial morbidity and mortality. Thus this study was taken up in RMRI Bareilly UP India to estimate the incidences of SSIs and various pathogen causing SSIs.

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Defining surgical site infections: The majority of SSI became apparent within 30 days of an operative procedure according to the CDC. (The center for disease control and preventions)[1,2,3,4] or the surgical site infections surveillance service [10]. CDC level describes three levels of SSI:

1. Superficial incisions: Affecting skin and subcutaneous tissue.

2. Deep incisions: Affecting the fascial and muscle layers.

3. Organ or space infection: Involves any part of the anatomy other than the incision that is opened or manipulated during the surgical procedure. For example joints and peritoneum. It is proved that the SSIs are the

most common infections among all infections.[4]

US National research council group developed a systematic classification for operative infections which was based on degree of microbial contamination.[5] Gram positive bacteria such as S.aureus are the most common causative skin dwelling micro-organisms. SSIs also caused by organisms within the patient's body that are exposed during surgery. SSIs becomes hazards in the hospitals now a days[2, 3]

Materials & Method

Hospital setting and study design

This study included patients undergoing surgery at RMRI tertiary care academic medical center, Bareilly. Hospital has active infection control surveillance programs.

This study was approved by ethical committee RMRI. This was a cohort study on all the patients who underwent surgical procedure during this period. The detailed history regarding patients associated type of surgery (emergency and elective) pre and post-operative hospital stay, duration and order of surgery, presence of surgical drains and its duration were recorded in the individual proforma.

Samples in the form of swabs were collected aseptically at the time of first dressing, 8-10 days, and then 1-3 weeks after the surgery from the wounds having serous or purulent discharge showing signs of inflammation.

All the samples were analyzed aerobically and anaerobically. One swab was used to smear and gram staining was done to ascertain the morphological form of bacteria present. The other swabs were cultured on blood agar and Mac Conkey's agar. The causative agents were identified. Antibiotic sensitivity pattern of the isolates was done by the modified stokes disk diffusion method. Antibiotic sensitivity pattern were observed, analyzed, and recorded. Patients were followed up for a period of 20 days after the surgical procedure. The observations were recorded. All the results were analyzed by the student's test for age, duration of hospitalization, elective and emergency surgery, wound classification criteria, (CDC) duration of surgery drainage and duration of surgery.

Observations:

Culture and Sensitivity

E.coli and staphylococcus aureus were isolated in all 98 SSIs patients among a total number of 1245 surgeries. Patients infected by E.coli were 24.84%. Patients infected by anaerobes were 40%. Patients infected by S.aureus were 31.91%. Patients infected by pseudomonas aeruginosa were 16.96%. Patients infected by Klebsiella were 5.99%. Patients infected by Electrococcus faecalis were 18.01%.

Table-1: Duration of hospital stay

Serial Number	Length of stay	Number of patients (1245)	Non infected patients(1147)	Number of SSIs(98)
1	1 day	596	572	24 (4.11%)
2	1-7 days	456	425	31 (7.01%)
3	>7 days	193	150	43 (19.99%)

X2=68.122; df=2; P<0.05

Results & Discussion

98 patients developed SSIs. Surgery was performed in 1245 patients. The infection rate was 7.89%. A research showed that probability of nosocomial infections increased during hospitalization [8]. In our study the mean duration of hospital stay in patients with SSIs was 09 days. This study showed that the duration of preoperative hospital stay is directly proportional to the SSIs. Result of our study matched the reported inferences. Several studies reported association between the rate of SSIs and duration of operation and order of operation. Mahesh et al also proved association between

this .[4] Another study shown that Staphylococcus aureus followed by Pseudomonas aeruginosa were the most common bacteria causing wound infections in children, these are also the predominant pathogens in adult causing wound infections [6]. Data of our study has shown that the duration of hospital stay is directly proportional to the SSI as another study results showed almost same results. The infection rate was less in patients who received pre-operative antibiotics and the most common isolate in clean surgical wounds was Klebsiella pneumoniae followed by Staphylococcus aureus and Pseudomonas aeruginosa, suggesting the emergence of K. pneumoniae as a hospital acquired pathogen[7]. A study showed that overall SSI rate was estimated to be 30.7%; 5.4% for clean, 35.5% for clean-contaminated, and 77.8% for contaminated operations. Seventy-nine per cent of the isolates were gram-negative and almost 64% demonstrated polyantimicrobial resistance.[8] Surgical site infections rates were also compared in several studies . INICC and CDC-NHSN reports, respectively: 4.3% for coronary bypass with chest and donor incision (4.5% vs 2.9%); 8.3% for breast surgery (1.7% vs 2.3%); 6.5% for cardiac surgery (5.6% vs 1.3%); 6.0% for exploratory abdominal surgery (4.1% vs 2.0%), among others. In most types of surgical procedures, surgical site infections rates were higher than those reported by the CDC-NHSN, but similar to INICC.[9] A study conducted in tertiary care hospital in Mumbai, India on the incidences of Surgical Site Infections (SSI) and risk factors affecting SSI . in This study 1000 patients underwent various surgeries and the risk factors were studied[11]. Swabs obtained from wounds were processed using standard microbiological methods. The Overall SSI rate was 9.6% (96/1000). Reslts shown that SSIs rate is increased with Age >50 years, low immunity, diabetes mellitus, emergency surgery, presence of drain, surgical wound class, longer duration of surgery. The most common organism isolated is S.aureus (22/96) followed by E.coli (20/96).[11] .Another study conducted on 300 patients. Several factors like host factors, wound factors and surgery related factors that cause SSI were studied[12]. Swabs were collected from the infected surgical wounds. . Antimicrobial susceptibility was done by Kirby-Bauer disc diffusion method. Escherichia coli (31.25%) was the commonest pathogen, followed by Pseudomonas aeruginosa (25 %) and Staphylococcus aureus 22%. The incidence of SSI are most likely same as our study.[12] . Infected wounds were studied bacteriologically in other study[13]. Samples such as pus swabs from the infected wound site, aspirates, surgical drain tips or blood were collected . Direct staining, aerobic bacterial cultures and identification followed by antibiotic sensitivity testing were performed and the results showed that the overall infection rate was 7.44% among 685 patients . A higher SSI rate was observedin cases of emergency surgeries and with increasing degree of wound contamination.[13]

Conclusion

SSIs have been a major complications of surgeries. We observed comorbiality, prolonged hospital stay, proper drainage, culture sensitivity all increases the probability of SSIs. Slightly low incidences of SSIs in our study are due to better setup and better infection control practices. This study is an important advancement towards the knowledge of surgical site infections epidemiology in the Indian hospitals set up. . To decrease the incidence of SSI we would have to: a) less duration of hospital stay (b) focus on regular and intensive drain care c) identify risk factors (d) should done periodic surveillance to keep a check on SSI. Prolonged duration of surgery and drain usage increases SSI. The most common isolate was E. coli followed by S. aureus. A Gram-negative bacteria in causing infection was also identified.

Ethical Clearance: This study was approved by institutional ethics committee.

Source of Support: Nil.

Conflict of Interest: None

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DOI Number: 10.5958/2320-608X.2019.00103.3

Comparative Study of Effect of Stress on Headache in Medical and Non-Medical Students

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Abstract

Background- This study was conducted to compare the effect of stress on headache in medical and non-medical students.

Method- In this study, comparisons were made between 200 medical students of S.N.M.C, Agra and 200 non-medical students of Agra College, Agra, aged between 18-21 years, from 1 January 2017 till 30 June 2018. Perceived stress scale was used to determine the prevalence of stress among medical and non-medical students. On the basis of frequency of occurrence of headache, it was categorized as daily, weekly and infrequent.

Results-Moderate and high perceived levels of stress were found to be more common in medical students as compared to non- medical students and the result was found to be statistically significant ($p < 0.0001$).

Daily and weekly headaches were commoner in medical students, whereas, infrequent headache was more common in non-medical students and there was statistically significant difference among both groups ($p < 0.0001$).

Among medical students, daily and weekly headaches were more commonly found in high perceived level of stress and infrequent headache was more common in low level of stress and statistically significant difference was found between headache and level of stress among medical students ($p < 0.0001$).

Among non-medical students, daily and weekly headaches were common in high perceived level of stress and infrequent headache was also more common in low level of stress and statistically significant difference was found between headache and level of stress among non-medical students ($p < 0.0001$).

Conclusion- Among the medical students, 48% (96) had infrequent headache, 43.5% (87) had weekly episode of headache and 8.5% (17) had daily headache. While among non-medical students 64% (128) had infrequent headache, 35 % (70) had weekly episode of headache and 1% (2) had daily headache which was a statistically significant. Stress headaches are more common among the medical students.

Keywords- *Stress, Headache, Medical students, Non-Medical students.*

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Introduction

Stress is a psycho-physiological homeostatic imbalance which arises when there is an actual or perceived demand capacity mismatch between the individual and his or her environment.[1]

It can be defined as any challenges to homeostasis that require an adaptation response. It is a consequence of a change in the external environment that perturbs the internal milieu. However, it can be a direct result of dysfunction in one or more organ systems within the body's internal environment.[2]

There are three types of stress:

Acute stress: It is the most common type of stress. It is the body's immediate reaction to a new challenge, event, demand and it triggers the fight or flight response.

Episodic acute stress: When acute stress occurs frequently it is called episodic acute stress.

Chronic stress: If acute stress doesn't resolve and begins to increase and lasts for a long period of time, it becomes chronic stress.

Academic stress is a good model of psychological stress in humans and is therefore useful for studying psycho-neuro-hormonal changes in students.[3]

Physiological consequences of these stressors include specific biological and cellular tissue alteration.[4]

There are many physiological alterations that occur in stress like anxiety, depression, tension, headache, altered sleep pattern, altered food habits, bowel habits, and increase consumption of caffeinated drinks.

Academic stress has emerged as a major psychosocial influence on physical and mental health over recent decades.

A student generally faces different kinds of stressors such as vastness of academic syllabus, language problem, frequent examinations, homesickness, high parental expectations, lack of time for recreation and improper quality of food in mess etc.

Material and Method

The present study was conducted in the Department of Physiology, S.N. Medical College, Agra from 1 January 2017 till 30 June 2018. It was a cross-sectional, double blinded study where comparisons were made between randomly selected 200 medical students of S.N. Medical College and 200 non-medical students of Agra College, aged between 18-21 years. Multistage stratified random sampling technique was applied for both medical and non-medical students. To help determine the degree of stress the participants were experiencing, they were made to fill out a self-assessment questionnaire: Perceived stress scale.

Perceived stress scale (PSS) was originally developed in 1983 and it still remains a popular choice for helping us understand how different situations affect our feelings and our perceived stress. The questions in this scale ask about feelings and thoughts during the last month.

Headache is one of the most common complaints during medical curriculum and it occurs due to numerous psychological and physical stressors, which are more common in medical students than general population. Frequent and severe headache have a major impact on academic performance and quality of life, and may bring about limitation in daily activities and work. The problem may also influence the student future job performance, causing a large burden for individual and society, considering the role of medical students in improving the community health. On the basis of frequency of occurrence of headache, it was categorized as daily, weekly and infrequent.

The study was conducted in 2 groups –

Group A- Medical students of S.N. Medical College, Agra.

Group B- Non-medical students of Agra College, Agra.

The data collected from all the students was recorded on an MS Excel sheet and subjected to statistical analysis. Chi square test was applied to analyze the data by using SPSS software (version 20).

Inclusion criteria:

All the medical and non-medical students who were willing to participate in the study after being informed in details about the study.

Exclusion criteria:

Students who were unwilling to participate.

Students having any other systemic disorders, chronic illnesses or any precipitating factors for acute stress.

Students having known pathological diseases of eye.

Permission was sought from the principal of SNMC, Agra and Head of department for accomplishing this research work. Permission was also sought from Agra College's principal and dean for accomplishing this research work to take participation of non-medical students.

Observation and Result

Table: 1- Gender wise distribution of all study participants.

S.No	Gender	Medical students (N=200)		Non-medical students (N=200)	
		n	(%)	n	(%)
1	Male	105	(52.5)	105	(52.5)
2	Female	95	(47.5)	95	(47.5)

Among 200 medical and non-medical students, majority of the participants, 52.5% were male (n=105), while 47.5% were female (n=95) with male to female ratio was 1.1:1 among both groups.

Table: 2- Level of stress among medical and non-medical students: Perceived Stress Scale

S.No	Level of Stress	Score	Medical students (N=200)		Non-Medical students (N=200)	
			n	(%)	n	(%)
1	Low (A)	0-13	41	(20.5)	86	(43)
2	Moderate (B)	14-26	136	(68)	104	(52)
3	High perceived (C)	27-40	23	(11.5)	10	(5)
	Chi square test =25.33; df =2; p value =<0.0001					

Among 200 medical students, the maximum students had moderate level of stress which included 68% (136) students. 20.5% (41) had low level of stress and 11.5% (23) had high perceived level of stress.

Among the 200 non-medical students, maximum had moderate levels of stress accounting to 52% (104) followed by 43% (86) with low level of stress and 5% (10) with high perceived level of stress.

Moderate level of stress and high perceived level of stress were more common in medical students as compared to non-medical students. By applying chi square test, statistically significant difference was found between both the groups.

Table: 3- Headache among Medical and Non-Medical students:

S.No	Headache	Medical students (N=200)		Non-Medical students (N=200)	
		n	(%)	n	(%)
1	Daily	17	(8.5)	2	(1)
2	Weekly	87	(43.5)	70	(35)
3	Infrequent	96	(48)	128	(64)
Chi square test =18.25; df =2; p value =0.0001					

Among 200 medical students, 48% (96) had infrequent headache, 43.5% (87) had weekly episode of headache and 8.5% (17) had daily headache. While among non-medical students 64% (128) had infrequent headache, 35 % (70) had weekly episodes of headache and 1% (2) had daily headache.

Daily and weekly headaches were more common in medical students (8.5% and 43.5% respectively) as compared to non-medical students (1% and 35% respectively) whereas, infrequent headache was more common in non-medical students (64%) as compare to medical students (48%). By applying chi square test, statistically significant difference was found among both groups.

Table: 4-Comparison of level of stress and headache among medical and non-medical students.

S.No	Level of stress	Headache					
		Medical students (N=200)			Non-medical students (N=200)		
		Daily	weekly	Infrequent	Daily	Weekly	Infrequent
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
1	Low stress (A)	1 (2.43)	7 (17.07)	33 (80.49)	0 (0)	9 (10.47)	77 (89.53)
2	Moderate stress (B)	8 (5.88)	67 (49.26)	61 (44.85)	0 (0)	53 (50.96)	51 (49.04)
3	High perceived stress (C)	8 (34.78)	13 (56.52)	2 (8.7)	2 (20)	8 (80)	0 (0)
		Chi square test =46.78, df =4, p value = <0.0001			Chi square test =91.54, df =4, p value = <0.0001		

Among 200 medical students, daily and weekly headaches were more commonly found in high perceived level of stress (34.78% and 56.52% respectively). Infrequent headache was more commonly found in low level of stress (80.49%).

By applying chi square test, statistically significant difference was found between headache and level of stress among medical students.

Among 200 non-medical students, daily and weekly headaches were common in high perceived level of stress (20% and 80% respectively). Infrequent headache was also more common in low level of stress (89.53%).

By applying chi square test, statistically significant difference was found between headache and level of stress among non-medical students.

Discussion

In the current study, among the medical students, percentages with low, moderate and high perceived levels of stress were 20.5%, 68% and 11.5%, respectively. Among the non-medical students, percentages were 43%, 52% and 5%, respectively (table 2). When we compare both the groups, moderate level of stress and high perceived level of stress were more commonly observed in medical students. The cause may be the longer duration of study, greater duration required to complete professional degree, coupled with frequent examinations and high expectations from parents of same background serving as role models, which may culminate into a greater degree of stress among medical students as compared to non-medical students.

Similar study conducted in Department of Community Medicine, Jinnah Medical and Dental College, Karachi, Pakistan stress levels among medical, engineering, arts and commerce students were studied. The results showed that the stress levels of medical students had been found to be significantly higher than those of the other 3 professional colleges[5].

In a study conducted by Hamza et al, prevalence of stress of all levels was about 63.8% and the prevalence of severe stress was 25.2%. 75.6% of medical students had stress, among which 54.6% had moderate to highly perceived stress[6].

In current study, among 200 medical students, 48% (96) had infrequent headache, 43.5% (87) had weekly episodes of headache and 8.5% (17) had daily headache. While among non-medical students 64% (128) had infrequent headache, 35 % (70) had weekly episodes of headache and 1% (2) had daily headache. Daily

and weekly headache were more common in medical students, whereas infrequent headaches were more common in non-medical student. (Table 3)

A study conducted in the medical students showed that, the prevalence of tension-type headache was 64.7%, migraine 18.7%, 1.7% had never had headaches and there was no diagnosis in 14.9%. Among the psychology students, the prevalence of tension-type headache was 48.5%, migraine 32% and no diagnosis in 19.4%. The study showed increased tension headaches in medical students which was statistically significant[7].

In this study, it was observed that in both the groups, daily and weekly headaches were commonly associated with high perceived level of stress, while, infrequent headache was seen in low level of stress (Table 4).

A longitudinal population based study conducted by Schramm SH et al showed the association between stress and headache. This study provides evidence for an association between stress intensity and headache frequency. Higher effects were observed in younger age group[8].

Many studies have found that stress can contribute to headaches, a condition characterized by pain in the head or neck regions. One study of 267 people with chronic headaches found that a stressful event preceded the development of chronic headaches in about 45% of cases[9] .A larger study showed that increased stress intensity was associated with an increase in the number of headache days experienced per month (32). Another study surveyed 150 military service members at a headache clinic, finding that 67% reported their headaches were triggered by stress, making it the second most common headache trigger[10].

Conclusion

Among the medical students, 48% (96) had infrequent headache, 43.5% (87) had weekly episode of headache and 8.5% (17) had daily headache. While among non-medical students 64% (128) had infrequent headache, 35 % (70) had weekly episode of headache and 1% (2) had daily headache which was a statistically significant. Stress headaches are more common among the medical students.

Conflict of Interest- None

Source of Funding- Self

Ethical Clearance- Taken from college ethical committee.

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DOI Number: 10.5958/2320-608X.2019.00104.5

Influence of Maternal Nutritional Status During Pregnancy on the Birth Weight of the Newborn

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Abstract

Background- The factors that affect the supply of nutrition to the fetus depend on the maternal body composition, size as assessed by the pregnancy weight and the weight gain during pregnancy **Objective**: To establish correlation between maternal body mass index and of maternal nutritional status during pregnancy with the birth weight of the new born. **Method-** This was a hospital based prospective study carried out at Dr.B.R. Ambedkar Medical College Hospital, and K.C. General Hospital, Bangalore during the period of Oct. 2001-Sept.2002. The subjects for the study were pregnant women delivering at full term Majority of the pregnant women participated in the study were in the age group of 20-30 years. **Results-** 58 female and 50 male babies were considered for the study, they had a mean birth weight (in Kgs) of 2.60 $\pm$ 0.28 and 3.01$\pm$ 0.41 respectively. There was a statistically significant positive correlation between maternal body mass index with birth weight in Group I and Group II ($P<0.05$) However in Group III male and female babies were non significant. There was no significant correlation between maternal hemoglobin content and birth weight of male babies.

Conclusion- It was concluded that there was a significant positive correlation between the maternal nutritional status with the birth weight of the babies.

Keywords*: Body mass index, Newborn weight, Hemoglobin, Maternal nutritional.*

Introduction

Pregnancy is a physiologically demanding condition. The outcome of pregnancy is strongly influenced by the maternal biosocial factors, intrauterine age, genetic and biological characters of the fetus.

The Birth weight or the Body mass index of the newborn has been used as an important tool to measure the outcome of pregnancy. The growth of the fetus is influenced by the availability of the nutrients and the supply of oxygen. Thus during pregnancy there is an increased nutritional demand.

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The factors that affect the supply of nutrition to the fetus depend on the maternal body composition, size as assessed by the pregnancy weight and the weight gain during pregnancy.[1] The foetal growth is also influenced by maternal nutritional stores the calorie and the protein intake.

The nutritional demand of the fetus draws its supply from the maternal side and grows at her expense. Thus when the mother's diet is nutritionally or calorically inadequate both the mother and fetus suffer from nutritional disorders.[2]

Poorly nourished mother's produce intrauterine growth retarded babies with low both weight with irreversible tissue damage it is reported that neonatal mortality and morbidity is very high in such conditions.[1] Inadequate nutritional supply to the mother as a result of poor socio-economic status, lack of knowledge

about the balanced diet consequent to the cultural or poor educational back ground can result in the morbid consequences like severe anemia and malnutrition. The severity of anemia, coupled with demonstrable malnutrition during pregnancy, can frequently predispose to the toxemia of pregnancy. [3]

Pre pregnancy weight and height can be an important factor influencing the birth weight. However it is not very clear whether the weight gain during pregnancy has any impact on the outcome of pregnancy.

Hence the present study was carried out with the objectives to establish correlation between maternal body mass index and maternal nutritional status with the birth weight of the new born.

Material and Method

This was a hospital based prospective study carried out at

Dr.B.R. Ambedkar Medical College Hospital, and K.C. General Hospital, Bangalore durin the period of Oct. 2001-Sept.2002.

The subjects were informed in detail about the protocol. They were explained the inherent risk involved during the course of the study and informed consent was obtained from all the subjects.

The subjects for the study were pregnant women delivering at full term Majority of the pregnant women participated in the study were in the age group of 20-30 years. However 4 subjects were between 31 & 35 years of age. The subjects considered for the study were screened for the following inclusion and exclusion criteria.

Inclusion criteria

Mother: Normal healthy pregnant women attending AMC Hospital and K.C. General Hospital below the age of 35 years.

New born: Healthy normal full term babies/Vaginal Delivery.

Exclusion criteria

Mother: Twins are excluded from the study. Pregnant women more than 35 years. Pregnant women with bad obstetric history. Pregnant women with previous history of Pre-Eclamptic Toxaemia Subjects with the H/o. Major illnesses or clinical examination indicating the possibility of the disease were excluded.

New born: Congenital anomalies**,** Still birth**,** Hundred and eight subjects satisfied the criteria put forth and were included in the study

Method of data collection: The relevant details pertaining to the subjects were obtained by a questionnaire. The Personal details of the subject like Name, age address Educational status and occupation was noted. The Socio economic status was determined by noting the type of family (Nuclear or Joint) and its size. The total family income and per capita income of members of the family was estimated.

The subjects were categorized as belonging to low, lower middle, upper middle, high and above Rs.86,000/- P.A. based on the recommendation of National Council of applied economic research. New Delhi 1993-94. Majority of the subjects belong to the first 3 groups. [6]

The Nutritional Status was assessed by a 24 hours dietary recall Based on the information furnished the approximate carbohydrate, fat, protein and calorie intake were calculated by using CFTRI nutritive chart (Mysore).[4] The subjects were divided into two groups with caloric intake of less than 2000 K.cal and more than 2000 K.cal.

A detailed menstrual and obstetric history were taken. The age of menarche, regularity of periods and the average duration of flow during each cycle were recorded.

In the obstetric history attempts were made to elicit information regarding the previous pregnancies with reference to abortion, complications during pregnancy and child birth.

The Personal History focused on the habit of smoking, consumption of alcohol and tobacco chewing. None of the subjects considered for the study had a habit of smoking or consuming alcohol.

After the detailed history taking a physical examination was done. In the general examination the build was assessed. The other features like pallor, clubbing, cyanosis, jaundice, pedal oedema enlargement of neck veins and thyroid swelling were observed.

A detailed system wise clinical examination was

conducted to rule out any organic illness.

Weight of the mother was recorded to the nearest 500 gms using UNICEF adult weighing machine. The Instrument was standardized with known weights before every weighing session. Same grown of known weight was used for each women and this weight was deduced from the observed value. [5]

Body mass index (BMI) was calculated by considering the weight and height of the mother. [6]

BMI= Weight (in Kgs)/ height (In Meters)^2

The subjects were classified into three groups on the basis of Body mass Index. (BMI). Group I <22.57, Group II 22,57-26.52, Group III>26.52. The value of each group was arrived by taking the mean ± SD**.** .

Birth weight: Weight of the baby was recorded by using an electronic balance which has sensitivity± 5 gms (Electromedik Pvt.Ltd.,)

Haematological investigation: 3 ml of blood samples were collected under aseptic precautions mixed thoroughly with EDTA and used for estimation of haematological parameters. By using semi-auto analyser SYSMEX-K-1000 (Transasia Bio Medical Pvt.Ltd., Mumbai).

The RBC count, Hemoglobin content, Haematocrit, MCH, MCHC, MCV were estimated. All haematological parameters were estimated by using a venous sample of blood from the mother and the umbilical cord (Cord Blood).

STATISTICAL ANALYSIS: The data obtained was tabulated utilizing computers. The data was analyzed using SPSS (Statistical package for social sciences) Package. ANALYSIS OF VARIANCE and STUDENT "T" TEST of statistical analysis have been used in this study. P value less than 0.05 was taken to be statistically significant.

Result: 58 female and 50 male babies were considered for the study, they had a mean birth weight (in Kgs) of 2.60 ± 0.28 and 3.01± 0.41 respectively (Table 1), Male babies weighted more than female babies.

Table 1: Distributions of Sex of the baby and birth weight

Sex of the Baby	N	Mean birth weight (In Kgs) ±SD
MALE	50	3.01±0.41
FEMALE	58	2.60± 0.28

Male vs Female P<0.05

Mothers with a body mass index (Kg/m^2) of less than 22.57 belonging to group 1 Gave birth to male babies with a mean birth weight (in Kgs) of 2.59±0.14 or female babies weighing 2.38± 0.40. Mothers with a body mass index (kg/m^2) of 22.57-26.52 belonging to group 11 gave birth to male babies with a mean birth weight (in kgs) of 3.40± 0.26 or female babies weighing 2.67±0.24. Mothers with a body mass index (Kg/m^2)of more than 26.52 belonging to group III gave birth to male babies with a mean birth weight (in Kgs) of 3.40±0.30 or female babies weighing 2.87 ±0.67 (Table). There was a statistically significant positive correlation between maternal body mass index with birth weight in Group I and Group II (P<0.05) However in Group III male and female babies were non significant (P>0.05).

Table 2: Correlation of maternal baby mass index and birth weight

Group	Maternal body mass index (Kg/ m^2)	Mean birth weight (In Kgs) ±SD			
		N	Male	N	Female
I	Less than 22.57	3	2.59±0.14	20	2.38±0.40
II	22.57-26.52	42	3.04±0.26	30	2.67±0.24
III	More than 26.52	5	3.04±0.30	8	2.87±0.67

Group I Vs. II	P<0.05	P<0.05
Group I Vs. III	P<0.05	P<0.05
Group II Vs. III	P>0.05	P<0.05

Mothers with calorie Intake (K cals) of less than 2000 gave birth to male babies with a mean birth weight (In kgs) of 2.84± 0.22 or female babies with mean birth weight (In kgs) 2.41±0.37. Mothers with calorie intake (k. cals)of more than 2000 gave birth to male babies with a mean birth weight (in kgs) of 3.14 ± 0.23 and 2.85 ± 0.33 .(Table 3). There was a significant correlation between maternal calorie intake and birth weight of male or female babies. (P< 0.05).

Table 3: Comparison of maternal calorie intake and birth weight

Group	Maternal calorie intake (k.cals)	Mean birth weight (In Kgs) ±SD			
		N	Male	N	Female
I	Less than 2000	23	2.84±0.22	33	2.41±0.37
II	More than 2000	27	3.14±0.23	25	2.85±0.33

Mothers with hemoglobin content (gm / dl) of less than 10 gave birth to male babies with mean birth weight of 2.98± 0.30 or female babies with 2.44 + 0.32 Mothers with hemoglobin content (gm / dl) of more than 10 gave birth to male babies with mean birth weight of 3.09 ± 0.21 or female babies with a mean birth weight of 2.94 ± 0.40 (Table 4) There was no significant correlation between maternal hemoglobin content and birth weight of male babies (P> 0.05) and there was a significant correlation between maternal hemoglobin content and birth weight of female babies (P< 0.05).

Table 4: Comparison of maternal hemoglobin content and birth weight

Maternal hemoglobin Content (gm/dl)	Mean birth weight (In kgs) ± SD			
	N	Male	N	Female
Less than /equal to 10	40	2.98±0.30	36	2.44±0.32
More than 10	18	3.09±0.21	14	2.94±0.40

Male babies P>0.05 Female Babies P<0.05

Discussion

The height and weight of the mother, therefore the body mass index is an important factor in deciding the weight of the newborn. The earlier reports, Meharban singh (44) indicate mothers weighing less than 40 kg with a height of less than 145 cms (BMI = 19.04kgs / mtrs2) gave birth to low birth weight babies .In the present study women with a body mass index less than 22.57, gave birth to babies with a lower birth weight when compared to the mothers with a BMI more than 22.57. It is also observed that extremes of age resulted in low birth weight babies.

The mothers who had a low body mass index evidenced by a small stature had inadequate skeletal growth, a small sized uterus resulting in a compromised placental size.

These maternal limitations could adversely affect the development of the foetus due to poor fetoplacental perfusion. [8]

It is observed that the protein calorie intake has a direct bearing on the outcome of pregnancy. Mothers with a intake of less than 2000 k cals gave birth to babies with a poorer birth weight as compared to mothers with higher and satisfactory calorie intake. Fetus, a true parasite depends on the mother for its nutritional requirement this exerts an extra load on maternal nutritional intake. In conditions of unsatisfactory calorie intake there is a competition between mother and her

growing foetus to satisfy the individual requirement. [9]

Thus in cases of a significantly reduced calorie intake, the foetal growth gets compromised resulting in a low birth weight babies.

The other aspect to be considered while evaluating the outcome of pregnancy is the individual constituent of the composite diet consumed by the pregnant women. It is reported that the proteins, iron, folate, iodine and calcium have a demonstrable influence in the growth and development of the foetus. Though it is observed that protein forms a key factor in the diet there appears to be a conflict in the quantity of proteins to be consumed during pregnancy. A low protein intake results in low birth weight babies due to intrauterine growth retardation. On the other hand a relatively high intake of protein is said to be determental to the growth and development of the foetus.

In our study, though we have considered the influence of calorie intake on the outcome of pregnancy, we have not been able to establish a relationship between the individual components of the diet on the intrauterine growth. It is our candid opinion that demonstrating a probable relationship between the major food components like carbohydrates, fats and proteins with the development of the foetus holds a great promise for management of intrauterine growth retardation and to reduce the incidence of low birth weight babies.

A poor nutrition and inadequate supplementation during a stressful condition like pregnancy could retard the placental development, reducing its size with a poor feto placental perfusion. These changes ultimately will result in a low birth weight baby. [10]

It was observed mothers with lower haemoglobin content gave birth to female babies with a lower birth weight. However this relationship was not true for the male babies the earlier reports by Thangaleela & vijayalakshmi[2] have reported iron status in the mother and newborn as evident from haemoglobin content indicate the transfer of iron from mother to the foetus. Further it is reported babies born to anaemic mothers were not necessarily iron deficient. When they correlated the indicators of newborn status with that of the mother they observed the iron deficiency in the mother adversely influenced iron status of the new born.

Tyagi et al have reported deficiency of maternal haemoglobin had intrauterine growth retarding effect . Thus it could be concluded that female babies were more susceptible to intrauterine growth retardation when the maternal haemoglobin content was significantly low. [11]

However the male babies appear to be less susceptible for retarded intra uterine growth despite a reduction in maternal haemoglobin. The placental HCG stimulates the formation and release of testosterone from the developing foetus between 10 and 20 weeks of gestation. As the foetal androgens enhance the erythropoeisis growth retardation of male babies is not commonly observed.

Conclusion

It was concluded that there was a significant positive correlation between the mothers having body mass index upto 26.52 with the birth weight of the babies. There was a significant correlation between birth weight of the baby with different levels of maternal calorie intake. The maternal haemoglobin content had an influence on birth weight of the female babies. However no such relationship was demonstrable in case of male babies.

Conflict of Interest: None

Funding: None

Ethical Clearance: Permission for the study was obtained from the College authorities prior to commencement.

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DOI Number: 10.5958/2320-608X.2019.00105.7

Prevalence of Urinary Tract Infection in Children (3-6 years); with Emphasis on Efficacy of Urine Leukocyte Esterase and Nitrite Test

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Abstract

Background & Objectives; Urinary tract infection (UTI) is among the most common childhood disease. The early intervention is prudent to reduce various renal complications. Our study determines the prevalence of UTI in anganwadi children(3-6 years) along with efficacy of dipstick tests in diagnosing UTI. **Method:** Urine leukocyte esterase (LT) and nitrite (NT) tests with urine culture were done and their usefulness was calculated by diagnostic odd ratio and chi square test. **Results :**It revealed prevalence to be 4.6 % with sensitivity and specificity of LT, NT as 85.7%, 85.7% and 95.5%, 94.8% respectively. The positive and negative predictive value of LT, NT was 48%, 44.4% and 99.3%, 99.3% respectively. **Interpretation & Conclusion:** Hence Dipstick tests appears to be a rational and cost effective approach especially in a mass population or in communities to diagnose UTI without adequate laboratory facilities.

Keywords: *Uti, Dipstick, Urine Culture, Urinalaysis*

Introduction

Urinary tract infection (UTI) is among the most common disease in childhood. The prevalence of UTI varies between 0.4 and 7.5% in different childhood populations (Brican 2002)[1]

Screening for asymptomatic bacteriuria if undertaken in order to detect infection and identification of structural abnormalities coupled with appropriate management will lead to prevention of pyelonephritis and renal damage [2].

This would be a tedious task unless a simple and economic screening methods which would be acceptable to the children, parents, school health authorities and bacteriologist.

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There are several rapid diagnostic tests like dipstick method & urine microscopy. Rapid diagnostic tests can rule out negative samples, are economical, save valuable time and thus useful.

The use of leukocyte esterase and nitrate as a screening test for UTI has not been recently evaluated in our environment. This study was therefore undertaken to evaluate dipstick leukocyte esterase and nitrate method in the diagnosis of UTI in this community with a view to recommend its use in screening, as well as in diagnosis of UTIs in resource poor communities so as to avert the long term complications of UTI in children [3,4].

Methodology

A cross sectional study of 300 children was conducted in Dr. D. Y. Patil Hospital, after taking clearance from Dr. D. Y. Patil Medical College ethical committee. Children between the age group of 3-6 years in Anganwadi's of Kolhapur city were included in the study, Whereas Children below 3 years and above 6 years and Children on antibiotics at the time of collection of the urine sample were excluded from the study.

The aim of our study was to know the prevalence of urinary tract infection in Anganwadi children (3-6years) and to evaluate the efficacy of Leukocyte esterase and Nitrite test in diagnosis of urinary tract infection.

The enrolment was made after taking permission from Anganwadi authorities, and written consent from the parents. The age of the children was obtained from the school records and weight was recorded using spring balance (bathroom scale) calibrated to 0.5kg accuracy.

The clean catch midstream 15 ml urine sample was collected in autoclaved bulb in Anganwadi itself after giving instructions to the guardian/helper. All specimens for urinalysis and culture were recorded & labelled including the patient's name, age, sex, and the time. Further it was transferred to the hospital as early as possible (within 2 hours).

In hospital urine sample were divided in to three parts, on one part dipstick tests were done immediately, and two parts were sent to the laboratory for urine microscopy and urine culture.

DIPSTICK SCREENING TECHNIQUE: Urine samples were tested by using the dipstick technique for leukocyte esterase and nitrite using Multisticks of Qickcheak® and by comparing with given colour code results were obtained.

MICROSCOPY: Microscopic examination of a centrifuged sample for White blood cells and bacteria was done. The presence of more than 5 WBC/HPF indicated pyuria and was considered as positive.

CULTURE AND SENSITIVITY: All samples were inoculated on chromogenic media and incubated at 37^{o} C for 24 hours in an incubator. Growth of more than 105 colony forming units (CFU) /ml was considered as positive.

STATISTICAL ANALYSIS: All results were recorded accordingly. Results of NT, LE, combined NT and LE along with microscopy were compared with the culture results.

The specificity, sensitivity, of LE alone, NT alone and combined LE and NT, and the significance of the study results in general was computed with the help of a statistician.

The software used was Statistical Package for Social Sciences (SPSS) Version 11.5The test used for statistical analysis were Chi square test and Diagnostic odds ratio. The P value <0.05 was considered as significant.

Results

300 children were taken into study out of which 164 were boys and 136 were girls. Out of total children, 6 boys(3.66%) and 8 girls(5.88%) were culture positive accounting to 14(4.6%) of total study population.

Table 1: Results Of microscopy and strip leukocyte esterase and nitrite tests in 300 clinical samples

		Culture		
		+ ve	- ve	P-value
Microscopic Pyuria	+ ve	14	7	0.001
	- ve	0	279	
Leukocyte esterase (LT)	+ ve	12	13	0.001
	- ve	2	273	
Nitrite test (NT)	+ ve	12	15	0.001
	- ve	2	271	
LT or NT	+ ve	12	15	0.001
	- ve	2	271	
LT or NT or Microscopy	+ ve	14	15	0.001
	- ve	0	271	

*P-values by Chi-Square test. P-value<0.05 is considered to be statistically significant association.

Table 2. Usefulness of microscopy and strip leukocyte esterase and nitrite tests in 300 clinical samples

	Leukocyte esterase (LT)	Nitrite test (NT)	LT or NT
Positives (n=14)	12	12	12
Sensitivity (%)	85.7	85.7	85.7
Specificity (%)	95.5	94.8	94.8
PPV (%)	48.0	44.4	44.4
NPV (%)	99.3	99.3	99.3
Diagnostic odds ratio	1.02	1.02	1.02

*Positives among the culture positives only (n=14).

Discussion

Urinary tract infection occurs frequently in pediatric population. Pediatrician must maintain a high index of suspicion because of its nonspecific clinical features for which urine culture is considered as diagnostic standard.

In our study of 300 Anganwadi children (3-6years) in Kolhapur city, the overall prevalence of UTI was 4.6 %, with 5.88 % in girls and 3.66 % in boys.

Result of our study approximately matches with the studies of Fallahzadeh MH et al [5]and Schlager TA [6] in which the prevalence is found to be 4.44% and 4.11%. The variation in prevalence in different studies is likely due to geographical variations, different age groups included in the studies and many factors like inclusion criteria, education and socioeconomic status.

Table 3.shows the prevalence of UTI in children in various studies:

Study	Year	Age group	Prevalence
Bauchner et al [7]	1987	<5yrs	1.7 %
Fallahzadeh MH et al [5]	1999	0-5 yrs.	4.4 %
Schlager TA [6]	2001	<5yrs.	4.1 %
Present Study	2016	3-6	4.66 %

Second part of our study includes efficacy of dipstick test in diagnosis of UTI in Anganwadi children (3-6 yrs.). In present study the sensitivity and specificity of Microscopy, LE, NT was 100%, 85.7%, 85.7% and 97.6%, 95.5%, 94.8% respectively.

The positive and negative predictive values of Microscopy, LE, NT is 66.7%, 48%, 44.4% and 100%, 99.3%, 99.3% respectively.

Table 4. Shows the result of nitrate in various studies including present study:

Study	Year	Sensitivity	Specificity	PPV	NNV
Yuen SF[8] et al	2001	72%	85.8%	55.4	92.6%
CHON CH[9] et al	2001	83%	78%	--	--
Zorc JJ[10] et al	2005	83%	84%	--	--
Present study	2016	85.7%	95.5%	48%	99.3%

In present study sensitivity and specificity of dipstick leukocyte esterase was 85.7% and 95.5%.The positive and negative predictive value was 48%, 99.3% respectively. Yuen SF et al[8] stated PPV and NPV to be 55.4% and 92.6% which matches with the present study. Zorc JJ et al[10] reported sensitivity and specificity 83% and 84% respectively. CHON CH et al [9] coated sensitivity and specificity of 83% and 78% respectively.

Table 5. Shows the result of leukocyte esterase in various studies including present study:

Study	Year	Sensitivity	Specificity	PPV	NNV
CHON CH[9] et al	2001	53%	98%	--	--
Zorc JJ[10] et al	2005	50%	98%	--	--
Williams GJ[11] et al	2010	83-95.2%	49.9-100%	--	--
Present study	2016	85.7%	94.8%	44.4%	99.3%

The result of our study and above studies are almost similar.

In present study the sensitivity and specificity of dipstick nitrite test was 85.7% and 94.8% respectively. PPV and NPV was 44.4% and 99.3%. CHON CH et al[9] stated sensitivity and specificity 53% and 98%, Zorc JJ et al[10] stated 50% and 98%. Our results almost match with these study result. Our results are also similar to another study by Williams GJ et al [11] which shows 83-95.2% sensitivity and 49.9-100% specificity.

Conclusion

The Dipstick tests for diagnosis of UTI have high Sensitivity, Specificity and high Negative Predictive value but low Positive Predictive value.

Using Dipstick tests appears to be a rational and cost effective approach towards ruling out UTI, especially in mass population or in communities without an adequate laboratory facilities.

Acknowledgment: Many thanks to all the members of the Department Of Pediatrics and our colleagues for their support, in conducting this study.

Conflict of Interest- There is no conflict of interest

Source of Funding- Self funding

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DOI Number: 10.5958/2320-608X.2019.00106.9

Introduction and Evaluation of Mentorship Program for 1st Year MBBS Students

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Abstract

Introduction: First year MBBS is a transition phase in medical student's life. He is prone to lots of stresses in the form of exhaustive curriculum, ragging by seniors, loneliness and a host to so many other factors. Academic and psychological support is known to contribute to the student's success and it also helps them to cope up with the difficulties faced in new environment such a support can be given through mentoring.

Aims and Objectives: 1. To introduce mentorship program for 1st year MBBS students in the Department of Physiology

2. To evaluate the perception of mentees and mentors using a well defined questionnaire.

Methodology: The present study was conducted in the Department of Physiology, GSL Medical College Rajahmundry.150 students were randomly assigned to 10 mentors (faculty) and were mentored. At the end of the first year . a well structured and validated questionnaire was prepared to assess the perception of mentorship among mentees. Data was collected and statistically analyzed.

Results: The data was collected in two categories first one s perception of mentees towards the mentorship program and the second one is perception of mentor towards the program. The feedback was taken using Likert scale and were statistically analyzed ,the outcome was positive .

Conclusion: 1. Mentorship improves communication between students and faculty

2. Mentorship helps students to improve academically

3. Mentorship helps to reduce anxiety and stress among 1st year MBBS students

Keywords: *Mentee, Mentor, First year MBSS, Mentorship, Evaluation*

Introduction

First year MBBS is a transition between intermediate and a professional degree. New entrants are vulnerable to the challenges of medical education. An exhaustive curriculum with minimal time for relaxation, high parental pressures, fear of ragging, humiliating teachers, loneliness and a host of so many other factors make 1st year MBBS a tough period.[1] Academic and psychological support is known to contribute to the student's success and it also helps them to cope up with the difficulties faced in new environment.[2] This kind of academic and psychological support can be given by mentorship program.

It was in the era of Greek mythology when the concept of mentor came into being. Penelope, wife of Greek god Odysseus gave birth to a baby boy, Telemachus who grew up without any guidance and support from his father due to his non availability. At that time Odysseus

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entrusted his son's upbringing to Athena, the goddess of wisdom. According to Greek mythology it was Athena's constant mentoring that transformed Telemachus from a lame, shy boy into a young successful man.[3]

Historically significant mentorships are there in the form of guru disciple practiced in Hinduism and Buddhism, Disciple ship system in Rabbinical Judaism and the Christian church.

Mentorship is a kind of relationship in which more experienced will guide less experienced. The person who is guiding is called as Mentor and the person who is being guided is called Mentee. The mentor may be older or younger than the person being mentored, but he or she must have a certain area of expertise. It is a learning and development partnership between someone with vast experience and someone who wants to learn.[4] The person who is guiding is called as Mentor and the person who is being guided is called Mentee. Mentoring entails informal communication, usually face-to-face and during a sustained period of time, between a mentor and mentee .[5]Mentoring of medical students started in USA from 1990 onwards4 and is in progress till today.[6] Jacobi distilled five elements in the mentoring relationship on which there is general agreement.[7] A mentoring relationship (1) focuses on achievement or acquisition of knowledge; (2) consists of three components: emotional and psychological support, direct assistance with career and professional development, and role modeling; (3) is reciprocal, where both mentor and mentee derive emotional or tangible benefits; (4) is personal in nature, involving direct interaction; and (5) emphasizes the mentor's greater experience, influence, and achievement within a particular organization. Mutual respect and open communication between the mentor and mentee is important. Confidentiality must be maintained. The success of the mentorship program lies in the valuable time that is spent for mentor mentee interaction .

Methodology

The present study was conducted in the Department of Physiology, GSL Medical College Rajahmundry. Ethical clearance from ethical committee was obtained.

Sensitization of all the mentors (faculty) and the mentees (students) was done. Mentorship programme was designed for 1st year MBBS students. 150 1st year MBBS students were divided randomly among the 10 faculty members.

Mentorship program was initiated. Biodata forms of the students with their photographs were given to each mentor so that mentor knows their mentees .Their academic performances and attendance percentages were given to the mentor. Every month there used to be one mentorship program at the end of formative assessment and internal examinations. In each session mentor communicates with every mentee individually and guides them academically to get better scores and those who were lagging behind in their academic performances were taken more attention. Mentoring was informal, students were asked to set their self targets in next coming examinations .Not only academically, they were guided for their personal problems if it was expressed by the mentee. Before the final examination almost after 10 months of mentorship program feed backs were taken. A well structured and validated questionnaire was prepared at the end of mentorship program to assess the perception of mentorship among mentees and mentors.

The questionnaire was based on Likert Scale with strongly agree (SA), agree (A), neutral (N) as, disagree (DA) and strongly disagree (SDA). Data was collected and statistically analyzed.

Findings

Table 1: Perception of mentees towards mentorship

S. No.	Question	SD	D	None	A	SA
1	Mentor easy to approach			8%	72%	20%
2	Mentor knows me by my name				93%	7%
3	Mentorship held at regular intervals			6%	82%	12%
4	Mentor accepts advice & encourages			11%	76%	13%

Cont... **Table 1: Perception of mentees towards mentorship**

5	Mentor provides me with regular feedback		7%	12%	71%	10%
6	Mentor facilitated my participation in professional activities like seminars and quiz			9%	78%	13%
7	A written plan was made for my academic growth by my mentor		10%	10%	68%	12%
8	Mentorship helped me in reducing anxiety and stress				81%	19%
9	Mentor could communicate with me outside the working hours			8%	79%	13%
10	Mentorship should be continued in 2nd year		2%	3%	87%	8%
11	Mentorship is an extra burden on me	89%	8%	1%	2%	

Likert scale: SD-Strongly disagree, D-Disagree, A-Agree, SA-Strongly agree

Table 2: Perception of mentors towards mentorship program

Sl.No.	Question	SD	D	None	A	SA
1.	Mentorship has improved my communication with students				6%	94%
2	Mentorship helped me understand student's problems in a better way				70%	30%
3	Mentorship made me more empathetic and compassionate towards students				12%	88%
4.	Mentorship helped me improve my teaching				10%	90%
5	I wish to continue as mentor for future batches				2%	98%
6	Mentorship should be continued in 2nd year MBBS				13%	83%
7	Mentorship is an extra burden on me.	89%	11%			

Likert scale: SD-Strongly disagree, D-Disagree, A-Agree, SA-Strongly agree

Discussion

In this study we introduced mentorship for 1st year MBBS students as a part of curriculum. Perception of mentees and mentors was evaluated. Table 1 shows perception of mentees towards mentorship program. The mentees feel that the program has helped them improve them academically as well as it has helped them to participate in other activities like seminars and quiz competitions. One of the advantage of mentorship as per the study is reduction in stress and anxiety. 92% of mentees feel that mentorship should be continued in 2nd year also.

Table 2 shows perception of mentors towards mentorship program. The mentorship program has considerably improved the communication between the faculty and the students. It also helped the faculty to improve their teaching skills. Mentors had a positive approach for continuing as mentors for the future batches.

Mentorship program is like standing on the shoulders of giants, mentees can learn various things through the perspective of the mentor, who is a resourceful person. There were many studies supporting the effectiveness of mentorship program. Meta-analysis of 112 individual research studies found mentoring has significant

behavioral, attitudinal, relational, health-related ,motivational, and career benefits.[8] A systematic review identified that mentorship has an important influence on personal development, career guidance, career choice, and research productivity, including publication and grant success.[9] The success of mentorship program depends upon hoe the mentors is supporting their mentee academically and emotionally . Mentoring is an opportunity where mentees can come and express their grievances and mentor is there to listen to their problems and gives solutions so that mentee can think over the possibilities and can make their own decisions. Our work showed the same effectiveness as our mentors are patient listeners and are all student friendly. Medical students have to cope with lots of work load which certainly is a stress and in order to have a balance in their life, they need to be regimented. To make students balanced and disciplined mentor certainly play an important role. Most of the students at the start of medical career were very shy and there was almost no social interaction, mentors set meetings with the mentee individually and in groups to make students interact with each other and help them to become gregarious. Mentors provide encouragement and support required by the students for improving learning habits, interpersonal dealings, communication skills, problem solving strategies and positive attitude.[10] Still Long term study is required to know the efficacy on a long term basis and changes in mentors with time and any amendments required for the shortcomings in the mentorship program ,through the feed backs of many batch students .Mentorship must be introduce in all educational institutes as a part of curriculum .

Conclusion

1. Mentorship improves communication between students and faculty
2. Mentorship helps students to improve academically
3. Mentorship helps to reduce anxiety and stress among 1st year MBBS students
4. Mentorship should be continued throughout the course of MBBS
5. Long term studies are required to know the long term effectiveness of mentorship program

Conflict of Interest: None

Source of Funding: None

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DOI Number: 10.5958/2320-608X.2019.00107.0

Students Perception on Teaching Learning and Evaluation Methodologies Applied in Physiology

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Abstract

Background: Outgoing students from some colleges in particular from the central and some specific state medical colleges are better equipped with knowledge, skills and attitude than the rest. On the contrary some medical colleges produce inefficient medical graduates. This article is an initiate in finding out the best teaching learning and assessment methods in physiology from the students' perspective, to reduce the knowledge and skill gap between the students of different medical colleges. In the regular departmental meetings on better performance of the students, it is much needed to take the feedback from the faculty members also for improving teaching learning and evaluation methods in any educational institutions including medical colleges. **Aim:** To record and analyse the feedback from the students on present teaching learning and the evaluation methods used in the department of physiology in a medical college in South Indian state of Telangana. **Materials and Method:** The present study was conducted on 68 first year under graduate medical students. Two sets of questionnaires were used for acquisition of qualitative and quantitative data. **Results:** Much need to change in the present teaching learning and evaluation methods. **Conclusion:** All the students felt that many changes are required in the present teaching learning and evaluation methods for better performance of the students.

Keywords: *Perception, Medical Education, Teaching Learning Methods, assessment, performance.*

Introduction

Teaching learning and evaluation are an integral part of educational system that lead to meaningful way of living. Medical under graduate students will study anatomy, physiology and biochemistry in their first year. Unlike earlier days, presently the duration of first year MBBS course is only one year, and to clear the university examinations at the end of the first year, many times students are forced to study the concise notes of the three subjects. This reduces the quality of education by lacking the conceptual understanding. The primary objective of the medical education should be a holistic approach, which enhances the problem solving skills of the medical professionals with the critical and logical thinking[1]. If we know the preferred learning modalities of the students, we can adopt new methods of teaching accordingly[2]. The classroom teaching must focus on amount of learning but not on the quantum of the syllabus to be covered[3]. Are the present teaching learning and evaluation methods are efficient enough to impart knowledge for effective learning? The present study is aimed to understand the students' perception on teaching learning and evaluation methods used in the department of physiology in terms of effective learning.

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Objectives

To assess the perception of students on teaching learning and evaluation methods in learning physiology using a questionnaire.

Materials and Method

After obtaining the written informed consent, sixty eight first year MBBS students were recruited in

the study. The study was carried out after the ethical clearance from the Institutional Ethics Committee (IEC). Present study was carried out over a period of six months from the month of April till the end of September in the year 2018. The study was carried out in the physiology department. **Inclusion criteria:** Students who were willing to give consent and participate.

Exclusion criteria: Students who are not willing to participate.

Methodology: First of all focused group discussion was carried around 45-60 minutes before administering the questionnaire. Questionnaire for assessing the perception of listeners on teaching learning and evaluation methods was initially developed and later refined at Harvard University over 10 years ago by Dr. Ron Ferguson. We adopted it in the present study after validation. Quality of teaching, content of the topic, process of teaching, teacher and student characteristics and finally learning outcomes were discussed thoroughly. Clarified the doubts raised by the students. Test was conducted by mailing the two sets of questionnaires.

In keeping mind for assessing their classroom experience with each teacher across 7 dimensions two sets of questionnaires were adopted. First set of questionnaire, consisting of open ended questions[3] developed by Schiekirka et al, focused on students perception on quality of teaching and class evaluation in general, having 11 questions listed in detail in table 1. Second set of questionnaire is for the perception of the students on teaching learning methods[4] developed by Dr. Ron Ferguson, consisting of closed ended questions listed in table 2. Present project allows the students to assess their classroom experience with each teacher across 7 dimensions, namely;

1. Caring about students (Encouragement and emotional support)

2. Captivating students (Learning seems interesting and relevant)

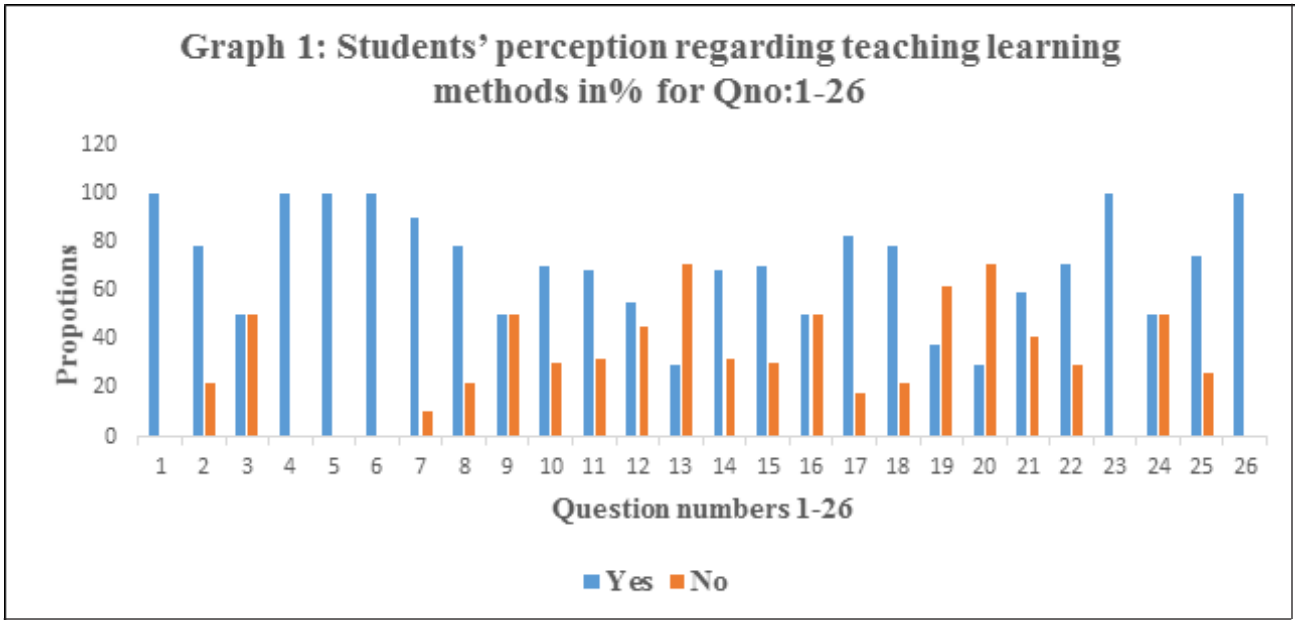
3. Conferring with students (Students sense their ideas are respected)

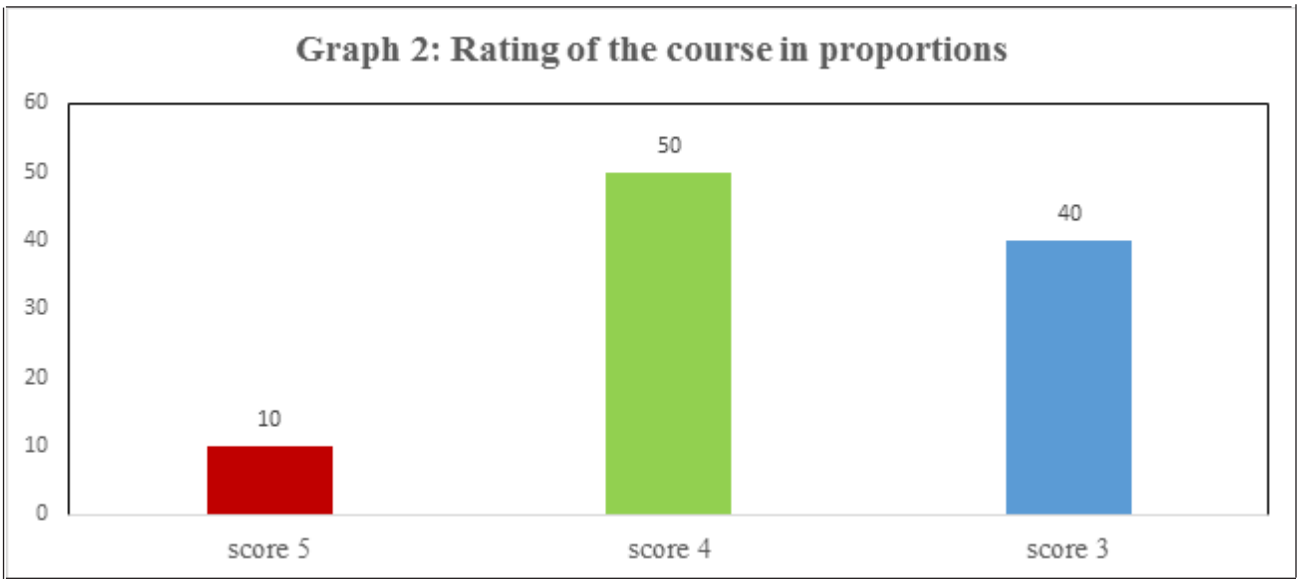
4. Clarifying lessons (Success seems feasible)

5. Consolidating knowledge (Ideas get connected and integrated)

6. Challenging students (Press for effort, perseverance, and rigor)

7. Controlling behavior (Culture of cooperation and peer support)





Results

After obtaining, the data was compiled and tabulated. The qualitative data was analyzed for content analysis by the investigator and another researcher and summarized in table 2. Student's opinion on total 26 (qualitative data) closed ended questions were represented in proportions (Graph-1). Rating of the course represented in graph 2.

Discussion

21st century medical teacher has the access to different technological tools on current medical education programs. Teacher must be a facilitator, for this he requires guidance from senior faculty and training. Faculty development programs on technical development will be huge help. Teacher shall clarify expectations and practical details to the students[5]. Teacher should be a role model by inspiring and influencing the peers and students for developing new skills in achieving their personal and professional goals[6-9].

On teaching and learning methods:

Students are having direct access with the teachers and are the firsthand consumers of a teacher's service, this is the basis for the preset study[10]. More than sixty percent of students were against three points in the closed ended questionnaire and they are; 1) Physiology class doest keep the attention of the students and make them bored 2) I (student) dint like the way we learn in physiology class and they get bored 3) Students behavior in the class makes the teacher angry. First two reasons were in favor of the teacher and their teaching in a positive way. The third point though we took the feedback from the students we feel that we are also supposed to the feedback from the teachers as well. And the feedback from the perspective of the physiology teachers will be our next focus, which will give a broader picture of the whole scenario. All the students were zeroed down unanimously on six points in the closed ended questionnaire and they are ; 1) Students are interested in learning physiology 2) Students want the active participation of junior and senior faculty in teaching 3) The comments that students get on their work help them to understand how to improve 4) Their physiology teachers wants to share their thoughts 5) The most effective evaluation tools include the formative assessments, summative assessments, practical exams, viva and discussions 6) Revision is required at the end of every lecture. Better to understand the students preferred way of learning and evaluation which may eventually yield positive results[11,12].So we also took the feedback from the students who have suggested that, following the above six points mentioned will make them to understand the physiology in a better, easier and faster way. Students preferred interactive teaching to keep them more attentive. Students listed a number of characteristics of the teacher, which were also coinciding with the earlier reports. Among the teaching learning modalities in didactic lectures one of the previous study showed that majority of the students are in favor of a combination of chalk and blackboard with power point presentation for better understanding of physiology[13]. But in the present study in addition to the power point and chalk and blackboard combination, they also

preferred animation videos. Regarding the rating of the course 50% of the participants gave score 4, 40% gave score 3 and 10% gave score 5, as represented in graph 2. It reflects the satisfaction of the students but not the quality of teaching.

Students defined good teaching from their gut feeling and it varied from person to person the gist of it is;

i. To keep it simple so that everyone can understand

ii. Teaching with more interactive sessions with students

iii. Teaching should create interest in student's minds for the subject

They prefer encouragement and summarization at the end of the class from the teacher to enhance their attention and interest in learning physiology. Students feedback allows to refine the definition of effective teacher14.

On evaluation methods:

There were studies, in support of participants gender doesn't impact on evaluation. So in the present study though the participants are both male and females we did not evaluated their findings separately15. Students opined positively on the purpose of evaluation. Some of their opinions on purpose of evaluation are;

i. To assess the understanding capability of an individual and the ability to present

ii. To test knowledge

iii. To know how much knowledge student gained

iv. Evaluation is just to know the way how evaluation is expecting us to present the thing that is imp among everything we inculcated and Skills in presentation

Conclusion

Present study concludes that majority of the students opine on didactic lectures should be more interactive, needs the active participation of the teacher.

Limitations:

Data was collected from those who participated voluntarily. If everyone participates we may get more information. Some of them were afraid to write thinking that their results may be affected with it.

Ethical Clearance: Taken from MediCiti ethical committee.

Source of Funding: Self

Conflicts of Interest: Nil

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DOI Number: 10.5958/2320-608X.2019.00108.2

Exam Anxiety Related to Exam Preparation Time and Number of Hours of Sleep and Comparison of Exam Anxiety among Rural and Urban, Hosteller and Non-Hosteller First Year Medical Students

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Abstract

Exam anxiety intensifies psychological distress, reduces academic motivation and lowers performance. The present study aimed to identify exam anxiety related to exam preparation time and number of hours of sleep. Additionally, the present study attempted comparison of exam anxiety among rural and urban, hosteller and non-hosteller first year medical students. Westside Text Anxiety Scale (WTAS) were administered among 151 first year undergraduate medical students attending Bangalore Medical College and Research Institute. The results showed higher test anxiety scores and more studying hours among rural students with female preponderance. There was no statistically significant difference with regards to sleep hours and among hostellers, non-hostellers.

The negative emotion of test anxiety which serves to raise the distress level among medical students is a common emerging concern and thus good intervention to build positive coping skills should be incorporated in the lives of medical students.

Keywords*: test anxiety, medical students, rural, urban, hosteller, non-hosteller*

Introduction

Test anxiety is considered as one of the major problems among medical students as it most likely causes underachievement, low performance, demotivation and psychological distress.[1, 2] Several studies in US and Canada outlined that student pursuing medical course experience more psychological distress than general population.[3] Further, 58.59% of first year medical students experience psychological distress in Malaysia.[4] The rationales are thought to be high expectation on medical students in mastering extensive professional knowledge and specific skills in highly competitive environment.[5] Additionally, the overwhelming information leaves a minimal opportunity for medical students to relax which has been consistently linked to psychopathology.[5] The negative emotion of test anxiety which serves to raise the distress level among students is a common concern emerging from the existing literatures. A moderate level of distress promote creativity and achievement of students, but intense pressure of highly anxious students most likely secure unsatisfactory grades in studies.[6]

A high prevalence of sleep disorder was found among medical students, specifically female students. Sleep pattern of these medical students was characterized by insufficient sleep duration, delayed sleep onset, and occurrence of napping episodes during the day.[7]

Stress was observed in 187 (27.7%) females and 112 (20.4%) males; the association with gender being statistically significant in a study conducted by Vivek. B. Waghachavare et al.[8]

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Students residing in rural areas showed significantly lower cortisol levels values, but subjectively perceived the situation of examination as more stressful as concluded by Zarzycka D et al.[9]

Another study conducted by Mihir P Rupani et al also concluded that the total anxiety scores were significantly higher among female medical students. The emotional effect of exam anxiety was significantly higher among the female medical students than the males and among the students living at hostel than those living with their families. [10]

Hence the present study was undertaken with the following objectives

Objectives:

To study correlation between exam anxiety and sleeping hours

To study correlation between exam anxiety and number of hours of studying

And to compare exam anxiety among rural and urban, hosteller and non-hosteller first year medical students.

Materials and Method

In this cross sectional study, convenient sampling method was used to collect data from 151 first year medical students attending Bangalore medical college and research institute. Out of 250 medical students, 151 were willing to participate in the present study. With regard to gender, 92(44.7%) medical students were male and 59(28.6 %) students were female. Students who completed their five weeks in medical program were included and students those who had taken mental health treatment were excluded as their mental health problem may contribute for demotivation and psychological distress

Westside Test Anxiety Scale (WTAS)

WTAS was used to measure test anxiety (Driscoll, 2007). It consisted of ten brief items and it is measured in five points likert scale. Total score was divided by ten to obtain the mean value in which a mean score of less than 3 was considered as normal or low anxiety whereas mean score of more than 3 showed test anxiety. The alpha reliability of this scale in this study was 0.89.

Results

Baseline characteristics

Baseline characteristics(Mean ±SD)	
Urban (n=151)(73.3%)	Male=92(44.7%),Female=59(28.6)
Non Hostellers (n=67) (32.5%)	Male=36(17.4%),Female=31(15)
No hrs. of sleep	7.05±0.9
No hrs. of study	4.1±1.5
Anxiety score	2.8±0.65

Table 1: Comparison of different parameters in rural and urban students expressed as Mean ±SD

Parameters	Rural	Urban	p value
No of hrs. of study	4.5±1.6	4±1.2	0.05*
No of hrs. of sleep	7.1±0.9	7±0.9	0.6
Anxiety score	2.9±0.5	2.7±0.6	0.04*

Rural students put in more hours of studying compared to urban students (p value 0.05).

Westside test anxiety score was significantly higher among rural students in comparison to urban students. (p value 0.04)

No statistically significant difference among the students regarding number of hours of sleep.

Table 2: Comparison of different parameters in hostellers and non-hostellers

Parameters	Hostellers	Non-hostellers	p value
No of hrs. of study	4.3±1.5	3.8±1.5	0.05*
No of hrs. of sleep	7±0.9	7.1±0.9	0.2
Anxiety score	2.8±0.5	2.7±0.6	0.3

Hostellers significantly studied more number of hours compared to non-hostellers

No statistically significant differences regarding number of hours of sleep and anxiety scores

Table 3: Comparison of different parameters in female students from rural and urban areas

Parameters	Rural	Urban	p value
No of hrs. of study	4.7±1.6	3.9±0.9	0.02*
No of hrs. of sleep	6.8±0.7	7.1±0.9	0.08
Anxiety score	2.9±0.5	2.7±0.5	0.01*

Rural female students are more anxious (p value 0.01) and study more (p value 0.02) compared to their urban counterparts.

But no significant differences with regards to number of hours of sleep

Table 4: Comparison of different parameters in male students from rural and urban areas

Parameters	Rural	Urban	p value
No of hrs. of study	4.3±1.6	4.08±1.4	0.36
No of hrs. of sleep	7.2±0.9	6.9±0.8	0.13
Anxiety score	2.9±0.6	2.6±0.7	0.01*

Rural male students are also more anxious (p value 0.01) compared to their urban counterparts.

But no significant differences with regards to number of hours of sleep and study.

Discussion

The present research activity was undertaken to study the effect of exam preparation time and number of hours of sleep on exam anxiety and comparison of exam anxiety among rural and urban, hosteller and non-hosteller first year medical students.151 medical students were administered West Test Anxiety Scale and the results were statistically analysed

The results of the study revealed the following

Rural students put in more hours of studying compared to urban students (p value 0.05).

Westside test anxiety score was significantly higher among rural students in comparison to urban students. (p value 0.04)

Rural female students are more anxious (p value 0.01) and study more (p value 0.02) compared to their urban counterparts.

Rural male students are also more anxious (p value 0.01) compared to their urban counterparts.

No statistically significant difference among the rural and urban students regarding number of hours of sleep

Hostellers significantly studied more number of hours compared to non-hostellers. No statistically significant differences regarding number of hours of sleep and anxiety scores

Test anxiety is a widespread phenomenon when an extreme nervousness arising from an anxiety-inducing test situation prevents one from demonstrating their true potential and thus lowers performance especially in the educational environment.[11] Test anxiety is a multidimensional construct combining with worry, emotionality, interference, fear of failure, self-esteem and lack of confidence. [12] First year medical students are more vulnerable for test anxiety as they are required to do lot of presentation in front of their peers in Problem Based Learning (PBL), Mock Objective Subjective Clinical Examination (MOSCE), demonstrate how to manage difficult clients and explain physiology and anatomy of the body in the lab.[13, 14]

In our study, rural students exhibited significantly higher test anxiety scores and studied more number of hours compared to urban students. This is in concordance with the study which states that Students residing in rural areas subjectively perceived the situation of examination as more stressful. [15] Barikani identified economic and accommodation-related problems as probable stressors among Iranian medical students. [16]

In the current study, gender was found to be one of the most important factors in the development of stress, with the results indicating a female predominance; a similar trend was observed by Abdulghani et al. and Abu-Ghazaleh et al.[17, 18]

Conclusion

Our study results indicate higher test anxiety

scores and more studying hours among rural students with female preponderance. There was no statistically significant difference with regards to sleep hours and among hostellers, non-hostellers.

The instructors, advisers and other faculty members who notice the signs of stress in a particular student need to have a non-threatening, non-judgmental way to help medical students recognize and handle their stress. Universities have to consider test anxiety as one of the problems which more likely affects the psychological wellbeing and motivation of the medical students. Provide psychological intervention for test anxiety at the first semester would be an advantage for medical students to secure good scholastic performance and overcome the sequel of test anxiety.

Good intervention includes relaxation basics like yoga, learning to identify and counter negative thoughts, practical ways to increase healthy eating, building positive coping, apply relaxing or activating words appropriately, and re-direct time and energy based on the level of importance

Conflict of Interests: This study authors declare that there is no conflict of interests regarding the publication of this article.

Acknowledgement: The authors are very grateful to all the participants who participated in this study.

Source of Funding- Self

Ethical Clearance: Taken

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DOI Number: 10.5958/2320-608X.2019.00109.4

Comparision of Mvv and other Vital Dynamic Lung Parameters between Wind Instrumentalists (Nadhaswaram Players) and Normal Persons

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Abstract

Wind instrument is probably the most strenuous activity that requires a high degree of voluntary control over breathing. Pulmonary Function tests help one to understand a person's respiratory physiology is in either healthy or diseased condition in relation to various environmental conditions. Playing a wind instrument influences the physiological condition of the respiratory tract according to the wind instrument being played and to the musical score so that of which the person's breathing pattern can be altered. Male Nadhaswaram players between 15-70 years, who had work experience of minimum 3 years and working for minimum 4 hours a day were used as study group and Male Subjects of same age who has the sedentary life style , who are also not any wind instrument players and those who do not have any respiratory illness were taken as control group. Pulmonary function tests of these subjects were done using the "global spirometer" machine. Our work shows that MVV and FEF max is significantly increased in study group and also shows that FVC, FEV1, FEF 25-75% are increased in study group comparatively to the control group. But it progressively decreases as their age(occupational years) advances .

Keywords: *Nadhaswaram players, PFT, MVV*

Introduction

Wind instrument is probably the most strenuous activity that requires a high degree of voluntary control over breathing was been said by John Robert Brown who is a musician and writer[(1)]. Playing wind instrument is an art where need to manipulate airflow by creating and sustaining the pressures and flows that is required by the instrument[(2)].Playing a wind instrument requires a coordination between three parts that is respiratory, lip and mouth muscles where the respiratory parts involves in generating the pressure inside the mouth and also allowing the stream of air to pass through the instrument continuously[(3)].

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Pulmonary Function tests helps one to understand a person's respiratory physiology is in either healthy or diseased condition in relation to various environmental conditions. Playing a wind instrument influences the physiological condition of the respiratory tract according to the wind instrument being played and to the musical score which can alter the person's breathing pattern. Certain Western Studies says that Wind Instrumentalists are supposed to develop emphysematous changes in lungs as well as changes in their respiratory functions[(4)]. Reflex methods of controlling breathing muscles,lip pressures,air pressures,air flow rates and air volumes are developed by the player to produce consistent performance on wind instrument[(5)]. A study on Lung volumes and breathing patterns in wind-instrument players shows much increase in vital capacity of the wind-instrument players[(6)].Another study shows that the practice of wind instruments has definitely got positive effects in the respiratory functions[(7)].

We choose Nadaswaram wind instrument for our study which is double reed wind instrument,a traditional

wind instrument used in Tamil Nadu. This instrument is similar to Shehnai which is used in North India. It is one of the loudest non-brass acoustic instruments in the world[8].

Nadhaswaram players do strenuous exercise and can also make a voluntary control effect over their respiratory muscles and breathing pattern respectively. These exercises may cause additional beneficial changes in their pulmonary function. Hence, we utilize them as our study materials to study their pulmonary function-concentrating on their Dynamic parameters and also to study any related changes in their BP and Heart rate.

Materials and Method

This project was carried out in the department of physiology, Government Vellore Medical College on the Dynamic parameters of PFT. We used EAGLE 'S 'GLOBAL SPIROMETRY' machine for this project. After getting clearance from institutional ethical committee and written informed consent from study and control groups, the study was performed. Male Nadhaswaram players of age between 15-70, who had work experience of minimum 3 years and working for minimum 4 hours a day were used as study group. Male Subjects who has the sedentary life style of the same age, who are not any wind instrument players and those who do not have any respiratory illness, other chest deformities were used as control group. Those who have any respiratory illness, chest deformities, Metabolic syndromes, smokers were all excluded from the study.

Characteristics of our subjects in study group were 20 subjects of Mean age = 37.75, Mean BMI = 26.1, Mean BSA=1.82, Occupational years varies from 3-47years with mean =22 years and that of control group were 20 subjects of Mean age=30.7, Mean BMI (Body mass index) =21.6, Mean BSA (Body surface area) =1.69, non-smokers and all are non-wind instrumentalists.

The following parameters were assessed in our study,they are

a)Peak flow rate / FEF max: The maximal velocity of air which can be expired from the end of maximal inspiration.

b)Maximum voluntary ventilation:The maximum amount of deep and rapid ventilation in 12 seconds done voluntarily by them.

c) Forced expiratory reserve volume in one second: The maximal amount of air which can be expired during the first second of a maximal expiration

d)Forced expiratory reserve volume in sixth second:The maximal amount of air which can be expired during the sixth second of a maximal expiration which should be almost equal to FVC

e)Forced expiratory flow at 25%: The maximal amount of air which can be expired during the first 25% of a maximal expiration which helps in determining the effort of respiratory muscles.

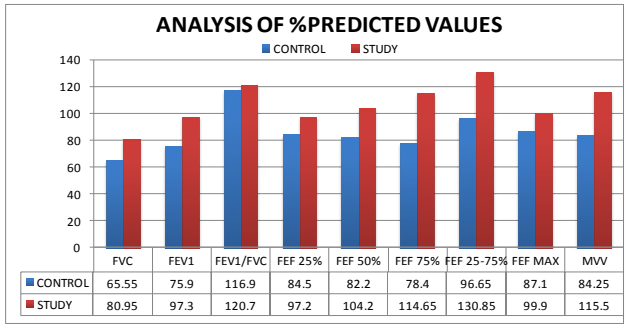
f) Forced expiratory flow at 50%:The maximal amount of air which can be expired during the first 50% of a maximal expiration

g) Forced expiratory flow at 75% :The maximal amount of air which can be expired during the first 75% of a maximal expiration

h)Frequency of breathing:The rate at which the subject breathes.

i)Heart rate responses:To the breath hold time exerting 20cm H_2O expiratory pressure

Results



	FVC	FEV1	FEV1/FVC	FEF 25%	FEF 50%	FEF 75%	FEF 25-75%	FEF MAX	MVV
CONTROL	65.55	75.9	116.9	84.5	82.2	78.4	96.65	87.1	84.25
STUDY	80.95	97.3	120.7	97.2	104.2	114.65	130.85	99.9	115.5

Fig1: The comparison between the study group and the controls in all lung parameters

In the Fig1 we can see that there is increase in FVC,FEV1,FEF25-75% in the study group than the controls. Moreover MVV is also increased about thirty times than the control group.

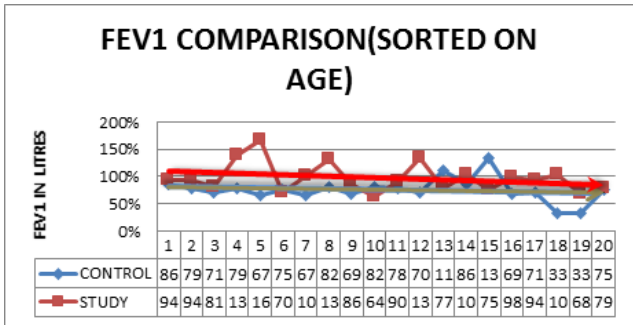


Fig 2:Showing FEV1 compared among the two groups based on advancing age

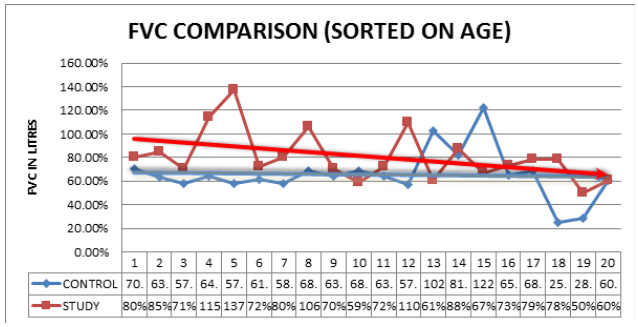


Fig 3:Showing FVC compared among the two groups based on advancing age

In the above figures 2 and 3 we can observe that both FEV1 and FVC is decreasing in our study group as the age advances. FEF max was also found to be decreasing in study group as age advances.

Table 1: Comparision between occupational years and lung parameters

Occupational years	3	4	5	8	10	15	20	25	28	30	35	36	38	47
FVC	71	67	137	114	106	95	92	80	70	68	78	60	84	87
FEV1	81	75	166	138	93	132	94	134	86	92	103	79	100	104
FEF25-75%	10	69	19	18	92	28	72	54	10	15	17	13	11	12
FEF MAX	80	59	11	10	13	16	82	59	80	13	76	50	12	12
MVV	88	84	161	138	109	170	122	112	98	129	127	69	168	138

In Table 1,it shows that there is gradual decrease in lung capacity is noted and there is gradual loss in their effort as their occupational years advancement is noted by decrease in FEV1. There is also significant decrease in FEF25-75% and is found to be statistically significant with P value=0.0210.We can see perfect maintenance in MVV even though the age advances.

Discussion

Wind instrument is probably the most strenuous activity that requires a high degree of voluntary control over breathing[1] . A study done on teenage asthamatic who are also wind instrumentalist where they showed that playing a musical wind instrument is a potential therapeutic agent in these teenage asthamatics[9].

Wind instrumentalist have significant greater values of FEV1 and FEF50 when compared to predicted values [10].Our study results also showed an increase in FEF and FEV1among 60% of the study group.

Studies have shown that wind instrumentalists may have larger VC than control subjects[11.12].A study done in male wind instrumentalists in U.S Navy Band and found that VC was 8.7% greater in them than the predicted normal values to the height and age[12].In another study where the male brass players and wind players were compared and found that wind players had greater VC,Total lung capacity, Expiratory reserve

volumes,Residual volumes[11].

In our study also it shows that the study group outperforms than the control group in all the lung parameters assessed like FVC,FEV1,FEF 25-75%,MVV and so on.

Aging is associated with decrease in the chest wall compliance ,decrease in the respiratory muscle strength and also decline in FEV1[13]. In our study we saw that as age advances there was decrement in the study group about 65% were able to produce normal results and rest 35% produced mild ,moderate and severe restriction,there was no results for obstruction noted.But in control group only 15% were able to produce normal results and 75% produced mild and moderate restriction, there was no results for obstruction noted in the study group.

Conclusion

In modern busy life this project gives an awareness about the lung function tests among the wind instrumental players and the normal subjects. 60 % of our study group shows significant increase in the MVV, FEF 25-75%, FVC, FEV1, FEF max when compared to the normal subjects.In the same study group the advancing age, increasing BMI and BSA will affect the Lung function tests, compare to that of the control group. In conclusion, the present study shows a beneficial effect on Lung Function tests among the wind instrument players.So, regular breathing exercises and controlled body weight definitely will improve the lung function tests.

Acknowledgement: We sincerely thank our Dean, Government Vellore Medical College, Vellore for support and help to do this work. We thank the faculties of the department of Physiology and wind instrument players and volunteers for the control group for their full cooperation for our study.

Ethical committee clearance: Institutional Ethical committee clearance obtained.

Conflict of Interest: No conflict of interest applicable for this study.

Source of Funding: self

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DOI Number: 10.5958/2320-608X.2019.00110.0

Psychological Distress in Undergraduate Medical Students

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Abstract

Introduction: Stress is a condition that affects a person's physical and mental health. It is a response of the person to the environmental condition including interaction with it, which can pose threat to physical and mental wellbeing of the subject. Every person has certain endurance to cope up with the impending stress but when it increases beyond it, leads to psychological stress.

Objective: To assess psychological distress among medical students.

Method: In this study which we planned on 200 medical students 197 participated. These students were admitted recently to the medical college. Using Kessler Psychological Distress Scale (K10) mental wellbeing of the participants was assessed. Participants were informed about the questionnaire and consent was taken as such. Standardised questionnaire was distributed and participants were asked to choose the most adequate option provided.

Result: 46.7% i.e. 92 of 197 students (50 female and 42 males, p value 0.283) scored below 20 that show no psychological stress or healthy status. 26.9% i.e. 53 (25 female and 28males, p value 0.6002), students scored 20-24 which shows mild distress and no significant difference between prevalence in both gender. 16.7% i.e. 33 (13 female and 20 males, p value 0.1729) scored 25-29, which shows moderate stress and without any significant difference and students which showed severe distress were 19(9.6%) (11 female and 8 male, p value 0.4747) with no significant difference and scored ≥ 30 on Kessler's score.

Conclusion: Approximately half of students were found of healthy mental status. 38 female students were found in mild to moderate distress as compared to 48 male students. 11 female and 8 male students were found in severe distress.

Keywords*: Kessler psychological distress (K10), Stress in medical students.*

Introduction

Graduate medical studies are considered one of the most stressful professional courses in India and worldwide.[1,2] Own high expectations with same expectations of family and peer group, coupled with the medical training for accepting a role for the well-being of the patient, make a medical student prone to psychological distress which may become excessive.[3] In the meantime medical students while being busy in their studies spare less time for other co-curricular activities that leads them to stress. Even health becomes neglected subject for few of medical students. Low physical activity, deprived sleep and irregular teaching and training schedules do play a role in stress building environment. The accumulating stress is likely to have several deleterious effects on medical students including academic jeopardy and poor quality of life.[4] Thus, high rates of psychological stress, undue anxiety and depression creeping in can result in poor quality of life and high rates of psychological morbidity. Various studies on medical students worldwide showed medical students develop symptoms of anxiety, depression and stress during the training period.[5-10] Indian medical

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education system starts from a procedure of online or offline medical entrance examination that checks the academic performance of the student only on the basis of multiple choice type questions. While in western countries academic qualification along with personalised interviews and discussion sessions, co-curricular records, social and voluntary services and even research potential is weighed. while Family pressure and influence rather have vital role in choosing medical profession in India versus a certain degree of autonomy in western countries to choose profession[11] combining with the pressure to secure residency training based on a single academic examination only leads to surmounting stress.[12]

Depression, anxiety and stress are the most common forms of psychological distress among university students. For example, a study of 1617 Turkish university students found that 27.1% had depression, 47.1% had anxiety and 27% had stress.[13] Consistently, a study of 506 undergraduate from four public universities in Malaysia estimated the prevalence of moderate depression, anxiety and stress to be 27.5%, 34% and 18.6%, respectively.[14] Moreover, higher estimates of depression (60.8%) and anxiety (64.3%) were reported in a study that included 442 medical students from Fayoum University (Egypt).[15] This leads to the study to assess psychological stress among newly admitted medical students as undergraduate training time is crucial for further career planning and thus proneness to psychological distress increases. The first definition according to Butler suggests that stress results from pressure, the greater the pressure the more likely that the recipient, whether a person or a load-bearing beam will succumb. The second definition focuses on stress as a response to noxious or aversive stimuli and finally, if the stress continues beyond the capacity of the body to respond, the system is damaged and may collapse. This is the stage of exhaustion.[16] Findings of this study may further help in identifying and understanding the problems that they face in due course of their training and further career.

Objective

The primary objective of the study was to assess the prevalence of psychological distress among medical students. Secondary objective was to assess the relationship based on gender in the prevalence of psychological stress.

Material and Method

The study was planned on 200 newly admitted undergraduate medical students of Pt. B D Sharma University of Health Sciences, Rohtak in state of Haryana India. 197 students of both the female and male sexes participated in the study finally. The structured questionnaire was distributed among the participants of the study. After explaining the purpose of the study verbal consent was taken. Written consent on the questionnaire itself was obtained. Confidentiality of the participants was assured and no supervision was done during the data collection.

The questionnaire consisted of the Kessler Psychological Distress Scale (K10) sourced from Kessler R. Professor of Health Care Policy, Harvard Medical School, Boston, USA. This is a 10-item questionnaire intended to yield a global measure of distress based on questions about anxiety and depressive symptoms that a person has experienced in the most recent 4 week period. The use of a consumer self-report measure is a desirable method of assessment because it is a genuine attempt on the part of the clinician to collect information on the patient's current condition and to establish a productive dialogue. When completing the K10 the consumer should be provided with privacy. This is a questionnaire for patients to complete. It is a measure of psychological distress. The numbers attached to the patients 10 responses are added up and the total score is the score on the Kessler Psychological Distress Scale (K10). Scores will range from 10 to 50. People who score

a) Under 20 are likely to be well
b) Score 20-24 are likely to have a mild mental disorder
c) Score 25-29 are likely to have moderate mental disorder
d) Score 30 and over are likely to have a severe mental disorder

Data thus obtained was compiled on Microsoft excel and statistical tests using SPSS, (Statistical Package for Social Sciences) applied. Chi square test was applied using SPSS and p- value calculated.

Table 1: Showing prevalence of psychological stress according to Kessler's scale.

Sr. no.	Score(K10)	Distress level	Male(98)	Female(99)	Chi-square value	p-value
1	10-19	Healthy	42	50	1.152	0.283
2	20-24	Mild	28	25	0.275	0.6002
3	25-29	Moderate	20	13	1.857	0.1729
4	≥30	Severe	08	11	0.511	0.4747

Results

197 out of 200 students responded i.e. 98.5%. Of these 98 were male and 99 were female student majority of which fall in age of 18-20 years (94%). 46.7% i.e. 92 of 197 students (50 female and 42 male) scored below 20 that showed no psychological distress(p value 0.283). 26.9% i.e. 53 (25 female and 28 male) students scored 20-24 on scale, which showed mild psychological distress (chi square value 0.275 and p-value 0.6002) i.e. >0.001 shows no statistically significant difference between prevalence of distress in male and female students.16.7% i.e. 33 (13 female and 20 male) scored 25-29, which showed moderate level of distress with no statistically significant difference between the two genders(p value- 0.1729) and students which showed severe distress were 19 in number (9.6%) out of which 11 were female and 8 male students, scored between 30-50 on Kessler's score no significant difference was found statistically (p value- 0.4747). It shows there is no significant statistical difference between prevalence of psychological stress based on gender in medical students.

Discussion

World Health Organization defines stress as "the reaction people may have when presented with demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope." Undergraduate medical learning is challenging and stressful as it comes with a load of eventful series of work and assessment that if not cope-up with becomes stressors and according to Butler through various processes of stimulus, response to stimulus and dynamicity can lead to stress.[16] Cope-up strategies play important role in stress management. In some studies done in Saudi Arabia, psychological distress was mainly studied among medical students, where the prevalence of mental distress is anyways high owing to the stressful medical education environment.[17-19]The present study was conducted on 197 medical students and it was found that more than half of the students (53.3%) were in various stages of psychological distress. It confirms the findings of the researchers from the middle-east countries about the prevalence of stress among medical students. Increased levels of psychological distress in the student health service sample were found associated with increased disability and reduced capacity to carry out normal activities in studies. In this study female students were found to be more affected with severe psychological distress and lesser number of female students as compared to male students were found to be in mild to moderate distress (**table 1**) but other studies conducted worldwide on medical students reported more of female students affected with psychological distress overall as compared to male students. [19-21] Findings in the present study roughly corresponded to the study reported in Singapore (55.5%).[22] Though other study reported in Malaysia[23] (46.2%) roughly corresponded with the present study but prevalence of psychological distress among medical student were reported significantly lower in studies done in United Studies (31.2%) and Spain (30.0%).[24-25] Dessie et al[26] reported 21.6% prevalence of stress in Ethiopian medical students.

In the present study more female students were found in severe stress based on Kessler's scale but in contrast male students were found more stressed in mild to moderate category. This can be due to various reasons as the newly admitted students have to face difficulties that become stressors and lead to stress disorders in medical students. Medical courses are considered among most challenging worldwide. In traditional societies like mid-east[27] countries and somewhat in India also starting

very early from inception of idea of choosing career in medicine and getting enrolment in medical colleges and further on it becomes difficult for the students to cope up with the stressors and thus psychological distress creeps in after the compensatory mechanisms exhaust. Medical students and medical practitioners remain continuously face to face with the life and death situations and an environment of regular academic performance and clinical stress. Peer pressure and demands of family and self in regard of further advancement in career and academic pursuits leads many a students in psychological distress.

Conclusion

This study concluded that more than half of newly admitted medical students undergo stress of varying degrees. Both male and female students were affected and no correlation based on gender can be established. Though more number of female students found affected by severe stress, But in contrast more male students were found in mild to moderate stress.

Limitations: This study was carried out on a small sample of students who were admitted recently. Moreover students of senior professionals can be included in the study. Also students of other medical streams like nursing, dental and pharmacy can be included. Other criteria and stressor factors can be studied with bigger sample size.

Conflict of Interest: No conflict of interest involved.

Source of Funding- No funds raised.

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DOI Number: 10.5958/2320-608X.2019.00111.2

Correlation of NLR with Oxidative Stress Markers in Sickle Cell Anemia with Vasoocclusive Crisis

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Abstract

Introduction- Sickle cell disease has long been recognized as an inflammatory condition and oxidative stress play an important role in pathophysiology of SCD. Several biomarkers have been associated with SCA clinical prognosis. This study was designed to determine the oxidative stress & inflammatory biomarker that can be used in monitoring the prognosis & management of SCA patients.

Aim & Objective- The present study is aimed to assess the role of NLR along with CRP , MDA and erythrocyte GSH in vaso-occlusive (HbSS) crisis patients compared to steady state (HbSS) patients.

Materials & Method- A total of 100 sickle cell anemia patients aged between 20-40 years of either sex were evaluated and divided into 2 groups. Group A-sickle cell anemia patients with vasoocclusive crisis(N=50) Group B- sickle cell anemia patients with steady state as control group(N=50). We analysed the oxidative stress marker i.e. reduced glutathione (GSH) & MDA along with inflammatory markers NLR,CRP and compared between both A& B groups.

Result- The Unpaired t test between A & B group shows significant increase in NLR,MDA, CRP Level in VOC patients as compared to steady state sickle cell patients($P \leq 0.05$). Compared with values of controls, SCA subjects with VOC had significantly lower erythrocyte GSH ($P \leq 0.05$). In the present study positive correlation of NLR with MDA and CRP in sickle cell anemia patient with vasoocclusive crisis is evaluated.

Conclusion- So the early prediction of vaso-occlusive crisis by the detection of the NLR count along with MDA ,CRP,GSH level might be beneficial in the management sickle cell anemia patient. Additional studies are warranted to test this hypothesis.

Keyword- *Sickle Cell anemia,vasoocclusive crisis(VOC),NLR(neutrophil to lymphocyte ratio), CRP, MDA, GSH*

Introduction

Sickle cell anemia (SCA) is characterized by chronic hemolytic anemia, a point mutation in the beta-globin gene of hemoglobin at the sixth amino acid (Glu6Val). It is a multisystem disease which include chronic hemolysis, repeated infections, growth retardation in addition to acute life threatening complications called crisis.

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In India prevalence of Sickle Cell Disease of 1-40% and the State of Odisha falls in the high prevalence zone (21-40**%)** [1]. High frequency and clinical severity of the sickle cell anemia, make it a major public health problem, due to the presence of different types of crisis. Most frequent crisis is the vaso-occlusive crisis(VOC) which accounts for the majority of SCD (Sickle cell disease)-related hospital admissions. [2].

The vaso-occlusive crisis results from the polymerization of deoxy-hemoglobin S, as a consequence there is tissue ischemia leading to acute and chronic pain as well as organ damage that can affect any organs in the body, including bones, joints, brain, eyes, liver, kidneys, and lungs. [3].

Vaso-occlusive crisis activate and damages the endothelial cells leading to inflammation; as a result inflammatory biomarkers are released. [4]. Production of C-reactive protein (CRP) is a part of a nonspecific acute phase response to inflammation and tissue necrosis. Most studies find that levels of CRP increase during vaso-occlusion and may be of value in anticipating the development of acute chest syndrome. [5,6].

Several studies have shown that white blood cells (WBC) particularly neutrophils may be involved in the initiation and propagation of vaso-occlusive events.[7] . Adhesion of activated neutrophils to endothelium in SCA may lead to endothelial damage because neutrophils do not lyse easily as RBCs do, thereby leading to obstruction of blood flow within the microcirculation. [8]. A number of studies have identified blood NLR as an important marker of inflammation, which has significant prognostic implications in a number of disease states, particularly those that involve the cardiovascular, renal and gastrointestinal intestinal systems.[9,10]. It is generally believed that higher is the NLR,the worse is the clinical outcome.

SCD has long been recognized as an inflammatory condition and oxidative stress play important role in pathophysiology of SCA .[11]. It is now well established that reactive oxygen species (ROS) mediate inflammatory process and may be involved in oxidative reactions such as lipid peroxidation and protein oxidation .[12]. Although results are sometimes contradictory, patients with SCA are shown to have high oxidative stress. Normal RBCs are usually, subjected to oxidative stress as a result of continuous ROS production that accompanies Hb autoxidation , a condition that increases two times more in SCA , leading to a continuous inflammatory response, oxidative stress and multiple organ damage. To counter the destructive effects of these oxidants, there are endogenous antioxidant enzymes such as superoxide dismutase, catalase and glutathione peroxidase , which help to detoxify ROS. In the cell, glutathione (GSH) is considered to be the most sensitive indicator of the cell's overall health, and of its ability to resist toxic challenge. GSH depletion in cell can trigger suicide of the cell by a process known as apoptosis.[13].

As the frequency of vaso-occlusive episodes was a marker of poorer survival in patients with sickle cell anemia the study of the biomarkers may helps in prevention of vaso-occlusive crisis. The present study is aimed to assess the role of NLR along with CRP , MDA and erythrocyte GSH in vaso-occlusive (HbSS) crisis patients compared to steady state (HbSS) patients.

Materials & Method

The prospective single centered study was conducted in the Department of Physiology, Biochemistry, in collaboration with department of General Medicine VIMSAR ,Burla over a period of 6 month from 1st August 2017 to 5th January 2018. The study was approved by the institutional ethical committee and informed consent was obtained from the study group.

A total of 100 sickle cell anemia patients aged between 20-40 years of either sex were evaluated clinically and were screened by sickling test and diagnosis is confirmed by haemoglobin electrophoresis. The cases divided into 2 groups

Inclusion Criteria-

Group A-sickle cell anemia patient with vasoocclusive crisis (hospitalised)as case

Group B- sickle cell anemia patient with steady state as control group

[Steady state condition was defined as no manifestation of crisis for at least 4 weeks after the last episode,3 or more months after the last blood transfusion and no febrile episode for at least 2 weeks]

Exclusion Criteria- SCA Patients with systemic diseases like diabetes mellitus, hypertension, neoplasm, thyroid disorder and other haemoglobinopathy.

Sampling Method

CBC, CRP, MDA & GSH(oxidative marker) were studied and compared in all groups.(A&B)

5 ml of venous blood were drawn from all participants after taking aseptic precaution. Complete blood count(CBC), were done using automated hematology analyzer (ACCULAB CBC-360) .NLR was calculated by dividing the value of absolute neutrophil count(ANC) by absolute lymphocyte count(ALC). Malondialdehyde (MDA) were evaluated by Satoh et al method. Estimation of C-Reactive Protein was done by using standard nephelometry procedure. The assay of GSH with DTNB was performed by a standard Beutler method (1963).

Statistical analysis was done using a SPSS version 20, IBM, IL, USA. Unpaired t test was used to compare test results between SCA patients with VOC and steady state. Statistical significance was set at p value ≤ 0.05 .Correlation analysis was carried out to test the relationship between NLR and MDA , NLR & CRP and NLR& GSH in VOC patients.

Results

Table 1- Comparision of Haematological Parameters in Study Groups

No. of subjects	**A=50**	**B=50**	**P value**
Age (years)	21.68±3.1	28.7±2.3	≥ 0.05
Hematocrit (%)	13.6±1.3	18.9±2.75	≤ 0.05 *
Hemoglobin (g/dl)	6.2±0.24	8.82±1.05	≤ 0.05 *
Total leukocyte Count (x109/l)	3.12±0.83	2.05±0.23	≤ 0.05 *
Red blood cells Count (x1012/l)	1.49±0.1	2.43±0.6	≤ 0.05 *
Platelet count (x109/l)	430±93	360±97	≥ 0.05
Mean cell volume(fl)	82.2±6.9	84.9±4.2	≥ 0.05
Mean cell hemoglobin Conc. (g/dl)	36.4±2.1	30.7±3.3	≤ 0.05 *
Absolute lymphocyte Count (x109/L) (ALC)	2.55±0.33	3.13±0.17	≤ 0.05 *
Absolute neutrophil Count (x109/L) (ANC)	6.1±0.41	5.31±0.34	≤ 0.05 *

* - Significant ‘p’ value

Table-2 : Comparisons of inflammatory & oxidative stress parameters between A & B group

	A=**Cases (SCD) (n=50) (Mean ± SD)**	B= **Control (SCD) (n=50) (Mean ± SD)**	p value
NLR	2.44±0.097	1.78±0.049	0.006 *
MDA(**µmol**/l)	3.69±0.03	2.9±0.02	0.02 *
CRP (mg/dl)	14.49±0.24	7.68±0.89	0.001 *
GSH(**µmol**/l)	7.06±1.02	15.6±1.3	0.04 *

* - Significant ‘p’ value

Table 3: Correlation of NLR with oxidative stress marker(MDA,GSH) & inflammatory marker CRP.

SCA with VOC(n=50)	**MDA (µmol/l)**	**GSH(µmol/l)**	**CRP(mg/dl)**
Mean ± SD	3.69±0.03	7.06±1.02	14.49±0.24
r	0.66	-0.83	0.77
p	≤ 0.001	≤ 0.001	≤ 0.001

Out of 100 HbSS patients 50 were with VOC and 50 were in steady state. The mean age of both steady state and voc patient with in normal range.

There was a significant decrease in the level of Hb in sickle cell anemia with VOC (6.2±0.24) while a moderate decline in sickle cell anemia(ss) in steady state (8.82±1.05).The total leucocyte count was found to be higher in VOC (11.7±4.05) comparison to steady state .

The mean level of ANC,NLR were significantly higher in VOC (6.1±0.41,2.39±0.11).But the mean level of ALC was higher in control group(3.13±0.17) as compared to VOC group(2.55±0.33).

The level of MDA was higher in A & B group with mean value (3.69±0.03, 2.9±0.08). Similarly the level of CRP was also higher in A group with mean value (14.49± 0.24)as compared to control group(7.68±0.89). But the mean value of GSH in the SCA group with VOC was less than that of control.

Table 3 show a strong positive correlation between NLR & MDA (r2 linear 0.661) & also between NLR & CRP (r2 linear 0.778) in sickling patient with VOC. There was a strong negetive correlation between NLR & GSH (r2 linear- 0.83) in sickling patient with VOC.

Discussion

The sickle cell disease patients due to chronic hemolysis are constantly exposed to the increased generation of ROS and vessel walls are the primary exposed tissue . Studies have reported that oxidative stress and inflammation may contribute directly to pathophysiological events in SCA. [14] .

In this study, the blood counts, were significantly higher while the PCV was significantly lower in VOC subjects compared with controls which is same as study in Lagos, Nigeria . [15].

The data presented in this study showed that NLR values in SCA patients with VOC were significantly higher ($P < 0.006$) compared with steady state subjects. There was also a positive correlation between NLR and CRP in SCA patients with VOC which is similar to study by C. Aneke John et al.[16].

Neutrophil represents the active nonspecific inflammatory mediator of cellular immunity (innate) while lymphocytes mediate the adaptive or protective aspect of inflammation.[17]. Elevated NLR and PLR values may be used to distinguish patients who do not have physiological capacity to withstand the inflammatory injury and low survival outcomes.[18]. Studies that have evaluated NLR and PLR ratios in SCA patients are very few. In this study NLR was high in VOC patients compared to steady state .

MDA and 4 hydroxynoneal(4-NHE) which can be measured as oxidative stress biomarker in urine or blood ,to indicate the degree of oxidative stress and have been demonstrated to be increased in SCD.[19].In our study MDA was found to be increased in SCD patients with VOC as compared to steady state P value 0.02. Some previous studies among sickle cell found similar results. [20].

In this study, we found that CRP level was higher in Vaso-occlusive crisis patients than in Steady state patients and this result is in agreement with studies .[21,22].Also there is a significant positive correlation between CRP level and NLR count in vaso-occlusive crisis patients .Krishnan et al found a strong positive correlation between CRP and vaso-occlusion.[6].

Chronic hemolysis and painful episodes (vaso-occlusive crisis) in SCD stimulates vascular tissue to counteract the pro-oxidative and pro-inflammatory environment created by free heme or haemoglobin. In the present study data showed that there were increases in oxidative stress (MDA) and inflammatory markers(CRP & NLR) in SCD patients with painful episode (VOC) . Studies have shown increased serum levels of acute phase protein and oxidative stress parameters in SCD patients in a steady state.[23].and sickle cell crisis.[24] which is similar to our study.

In this study, subjects with SCA had markedly lower erythrocyte concentrations of GSH compared with controls (≤0.05) this was similar to the study reported by Morris C R (2008). [24] .Previous research shows that sickle red blood cells are more susceptible to oxidative lipid damage.[25].

In this study, we found a significant positive correlation between NLR and MDA ,also between NLR & CRP & negetive correlation between NLR and GSH. This indicate inflammation and oxidative stress both are the culprit of vaso occlusive crisis in sickle cell anemia.

Conclusion

The patients with sickle cell anemia easily develop the complications specially the vaso-occlusive crisis which is the most frequent, and if not diagnosed early they may develop organ damage and die in early age.

The NLR is an index that can be calculated very simply and it was significantly higher in SCA subjects with VOC. It was significantly correlated with MDA & GSH which are oxidative stress markers and CRP an inflammatory marker. NLR is a cheap & useful marker that can be easily calculated from CBC.

So, the early prediction of vaso-occlusive crisis by the detection of the NLR count along with MDA,erythrocyte GSH & CRP level might be beneficial in the management sickle cell anemia patient.

Finacial support and sponsorship- Nil

Conflicts of Interest- There are no conflicts of interest

Ethical Clearance- Approved by IEC Vimsar Burla.

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DOI Number: 10.5958/2320-608X.2019.00112.4

Original Article

An Indian Study of Peak Expiratory Flow Rates in a Group of Young Adults

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Abstract

Background. Peak Expiratory Flow Rate (PEFR) reflects the strength and condition of respiratory muscles and the degree of airflow limitation in large airways. PEFR shows postural variation that follows a specific pattern in asthmatics and healthy individuals has been identified. Adequate data is not available for the postural variation in normal individuals who are students in professional courses and had a sedentary life style. Lung volumes in normal subjects were significantly higher in standing position. Others have reported that in healthy subjects spirometric indices were higher in the standing in comparison with the sitting position whereas other studies have reported no differences between spirometric values obtained in lying, sitting and standing positions.Hence this study is undertaken to study the postural variation in peak expiratory flow rates in healthy adult female subjects in South India.

Method. Peak expiratory flow rate was recorded in 50 adult healthy female students aged 18-23 years and studying in professional courses . Mini wright's peak flow meter was used to measure the peak expiratory flow rate. Three readings were taken PEFR in standing and lying posture. Best of three recordings taken as the final value.

Results. PEFR is decreased in lying posture compared to standing posture in subjects studied and the quantum of difference was noted.

Conclusion. In postural changes, peak expiratory flow rate measurements significantly differ based on whether the measurements are taken in the standing or in the lying posture in healthy participants. The effect of posture may be of importance in recording peak expiratory flow rate and changing to a better posture may be especially useful for those patients with weak expiration.

Keywords: *peak expiratory flow rate, postural variation, south Indian female.*

Introduction

Peak Expiratory Flow Rate (PEFR) reflects the strength and condition of respiratory muscles and the degree of airflow limitation in large airways. PEFR shows postural variation that follows a specific pattern in asthmatics and healthy individuals has been identified. Adequate data is not available for the postural variation in normal individuals who are students in professional courses and had a sedentary life style. Hence this study is undertaken to study the postural variation in peak expiratory flow rates in healthy adult female subjects in South India.

Peak expiratory flow rate is one of the pulmonary function tests that provide a quantifiable measure of lung function. It is relatively a simple and easy procedure

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to evaluate respiratory function when compared with pulmonary function testing. Peak expiratory flow is measurement of the movement of air into and out of the lungs during various breathing manoeuvres[1].

In effect of postural changes, lung volumes in normal subjects were significantly higher in standing position[2]. Other studies reported that in healthy subjects spirometric indices were higher in the standing in comparison with the sitting position[3] whereas some other studies have reported no differences between spirometric values obtained in lying, sitting and standing positions[4].

Aims & Objectives: This study is undertaken to study the postural variation in peak expiratory flow rates in healthy adult female subjects in South India.

Material & Method: Present study was conducted in the pulmonary function lab on 50 apparently healthy sedentary female subjects aged 18-23 years and studying in professional courses using wright's peak flow meter was used to measure the peak expiratory flow rate. Three readings were taken PEFR in standing and lying posture. Best of three recordings taken as the final value.

Ethical Clearance was obtained from institution ethical committee.

Before starting the actual study subjects were briefed about the protocol and informed consent was obtained. Thorough history regarding suitability as per the above inclusion and exclusion criteria was elicited. Basic clinical examination was done to rule out any cardiopulmonary or other illness.

Precautions observed, during the manoeuvre:

It was ensured that the subject was comfortable and relaxed.

Apparatus was sterilized and cleaned properly.

Subject was trained adequately to perform different maneuvers.

Subject was instructed to hold the instrument in such a way that the hand did not obstruct the movement of the pointer.

The pointer was kept at the lower most level. Both the nostrils were clipped while blowing into the equipment.

Body mass index (BMI)

BMI was calculated from height and weight of the subject by using following formula.

BMI= weight (kg)/ height $(m)^2$.

Body surface area (BSA)

BSA was calculated by using Dubois' Formula as follows.BSA (m^2) = weight (kg) $^{0.425}$ × height (cm) $^{0.725}$ ×0.007184 (Dubois 1916).

Statistical Analysis

To analyze the diurnal variation of PEFR, the maximum out of the 3 recordings was taken as the final value.

PEFR was measured in standing and lying position were analyzed by using one way ANOVA followed by Tukey's test with $p< 0.05$ was taken as the level of significance.

Results

The anthropometric values of the subjects are given in table 1.On analysis of PEFR records of individual subjects, it was seen that there was an overall dip in PEFR values in lying down posture (Table 2)

Table 1: Basic subject information

	Number	Age (years)	Height (cm)	Weight(kg)	BMI	BSA (m^2)
Female	50	18.14±2.05	172.2 ± 8.48	66.79± 16.54	21.84 ± 3.51	1.94 ± 2.69

Table 2: Mean PEFR values of standing and lying posture for female subjects

Female	7-8am	10-11am	1-2pm	4-5pm	7-8pm
Standing	346.6±48.6	345.4±48.71	361.5±52.5	353.3±45.9	350.2±43.45
Lying	317.7±44.02	319.3±48.06	329.2±49.6	326.3±49.7	322±42.6

Discussion

In this study postural change of healthy female individuals was studied. Our results show that PEFR is decreased in lying posture compared to standing posture in female subjects studied. These study findings are in contrast to the findings reported by Baduraddin *et al* 2010[4]. They have reported that there was no significant difference of PEFR in standing, sitting and lying position.

Our study findings are similar to the reports of Fiz *et al* 1991 where they have reported that maximum inspiratory and expiratory pressures values decreased in the supine posture with respect to standing and sitting positions[5].

In the erect posture the diaphragm descends, therefore, the capacity of the thoracic cage increases. In the supine position, the diaphragm is pulled upward because the abdominal viscera push the diaphragm. Therefore, the capacity of the thoracic cage decreases. Hence, vital capacity is greater in the erect posture than in the supine position. In the supine position due to elimination of the effect of gravity, the blood flow to the lung increases. This decreases vital capacity. In the standing posture, blood is pooled in the lower extremities, therefore venous return decreases. This decreases pulmonary blood flow, thus vital capacity increases on standing.

Increased lung volumes in the standing position appear to be related to the increased thoracic cavity volume[4]. Increased lung volume leads to greater elastic recoil. Following a deep inspiration (as in preparation for a maximal expiratory manoeuvre), a larger amount of potential energy is stored in the tissue of the chest wall. Further, the contracting diaphragm increases pressure on abdominal contents pushing them forward and distending the abdominal cavity. This places the abdominal muscles at a slight stretch. Expiratory muscles attain their optimal length during standing and at more stretched lengths, the abdominal muscles may be more capable of stronger contractions and thus help in the generation of higher maximum expiratory pressure (MEP).

During a forced expiration in standing, the greater recoil of the lung and chest wall is combined with higher pressures generated by abdominal contraction. This combined action pushes the air at high speeds through narrowing airways resulting in the higher MEP and PEFR. Other factors that may have influenced the results in the standing position could include subject comfort and a higher arousal level.

Conclusion

In postural changes, peak expiratory flow rate measurements significantly differ based on whether the measurements are taken in the standing or in the lying posture in healthy participants. The effect of posture may be of importance in recording peak expiratory flow rate and changing to a better posture may be especially useful for those patients with weak expiration.

Conflict of Interest: None

Source of Funding: Self

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DOI Number: 10.5958/2320-608X.2019.00113.6

Breath Carbon Monoxide Concentration", An Indicator of Early Airway Inflammation in Asymptomatic Smokers

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Abstract

Measurement of carbon monoxide(CO) concentration in expired air canbe used for detecting and monitoring cytokine mediated inflammation and oxidative stress in the respiratory tract of smokers if smokers are made to abstain from smoking for 8 hrs.Total 48 apparently healthy male volunteers (24 were asymptomatic male tobacco smokers and rest 24 were healthy non-smoker males) with age between 18 – 25 years participated in the study.Exhaled CO level measured by the breath CO analyzer.

Baseline Pulmonary function test(PFT) was done using RMS Helios Series Computer based Spirometer. Exercise challenge test was doneusing treadmill and PFT was recorded immediately, 5min., 10min. and 20min. of recovery period. Comparison of lung function before and after exercise in healthy volunteers and asymptomatic smokers respectively was done using paired t test. Correlation between post exercise percentage change in FEV1 and exhaled COwas seen using Pearson's coefficient of correlation.A negative correlation was found between CO concentration in exhaled breath and improvement in FEV1 after exercise challenge test. Hence, Breath CO analyser can be used to measure endogenous CO in so called "healthy smokers" as a tool to detect early inflammation and also to motivate them to quit smoking before the disease becomes irreversible.

Keywords – *Carbon monoxide, Pulmonary Function test.*

Introduction

Measurement of carbon monoxide concentration in expired air is used as an objective method to analyze the smoking status.It can also be used for detecting and monitoring cytokine mediated inflammation and oxidative stress in the respiratory tract of smokers if smokers are made to abstain from smoking for 8 hrs. Approximately 30% of smokers do not show chronic symptoms or abnormal lung function. Nevertheless, even these socalled "healthy smokers" show subtle changes in lung morphology, lung inflammation and lung function. Smoking, apparently, always affects the lungs, although the extent and severity of these changes differ between individuals.[(1)]Airway response to exercise and endogenous production of CO measurement can help to mark these changes in early asymptomatic smokers.

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Material and Method

The study was carried out in Department of Physiology, Baroda Medical College, Vadodara. Total 48 apparently healthy male volunteers with age between 18 – 25 years participated in the study. Out of which 24 were asymptomatic male tobacco smokers and rest 24 were healthy non-smoker males.

They consisted of volunteers, hospital workers or university students as cases and healthy non-smoker males. Personal information was collected through questionnaire. Subjects were excluded from the study if there was any history of exercise discomfort, wheezing, taking any medications that might influence airway tone,

current cough, dyspnoea, sputum production, asthma, allergic rhinitis, hay fever, urticaria, other allergic conditions, or any respiratory infection within two months, cardiac disease, chest deformity, or occupational exposure to hazardous substances. Written and informed consent was taken from each and every participant. The participants were instructed to avoid heavy physical activities, abstain from tobacco in any form, alcohol for at least 12 hours and tea or coffee for 2 hours before coming to the research lab and the subject was advised to come two hours after light breakfast.

Each participant had 2 visits, first visit for general instruction about how to perform the test, so that they become accustomed with proper maneuver. The second visit involved the baseline and post exercise breathing tests. The experiment was done in morning hours 9:00 AM to 12:00 noon to avoid circadian variations in the pulmonary function. Participants were familiarized with the surroundings. Instructions for the whole procedure were given.All the subjects first expired in *Breath CO analyzer* to get the value of carbon monoxide in exhaled air (in ppm).Exhaled CO and %COHb was measured on a portable smokerlyzer (Breath CO monitor, Bedfont Scientific Ltd., Kent, England). In this procedure, participants were said to inhale deeply and hold their breath fully for 15 sec before exhaling into a disposable mouthpiece. The subjects exhaled slowly from total lung capacity with a constant flow. This procedure was repeated three times with 1 min of normal breathing between each repetition and the mean value was used for analysisExhaled CO level measured by the analyzer and was reported to correlate closely with blood COHb concentration.[2]

Baseline PFT: Lung functions were measured by **RMS Helios Series Computer based Spirometer** with highly advanced and user-friendly software offering 34 parameter readings, Pre-Post bronchodialation results, Percentage Improvement & Lung Age Calculations. After giving rest for 15 minutes, baseline pulmonary function test was done using the FVC manoeuvre. Indices recorded were - Forced vital capacity (FVC), Forced expiratory volume in 1 second (FEV1), Mean forced expiratory flow between 25% and 75% of FVC (FEF25-75%), Mean forced expiratory flow between 75% and 85% of FVC (FEF75-85%). For baseline lung function three satisfactory manoeuvres were taken and best of three was chosen as final result.

Exercise challenge testing: For exercise challenge treadmill attached to 12 lead ECG monitor was used which continuously monitored heart rate and ECG while the subject was exercising. Participants were asked to exercise on the treadmill, so that they achieve 80-90% of the maximum predicted heart rate (220 - age) for 5 minutes. PFT was recorded immediately after completion of the exercise challenge. Other subsequent recordings were done at 5, 10 and 20 minutes of recovery period. Whilst several protocols exist, the most widely accepted protocol is based on the Guidelines produced by the ATS in 1999. The guiding principle is to create a degree of hyperventilation by pushing the participants quickly to perform high cardiac output exercise. This was done on the treadmill with the aim of achieving 80 – 90% of the maximal heart rate in 4 – 6 minutes.(4) The heart rate was monitored through ECG and the test was stopped when the patient achieved 80 – 90% of the maximal cardiac output.

Data entry and Analysis: Data was entered in MS excel and analyzed using software MedcalC. Comparison of lung function before and after exercise in healthy volunteers and asymptomatic smokers respectively was done using paired t test. Correlation between post exercise percentage change in FEV1 and exhaled COwas seen using Pearson's coefficient of correlation.

Result

There was no significant difference in age, height, weight and baseline pulmonary function among the 48 volunteers who participated in the study (Table1-2). They were divided into two groups, where the first group consisted of 24 healthy volunteers who had never smoked and the second group of 24 asymptomatic smokers who were smoking for not more than 5 years and none had score ND score (Nicotine Dependence) more than 5.

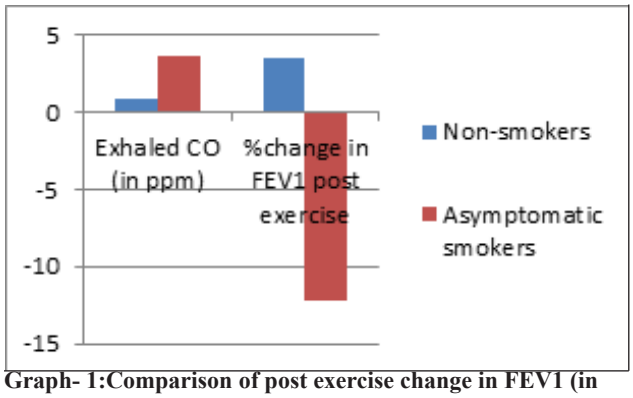
In our study we found negative correlation between exhaled CO concentration and FEV1 % change after exercise challenge when values of all the subjects in the study were compared irrespective of their smoking status. Fig 2 demonstrates the correlation between exhaled CO and FEV1 % change after exercise challenge in the participants ($r=-0.45$, $p=0.001$). The exhaled CO concentration was greater in the smokers as compared to the healthy subjects Fig 1(3.63±2.50 Vs 0.92±0.78) but the difference was not significant.

Table 1: General characteristics of the study group:

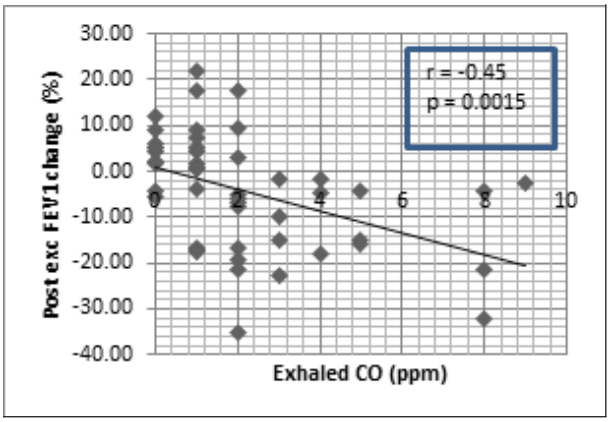
	Healthy Volunteers			Asymptomatic Smokers		
	Mean	**±SD**	**Range**	**Mean**	**±SD**	**Range**
Age (years)	22.54	±1.59	18 - 25	23.04	±2.01	18 - 25
Height (cm)	171.79	±4.90	158 - 180	171.75	±7.21	157 - 185
Weight (kg)	62.96	±7.71	50 - 75	62.5	±8.82	47 - 80

Table2: Baseline Spirometry before exercise challenge in healthy volunteers and Asymptomatic Smokers:

Parameters	**Healthy Volunteers**		**Asymptomatic Smokers**	
	Mean	**±SD**	**Mean**	**±SD**
FVC (litres)	4.02	±0.51	3.83	±0.63
PEFR (lit/sec)	8.07	±0.96	8.20	±1.05
FEV1(liters)	3.41	±0.37	3.37	±0.55
$FEF_{25-75\%}$ (lit/sec)	3.88	±0.87	4.36	±1.19
$FEF_{75-85\%}$ (lit/sec)	1.30	±0.51	1.58	±0.86



Graph- 1:Comparison of post exercise change in FEV1 (in percentage) and Exhaled CO (in ppm) in Asymptomatic Smokers and Non-smokers



Graph- 2:Correlation between post exercise percentage change in FEV1 and Exhaled CO:

Discussion

When using measurement of carbon monoxide concentration in expired air for detecting recent smoking 8ppm can be kept as line dividing smokers and non smokers as suggested by Jarvis M et al and Im BG KS et al. Induction of a stress response protein, heme oxygenase-1 (HO-1) is one of the mechanisms protecting against an oxidative stress. Enhanced HO-1 protein expression may be due to the induction of enzyme by inflammatory cytokines and oxidants such as interleukins, tumour necrosis factor-α (TNF-α), interferon- γ, and H2O2 which are capable of inducing HO-1 expression in cell line and tissues. Induced HO-1 catalyzes the degradation of heme into bilirubin that can scavenge HO. *in vitro* as efficiently as α-tocopherol and the by-products of HO-1 activity are free iron and CO. Yamada N et al and Yasuda H et al have also reported that hemeoxygenase is present in the pulmonary vascular endothelium and alveolar macrophages. Up regulation of heme oxygenase-1 (HO-1) by oxidative stress[3] and inflammatory cytokines in airways and lung inflammation has been reported, the cause of the increased levels of exhaled CO in patients with inflammatory lung diseases. These findings entail a role of endogenous CO in airway inflammatory diseases. [2, 4]

CO is a non-specific biomarker of tobacco exposure. Its half-life is short (2-6 hours).

Therefore if smokers are made to abstain from smoking for 8 hrs then the exhaled CO will be due to lung oxidative stress only[5]. Therefore, measurement of exhaled CO is a simple method for detecting and monitoring cytokine mediated inflammation and oxidative stress in the respiratory tract. In our study we found out negative correlation between exhaled CO concentration and FEV1 % change after exercise challenge when values of all the subjects in the study were compared irrespective of their smoking status. Fig 6 demonstrates the correlation between exhaled CO and FEV1 % change after exercise challenge in the participants (r=-0.45, p=0.001). The exhaled CO concentration was greater in the smokers as compared to the healthy subjects (3.63±2.50 Vs 0.92±0.78). Negative co-relation between CO and FEV1 percentage change is suggestive of alteration of airway mechanics due to some underlying inflammation with the increment of concentration of CO in exhaled air. Yamada N et al and Ahmad A et al have stated role of endogenous CO in airway inflammatory diseases.[2,3] Relative increase in CO was reported in current smokers with COPD compared to healthy smokers matched for age and smoking habits by Pearce MS et al in 2005.[6] This may indicate higher oxidative stress in the former group. Up regulation of heme oxygenase-1 (HO-1) by oxidative stress[3], inflammatory cytokines in airways and lung inflammation has been reported as the causes of the increased levels of exhaled CO in patients with inflammatory lung diseases.

Conclusion

A negative correlation was found between CO concentration in exhaled breath and improvement in FEV1 after exercise challenge when data of all the participants in the group were compared. Thus this negative correlation suggests that even in early asymptomatic smokers the decrease in improvement in FEV1 after exercise is due to oxidative stress due to smoking.Since, In our study all the smokers were smoking for not more than 5 years and none had ND score (Nicotine Dependence) more than 5 and all had a normal spirometry at rest, we can say that inflammatory changes start even before they are reflected in spirometry at rest. Breath CO analyser can be used to measure endogenous CO in so called "healthy smokers" as a tool to detect early inflammation and also to motivate them to quit smoking before the disease becomes irreversible.

Ethical Clearance- Taken from institutional Ethics committee for human research(IECHR), Medical college & SSG Hospital, Baroda.

Source of Funding- Self

Conflict of Interest - Nil

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DOI Number: 10.5958/2320-608X.2019.00114.8

Spatial Localization of Sound in the Late-Blind During Spatial Bisection Task and Minimum Audible Angle Task

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Abstract

Objectives: Our objective was to assess the spatial localization of sound in both minimum audible angle task and spatial bisection task in the azimuthal plane in late blind subjects.

Methods: A total of ten late blind individuals and eight normal sighted blindfolded controls performed the spatial bisection task and minimum audible angle task.

Results and Conclusion: The late blind performed as good as the controls in both the tasks. The late blind would have had intact vision in their developmental years, enabling development of the ability to spatially localize sound. These results support the cross sensory calibration hypothesis that vision calibrates spatial localization of sound while the sensory system is still maturing.

Keywords: *Spatial bisection task, Minimum audible angle task, late blind, Cross sensory calibration*.

Introduction

Blind people rely on other forms of sensory inputs like hearing in order to perceive and orient themselves to the environment they live in, largely by distinguishing and localizing the plethora of sounds they hear.

So, a question arises as to whether this increased dependence on the auditory system can lead to its enhancement or whether the lack of vision can affect the development of other senses. Before attempting to answer this question, an essential consideration is of the frame of reference that is used to localize sounds. The frame of reference is defined as the means of representing the location of entities in space[1]. The two dominant ones are egocentric and allocentric frames of reference. The egocentric frame uses the subject as the centre of the environment whereas the allocentric frame is centred either on external objects or the environment itself. [2, 3]

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The "Sensory compensation hypothesis" suggests that loss of vision leads to compensatory enhancement in other sensations, such as somatosensory or auditory in the egocentric frame of the listener.[4,5] Experiments have shown that the blind display more accurate localization in the peripheral auditory space.[6] Also, improved accuracy in sound localization has been reported even after blindfolding normal-sighted adults for just 90 minutes.[7] Further, spatial hearing tasks have been shown to elicit activation within the visual cortex of blind individuals, providing support to the model of cross modal neuroplasticity in the cortex.[8,9,10,11,12]

This view is opposed by the "Perceptual deficit hypothesis" which advocates that early visual experience has a profound influence on auditory learning and so, a deficiency in vision during development can impair spatial representation.[13] The calibration of auditory representation of space, in particular, is dependent on the visual feedback. This suggests that people born blind may develop cognitive spatial deficits in hearing especially in the allocentric frame of reference. Gori et al. showed that the performance of congenitally blind individuals was severely impaired in a spatial bisection task as compared to sighted individuals. In this task, the

participants were required to indicate, out of the three presented sounds, whether the second was closer in space to the first or the third sound.[14, 15, 16]

It was noted that the ability of late blinds in localizing sounds in the allocentric frame had not been tested before. Keeping with these observations, it was hypothesised that late blinds would localize sounds as good as sighted controls in an allocentric frame, attributable to the normal uninterrupted feedback of the visual system on auditory learning, just like sighted controls.

Aims and Objective

To compare the ability of spatial localization of sounds in the late blind with normal sighted blindfolded controls by the methods of spatial bisection task and minimum audible angle task.

Subjects, Materials and Method

Subjects:

Ethical approval was obtained from the Institutional ethical committee as part of a larger Indian Council of Medical Research (ICMR) short term studentship project. Ten late blind (onset of blindness after 16 years) young adults of either gender were recruited from a recreational centre for the blind and eight normally sighted individuals who were age and gender matched were recruited from the staff of Bangalore Medical College and Research Institute to serve as controls.

Inclusion Criteria:

Only subjects who gave informed consent to participate in the study were included. For blind subjects, the informed consent was administered in Braille and they gave their consent with their left thumb impression.

Only subjects defined as 'Blind' (categories 4 and 5, World Health Organization classification) were included in the study.

The hearing threshold of all the subjects had to conform to the normal range and this was tested by audiometry.

Exclusion Criteria:

The subjects were requested to bring their medical reports and those with cognitive and neurological deficits were excluded.

Subjects with any other acute or chronic diseases were excluded.

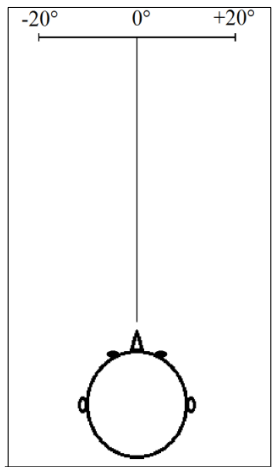
Materials:

The Audiometer mobile application 'Hearing Test version 1.1.2' (by developer: hearingtest@e-audiologia.pl), calibrated according to the default headphones of the phone was used.

The horizontal array of speakers was placed on a table 150 cm away from the height-adjustable chair where the subject was seated. An angle of 2° was maintained between adjacent speakers such that 21 speakers covered the total angular range of +20° to -20° with respect to the position of the subject. The speakers were Generic Passive 5Volt-Speaker modules, compatible with the Arduino microcontroller board. 'Arduino' is an open-source platform based on easy-to-use hardware and software that provides a programming tool, Arduino IDE (Integrated Development Environment), for writing code and uploading it to the Arduino board and was used in the study. The duration of sound production and intervals between successive sounds were programmed in the IDE software on the laptop to which the microcontroller was connected.

Methodology

All the experiments were performed in an anechoic room. First, the procedure was thoroughly explained to the subjects and any doubts were adequately clarified. The sighted controls were blindfolded.



Experimental Setup

A. Spatial Bisection Task

For this task, the subject was made to sit on a chair facing the array of speakers placed horizontally, 150cm away. The array of speakers was adjusted such that it was at the same height as the ears of the subject and the subject faced the centre of the array (0°). Three sounds each having a frequency of 1500 Hertz and lasting 75 milliseconds were played. The first sound was played from the first speaker at -20° to the subject's left. 500 milliseconds later the second sound was played from any one of the speakers from -18° to +18°. And after an interval of 500 milliseconds, the third and final sound was played from the last speaker at +20° to the subject's right. Then the subject had to indicate verbally whether the second sound seemed closer to the first sound (in which case "Left" was the correct response) or to the last sound ("Right" was the correct response). This concluded one trial. Thirty such trials were performed for each subject with the position of the second sound changing every time. The data recorded for each trial included (A) The angle at which the second sound was presented and (B) Whether the response of the subject was correct or incorrect with respect to the second sound being closer in space to the first or third sounds.

B. Minimum Audible Angle Task

In this task, the same setup was used as for the spatial bisection task. Here, two sounds 75 milliseconds long were presented successively with a 500 milliseconds interval. On the first trial, both the sounds were played from the central speaker (0°). Then the subject was required to indicate whether the two sounds seemed to come from the same location. Then, the first sound was played from the central speaker (0°), and the second sound from a speaker just adjacent to the central speaker (2°) and the question repeated and the response recorded. The trials were repeated with successive increase in angular distance of the second sound (2°, 4°, 6°, 8°) from the central speaker till the subject was able to distinguish the two sounds sources as separate and that angle was recorded as the Minimum Audible Angle. 5 sets of such trials were performed on each side of the central speaker alternately for each subject.

Statistical Analysis

Descriptive statistics were done and presented as Mean ± Standard deviation (SD). Inferential statistics for the spatial bisection task was done using Chi-square test and by independent t test for minimum audible angle task. A Graph was plotted using Microsoft Excel. P-value less than 0.05 was considered to be significant.

Observations and Results

Table 1: **Descriptive Statistics for age and gender matching of the subjects**

	Late blind n = 10	**Controls n = 8**	**P-value**
Age (in years)	27 ± 3	27 ± 1	P = 0.86
Gender (M : F)	7 : 3	5 : 3	P = 0.8625

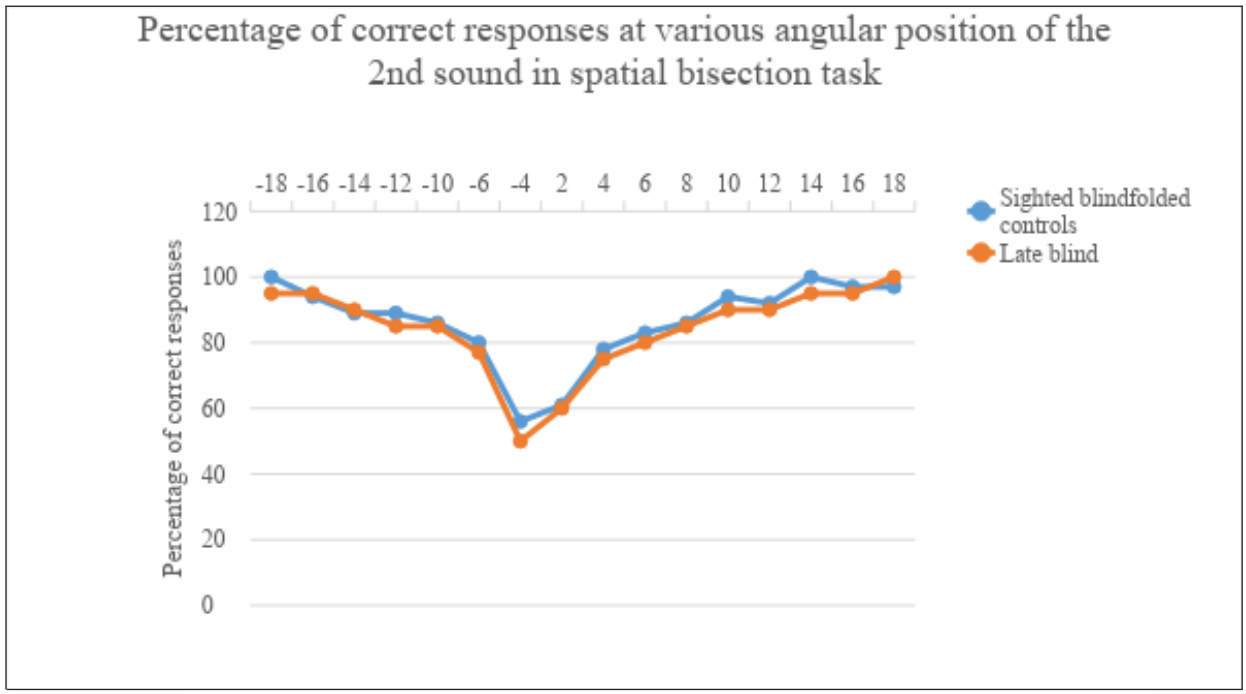
Table 2: Mean and Standard Deviation (SD) of the number of correct responses out of 30 trials per subject in the spatial bisection task

	Late blind n = 10	**Controls n = 8**	**P-value**
Number of correct responses (Mean ± SD)	26 ± 4	27 ± 2	P = 0.524
Percentage of correct responses	86%	89%	

Table 3: Comparison of proportion of right to wrong responses in the two groups for Spatial Bisection task

	Late blind n = 10	**Controls n = 8**
Number of correct responses	258	214
Number of wrong responses	42	26
Total	300	240

Chi-Square = 0.94, P-Value =0.3323



Graph 1: Percentage of correct responses at each angular position of the second sound in spatial bisection task

Table 4: Shows the minimum angular separation of the 2 sounds to be recognized as 2 distinct sound in minimum audible angle task.

	Late blind n = 10	**Controls n = 8**	**P-Value**
Minimum audible angle (left of the central speaker) (Mean ± SD) (in degrees)	4 ± 1	3 ± 1	P = 0.159
Minimum audible angle (right of the central speaker) (Mean ± SD) (in degrees)	4 ± 2	3 ± 1	P = 0.328
Minimum audible angle (mean of both sides) (Mean ± SD) (in degrees)	4 ± 1	3 ± 1	P = 0.230

Results

Table 1 shows the Mean ± Standard Deviation of ages, and the Male to Female ratios of the subjects in the 2 groups. The mean age was not significantly different between the 2 groups. The proportions of the genders were compared using Chi-Square test and the P-value was found to be insignificant.

Table 2 shows the Mean ± Standard Deviation of the number of correct responses of the subjects in the 2 groups in the spatial bisection task. The late blind and control group showed a mean of 26 and 27 correct responses respectively. The next row shows the percentage of correct responses.

Table 3 shows the proportion of correct to wrong responses in the 2 groups for spatial bisection task. Of the total of 300 trials in the late-onset blind subjects (30 trials each for 10 subjects), 258 were correct and 42 were wrong. Of the 240 trials in the sighted blindfolded controls, (30 trials for 8 subjects), 214 responses were right and 26 responses were wrong. Chi-Square test showed a significance of P=0.94. That means that the two groups were not significantly different from each other.

Graph 1 is plotted with the results of the spatial bisection task. While the X-axis of the graph denotes the angular position of second sound, the Y-axis shows the percentage of correct responses for the corresponding position. The graph shows that the accuracy is highest (100%) at the extreme positions of the second sound at ±18° when the second sound is closest to the first or third sounds and it is easiest to perform the spatial bisection task. The accuracy gradually reduces to 80% at ±6°. The accuracy drops to 50% at -4° when the second sound is close to the central speaker.

Table 4 shows the performance of the subjects in the minimum audible angle task. We observed that that there was no significant difference between the 2 groups.

Discussion

Mechanism of spatial localization of sound: A person determines the direction where the sound is coming from by two principal means. For frequencies below 2 kiloHertz, the time lag between the entries of sound into the two ears, known as Interaural Time Difference (ITD), is used to localize the sound. For frequencies above 2 kiloHertz, the shadowing effect of the head creates increasingly sizable differences in the intensity of the sounds at the two ears called as Interaural Level Difference (ILD). So, this mechanism is utilised for frequencies higher than 2 kiloHertz. The time lag mechanism discriminates direction more accurately than the intensity mechanism as it is only dependent on the exact interval of time between the signals and not on extraneous factors. Hence the sounds presented in our study were of the frequency of 1500 Hertz to enable better localization.[17]

Cross sensory calibration hypothesis states that when the sensory system is developing, the faster and more accurate system calibrates the other systems. Vision being faster and more accurate than hearing, calibrates spatial localization of sound during the developing years. Studies have shown that owls reared with distorted vision due to prisms attached to their eyes showed biases in sound localization. The spatial bisection task is based on the allocentric frame of reference. The study of Gori et al in this frame showed that early blind performed poorly in this task. The late blind were defined as those who develop complete blindness only after 16 years of age. During their childhood, their vision would have calibrated the spatial localization of sound. Hence we hypothesised that late blind must be similar in performance to normal controls. This had not been examined before our study. In accordance with this, our results show that they could perform the spatial bisection task as good as the sighted blindfolded controls.[18]

Strengths and limitations: Adequate age and gender matching ensured that sighted blindfolded controls were similar to the late blind in those aspects that would have otherwise been confounding factors. The use of Arduino microcontroller board ensured faster and more accurate testing.

The performance of spatial bisection by late blind in the vertical plane can be explored in further studies.

Conclusion

We found that the late blind performed as good as controls in the spatial bisection task and minimum audible angle task. This can be attributed to the intact vision of late blind during their developmental years which enables the calibration of the spatial localization of sounds, providing support to the cross sensory hypothesis.

Conflict of Interest: Nil

Source of Funding: Nil

Ethical approval: Obtained as part of Indian Council of Medical Research (ICMR) Short Term Studentship project from the Institutional Ethical Clearance Committee.

Acknowledgement: We acknowledge Indian Council of Medical Research for selecting Ganesh Prasanna for the ICMR-Short Term Studentship-2017.

We also wish to express our gratitude to all the blind subjects who were recruited for the study. We thank 'Premaanjali Educational Trust', JP Nagar, Bangalore and 'The Karnataka Welfare Association for Blind', Sampangiram Nagar, Bangalore for their sincere cooperation.

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DOI Number: 10.5958/2320-608X.2019.00115.X

Original Article

Comparative Study on Cardiovascular Autonomic Function Tests in Type 2 Diabetes Mellitus Patients with and without Diabetic Retinopathy

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Abstract

Introduction: Autonomic dysfunction is common in diabetics and presence of cardiac autonomic neuropathy is responsible for sudden death in diabetics. Detecting subclinical Cardiac Autonomic Neuropathy (CAN) early is crucially important for treatment and for preventing potentially serious consequences of CAN.

Aims and Objectives: The aim of the study is to clinically assess cardiovascular autonomic function tests in type 2 diabetes mellitus patients and compare those with healthy normal subjects.

Method: The study included 60 type 2 diabetic patients including 30 patients without any retinopathy and 30 others with non- proliferative diabetic retinopathy(NPDR), and 60 control subjects matched for age and gender. Autonomic function tests as given by Ewing were performed on all subjects to assess the parasympathetic and sympathetic nervous activity . These tests include heart rate response to deep breathing, valsalsa ratio, 30:15 ratio, and blood pressure response to standing and sustained hand grip. Statistical analysis of the data was done using One way ANOVA (Analysis of Variance) and multiple comparisons were done using post hoc Tukey Multiple Comparison Test. Statistical significance was set at 0.05.

Results: The results of our study show that there is decrease in cardiovascular autonomic functions more in diabetic patients with NPDR as compared to diabetic patients without retinopathy.

Conclusion: We conclude that there is involvement of both cardiovasvascular sympathetic and parasympathetic nervous system in patients with type 2 diabetes mellitus. So, type 2 DM patients should be evaluated for presence of autonomic dysfunction as early as possible to prevent complications and to improve the prognosis of the disease.

Keywords: *Diabetes mellitus, Autonomic neuropathy, Autonomic function tests*

Introduction

Diabetic Autonomic Neuropathy (DAN) is one of the most important complication of diabetes. Autonomic dysfunction is common in diabetics and presence of cardiac autonomic neuropathy is responsible for sudden death in diabetics. Detecting subclinical Cardiac Autonomic Neuropathy (CAN) early is crucially important for treatment and for preventing potentially serious consequences of CAN.[1] So, the present study is directed to show the comparative effects of cardiac autonomic activity between Type 2 DM patients with and without retinopathy, and non diabetic matched controls.

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Materials and Method

The study was carried out in the Neurophysiology lab of Department of Physiology, Gandhi Medical College & associated Hamidia Hospital, Bhopal.

The study was approved by the Ethical Committee of Gandhi Medical College.

Informed consent was taken from all the participants before enrolling in the study.

Patient was provided the information about the procedure of test to be performed on him.

The study was carried out on 120 subjects, 60 Type 2 diabetes mellitus patients and 60 non diabetic healthy subjects.

Test group : Diabetes mellitus type 2 patients were grouped as follows:

Group 1: Included 30 cases of type 2 diabetes mellitus without diabetic retinopathy.

Group 2: Included of 30 cases of type 2 diabetes mellitus with non proliferative diabetic retinopathy (NPDR).

Control group:

Group 3 : 60 non diabetic healthy volunteers matched for age and gender were included in the study to serve as control.

Inclusion criterion:

The study included following type 2 diabetes mellitus patients within age group of 40-60 years.

- Type 2 DM patients without retinopathy with duration of DM <10 years.
- Type 2 DM patients with non proliferative diabetic retinopathy (NPDR) with duration of DM <10 years.

Exclusion criterion:

Following patients were excluded from the study:

- Type 2 diabetes mellitus patients with proliferative retinopathy.
- Patients with significant occular disorders including cataract, glaucoma, optic nerve disease, best corrected visual acuity <6/9 for distance, amblyopia, vitreous opacities.
- Patients suffering from any cardiovascular illness or cardiac autonomic neuronal dysfunction of non-diabetic origin like hypertension.
- Subjects with history of smoking, alcoholism, chronic drug intake.

Data Collection Protocol :

- The patients who satisfied the inclusion and exclusion criterion, and gave written consent were included in the study.
- Relevant information was collected using a detailed questionnaire covering all the relevant symptoms and signs pertaining to Diabetes mellitus and autonomic disturbances. On the basis of response obtained the study group was selected.
- Detailed history was obtained and recorded from the control and the diabetic groups in the prescribed proforma. It included personal details, habit of smoking, alcohol, family h/o diabetes and hypertension, all types of medications taken, h/o being diagnosed or being treated for diabetes including age of onset, duration, treatment, associated risk factors. Particular emphasis was given on symptoms of autonomic neuropathy like syncope, loss of sweating erectile dysfunctions, gastric fullness after meals, weakness, tingling and numbness .
- Confirmation of Fasting blood glucose (FBS) measurements.

FBS more than 126 mg/dl was considered diabetes mellitus as per WHO criterion.2

Occular Examination

- Ocular examination findings were noted which include determination of visual acuity by Snellen's chart and near vision chart, ocular movements, pupil reactions, and confrontational visual field screening.

Direct ophthalmoscopy was done for the initial evaluation of the fundus occuli and to look for the status of retinopathy.

Assessment of Diabetic Cardiovascular Autonomic Neuropathy : Ewing' S Test Criterion

Baseline parameters:

The baseline parameters of subjects recorded were blood pressure and heart rate which were taken as control or baseline values. These parameters were taken before every test.

Autonomic Function Tests: 3

All the subjects performed five different autonomic function tests as given by **Ewing's and Clarke.** These tests are divided into two categories depending on the involvement of sympathetic and parasympathetic divisions of autonomic nervous system.

1. **Parasympathetic tests :** - the tests that reflect parasympathetic activity are those that measure heart rate response to:

a. Deep breathing (DBT, deep breathing test)

b. Valsalva manouever (valsalva ratio)

c. Lying to standing (30:15 ratio)

2. **Sympathetic tests:-** These tests reflect sympathetic activity. They measure blood pressure response to :

a. Sustained handgrip exercise (HGT, hand grip test)

b. Lying to standing up (PHT, postural hypotension)

Tests for parasympathetic functions :

A. Heart rate response to deep breathing :-

In this test, heart rate changes during respiration is assessed.

In the sitting position, the subject was asked to breathe quietly and deeply at the rate of 6 breaths per minute (five seconds inspiration and five seconds expiration). After taking baseline recording, continuous ECG (Lead II) was recorded for six cycles with marker to indicate the onset of each inspiration and expiration. The maximum and minimum R-R intervals were measured during each breathing cycle and converted to beats per minute.

The result was then expressed as mean of the difference between maximum and minimum heart rate for six measured cycles in beats per minute.

A normal response was a difference of 15 beats/min or more, 11-14 beats/min borderline and less than or equal to 10 beats/min was considered abnormal.

B. Heart rate response to Valsalva Manouever :-

A baseline ECG (lead II) recording was taken. The subject was asked to blow into a mouthpiece connected to mercury sphygmomanometer at a pressure of 40 mm Hg for 15 sec. At the end of 15 seconds the pressure was released. After taking the baseline ECG, recording was taken during and after the maneuver. The result of valsalva ratio was expressed as the ratio of longest R-R interval after the maneuver to the shortest R-R interval during the maneuver.

Reference values :Valsalva ratio (VR)

Normal : > 1.21,

Borderline : =1.11-1.20

Abnormal : < 1.10

C. Heart rate response to standing:-

The patient was instructed about the test. The test was conducted after 10 min rest in supine position. With the subject lying gently in the supine position baseline blood pressure, heart rate was recorded. The subject was then asked to stand unaided (without support i.e. not leaning against the wall). ECG (Lead II) was recorded continuously. The point of standing was marked on ECG paper.

In this test, after standing shortest R-R interval at or around 15th beat and the longest R-R interval at or around 30th beat were measured and the heart rate response expressed as the 30:15 ratio was calculated as the ratio between the longest R-R interval at or around the 30th beat and the shortest R-R interval at or around the 15th beat.

Reference values:-

Normal	:	> 1.04
Borderline	:	1.01- 1.03
Abnormal	:	< 1.0

1. Sympathetic Tests

A. Handgrip dynamometry/grip Test (HGT) – In this test autonomic stress is evoked by maximal voluntary contraction.

Apparatus used in this test was handgrip dynamometer (Manufactured by INCO; range max-90 kg, min 100 kg). After recording baseline heart rate and blood pressure in sitting position the maximum voluntary contraction was determined using the dominant hand. The subject was then asked to maintain the handgrip with dominant hand at 30% of maximum force for 4 minutes. The changes in blood pressure during handgrip were recorded on contralateral arm .

Change in diastolic blood pressure is calculated as the difference between highest DBP during the tests and basal DBP.

Reference Values :

Increase in DBP : > 16 mmHg – Normal

Increase in DBP : 11-15 mmHg – Borderline

Increase in DBP : < 10 mmHg – Abnormal

B. Blood pressure response from lying to standing (orthostatic test) :

In this the test BP change is assessed from lying to standing posture.

The blood pressure was recorded after 5 minutes of rest in supine position. The subject was instructed to attain standing posture without any support within 3 seconds and blood pressure was recorded within 30 seconds of standing up, then at 1st, 2nd, 3rdand 5th minutes. The difference in systolic blood pressure between supine and standing BP levels is taken as the measure of postural blood pressure change.

Reference Values :

Decrease in SBP < 10 mmHg – Normal

Decrease in SBP 11 - 29mmHg – Borderline

Decrease in SBP > 30 mmHg – Abnormal

Statistical methods applied:

The result were expressed as Mean+SD. One way ANOVA (Analysis of Variance) and multiple comparisons were done using post hoc Tukey Multiple Comparison Test to compare the variables between the three study groups. The mean difference was statistically significant at $p<0.05$ and non significant at $p>0.05$.

Results

Table : 1: Comparison of various autonomic function tests tests in the three study groups

TEST	GROUP 1 Mean±SD	GROUP 2 Mean±SD	GROUP 3 Mean±SD	P VALUE
DBT	13.66±5.66	11.03±4.09	18.48±3.21	F = 35.603 P < 0.01
VR	1.19±0.074	1.13±0.08	1.25±0.033	F = 42.516 P < 0.01
30:15 ratio	0.99±0.130	0.91±0.185	1.08±0.041	F = 20.484 P < 0.01
Fall in systolic BP	9.8±7.849	14.6±12.65	5.6±2.38	F = 14.297 P < 0.01
Rise in diastolic BP	15.8±4.245	12.8±4.88	18.87±3.08	F = 25.087 P < 0.01

Table : 2: Intergroup comparison of various autonomic function tests showing P value

TEST	Group-1 Vs Group-2	Group-1 Vs Group-3	Group-2 Vs Group-3
DBT	< 0.05	< 0.01	< 0.01
VR	< 0.01	< 0.01	< 0.01
30:15 ratio	< 0.05	< 0.01	< 0.01
Fall in systolic BP	< 0.05	NS	< 0.01
Rise in diastolic BP	< 0.01	< 0.01	< 0.01

Discussion

Cardiovascular autonomic function tests were used to assess autonomic neuropathy .The tests were analysed according to the criterion given by **DJ Ewing and Clarke(1982)[3]**. The observed data of these tests showed abnormal autonomic reactivity in diabetics as compared to euglycemic controls.

On comparing age of the study groups, the statistical difference of mean between diabetic patients and controls was not significant (p>0.05). So, the different study groups appear to be comparable statistically.

Tests Reflecting Parasympathetic Nervous Activity

Deep Breathing Test

In our study, on comparing the statistical difference of mean of ***Deep Breathing Test*** by using ANOVA, statistically significant difference of mean was observed in study groups with p < 0.01. On intergroup comparison of DBT in all the three groups using post hoc comparison test , comparing group 1 vs group 2 , group 1 vs group 3 and group 2 vs group 3 , the p values were <0.05, <0.01 and <0.01 respectively which were statistically significant.

The findings of our study are consistent with the results of **Krishna BH et al. (2014)[4],** they found that normal variation of heart rate during breathing may have a noticeable reduction and sometimes complete absence of variation of heart rate in diabetic patients.

A study conducted by **Prasad HB et al. (2014)[5]** showed that heart rate variation on DBT was the most abnormal test in all CAN assessing tests.

NagalaxmiV et al. (2016)[6]also suggested that there is predominance of involvement of parasympathetic system in diabetics first and also supported the evidence found in the present study that the DBT involvement occurs in type 2 diabetes mellitus.

In accordance to these studies, our study also suggests that heart rate variation is affected more in diabetic patients.

Valsalva Ratio

On comparison of heart rate during ***Valsalva Ratio*** in the three study groups by using ANOVA, p<0.01 which is statistically significant.

On intergroup comparison in diabetic patients, p <0.01 which is statistically significant.On comparing diabetics with control group p <0.01 which is statistically significant.

Krishna BH et al. (2014)[4] stated that during strain period of valsalva test, heart rate increases and blood pressure decreases but in diabetic patients the rise in heart rate during strain and decrease in heart rate during relaxing phase is decreased. Our findings are consistent with these findings.

Nazeema K et al. (2010)[7] reported similar findings.

HR-Lying to Standing Test

On comparison of heart rate from ***lying to standing (30:15 ratio)*** in the three study groups by using ANOVA, we found p<0.01 which is statistically significant.

On intergroup comparison in diabetic patients, p <0.01 which is statistically significant. On comparing diabetics with control group p <0.01 which is statistically

significant.

Mohapatre D et al. (2012)[8] stated that diabetic patients have lower 30:15 ratio in comparison to controls.

Gupta S et al. (2017)[9] found abnormal HR response on standing in diabetic patients.

Tests Reflecting Sympathetic Nervous Activity

Postural Hypotension Test

Blood pressure response from lying to standing was evaluated in diabetic patients and controls. The mean and SD of PHT in different groups is shown in **TABLE 1**

Fall in systolic blood pressure on standing was statistically significant between groups 1 and 2 ($p<0.05$, S). Highly significant difference of mean was found between groups 2 and 3 ($p<0.01$). However, no significant difference of mean was found between groups 1 and 3 ($p>0.05$). Blood pressure response was significantly reduced in diabetics.

The results in our study correlated with the study conducted by **Endukuru CK et al. (2015).**[10]

Hand Grip Test

In our study it was observed that mean value of ***increase in DBP during the sustained hand grip*** was significantly lower in diabetics in comparison to control group. Our results for HGT show highly significant difference between different groups ($p<0.01$).

The findings of the present study are in conformity with study done by **Datta S et al. (2005)**[11] on patients with varying severity of diabetic retinopathy. They found significant difference in DBP on handgrip test between normal controls and diabetics with retinopathy.

Hassan ZF et al. (2014)[12] found abnormal blood pressure response to sustained hand grip in diabetic patients.

Conclusion

It may be concluded that diabetes has an effect on Cardiovascular Autonomic Functions**.** The observations in the present study suggest the presence of autonomic dysfunction in diabetics. Both parasympathetic and sympathetic cardiovascular responses were altered. The decrease in cardiovascular autonomic functions is more in diabetic patients with NPDR as compared to diabetic patients without retinopathy.

Ethical Clearance: The study was approved by the Ethical Committee of Gandhi Medical College, Bhopal

Source of Funding: None

Conflicts of interest: Nil

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DOI Number: 10.5958/2320-608X.2019.00116.1

A Study of Critical Flicker Fusion Frequency among Individuals Exposed to Artificial Light from Electronic Gadgets

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Abstract

Background: The critical flicker fusion frequency (CFF) is the frequency at which a flickering stimulus is perceived to be steady, with higher values suggesting greater perceptual accuracy. Measurement CFF has been used to evaluate the processing speed of central nerves system and the coordination between the sensory and the motor systems. Exposure to LED light from smart phones causes sleep disorders. Lack of sleep affects alertness, concentration, memory leading to later developing anxiety disorders, depressive illness, and substance abuse. Hence the current study is designed to estimate CFF exposed to artificial light from electronics.

Materials & Method: Fifty young healthy subjects not exposed to the artificial light from electronic gadgets (group I) & fifty age and sex matched subjects exposed to the artificial light from electronic gadgets (group II) in the age group of 18 -38 years were included for the study. Informed consent was taken from the participants. Critical fusion frequency was recorded. Sleep quality, pattern & daytime sleepiness were assessed by questionnaire.

Results: CFF in group I (38.33 ± 0.98) Hz was significantly higher at 95% confidence interval than higher than in group II (36.65 ± 0.71) Hz, $p < 0.001$. CFF was positively and significantly correlated with the duration of electronic gadget usage.

Conclusion: CFF was higher in not exposed to the artificial light from electronic gadgets than subjects exposed to artificial light.

Keywords: *Artificial light, CFF, Sleep, Electronic gadgets.*

Introduction

Global warming and industrialization has affected public health. Modern world has explored a popularity of hand-held digital devices. The advent of electronic devices has significantly impacted on the sleep-wake patterns because of the LED light. Melatonin, which is a hormone produced during dark, helps to regulate & promote sleep. People who do not have enough melatonin of the hormone take longer to fall asleep. Sleep at night is essential for good health. Lack of sleep can affect alertness concentration memory leading to problems at study/work place. Exposure to artificial light from electronics disrupts sleep pattern, causes decreased melatonin and difficulty falling asleep.

The critical fusion frequency (CFF) is the frequency at which a flickering stimulus is perceived to be steady, with higher values suggesting greater perceptual

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accuracy. Measure of CFF has been used to evaluate the processing speed of central nerves system and the coordination between the sensory and the motor systems. So CFF measurement is useful in studying the cognitive function, neurological deficit and also in psychological illness.[1-3] Hence the current study was designed to record CFF among individuals exposed to artificial light from electronics and not exposed individuals.

Materials & Method

The study was conducted in a sample of fifty young healthy subjects exposed to artificial light from electronic gadgets of both sex and fifty young healthy subjects not exposed to artificial light in the age group of 18-38 years. Informed consent was taken from all the participants who volunteered for the study. The study was approved by Institutional Ethical Committee.

Inclusion criteria [Group 1]:

1. Fifty normal healthy subjects of either sex between 18 and 38 years not exposed to artificial light from electronics.

Inclusion criteria [Group 2]:

1. Fifty normal healthy subjects of either sex between 18 and 38 years exposed to artificial light from electronics for more than 2-3hrs a day.

Exclusion criteria [Group 1 & Group 2]:

1. History of consumption of alcohol/smoking.
2. History of depressive disorders in the past.
3. History of sleep disorders
4. Hypertension
5. Diabetes mellitus
6. History of consumption of drugs acting on CNS

Experimental design: The subjects were selected by a detailed history & thorough physical examination. ***CFF*** was measured by delivering gradually increasing frequency of stimuli. The frequency at which stimuli appear continuous was noted. Also gradually decreasing the frequency of the stimulation, the point at which flickers felt was noted. Mean of such six frequencies was considered as CFF.

CFF was measured using an in house built device. This device can lit a Red light emitting diode (5mm) at different frequencies in the range of 10Hz to 60 Hz (Square wave) with the help of software called as 'Sweepgen'. The subject will be seated in front of the module at near vision distance of 25-30 centimeters in a semi dark room. To begin with the test the Red light is made to flicker at low frequency of 10Hz and the subject is asked to prompt when the flickering stops. Now the frequency is gradually increased in steps of 1Hz. The frequency at which the subject is no longer able to discriminate individual flickers and he starts perceiving it as a single stimulus is recorded & reported as CFF. We can try the same in the decrement order of frequency to identify at what frequency he perceives the flicker.[4]

Statistical Analysis:

The results were expressed as mean ± standard deviation (SD). A p value of <0.05 was considered statistically significant. Statistical analysis was performed using the statistical package for social & sciences. Pearson's correlation analysis was carried out between CFF & artificial light.

Results

The present cross sectional study included Fifty normal healthy subjects in the age group of 18-38 and 50 (24.46 ± 3.89) years, who were not exposed to artificial light from electronic devices (Group I) and fifty normal healthy subjects in the age group of 18-38 (24.78 ± 4.01) years who were exposed to artificial light from electronic devices(Group II). CFF was recorded in both the groups. CFF in group I (38.33 ± 0.98) Hz was significantly higher at 95% confidence interval than higher than in group II (36.65 ± 0.71) Hz, $p < 0.001$.

Discussion

Smart mobile phones are a major cause of distraction in adolescents which deranges psychomotor performance and alertness. Light emitting diode (LED) technology is also increasing in popularity in smart phones and has a high flicker index. Our study evaluates the effect of cellular mobile phone use on hand-eye coordination. Critical Flicker Fusion (CFF) measurement is non-invasive and of good reliability in assessing cortical arousal and a good marker of cortical alteration to physical workload.[5] Flickering light has been shown to have detrimental effects in humans. The

advent of electronic devices has significantly impacted on the sleep-wake patterns because of the LED light.

Normal values of CFF range between 35-40Hz.[6] The higher values of CFF suggest greater perceptual accuracy.[7] Previous studies have included CFF as an integral aspect of hazard perception skill which affects psychomotor abilities and therefore predicts risky behavior.[8-9]

Melatonin, which is a hormone produced during dark, helps to regulate & promote sleep. People who do not have enough melatonin of the hormone take longer to fall asleep. The extent of the response of the circadian clock will depend on how bright the light is and how far the device is from the eyes as well as what color of light are being emitted. Sleep at night is essential for good health. Lack of sleep can affect alertness concentration memory leading to problems at study/work place. Exposure to artificial light from electronics disrupts sleep pattern, causes decreased melatonin and difficulty falling asleep.[10]

Conclusion

CFF was higher in not exposed to the artificial light from electronic gadgets than subjects exposed to artificial light. The use of smart mobile phone has detrimental effects on psychomotor skills. The distraction caused by the use of mobile phones is the main reason for the impairment of psychomotor skills while performing any task.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Institutional Ethical Committee

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DOI Number: 10.5958/2320-608X.2019.00117.3

Correlation of Visual Evoked Potentials with Duration of Diabetes in Type 2 Diabetes Mellitus Patients

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Abstract

Introduction: Chronic hyperglycemia of diabetes is associated with dysfunction and failure of various organs, especially the eyes, kidneys, neves, heart and blood vessels. Visual evoked potential (VEP) test evaluates how the visual system responds to light. As it tests the function of the visual pathway from the retina to the occipital cortex, VEP is a useful clinical tool in the diagnosis and documentation of visual impairment in many ophthalmological disorders.

Analysis of pattern reversal VEPs may provide early diagnosis of diabetic changes and determine prognosis during treatment. The visual evoked potential is suggested to be a sensitive indicator of functional changes in the visual processing pathway.

Aims and Objectives: The objective of this study was to establish whether duration of DM has an effect on the VEP measurements, P100 wave latency.

Material and methods: VEP was recorded in 60 type 2 diabetic patients and compared to 60 age and sex matched normal healthy non-diabetic controls. The patients were divided into three groups based on the duration of diabetes.VEP was recorded with a pc based, two channel, RMS EMG EP MK II machine. Comparison between two groups were done using independent Students' 't' test.. One way ANOVA (Analysis of Variance) and multiple comparisons were done using post hoc Tukey Multiple Comparison Test to compare the variables between the three study groups.To determine correlation between variables, Pearson's correlation coefficient was used.The mean difference was statistically significant at $p<0.05$

Result: P100 wave latency was significantly longer in diabetic patients as compared to normal controls ($P<0.001$); There was significant reduction in N75- P100 amplitudes in diabetic subjects($p<0.01$). Duration of diabetes was found to influence the VEP parameters as statistically significant increase in the mean P100 latency with the duration of the disease.(110.2 ± 6.51 ms in group <3 yrs duration of DM , 113.4 ± 5.00 ms in 4-6 yrs duration group, 118.2 ± 4.23 ms in 7-10 years duration group) ($p< 0.01$).On applying, Pearson's correlation coefficient test, significant positive correlation was observed between P100 latency and duration of diabetes. ($r = 0.5803$; $p <0.001$) .

Conclusion: It is concluded that diabetes has effect on the visual pathway and changes in VEP response in diabetic patients are correlated with duration of disease. So, VEP can be used for early diagnosis of diabetic changes of the visual pathway.

Keywords: *Visual Evoked Potential, Type 2 Diabetes Mellitus, P100 wave latency.*

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Introduction

Diabetes mellitus is one the most serious challenges to healthcare, primarily because of the increase in the prevalence of sedentary lifestyles and obesity.[1]

Chronic hyperglycemia of diabetes is associated with dysfunction and failure of various organs, especially the eyes, kidneys, neves, heart and blood vessels.[2]

Visual evoked potential (VEP) test evaluates how the visual system responds to light. As it tests the function of the visual pathway from the retina to the occipital cortex, VEP is a useful clinical tool in the diagnosis and documentation of visual impairment in many ophthalmological disorders.[3]

Functional exploration of the optic pathways with pattern reversal visual evoked potentials (PRVEPs) had been accepted as a non-invasive method of investigation of diabetics. Analysis of pattern reversal VEPs may provide early diagnosis of such diabetic changes and determine prognosis during treatment.[4] The visual evoked potential is suggested to be a sensitive indicator of functional changes in the visual processing pathway. [5]

Aim and Objective

The objective of this study was to establish whether duration of DM has an effect on the VEP measurements.

Material and Method

The study was carried out in the Neurophysiology lab of Department of Physiology, Gandhi Medical College, Bhopal, in collaboration with the Department of Medicine and Department of Ophthalmology, Gandhi Medical College & associated Hamidia Hospital, Bhopal.

The study was carried out on 120 subjects, 60 Type 2 diabetes mellitus patients and 60 non diabetic healthy volunteers matched for age and gender were included in the study to serve as control.

The study included Type 2 diabetes mellitus patients within age group of 40-60 years with duration of DM <10 years.

Following patients were excluded from the study:

Type 2 diabetes mellitus patients with proliferative retinopathy.

Patients with significant occular disorders including cataract, glaucoma, optic nerve disease, best corrected visual acuity <6/9 for distance, amblyopia, vitreous opacities.

Patients suffering from any cardiovascular illness or cardiac autonomic neuronal dysfunction of non-diabetic origin like hypertension.

Patients with prior history of head injury,cerebrovascular accident, h/o migraine, epilepsy.

Medical conditions such as multiple sclerosis and other demyelinating disorders led to exclusion from the study.

Subjects with history of smoking, alcoholism, chronic drug intake.

The patients who satisfied the inclusion and exclusion criterion, and gave written consent were included in the study.

Detailed systemic clinical examination was done on the patient to rule out any other systemic diseases which might lead to effect on VEP and cardiac autonomic functions.

Relevant information was collected using a detailed questionnaire covering all the relevant symptoms and signs pertaining to Diabetes mellitus and autonomic disturbances. On the basis of response obtained the study group was selected.

Detailed history was obtained and recorded from the control and the diabetic groups in the prescribed proforma. It included personal details, habit of smoking, alcohol, family h/o diabetes and hypertension, all types of medications taken, h/o being diagnosed or being treated for diabetes including age of onset, duration, treatment, associated risk factors.

Patients were subjected to VEP test on RMS EMG EP MK-II machine in the Neurophysiology unit of Department of Physiology, Gandhi Medical College, Bhopal.

Pre test evaluation - Participant preparation for PRVEP test

1. The subjects were advised to come without oil or any hair chemical to the scalp.

2. Subjects were also instructed to avoid any mydriatic or miotic drug 12 hours before the test as altered pupil size may change the stimulus luminance thereby affecting the PVEP parameters.

3 Patients were asked to put on their usual glasses during the test.

4. They were instructed to have an adequate sleep the previous night to prevent the effect of drowsiness on the responses.

VEP instrumentation room set-up

Equipment –

VEP was recorded with a pc based, two channel, RMS EMG EP MK II machine -equipped with pattern-shift stimulator television screen, signal amplifier with filters, computer system for averaging.

VEP was performed in a specially equipped electro diagnostic procedure room, made dark and sound attenuated for the test. Subjects were seated comfortably about 100 cm away from a video monitor.

VEP Recording-

A montage consisting of one channel (Oz-Fz) was used for VEP recording. The subjects were made to sit comfortably approximately 100 cm away from the video- monitor which presented a black and white checkerboard pattern with a fixation spot in the centre of the screen (mean luminance 50 candela/m2 and contrast 70%). At the viewing distance of 100 cm, the check edges subtend a visual angle of 15 minutes with video monitor screen subtending an angle of 12.5°. The checks / pattern elements reversed alternately at a rate of twice per second. The bioelectric signal was amplied (gain 20,000), filltered (band-pass, 1-100 Hz), and 150 events free from artifacts were averaged for every trial. Every time the pattern alternates, the subject's visual system generates an electrical response that was detected and recorded by surface electrodes, which were placed on the scalp overlying the occipital and parietal regions with reference electrodes on the midline of frontal region (Fz). Subjects were instructed to fix the gaze on a small red coloured square at the centre of the screen of video monitor. Monocular stimulation was done with an eye- patch covering the other eye.

Electrodes and Electrode Placement -

The recording electrodes were placed on the scalp at the following reference points:

Oz (Occipital region) = Active or recording electrode

Cz (Vertex) = Ground electrode

Fz (Frontal region or forehead) = Reference electrode

Head size measurements were taken from nasion to inion prior to the electrodes placement. To apply the electrodes, conductive electrode paste was applied on the marked electrode locations to make sure a good, stable electrical connection between the scalp and the electrodes was made. Each electrode was pressed firmly onto the scalp with the help of contact paste .Micropore gauze was placed on top of the electrodes to ensure their contact was maintained. The electrode impedance was kept below 5 kΩ.

PRVEP instructions given to participants :

The participants were requested to remain comfortable and relax when viewing the checkerboard screen. They were instructed to maintain a normal blink rate to ensure a clear optical image. Also, if the subject experienced any discomfort he or she was asked to mention it.

The participants were instructed to maintain their focus on the central red coloured block in the centre of the display screen VEP test was started only when the participant confirmed that he or she was comfortable to begin the test.

PVEP waveform and markings --PVEP recording parameters

With the preset stimulus and recording conditions as mentioned above and keeping the electrode impedence <5 kΩ, the recording procedure was started. To verify the reproducibility of the waveform, two responses were recorded and superimposed. Trials were repeated if there was inconsistency of the response.

Statistical methods applied:

Comparison between two groups were done using independent Students' 't' test.. One way ANOVA (Analysis of Variance) and multiple comparisons were done using post hoc Tukey Multiple Comparison Test to compare the variables between the three study groups. To determine correlation between variables, Pearson's correlation coefficient was used.The mean difference was statistically significant at $p<0.05$ and non significant at $p>0.05$.

Results

As compared to control group, values of peak latencies of P100 waves were found to be delayed in diabetic groups.

It was observed that mean P100 latency was 114.27±6.76 ms in diabetic group and 98.79±5.75 ms in control group . The difference was significant between different groups (p<0.001).

The mean N75-P100 amplitude was decreased in the diabetic groups 5.80±1.42 *μV in diabetic group* , while in control group it was 7.45±1.14μV.

Duration of diabetes was found to influence the VEP parameters as statistically significant increase in the mean P100 latency with the duration of the disease.(110.2±6.51 ms in group <3 yrs duration of DM , 113.4 ±5.00 ms in 4-6 yrs duration group, 118.2±4.23 ms in 7-10 years duration group) (p< 0.01).

On applying, **Pearson's correlation coefficient** test, significant positive correlation was observed between P100 latency and duration of diabetes. (r = 0.5803 ; p <0.001) .

Table No. 1: Mean P_{100} latencies and amplitudes in type 2 diabetics and controls

groups	No. of subjects	P100 Latency (MEAN ±S.D.)	P100 AMPLITUDE (MEAN ± S.D.)
DIABETIC	60	114.27±6.76	5.80±1.42
CONTROL	60	98.79±5.75	7.45±1.14

Table : 2: vep test(mean p100 latency) in relation to duration of Dm in study groups

Duration of DM (Yrs)		No. of Cases	P 100 Latency (Mean±SD)	Inference
A	< 3	17	110.2±6.51	F = 26.863
B	4-6	21	113.4±5.00	
C	7-10	22	118.2±4.23	P < 0.01
Total		**60**		

INTERGROUP COMPARISON OF VEP TEST (MEAN P100 LATENCY) IN RELATION TO DURATION OF DM

	A VS B	A VS C	B VS C
P VALUE	<0.05	<0.01	<0.01

Comparison between two groups were done using independent Students' 't' test.. One way ANOVA (Analysis of Variance) and multiple comparisons were done using post hoc Tukey Multiple Comparison Test to compare the variables between the three study groups.

To determine correlation between variables, Pearson's correlation coefficient was used.The mean difference was statistically significant at p<0.05

TABLE 3: PEARSON'S TEST FOR DETERMINING CORRELATION BETWEEN VEP P 100 LATENCY AND DURATION OF DM

Parameter	VEP P100 LATENCY
Duration of DM	r = 0.580
	p< 0.001

Significant positive correlation was observed between P 100 latency and duration of DM with r = 0.580.

Discussion

The present study is conducted to assess and evaluate changes in Visual Evoked Potentials Type 2 Diabetes Mellitus patients in the Department of Physiology and Department of Medicine, Gandhi Medical College, Bhopal. Visual Evoked Potentials of diabetic patients were compared with the control group.

The study was carried out on 60 diabetic patients. The **control group** comprised of 60 healthy age and gender matched individuals. Involvement of optic nerve as an indicator of central neuropathy was assessed by **Visual Evoked Potential.**

The objective of this study was to establish whether duration of DM has an effect on the VEP measurements.

It was observed in the results of this study that duration of DM was associated with abnormalities in VEP P100 latency. Mean P100 latencies increased with duration of diabetes with statistically significant difference ($p<0.01$) between group with duration of DM <3 years and > 7 years. Intergroup comparison between different groups based on duration of diabetes reveal significant difference in mean P100 wave latency. Pearson's correlation coefficient was applied to assess the correlation between P100 latency and duration of diabetes in diabetic patients. A significant positive correlation was found between duration of diabetes and P100 latency. ($r= 0.5803$; $p < 0.001$).

Bhanu R et al. (2012)[6], Chopra D et al. (2011)[7], Dolu H et al. (2003)[8] and Azal O et al. (1998)[9] indicated results similar to those of the present study in that they found a significant positive correlation between the duration of DM and increase in P100 latency.

On the other hand, in various other studies conducted by authors such as **Ismail GM (2014)[10], Heravian J et al. (2012)[11], Ziegler D et al. (1992)[12]and Algan M et al. (1989)[13],** no correlation between P 100 latency prolongation and duration of DM was found.

In **contradiction** to the result of present study, **Rajewski P et al. (2007)[14]** reported no significant correlation between duration of DM and latency of P100.

Conclusion

It is concluded that the changes in VEP response in diabetic patients are correlated with duration of disease. So, VEP can be used for early diagnosis of diabetic changes of the visual pathway. It can be used as noninvasive and valuable test for detecting changes in central visual pathways in diabetics.

Ethical Clearance: The study was approved by the Ethical Committee of Gandhi Medical College, Bhopal

Source of Funding: None

Conflicts of Interest: Nil

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DOI Number: 10.5958/2320-608X.2019.00118.5

The effect of Integrated Amrita Meditation (IAM) Technique on Glycemic Control in Type 2 Diabetes

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Abstract

Objective To determine the effect of Integrated Amrita Meditation (IAM) technique on glycemic control and short term stress response in type 2 diabetic subjects **Study Design** Thirty eligible type 2 diabetic patients were screened and informed about the study. After the initial drop out, ten diabetic subjects between age group of 30 – 60 years who agreed to participate were randomized to IAM and control group **Intervention** Participants in the IAM group practiced the meditation for 23 min/day for duration of three months and the control group participants continued with their daily routines without practicing any form of yoga and/ or meditation **Results** Within group analysis of IAM group showed a statistically significant decrease in weight, BMI, heart rate, systolic BP, fasting blood glucose, HbA1c, cortisol and perceived stress score. Between group analysis showed significant differences in the percentage change for Weight, BMI, Heart rate, Systolic BP, Fasting Blood Glucose, HbA1c,Insulin resistance, Cortisol and PSS from baseline to three months. **Conclusion** Our study shows the efficacy of the technique in bringing about a better glycemic control and psychological stress reduction in type 2 diabetic subjects

Keywords: *Diabetes, IAM, meditation, yoga, insulin resistance*

Introduction

Diabetes Mellitus (T2DM) is one of the major public health concern faced by several countries including India.[1] In India diabetes is approaching the status of a potential epidemic as is evident from the statistics projected by International Diabetes Federation 2015.[2] T2DM specifically is caused due to a combination of insulin resistance and an inadequate compensatory insulin secretory response. In addition factors like aging, obesity and lack of physical activity contribute considerably to the risk of T2DM.[3] This worsens the situation for diabetic patients who end up struggling with infections and lifelong medications to maintain good health. Hence maintaining blood glucose levels under control should be the paramount recommendation for diabetes management[4]

While attempting to integrate diabetes care into daily life, these patients are faced with multiple challenges including psychological and financial burden along with the complex treatment regimens. International Diabetes Federation advocates for evidence based care that is cost effective and is available to all people with diabetes.[5] Hence a logical option for diabetes management along with medication would be to incorporate some modes of life style habits in their daily routine such as increased physical activity and mind – body relaxation techniques in people surviving with diabetes

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In India there is rich history of using yoga to manage T2DM.[6] A number of studies on mind – body therapies such as yoga and meditation have been implicated in diabetes care and management to improve the glycemic control as well as reduce the level of psychological stress among type 2 diabetic patients[4,7]

Integrated Amrita Meditation technique designed by Sri Mata Amritanandamayi Devi lovingly called as "Amma" is a form of meditation that has its roots in Indian Tantric practices.[8] Understanding the potential of IAM technique in stress management [9] a new study was planned on diabetic patients so as to alleviate the stress relating hyperglycaemia and attain a better glycemic control. The objective of the study was to determine the effect of IAM on glycemic control and stress in type 2 diabetic patients. This is the first study of IAM technique on patients

Materials and Method

This is an open labeled, randomized case- control pilot study conducted in Amrita Institute of Medical Sciences. After the initial screening of 30 type 2 diabetic subjects, 10 eligible participants in the age-group of 30 -60 yrs with diabetes of 1-10 years duration and whose HbA1C level ranged between 7 – 10 % were recruited for the study. These patients had not previously undergone any specialized relaxation training and volunteered to participate in the study. Patients diagnosed with advanced diabetic complications - ongoing treatment for retinopathy/ renal impairment/ symptomatic or unstable heart disease / uncontrolled BP were excluded from the study

The subjects were randomly assigned to two groups. Group 1 consisting of Type 2 diabetic patients receiving standard medical care and undergoing IAM technique (Diabetic test group) and Group 2 consisting of Type 2 diabetic patients receiving standard medical care alone and not undergoing any relaxation exercises (Diabetic control group). IAM technique is taught by teachers who are well versed with the technique and approved as teachers by the Mata Amritanandamayi Math. Both the groups continued with the same dietary pattern and there was no change in medication during the study period

The test group patients were asked to report for the meditation class after an overnight fast of 8 – 12 hrs. Height and weight were measured and Body Mass Index (BMI) was calculated. Physiological measurements of heart rate and blood pressure were taken and fasting blood samples collected. Before starting the meditation the subjects were given the psychological questionnaires for rating. We used the standardized Sheldon Cohen's Perceived Stress Scale questionnaire for assessing the stress level of subjects.[10] A self maintained diary would assess their daily compliance on practice. These subjected were then called up to report for the second visit after 3 months and all the baseline parameters were repeated. Biochemical investigations were carried out to determine the level of Fasting Blood Glucose (FBG), HbA1c, Insulin, Cortisol and C Reactive Protein (CRP). The value of Insulin Resistance (IR) was calculated using Homeostatic model assessment (HOMA) formula[11]

Statistical Analysis

Statistical analysis was done using IBM SPSS Statistics 20 Windows. For all the continuous variables, the results are given in Mean±SD and for categorical variables as percentage. To compare the percentage difference of numerical variables between groups, Mann – Whitney U Test was applied for Non – parametric data. Wilcoxon Signed rank Test was applied for within group comparison. A 'p' value less than 0.05 was considered as statistically significant

Results

Table 1 provides the socio demographic characteristics of the study participants. The groups were found to be comparable on the basis of age, sex and BMI. We have used the non parametric test of analysis due to the small sample size. Within group analysis of IAM group at the end of third month showed significant decrease in mean values of Weight, BMI, Heart rate , Systolic BP, FBG, HbA1c and Cortisol. Continuous 3 months of IAM practice within this group had significantly brought down the mean values of weight from 60.60 to 58.60. BMI reduced from 24.14 to 23.36, Heart rate from 77.20 to 71.60, Systolic BP from 138.00 to 112.80, FBG from 132.92 to 122.52, HbA1c from 7.24 to 6.92 and cortisol from 8.74 to 6.70. However no significant change was observed for Diastolic BP, Insulin, Insulin resistance and C Reactive Protein. In case of control group, we observed a significant increase in weight, BMI, FBG and cortisol before and after the IAM intervention for 3 months. All other variables in the control group showed a non significant change (Table 2)

Since the baseline values of the study variables were different, on an average in the two groups comparison between the groups was done based on the percentage changes. Thus, when the percentage differences of variables from baseline to 3 months were compared between IAM and control group, significant changes were observed for Weight, BMI, Heart rate, Systolic BP, Fasting Blood Glucose, HbA1c,Insulin resistance and Cortisol(Table 3)

The Perceived Stress Scale analysis showed a significant drop in stress within IAM participants after 3 months of yoga and meditation. The mean stress score reduced from 22.80 to 18.00 (Table 2), while stress score was not significant in the control group. Between group analyses of PSS again showed a significant change in the percentage difference of total stress score from baseline to 3 months(Table 3)

Table 1: Sociodemographic characteristics of study participants

	IAM (n =5)	**Control (n =5)**	**p value**
Age (years) (mean ±SD)	54.80±9.88	45.60±6.69	0.15 (p>0.05)
BMI (mean ±SD)	24.14 ±1.87	27.13 ±2.60	0.06 (p>0.05)
Gender (Male : Female) (%)	3 : 2 (60 : 40)	2 : 3 (40 : 60)	1.00 (p>0.05)

Table 2: Within Group Analysis

Variables	**Visit (n=5)**	**IAM Mean ± SD**	**P value**	**CONTROL Mean ± SD**	**P value**
Weight(Kg)	Baseline 3 months	60.60 ± 10.64 58.60 ± 10.03	0.03	72.08 ± 6.73 73.20 ± 6.97	0.03
BMI(kg/m^2)	Baseline 3 months	24.14 ± 1.87 23.36 ± 1.76	0.04	27.13 ± 2.60 27.52 ± 2.61	0.04
Heart rate (Beats/min)	Baseline 3 months	77.20 ± 5.58 71.60 ± 6.69	0.04	75.80 ± 9.49 79.80 ± 8.89	0.10
Systolic BP (mmHg)	Baseline 3 months	138.00 ± 17.88 112.80 ± 14.80	0.04	132.60 ± 17.99 132.80 ± 17.29	1.00
Fasting Blood Glucose (mg/dl)	Baseline 3 months	132.92 ± 11.77 122.52 ± 9.32	0.04	120.76 ± 12.75 128.68 ± 16.57	0.04
HbA1c(%)	Baseline 3 months	7.24 ± 0.54 6.92 ± 0.34	**0.04**	7.24 ± 0.88 7.52 ± 1.04	0.06
Fasting cortisol(ug/dl)	Baseline 3 months	8.74 ± 2.73 6.70 ± 1.74	**0.04**	8.40 ± 5.71 9.63 ± 6.16	0.04
PSS	Baseline 3 months	22.80 ± 4.08 18.00 ± 3.31	0.04	22.40 ± 4.87 24.60 ± 3.97	0.14

Table 3: Comparison of percentage change of variables from baseline to three months BETWEEN GROUPS

Variable	IAM GROUP (n=5) Mean ± SD	CONTROL GROUP (n=5) Mean ± SD	P value
Weight(Kg)	3.24±0 .78	-1.53±0.67	**0.008**
BMI(kg/m^2)	3.21±0.75	-1.44 ± 0.56	**0.008**
Heart rate(beats/min)	7.35± 2.55	-5.66±8.97	**0.008**
Systolic BP(mmHg)	17.93±9.20	-0.21±1.82	**0.008**
Fasting Blood Glucose (mg/dl)	7.72 ± 2.14	-6.37± 3.24	**0.008**
HbA1c (%)	4.26±3.04	-3.71± 2.33	**0.008**
Insulin resistance	17.89±15.15	-25.968 ± 32.28	**0.032**
Cortisol(ug/dl)	21.49±14.86	-18.301 ± 15.71	**0.008**
PSS	21.13±1.60	-10.973 ± 12.03	**0.008**

Discussion

The results of the current study have found a significant reduction in FBG and HbA1c in the experimental group after 3 months of intervention. These positive changes in the yoga group are similar to other reports in the literature. In a community based follow up study on adherence to yoga and its resultant effects on blood glucose in type 2 diabetes a significant drop in HbA1c over a period of 3 months was observed in the study participants. In those subjects who continued to practice yoga till the completion of study, Fasting Blood Glucose (FBG) was found to have a negative correlation with their adherence level. The author points out the importance of motivating diabetic patients to undergo lifestyle modification practices so as to achieve a better glycemic control[12]

The exact mechanism by which yoga and meditation reduces blood glucose level, HbA1c and its related risk profiles is yet to be fully understood. However two major pathways have been postulated. First, by reducing the activation and reactivity of the sympatho adrenal system and the hypothalamic pituitary adrenal (HPA) axis and promoting feelings of well-being, yoga may alleviate the effects of stress and foster positive effects on neuroendocrine status and metabolic function. Second, by directly stimulating the vagus nerve, yoga may enhance parasympathetic activity and lead to positive changes in cardiovagal function, mood and energy state[13,14]

In our study the experimental group showed a significant decrease in weigh and BMI after 3 months of IAM practice. The changes in the percentage difference of both these variables from baseline to three months between the two groups were also highly significant in our study. This will further reduce the risk of several complications of type 2 diabetes. A comparative study of yoga and aerobic exercise in obesity demonstrated a highly significant drop in BMI in the yoga practitioners after one year of regular practice[15]

Our result shows that within IAM group there was a significant drop in heart rate in the second visit when compared to baseline. Similar positive findings were observed in a number of studies on Yoga on diabetic subjects as well as on normal subjects.[13,16] Positive impact of IAM technique on heart rate was studied by Vandana Balakrishnan et al and found that the heart rate reduced after 48 hrs onwards in IAM group and that drop was sustained for 8 months.[8] In the current study, the experimental group however showed a

significant decrease in systolic blood pressure after 3 months of practice. From baseline to 3 months when the percentage change in heart rate and systolic BP was compared between the two groups in our study, a statistically significant change was observed for both the variables. A growing body of evidence based on various randomized controlled trial in diabetic subjects have proved the possible improvement in blood pressure, both systolic and diastolic through intervention by Yoga and meditation.[17,18] This may be due to a normalization of autonomic cardiovascular rhythms as a result of increased vagal modulation and/or decreased sympathetic activity and improved baroreflex sensitivity[19]

In our study the level of stress hormone cortisol showed a significant decrease within the test group and significant increase within the control group. The percentage difference in cortisol levels from baseline to three months between the two groups also showed a significant change in our study. Study on the effect of IAM on stress hormones in normal healthy individuals showed that adrenaline reduced in IAM group within 48 hrs, and cortisol decreased significantly after 8 months of IAM practice.[20] In our study we have used the 10 item's Cohen's Perceived Stress Scale for assessing the diabetic subjects stress score. Both sympathetic and parasympathetic nervous system are often postulated as the mechanism through which yoga reduces stress Three months of pranayam training in young volunteers was associated with blunted sympathetic and enhanced parasympathetic activity.[21] We have already started a larger study with a bigger sample size and long term follow up to validate the short term as well as long term effects of IAM technique on type 2 diabetic patients

Conclusion

Meditation is one of the most desirable techniques that help patients achieve homeostasis by optimal functioning of autonomic and endocrine system in the body. Along with medically prescribed regimes, diabetic patients can safely incorporate meditation to their daily therapy to bring about a healthy and stress free life

Conflicts of Interest: The authors declare that they have no conflict of interest

Financial support: This work was supported by Research fund of Department of Endocrinology, Amrita Institute of Medical Sciences

Ethical approval: All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee of Amrita Institute of Medical Sciences and Research Centre

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DOI Number: 10.5958/2320-608X.2019.00119.7

Severity of Cardiovascular Autonomic Neuropathy in Type 2 Diabetes Mellitus Patients : Correlation with Duration of Diabetes

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Abstract

Introduction: Cardiovascular Autonomic Neuropathy (CAN) is one of the most overlooked complications of DM and is clinically important because of its life threatening consequences. CAN results from damage to the autonomic nerve fibers that innervate the heart and blood vessels.

Aims and Objectives The aim of the present study is to assess the correlation between severity of cardiovascular autonomic functions in type 2 DM and duration of diabetes.

Method: The study included 30 cases of type 2 diabetes mellitus without diabetic retinopathy and 30 cases of type 2 diabetes mellitus with non proliferative diabetic retinopathy (NPDR). 60 non diabetic healthy volunteers matched for age and gender were included in the study to serve as control. The study group was classified into 3 groups according to duration of diabetes. All the subjects performed five different autonomic function tests as given by Ewing's and Clarke. The score value was obtained from various tests and a scoring system was applied as recommended by Bellavere F et al (1983).[4] The results obtained were analysed statistically by one-way ANOVA and intergroup comparisons were made using post hoc Tukey multiple comparison test.

Results: The observations suggest that cardiac autonomic function declines in type 2 diabetics and CAN is more in diabetic patients with associated retinopathy The observations revealed that number of patients with autonomic dysfunction was more when duration of DM was long (>7 years) (83.3% in group 1 and 81.2% in group 2). The number of patients with CAN increased with duration of DM.Correlation between disease duration and cardiovascular autonomic score indicates significant positive correlation (r=0.5920).

Conclusion: The cardiac autonomic functions were found to be altered significantly in diabetics. Diabetic patients with longer duration of diabetes showed more severe dysfunction of cardiovascular functions. Hence, Evaluation of cardiovascular reflexes should be included as a routine in the work-up of patients of Type 2 diabetes mellitus.

Keywords: *Diabetes mellitus, Cardiovascular Autonomic Neuropathy, Autonomic function tests.*

Introduction

Neuropathy is one of the most common complications of diabetes. About half of all people with diabetes have some degree of neuropathy, which can be polyneuropathy, mononeuropthy and /or autonomic neuropathy. Cardiovascular Autonomic Neuropathy (CAN) is one of the most overlooked complications of DM and is clinically important because of its life threatening consequences[1]. CAN results from damage to the autonomic nerve fibers that innervate the heart and blood vessels and it causes abnormalities in control of heart rate and vascular dynamics[2].

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The present study was designed to assess the correlation between severity of cardiovascular autonomic functions in type 2 DM and duration of diabetes.

Materials and Method

The study was carried out on 120 subjects, 60 Type 2 diabetes mellitus patients and 60 non diabetic healthy subjects within age group of 40-60 years.

Test group : Diabetes mellitus type 2 patients were grouped as follows:

Group 1: Included 30 cases of type 2 diabetes mellitus without diabetic retinopathy.

Group 2: Included of 30 cases of type 2 diabetes mellitus with non proliferative diabetic retinopathy (NPDR).

Control group:

Group 3: 60 non diabetic healthy volunteers matched for age and gender were included in the study to serve as control.

Type 2 DM patients without retinopathy with duration of DM <10 years.

Type 2 DM patients with non proliferative diabetic retinopathy (NPDR) with duration of DM <10 years.

Following patients were excluded from the study:

Type 2 DM patients with proliferative retinopathy.

Patients with significant occular disorders including cataract, glaucoma, optic nerve disease, best corrected visual acuity <6/9 for distance, amblyopia, vitreous opacities.

Patients suffering from any cardiovascular illness or cardiac autonomic neuronal dysfunction of non-diabetic origin like hypertension.

Patients with prior history of head injury,cerebrovascular accident.

Medical conditions such as multiple sclerosis and other demyelinating disorders led to exclusion from the study.

Subjects with history of smoking, alcoholism, chronic drug intake.

Autonomic Function Tests: [3]

All the subjects performed five different autonomic function tests as given by **Ewing's and Clarke**. These tests are divided into two categories depending on the involvement of sympathetic and parasympathetic divisions of autonomic nervous system.

Tests for parasympathetic functions :

Heart rate response to deep breathing (DBD, deep breathing difference):-

In the sitting position, the subject was asked to breathe quietly and deeply at the rate of 6 breaths per minute (five seconds inspiration and five seconds expiration). After taking baseline recording, continuous ECG (Lead II) was recorded for six cycles with marker to indicate the onset of each inspiration and expiration. The maximum and minimum R-R intervals were measured during each breathing cycle and converted to beats per minute.

The result was then expressed as mean of the difference between maximum and minimum heart rate for six measured cycles in beats per minute.

B. Heart rate response to Valsalva Manouever :-

A baseline ECG (lead II) recording was taken. The subject was asked to blow into a mouthpiece connected to mercury sphygmomanometer at a pressure of 40 mm Hg for 15 sec. At the end of 15 seconds the pressure was released. After taking the baseline ECG, recording was taken during and after the maneuver. The result of valsalva ratio was expressed as the ratio of longest R-R interval after the maneuver to the shortest R-R interval during the maneuver.

C. Heart rate response to standing:-

With the subject lying gently in the supine position baseline blood pressure, heart rate was recorded. The subject was then asked to stand unaided (without support i.e. not leaning against the wall). ECG (Lead II) was recorded continuously. The point of standing was marked on ECG paper.

Heart rate response expressed as the 30:15 ratio was calculated as the ratio between the longest R-R interval at or around the 30th beat and the shortest R-R interval at or around the 15th beat.

Sympathetic Tests

Handgrip dynamometry/grip Test (HGT) –After recording baseline heart rate and blood pressure in sitting position the maximum voluntary contraction was determined using the dominant hand. The subject was then asked to maintain the handgrip with dominant hand at 30% of maximum force for 4 minutes. The changes in blood pressure during handgrip were recorded on contralateral arm .

Change in diastolic blood pressure is calculated as the difference between highest DBP during the tests and basal DBP.

Blood pressure response from lying to standing (orthostatic test) : The blood pressure was recorded after 5 minutes of rest in supine position. The subject was instructed to attain standing posture without any support within 3 seconds and blood pressure was recorded within 30 seconds of standing up, then at 1st, 2nd, 3rdand 5th minutes. The difference in systolic blood pressure between supine and standing BP levels is taken as the measure of postural blood pressure change.

NORMAL AND ABNORMAL VALUES OF VARIOUS CARDIOVASCULAR REFLEX TESTS [3]

Type of Tests	Cardiovascular Reflex Tests	Variables	Normal	Borderline	Abnormal
Parasympathetic Tests	Valsalva Maneuver	Valsalva Ratio	≥ 1.21	1.11-1.20	≤ 1.10
	HR Response to Standing	(30:15 ratio)	≥ 1.04	1.01-1.03	≤ 1.00
	HR response to deep breathing	DBD (beats/min)	≥ 15	11-14	≤ 10
Sympathetic Tests	Handgrip Test	Increased DBP (mm of Hg)	≥ 16	11-15	≤ 10
	Orthostatic Hypotension	Fall in SBP (mm of Hg)	≤ 10	11-29	≥ 30

CARDIAC AUTONOMIC NEUROPATHY SCORING

1. Categorization as per Ewings and Clarke criterion:-[3]

The participants are subjected to five non-invasive autonomic function tests as recommended by Ewing's criterion .

For grading of cardiovascular autonomic function, results are classified into normal, borderline and abnormal (scores 0, 0.5 and 1 respectively).

Overall scores are categorized as:

Normal: all five tests normal or one borderline.

Early involvement: one of the three heart rate tests abnormal or two borderline.

Definite involvement: two or more of the heart rate tests abnormal.

Severe involvement: two or more of the heart rate tests abnormal plus one or both blood pressure tests abnormal or both borderline.

Categorization as per Bellavere' s criterion

Bellavere F et al. (1983)[4] have given a scoring system to determine severity of CAN. According to this , score 0, 1 and 2 are assigned for each test as shown below :

0: normal result

1: borderline result

2: **abnormal result**

Therefore, a total score of 0-10 was obtained for each patient who underwent the standard battery of all five tests.

CAN Scoring System :-

The score value was obtained from various tests

and a scoring system was applied as recommended by Bellavere F et al (1983).[4]

The sum of the score obtained from each test determines the degree of autonomic involvement. Classification of patients was done according to the total score.

CAN Scoring System : Grading of Cardiac Autonomic Neuropathy

CAN Score	Categories
0-1	No autonomic neuropathy
2-4	Early autonomic neuropathy
5-10	Severe autonomic neuropathy

The results obtained were analysed statistically by **one-way ANOVA** and intergroup comparisons were made using **post hoc Tukey multiple comparison test** to compare the variables between the groups.

Results

Table : 1: Distribution of patients according to can scoring system

CAN Score	Categories	Group -1 (n=30)		Group -2 (n=30)	
		No. of Patients	%	No. of Patients	%
0-1	No CAN	13	43.3%	8	26.6%
2-4	Early CAN	10	33.3%	9	30%
5-10	Severe CAN	7	23.3%	13	43.3%
Total		**30**		**30**	

TABLE : 2: Comparison of mean of can score in the study groups

Groups	Mean±SD	P Value
Group-1	2.9±2.91	F = 43.712 P < 0.01
Group-2	5.0±3.698	
Control	0.20±8.408	

TABLE : 3: INTERGROUP comparison of mean can score BETWEEN different groups

	Group-1 Vs Group-3	Group-2 Vs Group-3	Group-1 Vs Group-2
P Value	< 0.01	< 0.01	< 0.01

The above table shows that there was a significant increase in autonomic score in groups 1 and 2 when compared to group 3.

Autonomic score were significantly increased in both the diabetic groups (P<0.01).

The observations suggest that cardiac autonomic function declines in type 2 diabetics and CAN is more in diabetic patients with associated retinopathy.

Table : 4: Distribution of cases with respect to duration of diabetes and cardiac autonomic neuropathy

Duration of DM	Group-1 (n=30)					Group-2 (n=30)				
	Total	CAN				Total	CAN			
		PRESENT		ABSENT			PRESENT		ABSENT	
		N	%	N	%		N	%	N	%
0-3	13 (43.33%)	4	30.7%	9	69.2%	4 (13.33%)	1	25%	3	75%
4-6	11 (36.66%)	8	72.7%	3	27.2%	10 (33.33%)	8	80%	2	20%
7-10	6 (20%)	5	83.3%	1	16.6%	16 (53.33%)	13	81.2%	3	18.7%
Total	**30**	**17**		13		30	22		8	

The observations revealed that number of patients with autonomic dysfunction was more when duration of DM was long (>7 years) (83.3% in group 1 and 81.2% in group 2). The number of patients with CAN increased with duration of DM.

Table 5: **Pearson's correlation between duration of dm and cardiovascular autonomic function tests score**

Parameter	Total CAN Score
Duration of DM	r = 0.5920
	p = < 0.001

Correlation between disease duration and cardiovascular autonomic score indicates significant positive correlation.

Discussion

In the present study grading of CAN was done on the basis of scoring system as recommended by Bellavere F et al. (1983)[4] as normal (score 0-1), early autonomic neuropathy (score 2-4) and severe autonomic neuropathy (score 5-10).

TABLE 1 shows distribution of patients according to CAN scoring system.

33.3% patients had early CAN and 23.3% had severe CAN in group1 while the number of patients with early CAN was 30% and 43.3% had severe CAN in group 2.

It is observed that majority of the patients with severe CAN (score 5-10) were in group 2 (43.33%, 13/30) whereas number of patients with no CAN (score 0-1) was more in group 1 (13/30, 43.33%) as compared to group 2 (26.66%, 8/30).

Our findings are in conformity with the findings of **Smith SE et al. (1981)**[5] and **Krolewski AS et al. (1992).**[6] They suggested that severity of autonomic neuropathy is more in patients with associated diabetic retinopathy.

Nayak UB et al. (2013)[7] in their study found 40% of patients had no CAN, 20% had early CAN and rest 20% had severe CAN.

Mathur CP et al. (2006)[8] reported 58% CAN among diabetics including 20% had early CAN**,** 30% having definite CAN & 8% had severe CAN. Another study by **Ahire C et al. (2014)**[9] reported severe CAN as 20%. Early and definite cardiac dysautonomia was present in 33.3% and 23.3% respectively.

Mean and SD of autonomic score in the study groups are shown in TABLE 2. There was significant increase in autonomic score in diabetics group when compared to controls ($p< 0.01$) (TABLE 3) . Our results are consistent with previous studies.

Similar findings were reported by **Nayak UB et al. (2013)**.[7] They found mean CAN score as 2.04 in diabetic patients. **Roy TM et al. (1989)**[10]found the mean CAN score in diabetic males to be 2.11.Similar observations were reported by **Noronha JL et al. (1981)**[11]

Basu AK et al (2010)[12] found retinopathy in 10% of the study population who also had CAN.

TABLE 4 shows that the percentage of patients affected by CAN was increased with a longer duration of diabetes.

Most of the patients with longer duration of diabetes (>7 yrs) had CAN (5/6, 83.3 % in group 1 ; 13/16 , 81.2 % in group 2)..

A similar finding was obtained by **David CL et al. (2012)**[13] who reported an increase in CAN prevalence as the duration of diabetes is prolonged.

The relation of CAN prevalence with diabetes duration could be explained by the prolonged exposure to the metabolic abnormalities as the duration of diabetes increases **(Vinik AI et al. , 2003)**.[14] Furthermore, increased concentration of oxidative stress may also play a role **(Schmidt MI et al. , 2005; Hoeldtke RD et al. , 2011)**.[15,16]

TABLE 5 shows correlation of total CAN score with duration of diabetes. In the present study, a **positive correlation** between duration of DM and presence of cardiac autonomic neuropathy was found which was significant ($r= 0.5920$; $p < 0.001$).

We observed that CAN was associated with increase in duration of DM. A moderate correlation between duration of diabetes and CAN was found in our study.

Similar observations were reported by **Toyry JP et al. (1996)**.[17]

Nayak UB et al. (2013)[7], **Noronha JL et al. (1981)**[11] found increasing CAN score with duration of diabetes but their observation was not statistically significant.

Conclusion

Duration of diabetes affects the occurrence of cardiovascular autonomic dysfunction. Diabetic patients with longer duration of diabetes showed more severe dysfunction of cardiovascular functions. Hence, Evaluation of cardiovascular reflexes should be included as a routine in the work-up of patients of Type 2 diabetes mellitus.

Ethical Clearance: The study was approved by the Ethical Committee of Gandhi Medical College, Bhopal

Source of Funding: None

Conflicts of Interest: Nil

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DOI Number: 10.5958/2320-608X.2019.00120.3

Study of Inflammatory Biomarker (PARC/CCL 18) in Chronic Obstructive Pulmonary Disease and its Correlation with Disease Severity in South Indian Population

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Abstract

Aim: Our recent studies have shown that inflammatory biomarker (PARC/CCL 18) in chronic pulmonary disease and its correlation with disease severity in south Indian population. Chronic obstructive pulmonary disease (COPD) is a lung disease characterised by chronic obstruction of lung airways which is not entirely reversible. Pulmonary and activation-regulated chemokine ligand-18(PARC/CCL18) is a 7-kD protein that is constitutively expressed by monocytes/macrophages and dendritic cells and is secreted predominantly in the lung. It is a promising inflammatory marker in COPD. **Material and Method:** This was a Descriptive study conducted in 130 male COPD patients. It was designed to assess the specific inflammatory marker and study their relationship with disease severity levels in male COPD patients. **Results:** inflammatory biomarkers of Pulmonary and activation regulated chemokine ligand-18 levels were significantly ($P<0.003$) increased in very severe COPD patients when compared with mild, moderate and severe COPD patients. **Conclusion:** From the present study, we conclude that in COPD specific biomarker serum PARC/CCL18 associated with disease severity

Keywords: *Chronic obstructive pulmonary disease, Pulmonary and activation regulated chemokine ligand-18, lung*

Introduction

Chronic obstructive pulmonary disease (COPD) is a lung disease characterised by chronic obstruction of lung airways which is not entirely reversible.[1] According to WHO, the burden of COPD is 65 million around the world.[2] COPD was predicted to be the third most common cause of death by 2020.[2]In India, burden of COPD -14.84 million, out of which 2 to 22% are men and 1.2 to 19% are women.[3,4]

The gold standard investigation for diagnosis of COPD is Spirometry.[5-7] But, in India, most of the epidemiological studies use symptoms and self-reported questionnaires for the screening of COPD patients.[4]These are subjective and nonspecific methods having large failure rates and will lead to under diagnosis of COPD.[8, 9]

Cigarette smoking is considered as a significant risk factor of COPD in 50-70% of patients.[10] Studies proved that non-smokers also develop COPD & may account for one third of all COPD cases.[11-13] In India 68.6% COPD patients are Non- smokers.[13] Secondhand smoke exposure (SHS) believed to be the essential cause for COPD in nonsmokers.[14] In India, Smoking index & Questionnaires were commonly used to assess smoking status of COPD patients but these can't measure SHS and Passive smoking which cause COPD in nonsmokers.[15,16] So COPD in non-smokers go often undiagnosed in India which make them vulnerable to COPD induced morbidity and mortality.

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Most of the studies used inflammatory biomarkers such as C - reactive protein (CRP), Fibrinogen, Interleukin -6 (IL-6) & TNFα to assess cardiovascular risk in COPD.[31] The use of these inflammatory biomarkers may be limited in COPD because they are secreted also by non-pulmonary organs such as the liver and the bone marrow. Hence these inflammatory markers are not specific to COPD.

Pulmonary and activation-regulated chemokine ligand-18(PARC/CCL18) "is a 7-kD protein that is constitutively expressed by monocytes/macrophages and dendritic cells and is secreted predominantly in the lungs".It is a promising inflammatory marker in COPD.[37] In COPD, PARC levels found to be increased, in association with reduced FEV1 and was also found to be associated with acute exacerbations. PARC was found to be independently associated with lung function, cardiovascular morbidity and mortality associated with COPD.[17]

Hence in the present study, specific inflammatory markers of PARC/CCL18 levels were assessed, and their relation with disease severity was studied.

Materials & Method

Study Design: This was a Descriptive study conducted in 130 male COPD patients. It was designed to assess the cardiac autonomic functions, specific inflammatory marker and serum cotinine levels and study their relationship with disease severity and also to find the association of cardiac autonomic function, the specific inflammatory marker with serum cotinine levels in male COPD patients. The study was conducted in Department of Physiology, JIPMER in Collaboration with Department of Pulmonary Medicine, JIPMER. Before the start of the study, approval from JIPMER scientific advisory committee and Institute ethics committee for human studies were obtained. In the study group, biochemical parameters of PARC/CCL18 were studied. Later they were classified into four subgroups based on GOLD stage criteria into mild, moderate, severe and very severe COPD.

Selection of Subjects:

Male COPD patients attending JIPMER Pulmonology OPD who come under Inclusion and exclusion criteria were included in the study. Subjects were health educated about the disease and are motivated to know their Disease severity & Cardiovascular risk associated with their Disease.

Experimental Design:

The study was carried out in pulmonary function testing laboratory, and autonomic function testing laboratory in Department of Physiology, JIPMER between 9 am to 1 pm. The laboratory conditions were quiet, the temperature of 25-27* C and adequate lightening provided. The study involved minimal invasive procedure of collecting 5 ml blood. The subjects were explained clearly about study protocol in their native language and written informed consent was obtained from them. The participants were asked to have light Breakfast around 7 am and come for tests around 9 am as the subjects will have difficulty in performing PFT and CAFT with the full stomach. The subjects were told to refrain from smoking, drinking caffeinated beverages and the morning dose medications for COPD at least 12 hours before the recording. In case of any adversity in health, such as fever, exacerbation of COPD, poor sleep or physical discomfort, tests were postponed, and the subjects were asked to report on another convenient day. Subjects were also asked to stop taking medications affecting their attention like psychotropic drugs (sedatives & antihistaminics).

Statistical Analysis of Data

SPSS version 19 was used for statistical analysis. The data were subjected to Kolmogorov-Smirnov normality test. The continuous data such as age, duration of illness, anthropometric parameters (Ht, Wt, WC, HC, WHR, WhtR), heart and blood pressure were expressed as mean with standard deviation and the intergroup differences in mean between mild, moderate, severe and very severe COPD groups were compared using Oneway ANOVA test, for normally distributed data. The difference was considered statistically significant if probability of chance was less than 0.05

Results

After obtaining approval from the JIPMER Scientific Advisory Committee (JSAC) and the institutional Ethics Committee for human studies, the study was conducted on 130 male COPD patients based on inclusion and exclusion criteria. Further, they were subgrouped into mild, moderate, severe and very severe COPD groups based on Gold stage criteria.

All the anthropometric, PFT, AFT, BRS, and biochemical parameters were assessed in 130 COPD patients after obtaining informed consent from them, and the data were analysed.

Comparison of parameter among different stages of COPD:

Biochemical parameters:

Comparison of PARC/CCL18 levels among patients in different COPD severity groups was done using Kruskal- Wallis test and the post – hoc (Dunn's) test was performed to find the significant difference among the groups

Serum PARC/CCL18 levels were significantly high (Table 1)(Figure 1) in very severe, severe and moderate COPD patients when compared to mild COPD patients.

Table: 1 Comparison of Biochemical parameters among COPD patients

Biochemical parameters	Total (n=130)	Mild COPD (n=18)	Moderate COPD (n= 41)	Severe COPD (n= 44)	Very severe COPD (n= 27)	P value*
PARC/CCL 18	50.50(22)	43.66 (12)	46.21 (19.23)	54.62 (24.34)	61.98 (30.77)	0.003

Values are expressed as Median (Interquartile range); Comparison of variables between groups done using Kruskal Wallis Test

*p<0.05 is statistically significant among the four groups of COPD

PARC/CCl-18: Pulmonary and activation regulated chemokine ligand-18 (ng/ml)

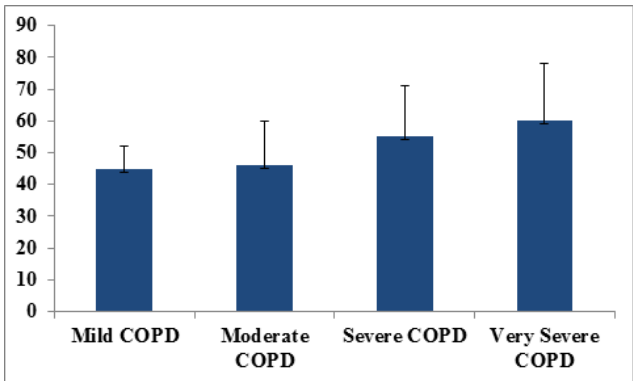

Figure.1. Comparison of PARC/CCL18 (ng/ml) among COPD patients

Discussion

This study was conducted in pulmonary function testing laboratory and autonomic function testing laboratory in Department of Physiology in collaboration with department of pulmonary medicine from January 2016 to July 2017. 130 male stable COPD patients without any major systemic illness were recruited for the study. Biochemical parameters such as PARC/CCL18 were studied in them. Later they were classified into four subgroups based on GOLD stage criteria into mild, moderate, severe and very severe COPD.

In our study, Serum PARC/CCL18 a COPD specific inflammatory biomarker was used to assess cardiovascular risk in COPD patients. We had assessed the levels of PARC/CCL18 in COPD patients and got the mean PARC/CCL18 concentration as 50.50 ng/ml.

We found that the levels of PARC/CCL18 significantly increased (p<0.05) in very severe, severe and moderate COPD patients when compared to mild COPD patients. These results were in accordance with Lung health study (LHS) and ECLIPSE study. [17] We observed the levels of PARC/CCL18 were high in COPD patients and also associated the levels of PARC/CCL18 levels with total mortality caused by COPD. A study done by Asli Gorek Dilektasli et al. found increased levels of PARC/CCL18 in COPD patients and associated the levels of PARC/CCL18 with exacerbation of COPD. They found that patients with PARC/CCL18 more than 181.71ng/ml could differentiate COPD patients with hospitalised exacerbations from those who were not hospitalised and concluded that PARC/CCL18 is a promising biomarker for COPD.[18]

Increased levels of PARC/CCL18 in COPD patients suggested that there is persistent inflammation exists in patients with COPD. These findings support that there is a link between increased sympathetic activity and

inflammation caused by COPD.

Conclusion

From the present study, we conclude that in COPD patients, as the disease severity increases, the levels of PARC/CCL18 were also increased. Inflammatory biomarker of serum PARC/CCL18 associated with COPD disease severity.

Conflict of Interest – No

Source of Funding - Self source

Ethical Clearance– Yes

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DOI Number: 10.5958/2320-608X.2019.00121.5

Forced Vital Capacity Parameters in Tibetan Youths Born and Residing in India

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Abstract

Background and Objective -There is evidence of considerable variation in pulmonary functions in different ethnic groups, between races and across generations attributed to genetic factors leading to the formation of airways of different size or with different elastic recoil. This study was aimed to evaluate and compare pulmonary functions between Tibetan males with Indian origin and young Indian males.

Materials and Method- Forced Vital Capacity parameters (measured using spiroanalyser SPL -95) of 50 Tibetan males aged 20-30 years born and brought up in Mundgod, North Karnataka District, were compared with 50 Indian males matched for age, sex, height and weight as controls. The obtained data was analyzed between the two groups by applying unpaired student's 't' test.

Results -The anthropometric data between the two groups showed no statistical significant difference. The FVC (litres), FEV_1(L/sec) and FEV_1/FVC were higher in Tibetan males with Indian origin when compared to Indian males being statistically significant at $P<0.001$ [95% CI(0.79,1.08), (0.87, 1.20) and (0.02,0.06) respectively]. Flow rates [MMEF (L/sec), $MEF_{75\%}$(L/sec) and $MEF_{50\%}$(L/sec)] were higher in Tibetan males as compared to Indian males. MMEF was statistically significant at $P<0.01$[95% CI (0.24, 1.17)] , $MEF_{75\%}$ and $MEF_{50\%}$ were statistically significant at $P<0.001$ [95%CI (2.13, 3.73) and (0.43, 1.51) respectively]. The $MEF_{25\%}$ was lesser in Tibetan males than compared to Indian males but was not statistically significant.

Conclusion - There is a difference in lung functions between Tibetan youths with Indian origin and Indian youths though both share similar environmental challenges showing that Tibetan males with Indian origin still retain better respiratory parameters as their ancestors which could be due to their inheritance of genetic factors that favour their survival at a high altitude.

Keywords- *Tibetan males with Indian origin, Indian males , pulmonary function, environmental factors.*

Introduction

Pulmonary function testing measures the function of lung capacity and chest wall mechanics to determine whether or not the patient has a lung problem[1]. A person's genetic constitution influences the size of lungs. Additional variation is contributed by selective migration, nutrition, habitual activity and other environmental factors. Together these factors give rise to ethnic differences in lung volumes and related indices between people[2]. Tibetans are the oldest population living permanently at high altitude (4000m)[3]. Previous research has shown that Tibetans living at high altitude have superior pulmonary functions[4]. Pulmonary gas exchange functions such as lung volumes and diffusing capacity may be more strongly influenced by environmental and developmental components[5]. In the early 1960s (52 yrs back), Tibetans had come to India as refugees for political shelter. Present Tibetan youths of this study have been born and brought up completely in India since then. There are very few studies in India which have thrown

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light on this subject. These factors have made us to study respiratory volumes and capacities in these Tibetan young males with Indian origin and to compare the data with other young Indian males.

Materials and Method

A comparative study was conducted on 50 healthy Tibetan young males with Indian origin aged 20-30 years born and residing in Mundgod, North Kannada District, Karnataka and 50 other young Indian males, (students of Karnataka Institute of Medical Sciences, College, Hubli) matched for age, sex, height and weight as controls. This study was carried out during June 2011 to May 2012.

In the present study visits were made to Mundgod to sensitize the Tibetan youths regarding objectives of the present study. This study was carried out at DTR (Doeguling Tibetan Resettlement) hospital, Mundgod. Assistance of local doctors and technician was obtained to inform the details of the tests to Tibetan youths in their own language.

The study and its conduct were cleared from institutional research and ethical committee. The prior permission of subjects and controls were taken and an informed written consent from the youths involved in the study were obtained. A detailed Performa was filled up for both subjects and controls and a thorough clinical examination of each subject was done to rule out any significant findings coming under the exclusion criteria.

About 75 Tibetan young males with Indian origin had come forward amongst which 50 were randomly selected on the basis of following inclusion and exclusion criteria. Similarly height and age matched 50 young Indian males, (students of medical college KIMS, Hubli), were involved as controls in the present study.

Inclusion criteria:

Healthy young Tibetan males born and residing in India and never migrated to Tibet or to any other high altitude regions.

Exclusion criteria:

Youths born in India but travelled to Tibet or to any other high altitude regions.

History of smoking.

History of occupational hazards / exposure to dust (particulate matter).

History of COPD and obstructive sleep apnoea syndrome.

History of congenital cardiopulmonary diseases.

History of Diabetes Mellitus, Hypertension.

History of medications like antihypertensive, antitubercular drugs.

History of addiction to narcotics.

Age less than 20yrs and more than 30yrs.

History of allergy and any bone deformity of chest and spine.

Anthropometric data like height, weight, body surface area (BSA) and body mass index (BMI) of each subject and control was recorded. BSA was calculated using Dubois nomogram. BMI was calculated using the formula BMI=Weight in kg / Height in metre^2. Vital parameters like pulse rate, blood pressure and respiratory rates were recorded. A detailed clinical examination of respiratory, cardiovascular and central nervous system was done.

Evaluation of forced respiratory parameters and flow rates such as Forced Vital Capacity (FVC), Forced Expiratory Volume in 1st second (FEV_1), Maximal Mid Expiratory Flow Rate (MMEFR), Maximal Expiratory Flow Rate at 75% FVC ($MEF_{75\%}$), Maximal Expiratory Flow Rate at 50% FVC ($MEF_{50\%}$) and Maximal Expiratory Flow Rate at 25% FVC ($MEF_{25\%}$) were carried out on both the groups by using Spiroanalyser SPL-95.The instrument was calibrated daily using calibration syringe of 2 litres. The obtained data was tabulated, analysed and expressed as Mean ± Standard Deviation (Mean ± SD) to assess anthropometric, vital and various Pulmonary Function Test parameters in the 2 groups. In order to compare the level of PFT parameters between the two groups, the unpaired student's 't' test was applied by using SPSS version 16 and statistical significance was indicated by 'P' value less than 0.05 ($P < 0.05$) at 95% confidence intervals (95% CI).

Procedure-The sensor was kept on the stand and the FVC key pressed. The subject was asked to keep the mouthpiece in mouth taking care to avoid obstruction by tongue. The start button was pressed and subject

was asked to take a maximum inspiration followed by forceful expiration and then followed by maximum inspiration after which the stop button was pressed. The screen displays values and graphs representing FVC, FEV_1, MMEF, $MEF_{75\%}$, $MEF_{50\%}$, $MEF_{25\%}$. The best one of the three tests was used as observed value.

Results

In the present study the anthropometric data [age in years, height in cms, weight in kgs, BMI in kg/m^2 and BSA in sq.m] of Tibetan males with Indian origin when compared to Indian males showed that the mean and standard deviation observed was not significant statistically ($P > 0.05$) [95 % CI (-0.25, 2.61), (-1.86, 3.22), (-2.84, 5.40), (-0.91, 1.53) and (-0.10, 0.02) respectively]. (Table No-I)

The vital parameters [respiratory rate (breaths/min), pulse rate(beats/min), systolic blood pressure (mmHg) and diastolic blood pressure (mmHg)] of Tibetan males with Indian origin and Indian males showed that the mean and standard deviation observed was statistically significant in Tibetan young males with Indian origin [95% CI (0.42,2.50), (1.39, 4.88), (-0.39, 4.15) and (-4.29, -0.26) respectively] except for systolic blood pressure which was not statistically significant. (Table No-II)

The forced vital capacity parameters [FVC (litres), FEV_1(L/sec) and FEV_1/FVC] were higher in Tibetan males with Indian origin when compared to Indian males being statistically significant at $P<0.001$ [95% CI(0.79,1.08), (0.87, 1.20) and (0.02,0.06) respectively]. (Table No-III)

Flow rates [MMEF (L/sec), $MEF_{75\%}$ (L/sec) and $MEF_{50\%}$ (L/sec)] were higher in Tibetan males with Indian origin as compared to Indian males. MMEF being statistically significant at $P <0.01$[95% CI for MMEF(0.24, 1.17)], but $MEF_{75\%}$ and $MEF_{50\%}$ being statistically significant at $P <0.001$ [95% CI for $MEF_{75\%}$ and $MEF_{50\%}$ were (2.13, 3.73) and (0.43, 1.51) respectively]. The $MEF_{25\%}$ was lesser in Tibetan males with Indian origin than compared to Indian males but this was not statistically significant [95% CI (-0.42, 0.27)].(Table No-III)

Discussion

Although our subjects in the present study were well matched for age, body size and nutritional condition, we observed that the values of FVC, FEV_1, FEV_1/FVC, MMEF, $MEF_{75\%}$ and $MEF_{50\%}$ in Tibetan young males with Indian origin were significantly higher than those in the young Indian males. The flow rates indicate the patency of smaller airways.

FVC is an important index of pulmonary function.[6] Increase in FVC may be due to the relative increase in the negativity of the intrapleural pressure which may be brought about by an increased expansion of thoracic cavity by muscles of respiration.[7] The difference in FVC and FEV_1 between Tibetan refugees and Caucasians was related to differences in height between the 2 groups.[8] Recent studies confirm that FEV_1, exhibit systemic differences between ethnic groups.[9] One of the study concluded that higher PFT values in Tibetan youths are due to their having a greater alveolar surface area and increased capillary surface volume and a greater capacity in their O_2 transport system.[9] A study observed that Tibetans born at low altitude do not seem to differ from lowlanders with regard to their metabolic responses whereas their ventilatory response to exercise is greater.[10] One of the studies comparing Tibetans and Caucasians observed that Tibetan lowlanders born with genetic adaptations of their ancestors, could be expected to acclimatize to high altitude more quickly than Caucasians.[11] Another study found that there was no statistically significant difference in pulmonary functions between Tibetan refugees and Caucasians living at moderate altitude.[5] Tibetan lowlanders born with genetic adaptation of their ancestors could be expected to perform better cardiorespiratory parameters. Tibetan lowlanders are characterised by smaller muscle fibre cross- sectional area, this adaptive change may result in a shorter diffusion path for oxygen at the muscular level.[11] In one study it was found that there is an association between genetic ancestry and lung functions among subjects who identified themselves as African Americans.[12] A study showed that improved pulmonary functions indicate that there could be a change in the compliance of the lungs and a possible increase in surfactant levels.[13] Another study provided the data which indicates that growth at high altitude produces small to moderate increase in lung volumes (about 6%) relative to genetically similar groups growing up at low altitude[14]. This indicates that environmental factors have interfered in the lung function test values of Tibetan young males with Indian origin. Ancestors

of the Tibetans youths of our study had been living at high altitude since birth, whereas Indian youths of our region were born at sea level. Lung functions are influenced by chest wall anatomy, mechanical properties of the thorax, parenchymal lung development and current body mass index.[15] More precise information is also needed regarding the genetic factors underlying the characteristics of ventilatory functions of Tibetan youths.[16]

Conclusion

The pulmonary function parameters such as FVC, FEV_1, FEV_1/FVC, MMEF, $MEF_{75\%}$ and $MEF_{50\%}$ showing significantly higher values in Tibetan males with Indian origin compared to Indian males may be due to stronger forces of contraction of the respiratory muscles, high compliance, mechanical properties of thorax and better parenchymal lung functions. Though Tibetan young males with Indian origin of our study were born and brought up in India and never migrated to Tibet or any other high altitude regions, most of the pulmonary function test values are found higher in them. Though both Tibetan young males with Indian origin and other young Indian males shared similar environmental challenges, this difference in PFT could be attributed to genetic component. These genetic effects on pulmonary function tests may be obscured after some years because of environmental conditions existing in their camps. Environmental factors (staying at sea level) just like that of other young Indian males have not made their impacts on effects on the lung function tests of Tibetan young males with Indian origin that are genetically inherited. Therefore it is required to evaluate the role of genetic versus environmental factors in the genesis of better lung function tests in Tibetan young males with Indian origin.

Table No-I: The anthropometric data of Tibetan young males with Indian origin and other young Indian males

	Tibetan young males with Indian origin	**Young Indian males**	**'t' value**	**(95% CI)**
No. of Subjects	50	50		
Age (years)	25.58 ± 4.11	24.40 ± 3.00	1.63	(-0.25, 2.61)
Height (cms)	169.70 ± 6.68	169.02 ± 6.14	0.53	(-1.86, 3.22)
Weight (kgs)	66.30 ± 11.58	65.02 ± 9.06	0.615	(-2.84, 5.40)
BMI (kg/m^2)	23.00 ± 3.66	22.69 ± 2.38	0.49	(-0.91, 1.53)
BSA (sq.m)	1.72 ± 0.15	1.75 ± 0.17	-1.10	(-0.10, 0.02)

*P < 0.05, **P <0.01, ***P<0.001

P-value: P < 0.001 HS Highly significant, P 0.01 to 0.05 S Significant, P > 0.05 NS Not significant

Table No-II: The vital data of Tibetan young males with Indian origin and other young Indian males

	Tibetan young males with Indian origin	**Young Indian males**	't' value	(95% CI)
No. of Subjects	50	50		
RR(per min)	16.64 ± 2.84**	15.18 ± 2.37	2.78	(0.42, 2.50)
Pulse (beats/min)	78.34 ± 4.77***	75.20 ± 3.98	3.57	(1.39, 4.88)
SBP (mmHg)	122.60 ± 5.33	120.72 ± 6.08	1.64	(-0.39, 4.15)
DBP (mmHg)	77.48 ± 4.56	79.76 ± 5.53*	-2.24	(-4.29, -0.26)

*P < 0.05, **P<0.01 and ***P<0.001

P-value: P < 0.001 HS Highly significant, P 0.01 to 0.05 S Significant, P > 0.05 NS Not significant

Table No- III: Comparison of forced vital capacity parameters and flow rates between Tibetan young males with Indian origin and other young Indian males

Variables	Tibetan young males with Indian origin	Young Indian males	't' value	(95% CI)
No. of Subjects	50	50		
FVC (Litres)	4.59 ± 0.40***	3.65 ± 0.34	12.66	(0.79, 1.08)
FEV_1 (L/sec)	4.17 ± 0.49***	3.13 ± 0.31	12.64	(0.87, 1.20)
FEV_1 / FVC	0.90 ± 0.04***	0.85 ± 0.04	5.18	(0.02, 0.06)
MMEF (L/sec)	4.14± 1.38**	3.43 ± 0.93	3.00	(0.24, 1.17)
$MEF_{75\%}$ (L/sec)	7.28 ± 2.26***	4.34 ± 1.70	7.31	(2.13, 3.73)
$MEF_{50\%}$ (L/sec)	4.80 ± 1.54***	3.82 ± 1.15	3.59	(0.43, 1.51)
$MEF_{25\%}$ (L/sec)	2.30 ± 1.05	2.38± 0.67	-0.44	(-0.42, 0.27)

*P < 0.05, **P<0.01, ***P<0.001

P-value: P < 0.001 HS Highly significant, P 0.01 to 0.05 S Significant, P > 0.05 NS Not significant

Conflict of Interest –Nil

Source of Funding- Self Funding

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DOI Number: 10.5958/2320-608X.2019.00122.7

Introduction of Concept Mapping as an Innovative Tool to Enhance Learning Outcome in the Medical Students

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Abstract

Introduction- In today's multifaceted & challenging context of medical education, students are unable to organise, integrate information to the medical problems, so a need to fill this gap is strongly felt. The purpose of this study was to evaluate the effectiveness of Concept Mapping (CM) over the traditional method of teaching & learning. **Aims & Objectives-** To compare learning by traditional lecture with lecture using CM. To foster meaningful learning using CM & boosting the relevance of topic. To obtain feedback & reflection for CM based learning. **Materials & Method**-Total 112 students were taken for the study .They were divided randomly in two groups. For group-A, lecture on Systemic lupus erythematous was taken by traditional method of teaching. For group-B lecture was taken by using concept mapping of same topic. Post-test (10 Marks MCQs) was taken from both groups & comparing was done. Cross over study was conducted for ethical purpose. Reflection & feedback was taken from students about CM. **Result** - The result of post-test shows significant ($P<0.01$) rise in marks in Group B (CM) as compare to Group A (Traditional method), suggesting CM as a potential tool for better understanding & easy recall. Regarding reflection of students about concept method over traditional lecture method it was observed that more than 90% students said that it is simpler, easy, smart, concise, efficient and effective method of learning. **Conclusion**-Students found it very interesting & effective tool for learning. Students also feel that this method will be helpful for revision before the sessional & professional examination**.**

Keywords: *Concept Mapping , Retention, Recall*

Introduction

It has been observed that first year M.B.B.S students face difficulty in linking and correlating the basics of Physiology to clinical problems which is the most important lacuna identified as of now. Now a days students are more focused on competitive examination rather than deep understanding of the subject. Less motivation in students about in depth knowledge. The students are unable to organise, integrate information and relate the link of the basics of physiology to the medical problems, so a need to fill this gap is strongly felt. In anticipation, introducing concept mapping would be a stepping stone in making a competent IMG. Concept mapping would facilitate active, self - directed and deep learning. It will facilitate the better retention & recall of the content area. During the past decade, the use of concept mapping in medical education provided a chance for the medical students to improve their meaningful and deep learning [1 2].

A concept map is a graphical tool which represents ideas & information as circles or boxes that are connected with labelled arrows in a downward branching structure[3]. Concept maps are a way to develop logical thinking and study skills by revealing connections and helping students see how to organise and comprehend the concept. In concept map each word or phrase connects to another & links back to the original idea , word or phrase[4]. Concept mapping has also been recently used in depth in physiology education to improve students' understanding of pulmonary concepts and to compare their understanding with that of teachers and medical

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experts [5-6]. By navigating through the concept maps, each learners can choose a personal path to follow that depends on the information being sought[7].Our objectives for this study was to improvise reasoning & learning skills as well as their deeper understanding of the subject by using concept mapping. Also to organize thinking & to foster the relevance of the subject to clinical practice to improve learning gains.

Methodology

This was a qualitative & analytical type of study. This study was conducted on 112 second year medical students continued for a period of six months.

Approval from Institutional Ethical committee was taken. One day workshop was conducted to sensitize the faculty members & students about concept mapping. For study purpose, students were divided into two group ,Group A(n=56) & Group B (n=56) .Initially the topic Systemic Lupus erythematous was taught by Traditional teaching method to Group A,while same topic was taught by using concept Mapping to Group B. Learning outcome was checked by conducting 10 marks pre-validated MCQ questionnaire for both groups.

For ethical justification, the group A which was taught initially by traditional method, was now crossover with another group ie. Group-B. Within a period of month this Group -A was taught by newer method ie by using concept mapping. This was not to be included as a part of study, but the motive was to give exposure for the newer method of Teaching & Learning to every student. Feedback using 5 point Likert scale & reflection was taken from students about CM. Then the result was analysed using student t-Test. Feedback & reflection was analysed in percentage. The questionnaire assessed the following issues: deep understanding of the subject matter, relevance of the cases, opportunities for discussion, use of critical thinking, usefulness of concept mapping, relevance for future practice, promotion of self-assessment, promotion of active learning, motivation to learn, meaningfulness of learning, and the role of the teacher with an open-ended question at the end of the questionnaire.

Results and Observations

Table 1: Test of significance between marks obtained by students using Concept Mapping and Traditional Lecture

Teaching Method	N	Mean	SD	t-value	P value
Concept Mapping	56	7.8	0.76	2.713	0.008
Traditional Lecture	56	7.4	0.80		

Out of 10 marks, mean marks of student with concept method was 7.8 and with traditional lecture was 7.4 with SD 7.8 and 7.4 respectively. The difference in marks of students by different methods of teaching was significant ($t = 2.713$, $P<0.01$). It has been concluded that there was significant increase in marks of students who learnt by using concept method as compared to traditional lecture method. From the result we can conclude that concept method is more effective than traditional lecture method.

Table 2: Feedback response of students regarding session (n=112)

Questions	VD	D	N	S	VS
How was the session?	0	0	2	34	76
			(1.79%)	(30.36%)	(67.86%)
How was Content of Session?	0	0	8	13	70
			(7.14%)	(11.61%)	(62.5%)
How was Presentation of session?	0	0	8	28	76
			(7.14%)	(25.0%)	(67.86%)
How was Usefulness of session?	0	0	8	24	80
			(7.14%)	(21.43%)	(71.83%)

VD: Very Dissatisfactory, D: Dissatisfactory, N: Neutral, S: Satisfactory, VS: Very Satisfactory

Out of total, 67.86% students liked the concept method and were **very satisfied** with the session, followed by 30.36% who were **satisfied** and no student was dissatisfied by the session. More than 70% students were very satisfied regarding content, presentation and usefulness of session.

Table 3: Feedback response of students regarding effectiveness of Concept Mapping (n=112)

Questions	S D	D	N	A	S A
Time duration (15 mins) was sufficient?	0	2 (1.79%)	8 (7.14%)	42 (37.5%)	60 (53.57%)
Given questions were adequate in number and content of course?	0	2 (1.79%)	12 (10.71%)	58 (51.79%)	40 (35.71%)
Concept Mapping is more effective than Traditional Lecture?	2 (1.79%)	0	8 (7.14%)	4 (3.57%)	98 (87.5%)
Satisfied with the pattern of teaching?	2 (1.79%)	0	4 (3.57%)	38 (33.93%)	72 (64.29%)

Regarding time duration for the session of concept method, 91.07% were opined that it was sufficient and good. 87.50 % students agreed that the given questions were adequate in number. Overall 91.07% students agreed on the point that concept method is more effective than Traditional lecture method. 98.22% students were satisfied with the pattern of teaching.

Table 4: Reflection of students about Concept Mapping over traditional lecture (n=112)

Reflections	Number of students (%)
More Simple and easy to understand	110 (98.21%)
Much Smart and concise lecture	102(91.07%)
More Efficient and effective	102(91.07%)
More Interesting and useful	90(80.36%)
More Useful for exam purpose	98(87.5%)
Like to learn by concept method	106(94.64%)

Regarding reflection of students about concept method over traditional lecture method it was observed that more 90% students said that it was simpler, easy, smart, concise, efficient and effective method and they would like to learn by this method frequently. Also more than 80% students agreed that concept method was more interesting and useful for exam as compared to traditional lecture method.

Discussion

Medical Educators can utilize concept map to find out students misunderstanding of the topic & to identify knowledge gaps that need to be fulfilled. CM can be used as a supplement to more traditional learning methods. In our study students found that learning by using CM is more interesting than the traditional learning. Students opined that topic became more easy to understand by using CM. Our results are supported by various other studies that shows that CM is an innovative tool which increase the contextual thinking, retention & recall of the topic.CM helps to identify the existing knowledge & correlate with the new concept. These findings strongly suggest that CM is a useful strategy to promote meaningful learning in medical education[8]. CM is a easy way to reach at high levels of cognition when the process is done well, This can be one of the powerful evaluation tool [9].Students of all age navigate through the CM as a way to both learn from experts knowledge & various links in CM. The strength of CM is its multiutility, it can be used for assessment purpose also. It can be given as project or home assignment for students. Concept maps are a valid means of evaluating students' knowledge in the area of biology.[10]. The use of concept maps within a PBL course stimulated meaningful learning and promoted the development of students' learning strategies both individually and as a group[11]. All of the usual educational activities can be combined and integrated through an evolving concept map.[12]

Concept mapping fosters learners critical thinking ability in reading classes. As a result of this ability learners are to question or evaluate the validity of ideas or premises residing in the texts and to identify the lines of reasoning and arguments along with the associated fallacies.[13]Concept Maps are a kind of schematic summary of what students know. They can be used to display students' prior knowledge about a given topic, or they can be used to summarize what has been learned.[14]

Concept Maps have been used to examine students' prior knowledge, to track a student's progression of knowledge throughout a course, to compare students at different levels of knowledge and so forth.[15,16,17,18] Concept Maps have also been used to identify specific misconceptions in knowledge and to identify alternative educational approaches to address misconceptions.[19 20,21,22]

From the volume of literature on the subject of uses of Concept Maps, it is easy to conclude that the most prevalent use of Concept Mapping is for teaching and learning.

Conclusion

Lecture using concept Mapping was appreciated by the students & found it easy to correlate the clinical case with the basic principles of Physiology. Students found it very interesting with a significant gain in the learning of the subject taught, $p \leq 0.001$

It is also effective in retention of knowledge extremely helpful for revision before the sessional exam & professional examination.

Recommendations

The study can be continued further by taking CM as a tool for assessment.

Limitations

Study outcome is based on only two topics out of whole subject. Study is conducted only in 2nd year students, can be conducted in all years of M.B.B.S.

Acknowledgement: Sincere thanks to the faculty & students of American International Institute of Medical Sciences, Udaipur for their consent, guidance & active participation.

Conflict of Interest – NIL

Ethical Clearance- From Institutional Ethics Committee.

Financial Support- NIL

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DOI Number: 10.5958/2320-608X.2019.00123.9

Effect of Stress Factors of Stress Response Inventory on Cardiovascular Autonomic Function

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Abstract

Introduction- Stress involves alteration in behavior, autonomic function and the secretion of several hormones such as cortisol, corticosterone, and adrenal catecholamines[1]. **Material and Method-** SRI questionnaire,ECG machine,glucometer,sphygmomanometer, **Results and conclusion-** blood pressures, blood glucose level, mean RR, and SI were positively correlated, whereas body temperature, mean HR, HRV Index, LF, and HF were inversely correlated with ages (Pearson's correlation, $p < 0.05$). All stress factors scores were negatively correlated with ages ($p < 0.001$). In the present study, age was newly found to be correlated with geometrical features such as HRV index, and SI at moderate levels (-0.398 ~ 0.421). In addition, all physiological measures were found to be dependent on ages although at low levels in our subjects (0.244~0.392). Normalized HRV features such as LF/HF.

Keywords- *Heart rate variability; autonomic nervous system; physiological measure; stress; Stress Response Inventory*

Introduction

Stress involves alteration in behavior, autonomic function and the secretion of several hormones such as cortisol, corticosterone, and adrenal catecholamines[1]. Higher blood pressure and heart rates during stress reflected the predominance of sympathetic nervous system activity[2]. Mental stress decreased high frequency of heart rate variability (HRV) and increased low frequency of HRV [3]. HRV decreased in subjects with depression, higher hostility and anxiety[4]. Stress increases susceptibility to negative health outcomes [5]. Numerous stress questionnaires have been used in clinical practice and psychiatric researches such as Perceived Stress Scale (PSS) [6,7], and Stress Response Inventory (SRI) [8]. PSS measures thedegree to which situations in one's life are considered as stressful. SRI scores could be categorized into seven stress factors: tension, aggression, somatization, anger, depression, fatigue, and frustration[8]. Both PSS and SRI were designed to measure stress severity in adults. PSS was designed to assess how unpredictable, uncontrollable, and overloaded respondents find their lives. Unlike PSS, SRI assesses the stress severity based on the stress symptoms or the effects of stressors. In this study, we compared physiological and HRV features in subjects with high and low stress factors to investigate stress-related symptoms and their influence on HRV features.

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Materials and Method

The experiment was carried out in Department of physiology,MNR Medical College & Hospital, SANGAREDDY.

TABLE I.	Ages and genders of participants		
Age	Gender		Total
	Male	Female	
20-29	72	33	105
30-39	43	80	123
40-49	45	45	90
50-69	22	20	42
Total	182	178	360

Subjects who had psychopathic treatment history were excluded from the experiment. 360 subjects participated in studytable(I).

A simplified version of original SRI questionnaire was devised by one of the authors (JMW) and used in this study. The simplified version of SRI questionnaire was composed of 22 questions (Table II) that have been categorized into seven stress factors as in the original SRI [8]. Each question was scored in a five-point Likert scale format: 'Not at all' (0), 'Somewhat' (1), 'Moderately' (2), 'Very much' (3), or 'Absolutely' (4). SRI questionnaires were filled up before the physiological and heartbeat measurements.

Height, body fat, body temperature (at the forehead), blood pressure and blood glucose levels were measured by sphygmomanometer,glucometer.Subjects were seated in the comfortable chair and rested for five minutes prior to the heartbeat measurement. Three minute records of heartbeat were then recorded right after the resting stage. ECG was used to produce heartbeat (R peak) interval records.

TABLE II	A simplified stress response inventory items
CATEGORIZED INTO SEVEN STRESS FACTORS	
Stress Factor	Questions
Tension	My body trembles.
	I feel tense.
	My head hurts or it feels heavy.
Aggression	I act violently (such as reckless driving, cursing, fighting).
Somatization	I suffer from indigestion.
	My stomach hurts.
	I feel dizzy.
Anger	My voice is louder than it usually is.
	I easily get impatient.
Depression	I often stare blankly.
	I feel bored.
	I am useless (or unworthy).
	I don't like moving any part of my body.
Fatigue	I am easily fatigued.
	I feel totally exhausted.
Frustration	Everything bothers me.
	I feel on edge.
	My heart throbs.

To assess the association with stress factors, individual SRI scores were grouped into their corresponding stress factors (Table II) to calculate stress factor scores. Dependence on ages of stress factor scores as well as physiological measures and HRV features was evaluated using Pearson's correlation analysis. Dependence on stress factors of physiological measures and HRV features was evaluated using multiple regression analysis.

The subjects were divided into low and high stress group using k-means cluster analysis.Physiological measures and HRV features in these two groups were compared, with age as the covariate using analysis of covariance (ANCOVA).

Results

Relationships of Physiological Measures, HRV Features, and Stress Factors with Ages

Table III summarizes the relationships of physiological measures, HRV features, and stress factors with ages. Body fat content, blood pressures, blood glucose level, mean RR, and SI were positively correlated, whereas body temperature, mean HR, HRV Index, LF, and HF were inversely correlated with ages (Pearson's correlation, $p < 0.05$). All stress factors scores were negatively correlated with ages ($p < 0.001$).

Tension, depression and frustration were the stress factors that were frequently associated with body fat, body temperature, and HRV features. Depression factors were positively associated with body fat, body temperature, SI, and HFnu; negatively associated with LF, LF/HF, and LFnu (multiple regression, $p < 0.05$). Tension factors were positively associated with LF, LF/HF, and LFnu; negatively associated with body fat and HFnu (multiple regression, $p < 0.05$). Frustration factors were positively associated with SI, LF/HF, and LFnu; negatively associated with, HRV Index, HF and HFnu.

Cluster analysis classified 225 subjects as low stress factor (total SRI scores: 7.1 ± 4.1) and 135 as high stress factor group (22.5 ± 7.4).

Using ANCOVA with age as covariate, several physiological measures and HRV features were found to be significantly different in the low and high stress factor group (Table IV). Systolic blood pressure, glucose level, and HFnu were significantly lower, whereas body temperature, LF/HF, and LFnu were significantly higher in high stress factor group.

Conclusions and Discussion

Previous studies have found that HRV declines with ages [11, 12]. In the present study, age was newly found to be correlated with geometrical features such as HRV index, TINN, and SI at moderate levels (-0.398 ~ 0.421) (Table III). In addition, all physiological measures were found to be dependent on ages although at low levels in our subjects (0.244~0.392). Normalized HRV features such as LF/HF,LFnu, and HFnu did not show significant dependence on ages (Table III).

TABLE III.	**Statistically significant features that Distinguish two groups with low versus high stress factors (Ancova with age as covariate, P<0.05)**	
Measures	**Subject with Low Stress Factor Scores (n=225)**	**Subjects with High Stress Factor Scores (n=135)**
Body Temperature	36.36 ± 0.352	36.43 ± 0.629
Systolic blood pressure	120.0 ± 14.12	115.5 ± 13.39
Glucose level	98.38 ± 17.20	91.70 ± 12.10
LF/HFSTRESS factors	1.751 ± 1.715	1.862 ± 1.526
LFnu	53.43 ± 18.74	56.94 ± 16.94
HFnu	45.82 ± 18.93	42.31 ± 17.15

TABLE IV	**Relationships of physiological measures, HRV features, and stress factors with ages (Simple regression, N=360)**
Measurements/Stress Factors	**Correlation with age (r)**
Body fat	0.255**
Body temperature	-0.304**
Systolic blood pressure	0.322**
Diastolic blood pressure	0.244**
Glucose level	0.392**
Mean HR	-0.138*
Mean RR	0.139*
HRV Index	-0.402**
SI	0.421**
VLF	-0.233**

Cont... **TABLE IV**

LF	-0.270**
HF	-0.155**
LF/HF	-0.023
LFnu	-0.069
HFnu	0.063
Tension	-0.236**
Aggression	-0.234**
Somatization	-0.190**
Anger	-0.232**
Depression	-0.259**
Fatigue	-0.245**
Frustration	-0.246**

*$p < 0.05$

Physiological measures and HRV features were correlated with the stress factor scores in the SRI questionnaire (data not shown). In brief, tension, depression and frustration were the main stress factors associated with HRV features. Tension and frustration factors were positively associated with the sympathetic activity (LF and LFnu) and negatively associated with parasympathetic activity (HFnu). Conversely, depression factors were negatively associated with sympathetic activity and positively with parasympathetic activity. During the experience of negative emotions such as anger, frustration, or anxiety, heart rhythms are known to become disordered, indicating less synchronization in the reciprocal action between the parasympathetic and sympathetic branches of the ANS [13].

Since age was a strong factor influencing HRV features, we sought to rule out age-dependent features and seek out the relationship between stress factors and HRV features. Cluster analysis using stress factor scores was useful to identify high stress group in our case. High stress group showed higher LF/HF (reflects the predominance of sympathetic over parasympathetic activity) and LFnu (mainly influenced by sympathetic activity), whereas lower HFnu (mainly influenced by parasympathetic activity) compared to the low stress factors group (Table IV). Significant association of stress factors with HRV features suggested that the questionnaire items in our simplified version of SRI are useful to classify subjects into high and low stress group. In addition, our results indicated that further investigation is warranted for stress factors and their relationships with body temperature systolic blood pressure, and blood glucose level.

Conflict of Interest – Nil

Source of Funding – Self

Ethical Clearance – Given by the Institution.

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DOI Number: 10.5958/2320-608X.2019.00124.0

Aortic Stiffness is Associated with Cardiac Function and Cerebral Blood Flow Pulsatility in Type2 Diabetes Mellitus

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Abstract

Introduction: Central hemodynamics has an important role in maintaining appropriate cerebral and other end-organ perfusion and is altered in type2DM. Arterial stiffening is an early phenomenon in patients with type2DM, affecting cardiac function by increasing the cardiac afterload and reducing diastolic coronary artery perfusion, also involving small vessel disease in the brain and subsequent hypoperfusion.

Aims and Objectives: The aim of present study was to determine whether aortic stiffness affects cardiac function and whether central elastic artery stiffness was associated with cerebral blood flow pulsatility and subsequent, cerebral perfusion in type 2 DM patients.

Materials and Method: Fifty six patients with type2DM and 60 age-matched healthy volunteers were enrolled. Aortic PWV was measured using non-invasive cardiovascular risk analysis system (Periscope). Cerebral blood flow was measured by using Trans-Cranial Doppler.

Results: CFPWV of diabetic group showed significantly higher mean values (Group 1=931.00±215.98cm/s Group 2=1241±152.03cm/s) than control subjects (758±151.82). CFPWV was significantly (p value <0.01) increased between two diabetic groups. HbA1c was most significantly correlated to CFPWV (r=1.00, p<0.001) followed by weak correlation between central aortic stiffness quantified by PWV and PI (r=0.5, p>0.01).

Conclusion: In patients with type2DM, aortic stiffness is significantly associated with pulse pressure, aortic pulse pressure, aortic augmentation pressure as well as with cerebral blood flow pulsatility and subsequent cerebral perfusion, contributing to decreased cardiac function and cerebral hypoperfusion. Aortic PWV and TCD measurement might be useful prognostic marker of cardiac and cerebrovascular disease in type2DM.

Keywords: *Pulse-wave velocity, type2DM, HbA1c, Pulsatility index, Arterial stiffning.*

Introduction

Type2diabetes mellitus (DM) is an important vascular risk factor for cerebral hypoperfusion and cognitive impairment. Central hemodynamics has an important role in maintaining appropriate cerebral and other end-organ perfusion and is altered in type2DM. Type2DM patients show functional and structural alterations of the arterial vessel wall, resulting in arterial stiffness.[1,2] Arterial stiffening has been described as an early phenomenon in subjects with type2DM, already apparent before clinical onset of cardiovascular (CV) complications and also as an independent predictor of overt CV disease and mortality.[3] Therefore, arterial stiffening may be related to the pathogenesis of CV complications in type2DM. This notion could be substantiated if an independent relationship be established between arterial stiffness and cardiac function in type2DM.

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Furthermore, CV complications in type2DM also involve small vessel disease in the brain. Aortic stiffening can limit buffering capacity of the large central arteries such that small changes in cardiac stroke volume can result in excessive rises in local pulsatile pressure.[4] These excess pressures may damage peripheral capillary networks[5], which is of relevance to the brain as a high flow organ with low resistance proximal large vessels and an extensive microcirculation. If a relationship between arterial stiffness and cerebral small vessel disease could be established as well, this would support the importance of arterial stiffness in CV complications and cerebral hypoperfusion in type2DM and timely intervention can be done to prevent complications. Stiffening of the aorta affects cardiac function by increasing the cardiac afterload and reducing diastolic coronary artery perfusion.[6] Myocardial perfusion might fail to compensate for the increased metabolic energy demand, resulting in an impaired myocardial contractility function.[7] Furthermore, stiffness of the central large arteries results in the deficient absorption of the pulse wave. This high pulsatile flow is transmitted from the aorta to the brain causing damage to the endothelial and smooth muscle cells, disrupting the cerebral small vessels.[8,9] Also, aortic stiffness may represent coronary and cerebral endothelial dysfunction or wall thickening caused by shared underlying mechanisms. As aortic function plays a central role in maintaining adequate perfusion of both the heart and the brain, we hypothesized that aortic stiffness is associated with cardiac function as well as with cerebral small vessel disease in DM patients. To our knowledge, very few studies have evaluated the relationship between aortic pulse wave velocity, cardiac function and cerebral small vessel disease in one comprehensive protocol. Periscope is a non-invasive tool for the accurate assessment of aortic pulse wave velocity (PWV)[10] as a marker of aortic stiffness.[11] Accordingly, the aim of present study was to determine whether aortic stiffness affects cardiac function and whether central elastic artery stiffness was associated with cerebral blood flow pulsatility and subsequent, cerebral perfusion in type2DM patients. We hypothesized that individuals with type2DM have increased stiffening of central arteries, which may be one factor mediating cerebral hypoperfusion.

Materials and Method

The study population consisted of 56 patients with type2DM (mean±SD age 58±8 years; 23 men and 33 women); and 60 age-matched healthy volunteers (mean±SD age, 52±8 years; 27 men and 33 women). The control group was selected from subjects visiting our hospital for a health screening program, residents and working staff, who agreed to participate in this study. They were explained its purposes, risks, and potential benefits. All of the diabetic patients were selected from the Medicine OPD of associated hospital of BPSGMCW, Sonepat, where the diagnosis of type2DM had been made according to the established criteria.[12] The subjects willing to participate were selected, based on certain inclusion and exclusion criteria.

Inclusion criteria included age 35-55 years, systolic blood pressure <140 mmHg and diastolic blood pressure <90 mmHg, no antihypertensive drug use, no ECG abnormality and renal disorder and willingness to participate in study.

Exclusion criteria included smoking, hypertension, DM, hyperlipidemia, pulmonary disease, renal disease, neurological disease or peripheral artery disease and use of medications of any kind.

Design

Participants provided written, informed consent to participate in this study. At visit 1, participants rested for 10 minutes in the supine position. This was followed by anthropometric measures, questionnaires relating to BP, medical history and all vascular and haemodynamic measures. Vascular testing was conducted at the same time of the day in a quite dimly lit, temperature-controlled laboratory. Participants were in post-absorptive state and were instructed to avoid vigorous exercises and caffeine/ alcohol ≥12h before testing. Height and weight were assessed via wall-mounted ruler and electronic scale, respectively.

Instruments used

Arterial stiffness in terms of PWV was measured using non-invasive cardiovascular risks analysis system (PeriscopeTM). Cerebral blood flow was measured by using non-invasive Trans-Cranial Doppler TCD DWL MultidopX4 instrument with 2MHz hand-held pulsed wave Doppler probe. Instruments are available in central research lab of our institute. Middle cerebral artery (MCA) blood velocity was assessed using a 2-mHz TCD ultrasound probe (DWL Doppler Box-X, Compumedics, Germany) applied to the temporal window.[13]

The study was approved by institutional ethical committee for research.

Statistical Analysis

All data is reported as mean±standard error of the mean. The data was analyzed by SPSS 17.0 program. Unpaired t-test was used to compare clinical characteristics of both groups. p value <0.05 was considered significant. An analysis of variance with repeated measures, was used to analyze main outcome variables. Pearson correlation analysis was used to analyze association between aortic PWV and pulsatility index (PI).

Results

The final number of patients recruited were 56 type2DM patients (23 men and 33 women, mean±SD age=58±8 years) and 60 age-matched healthy volunteers (mean±SD age=52±8 years; 27 men and 33 women) were included. Baseline characteristics of subjects are presented in Table 1.

Table 1: Clinical characteristics of study participants

Characteristics	Control group (n=60)	T2 DM (n=56)	P value
Age (years)	52±8	58±8	<0.05
BMI (kg/m^2)	24.1±4.0	26.8±4.5	-
Gender (M/F)	27/33	23/33	-
Systolic blood pressure (mmHg)	121±14	124±15	0.28
Diastolic blood pressure (mmHg)	78±9	79±9	0.494
HbA1c (%)	5.1±0.4	8.5±0.4	<0.05

Data are represented as mean±SD, HbA1c glycosylated haemoglobin

The mean±SD values of age, BMI, systolic and diastolic blood pressure were higher among the subject groups (Table-1) but there was no significant difference (p value >0.05). The mean±SD values of HbA1c were 8.5±0.4 and 5.1±0.4 in diabetic and control group respectively. As compared to control group HbA1c was significantly higher (p value < 0.05) in diabetic group.

Table 2 shows the results of analysis of variance.

CFPWV and cerebral blood flow quantified by PI are displayed independently in Table 2.

CFPWV of diabetic group showed significantly higher mean values (Group 1=931.00±215.98, Group 2=1241±152.03) than control subjects (758±151.82). The mean±SD values of PI in LMCA and RMCA are higher in diabetic group as compared to control group but the difference was not statistically significant (p value >0.05).

Table 2: Analysis of variance of CFPWV, PI and HbA1c

Parameter (Unit)	Control group (n=60)	Group I HbA1c (5.5-7.5%) (n=30)	Group II HbA1c (7.6-9.5%) (n=26)	P value
CFPWV (cm/s)	758.72±151.82	931.00±215.98	1241.99±152.03	<0.05
Pulsatility index LMCA	0.76±0.13	0.98±0.27	1.14±0.27	0.05
RMCA	0.81±0.15	0.99±0.31	1.10±0.25	0.5

Associations between aortic PWV and cardiac function parameters are summarized in Table 3.

Aortic PWV was significantly correlated with pulse pressure, aortic pulse pressure, aortic augmentation pressure and HbA1c and weakly associated with ASI.

Table 3: Aortic PWV and the association with central hemodynamic variables in patients with Type 2 DM

Cardiac function parameters	Mean±SD (n=50)	r	P value
Heart rate (bpm)	83.77±15.37	-0.38	0.30
Pulse pressure (mmHg)	59.59±18.69	0.33	0.13
RBracASI	28.84±12.14	0.35	0.10
LBracASI	1490.60±468.55	0.40	0.065
RAnK ASI	37.62±16.83	0.34	0.11
LAnK ASI	37.42±15.13	0.15	0.49
R-ABI	1.08±0.25	0.08	0.69
Ao Sys (mmHg)	121.40±24.55	0.51*	0.01
Ao PP (mmHg)	40.59±16.09	0.64**	0.01
Ao Dia (mmHg)	80.36±11.42	0.19	0.39
Ao Aug P (mmHg)	11.13±6.57	0.51**	0.01

Data represented as mean±standard deviation

Association between aortic PWV and PI as an index of cerebral blood flow and perfusion in type2DM is illustrated in Fig.1. Aortic PWV was weakly correlated with PI of MCA (r=0.05, p=0.23) and no association with PI of ACA and PCA in type 2DM patients.

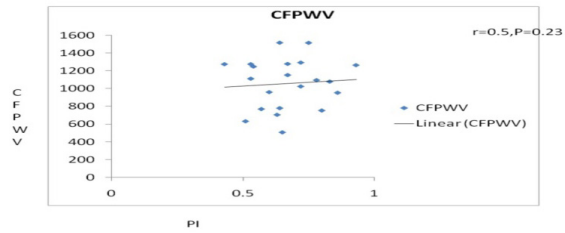

Figure 1: Scatter diagram showing Correlation between CFPWV and Pulsatility Index (PI) of ACA

Discussion

The purpose of current study was to evaluate whether aortic PWV is associated with cardiac function and to assess the possible association between cerebral perfusion and aortic stiffness in type2DM patients without hypertension by using non invasive TCD and periscope. The current study was designed to investigate changes in pulsatile hemodynamics (not the steady component or mean flow) during previously established times of elevated arterial stiffness following type2DM. The main findings of our study were that aortic stiffness in patients with type2DM is strongly associated with HbA1c and cardiac function, quantified by pulse pressure, aortic pulse pressure, aortic augmentation pressure and ASI. Aortic stiffness is affecting cerebral perfusion, quantified by PI and is weakly associated with PI of CBF in MCA and no correlation with PI of CBF in ACA and PCA in type2DM patients.

This study is first to report an integrated approach to establish relationship among arterial stiffness, cardiac function and impaired cerebrovascular blood flow in the form of PI in diabetes, using non invasive TCD and digital periscope.

The present study shows possible association between arterial stiffness and reduced cardiac function in type2DM patients. In our relatively young type2DM patients group, aortic stiffness was significantly associated with aortic systolic pressure and aortic augmentation pressure. Diabetic patients are at increased risk of developing systolic left ventricular [LV] dysfunction, leading to progressive heart failure and subsequent death.[14,15] In our study populations aortic diastolic pressure was in normal range and no association was found with PWV. Similar results were reported in previous studies.[16] So aortic stiffness might have important role in cardiac function, already manifesting

before occurrence of cardiac dysfunction or failure and compensatory remodelling. High blood pressure has an association with LV dysfunction and hypertrophy.[17] However, in type2DM patients, LV dysfunction and hypertrophy is not well known.[18] Our study on type2DM patients is in line with these findings.[19] No relationship was found between aortic PWV and aortic diastolic pressure and LV dysfunction in relatively young diabetic group.

In this study, we found that aortic stiffness quantified by PWVs is weakly associated with blood flow velocity in cerebral MCA in type2DM patients. The results imply that arterial stiffness is an important determinant of cerebral blood flow velocity. The results supports the suggestion by Kreja et al[20] that arterial stiffness could cause decreases in cerebral blood flow velocity. In humans, central elastic arteries in the cardiothoracic region (aorta and carotid artery) buffer the pulsatile pressure generated from the left ventricle, which fosters continuous peripheral blood flow and protects the microcirculation from end-organ damage. Stiffened central elastic artery in diabetes mellitus patients, increases left ventricular afterload and augment central and peripheral pulse pressure. Therefore, central artery stiffness in type2DM patients may be one factor mediating cerebral hypoperfusion. Despite these changes in carotid artery stiffness, there were mild change in MCA flow pulsatility and no changes in ACA and PCA flow pulsatility at these time points reinforcing our conclusion that increase in arterial stiffness may not have detrimental effect on cerebrovascular flow pulsatility in short duration type2DM patients as concluded by Wesley et al.[21] Further studies are required to explore central hemodynamic and cerebrovascular changes in type2DM patients. Lippera et. al.[22] also demonstrated significantly increased pulsatility of MCA in diabetic patients.

Previous research, suggested association between arterial stiffness and PI[23] and in turn impaired cerebrovascular functions.[24]

Limitations

The present study reveals that aortic stiffness reflects both cardiac function and cerebral small vessel disease, however small number of subject limits the generalization of the results. This study utilized middle aged type2DM patients with relatively short duration of DM. Despite this our data suggests that TCD and PWV assessment can be utilized in evaluation of interventions designed to prevent vascular complications of diabetes.

Conclusion

In conclusion, this study shows that in patients with type2DM, stiffness of aorta is significantly associated with pulse pressure, aortic pulse pressure, aortic augmentation pressure well as with cerebral blood flow pulsatility and subsequent cerebral perfusion, contributing to decreased cardiac function and cerebral hypoperfusion. By documenting that aortic stiffness reflects stages of both cardiac function and cerebral small vessel disease, our study results suggests that TCD and aortic PWV assessment might be a useful marker of cardiac and cerebrovascular disease in patients with type2DM. Future studies are needed to assess the prognostic implications of our observations.

Conflicts of Interest: There is no conflict of interest.

Source of Support : None

Abbreviations

CBF	Cerebral Blood Flow
CFPWV	Carotid Femoral Pulse Wave Velocity
DM	Diabetes Mellitus
HbA1c	Glycosylated haemoglobin
MCA	Middle Cranial Artery
PI	Pulsatility Index.
TCD	Trans Cranial Doppler

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DOI Number: 10.5958/2320-608X.2019.00125.2

Prevention of Neonatal Hypoglycaemia with Early and Exclusive Breast Feeding

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Abstract

Concern about hypoglycaemia in the new born infant is a common issue. Subsequent neurologic development may be affected in children experiencing hypoglycaemia in the neonatal period. This observational study enrolled 150 healthy term neonates who did not require admission to Neonatal Intensive Care Unit and were kept in post natal wards with mother. All neonates of mothers with complicated pregnancy such as diabetes, Hypertension and infections were excluded from the study. Glucose levels were monitored at 1, 2, 6, 12, 24 and 48 hrs of life. Hypoglycaemia was defined as blood glucose levels ≤ 46mg/dl. 24% of the screened neonates developed hypoglycaemia in 1st hour of life, which was corrected with immediate breast feeding only. 6% of the neonate and 3% of the neonate developed hypoglycaemia in 2nd and 6th hour of life respectively which was corrected with immediate breast feeding only. No formula feed supplementation was needed at any hour of life to correct hypoglycaemia. All mothers were assisted in positioning and attaching babies to the breast and were motivated to breast feed on demand. All neonates were able to maintain blood glucose levels in normal range at 12th, 24th and 48th hour of life with exclusive breast feeding only. We therefore concluded that with early and exclusive breast feeding healthy term neonates can maintain normal glucose levels with decreased risk of hypoglycaemia. Formula feed supplementation should be avoided to correct hypoglycaemia.

Keywords: *Neonatal Hypoglycaemia, Exclusive Breast feeding, Formula feed.*

Introduction

Concern about hypoglycaemia in the new born infant is a common issue. Subsequent neurologic development may be adversely affected in children experiencing hypoglycaemia in the new born period. During intrauterine life there is a continuous supply of glucose to foetus from mother through placental transfer. When the umbilical cord is cut at birth, this supply of maternal glucose ceases abruptly. Hence, the neonate must maintain its own supply of glucose during periods of fasting and when feedings are interspersed intermittently.(1) During the transition from continuous transplacental supply of glucose to the intermittent oral supply postnatally, episodes of hypoglycaemia can occur. (2)The developmental immaturity of adaptive mechanisms like gluconeogenesis, glycogenolysis and ketogenesis may further accentuate the occurrence of hypoglycaemia. (3)Healthy, full-term babies are functionally equipped to make the transition from their intrauterine into their extrauterine existence. Term neonates have homeostatic mechanisms which help to preserve enough energy substrate to vital organs like brain. (4) The American Academy of Pediatrics recommends that blood glucose screening be done for at risk or symptomatic neonates. They conclude that universal hypoglycemia screening is not required, inappropriate and may also be potentially harmful. (2)However, there have always been concerns that hypoglycemia without clinical signs might also lead to neuro developmental sequelae.(5,6)Some studies have reported that long term neurological sequelae may be seen to the extent of 35% of newborns with

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symptomatic hypoglycemia and upto 20% in those with asymptomatic hypoglycemia.[5,7]Therefore early detection of hypoglycemia in infants at risk is of utmost value to prevent the sequelae arising from neonatal hypoglycaemia.[8,9]Various factors influence newborn blood glucose concentrations even in healthy term newborns, such as birth weight, gestational age, presence or absence of disease, perinatal complications, mode of delivery and feeding behavior.[10,11]

Many hospital nurseries have the clinical practice of routine early glucose screening in healthy term neonates. This inappropriate glucose screening leads to misdiagnosis of pathological neonatal hypoglycaemia with aggressive treatment interventions harmful to successful establishment of positive maternal infant relationship.[12] So the present study was done to evaluate

1. The Incidence of hypoglycaemia with early and successful establishment of breast feeding in healthy term neonates,
2. Correlation between mode of delivery and blood glucose levels.
3. Need of formula feed supplementation to correct hypoglycaemia, if detected.

Material and Method

The prospective cohort study was conducted at JNU hospital from 15.08.17 to 31.10.18. Ethical clearance was obtained from the Institutional ethical board.

Inclusion criteria: term, normal birth weight, healthy, asymptomatic singleton neonates delivered by vaginal route or Caesarean section in JNU Hospital. All babies were exclusively breastfed as per the BFHI (baby friendly hospital initiative) hospital policy and roomed in with their mothers, with good sucking reflex and latching and had an uneventful neonatal course. Informed consent was taken from the parents of babies included in the study. Babies were selected prospectively using a random number table. The following neonates were excluded from the study: small for gestational age, babies with evidence of foetal malnutrition, large for gestational age, preterm, neonates with birth asphyxia, sepsis (proven/suspected), and neonates requiring admission in NICU / parenteral fluids / other modes of feed, neonates born to mothers with PIH / Diabetes. Counselling as well as assistance for exclusive breast feeding was done in all cases by nurses and treating doctors. Distribution of pamphlets and display of posters to promote breast feeding was also done in nurseries and post natal wards. Breast feeding was ensured within 30 minutes of birth in vaginal delivery and as soon as mother is comfortable after caesarean delivery(not later than 4 hrs) and there after every 2-3 hrs., including 2 night time feeds.[13] Under aseptic precautions heel prick was made and capillary blood glucose was screened using reagent strips and Glucometer(ACCU-CHEK Active, Germany) at 1, 2, 6, 12 and 48 hours of life, independent of feeding time.[14]For the study purpose hypoglycaemia was defined as blood glucose <46mg/dl.[15]Confirmation of blood glucose by sending the sample to the laboratory was done in case the blood glucose levels were below 46 mg/dl and the baby was treated with a trial of additional breast milk and glucose levels were monitored. The data was analysed using the SPSS (version 19 IBM). All the data was calculated applying descriptive statistics such as mean, percentage and Pearson correlation.

Results

We enrolled 150 new borns in our study. All the episodes of hypoglycaemia were seen in glucose values recorded at 1st, 2nd and 6th hours of life. There were no episodes of Hypoglycaemia documented in glucose values recorded at 12th, 24th and 48th hours of life. The average documented blood glucose levels at respective hours is documented in Table 1 and graph 1.

Breast feeding was initiated at the earliest possible time in all the neonates. 23% of the screened new-borns developed hypoglycaemia in 1st hour of life. 6% and 3% of the screened new-borns developed hypoglycaemia in 2nd and 6th hour of life. This documented hypoglycaemia was corrected with breast feeding alone. Intervention in form of formula feeds or intra venous glucose solution was not needed.

Though the P value was not significant, it was observed that there was influence of mode of delivery on the neonatal blood glucose levels. The mean blood glucose levels were high in babies delivered vaginally, at all the time points compared to the babies delivered by LSCS(table 2)

Table 1: Mean, Maximum and minimum Blood glucose levels at respective hours after birth

Variable	Mean	Standard deviation	Minimum	Maximum	Confidence Interval
1st Hr	57.09701	14.43972	34	107	57.1 ± 2.45
2nd Hr	67.58209	15.39107	34	110	67.59 ± 2.61
6th Hr	72.35075	15.13287	30	121	72.35 ± 2.56
12th Hr	78.90299	14.39676	48	147	78.90 ± 2.44
24th Hr	83.58209	15.29672	56	161	83.58 ± 2.59
48th Hr	87.10448	12.80349	53	128	87.11 ± 2.17

Graph 1

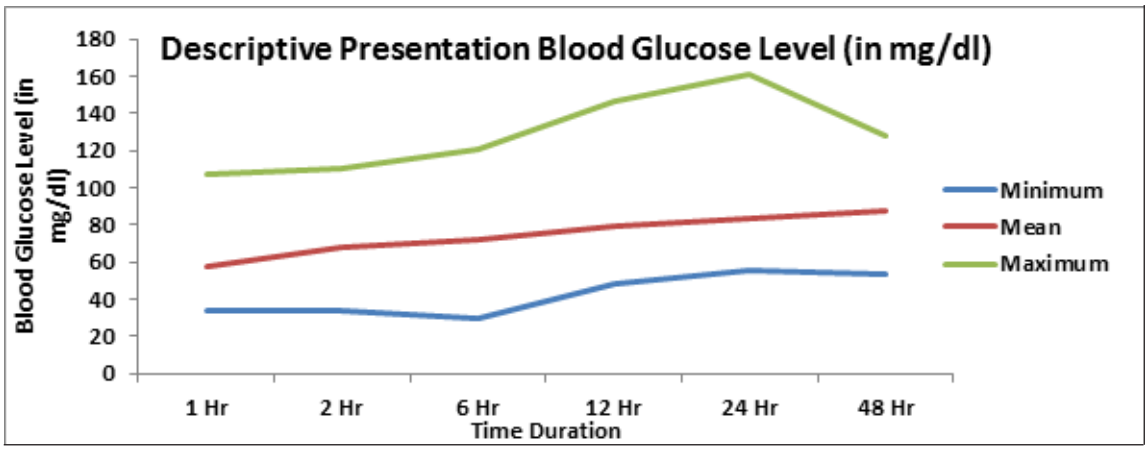

Table 2: (NVD –Normal Vaginal Delivery, LSCS –Lower Segment Caesarean Section)

Variables	Mean		Confidence Interval		P - Value
	NVD	LSCS	NVD	LSCS	
1st Hour	59.54	54.58	59.54 ± 3.44	54.58 ± **3.**37	0.1334
2nd Hour	69.57	65.53	69.57 ± **3.**51	65.53 ± **3.**80	0.09853
6th Hour	75.07	69.38	75.07 ± **3.**78	69.38 ± **3.**17	0.06872
12th Hour	80.85	76.17	80.85 ± **3.**16	76.16 ± **3.**05	0.06512
24th Hour	83.46	83.18	83.46 ± 2.66	83.18 ± 4.19	0.4574
48th Hour	86.93	87.14	86.93 ± 2.92	87.14 ± **3.**13	0.4621

Discussion

In our study, though the incidence of hypoglycaemia among exclusively breastfed new-borns was23%, 6% and 3% in 1st, 2nd and 6th hour of life. There was no severe hypoglycaemia which was not corrected with breast feeding. Yamauchi et al also reported no case of symptomatic hypoglycaemia in newborns breastfed early and frequently and cared by rooming in.[16]Anderson et al., noted that 38% of term uncomplicated infants had blood glucose < 2.6mmol/l (47 mg/dl) in Kathmandu, Nepal.[17]

Many studies have shown that early initiation of exclusive breast feeding meets the nutritional and metabolic needs of healthy, term neonates. Underfeeding alone does not cause symptomatic hypoglycaemia in these neonates. Establishment of normal breast feeding may be interfered, when unnecessary supplementation of healthy term neonates with water, glucose water or formula is done. [18,19,20] Healthy, term new-borns experience normal, self-correcting physiologic blood glucose nadir around 1-3 hours of life. This physiologic nadir may be misidentified by early routine glucose screening in these neonates and aggressive treatment of this hypoglycaemia is unnecessary and inhibits the establishment of maternal-infant interactions.[21]

Though the P value was not significant, it was observed that there was influence of mode of delivery on the neonatal blood glucose levels. The mean blood glucose levels were high in babies delivered vaginally, at all the time points compared to the babies delivered by LSCS (Lower Segment Caesarean Section). The caesarean section involves less stress for the baby and the possible impact of perinatal anaesthesia and shifting of mother from operation theatre may further delay breastfeeding and result in lower plasma glucose levels in babies delivered by LSCS compared to babies delivered vaginally as they are breastfed immediately or within half an hour after birth.[9,22] And also the babies delivered vaginally undergo stress which releases catecholamine which in turn increases the blood glucose.

Mothers those who deliver by LSCS have many factors that may interfere with the early initiation of breast feeding and lactation like pain, discomfort, post operative sedation and delayed intake of full oral feeds. These may contribute to hindrance with early effective latching and breast feeding. With motivation for early breast feeding, the blood glucose levels were maintained in normal range in newborns born by caesarean section.

Current guidelines of some forums recommend formula milk or dextrose infusion in asymptomatic hypoglycaemia only after single unsuccessful trial of feeding over 1 hr.[23,24] on the contrary, our study points out that most of the term neonates can be managed by supervised and repeated breast feeding rather than top feeding.

We conclude that newborns delivered either by vaginal delivery or caesarean section can maintain normal blood glucose levels with early and exclusive breast feeding alone. Top feeding supplementation in a routine should be discouraged as it is associated with increased risk of infections in newborns and also interferes with the development of positive mother child bonding.

Recommendation

Transient hypoglycaemia in the early neonatal period is a common adaptive phenomenon as the new born changes from the foetal state of continuous transplacental glucose transport to intermittent nutrient supply following cessation of maternal nutrition at birth. Subsequent to this misdiagnosis, further surveillance and unnecessary aggressive treatment interventions will follow that are potentially harmful to establishment of the love bonding between mother and the baby and leads to poor breast feeding experience.

Ethical Clearance- Taken from institutional Ethics committee, JNU Institute of Medical Sciences and Research Center, Jaipur.

Source of Funding: Self.

Conflict of Interest: None declared.

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DOI Number: 10.5958/2320-608X.2019.00126.4

Research Article

A Cross Sectional Study on Relationship between Duration of Rotating Shift Work & Sleep Quality in Nurses

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Abstract

Nurses in tertiary care hospital has to work in rotating shift work to provide 24 service to patients. As duty time is constantly changing it affects their circadian rhythm. This can affect sleep duration & quality, cognition leads to fatigue, depression & work time errors. **Aim & objectives: -** This study was carried out to observe effect of rotating shift work (RSW) on quality & duration of their sleep. **Material & Method**:- Based on rotating shift experience female nurses were divided into three groups- group I (less than 1 year), group II (1 to 5 years) and group III (6 to 10 years). Each group consists of 130 nurses. Sleep quality was assessed by using Pittsburgh sleep quality index. Analysis of data was done by using ANOVA. **Results: –** PSQI all component score & PSQI Global score was increases as experience of RSW increases which was highly statistically significant. **Conclusion: -** Nurses working in rotating shifts for long duration were having less sleep duration & poor sleep quality.

Keywords – *shift work, sleep quality, PSQI*

Introduction

The term 'shift work' generally refers to a way of organizing daily working hours in which persons or teams work in succession for at least 8 hours per day, up to and including the whole 24 hour [1]. In tertiary care hospitals shift work is necessary to provide continuous service to patients especially to casualty, ICU & IPD patients. Nurses have to work in rotation shift work pattern in this sectors.

Nurses working in rotating shifts faces problems related with "Shift work disorder". Shift- and night-work requires employees to work at times that disrupt their lives from the biological and social synchrony that is enjoyed by day workers.[2]

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Many studies has been carried out on shift workers to access sleep quality, insomnia & fatigue in them. Shift workers or night workers with symptoms of insomnia & excessive sleepiness are categorized as having Shift work sleep disorder. Individuals having shift work sleep disorder are more likely to develop gastric ulcers, sleep related accidents, depression, missed family and social activities than shift worker who did not meet criteria. Shift workers are more prone to develop metabolic syndrome as compared to day workers and associated with poor sleep quality.[3,4]

A study conducted on male security guards shown that working in rotating night shift for more than 1 year are associated with poor psychological health & reduced memory performance.[5]

Our study aimed to know the relationship between duration of rotating shift work and quality & duration of sleep in nurses.

Material & Method

This study was carried out on female nurses working in Bharati Vidyapeeth Medical College and Hospital, Sangli. Prior to study ethical committee permission & permission of concerned authority was taken. Informed written consent of participant was taken at beginning. Nurses were ask to fill up proforma which included information about their family, economical background, medical history. General health checkup of nurses was carried out to rule out any major health problem.

Nurses between_age ranges 25 – 45 years were included in study.[6] Those having major systemic illness, endocrine disorder, any acute or chronic condition affecting sleep, current use of hypnotic drugs or drugs which may affect quality of sleep, psychiatric disorder or on its treatment, those having menopausal symptoms, any other sleep disorder were excluded from study.

Total 390 nurses participated in study. They were divided into 3 groups.

Group I (control, n = 130) – Nurses not worked in rotating shifts

Group II (cases, n = 130) – Nurses working in rotating shifts for 1 to 5 years

Group III (cases, n = 130) – Nurses working in rotating shifts for 6 to 10 years

Sample size was calculated by taking level of significance 5%, power 80%.

Subjective Sleep Assessment: pattern & quality of sleep will be assessed by using PSQI. The PSQI allows assessment of sleep disturbances along seven dimensions: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication & day time dysfunction. Each dimension is rated on four point scales which are summed to yield global score. PSQI A total score of '5' or greater indicates poor sleep quality. The PSQI has a high test-retest reliability and a good validity for patients with primary insomnia.[7, 8]

Nurses were asked to fill up questioners when they were not on duty, in quiet room away from their individual work place. Collection of data was done after making participant comfortable & relaxed.

Analysis was done by applying ANOVA test.

Observations –Table showing comparison between Pittsburgh sleep quality index (global & component scores) in rotating shift workers & controls.

Sr. No.	Variable	Group I n = 130	Group II n = 130	Group III n=130	F value	Significance
1	Component 1- Subjective quality of sleep	0.40 ± 0.67	0.80 ±0.91	0.96 ±0.83	16.330	0.000
2	Component 2 - Sleep quality	0.56 ±0.80	0.89 ±0.92	0.96 ±1.01	6.947	0.001
3	Component 3 - Sleep duration	0.65±0.80	0.70±0.87	1.023±0.83	7.325	0.001
4	Component 4 - Sleep efficacy	0.054±0.22	0.21±0.43	0.30±0.59	10.888	0.000
5	Component 5 - Sleep disorder	0.49±0.60	0.7±0.68	0.88±0.81	10.038	0.000

Table Cont...

6	Component 6 - Use of sleeping pills	0.054±0.22	0.092±0.29	0.346±0.723	14.942	0.000
7	Component 7 - Sleep related daily dysfunction	0.469±0.63	0.669±0.78	0.838±0.90	7.259	0.001
8	PSQI (Global score)	2.7±2.5598	4.085±2.94	5.33±3.50	24.737	0.000

Results

Table shows comparison of components of sleep quality & global score between three groups of nurses having different rotating shift work experience. Results in our study suggests that with increase in duration of rotating shift work there is rise in all component score of PSQI including global score which is highly statistically significant.

Global PSQI score mean + S.D. in group III nurses having experience of RSW 6 to 10 years was 5.33±3.50, in group II nurses having RSW experience 1 to 5 years was 4.085±2.94 & in group I having no or less than 1 year RSW experience it was 2.7±2.5598 which shows that increased duration of RSW in nurses leads to poor sleep quality.

Discussion

Human being spend one third of time of their life span in sleep. Sleep is not only absence of wakefulness but is very essential to maintain health and wellbeing. Circadian rhythm regulates sleep wake cycle and many other functions of body. It is 24 hours clock regulated by suprachiasmatic nucleus of hypothalamus. Rotating shift work especially night work causes disturbance in endogenous circadian rhythm and the environmental synchronizers (particularly the light/dark cycle) leading to disturbances in psycho-physiological functions.[9, 10, 11]

Pittsburgh Sleep Quality Index (PSQI) is a self-reported questionnaire which measure the quality and patterns of sleep over one month time interval. It differentiates "poor" from "good" sleep quality by measuring seven components score.[12] The present study investigated the relationship between the rotating shift work & sleep quality by using PSQI in female nurses. The results indicated that nurses working in rotating shift work for long time were having poor subjective sleep quality, higher sleep latency, less sleep duration, less habitual sleep efficiency and more sleep related daytime dysfunction. Also use of medication for sleep is more as nurses work in RSW for longer duration.

Nurses working in rotational shifts for 6 to 10 years was having mean global PSQI score 5.33 (> 5) suggesting poor sleep quality in them. Similar to our findings, a study in Taiwan on female nurses found that rotational shift work was associated with poor sleep quality & mental health. They also found that two days off after night shift improves sleep quality & mental health which is useful to maintain physical and psychological health in nurses.[13,14]

Similar results were also obtained by P Lajoie et all in their study on female hospital employees observed that shift work (working for two 12 h days, two 12 h nights with 5 days off) is strongly associated with poor sleep latency (difficulty falling asleep), poor sleep efficiency with its components of prolonged sleep latency, waking during the night and early awakenings as compared to women working only during the day.[4] Christopher L. Drake in study on participants selected randomly from general population found out that prevalence of insomnia or excessive sleepiness was 32% & 26% in night & rotating shift workers respectively and 18% in day workers. Percentage of insomnia & excessive sleepiness was higher in night and RSW as compared to day workers.[3] In contrast K. McDowall et al in their study noted high prevalence of poor sleep quality in both Shift Worker & Non Shift Working Nurses (78 and 59%, respectively) with no association between poor sleep

and age, gender, body mass index (BMI), number of years worked and number of children in the house.[15]

Results of present study revealed longer the duration of rotating shift work for which female nurses working leads to with more daytime dysfunction leads to difficulty in performing daily routine activities. As Female workers have to manage their household chores, childcare, pregnancy in addition to their job they are more exposed to both physical & mental stress as compared to their male co-workers. Female nurses face problem of adjusting their household duties along with their irregular working schedules which can worsen sleep problems & can lead to chronic fatigue as compared to male co-workers. [11, 16, 17]

Wan-Ju Cheng et all in their study observed strong associations between a fixed night shift and poor sleep and mental health outcomes in women than in men, suggesting that women might face greater difficulty to cope with fixed night work than men which might be due to greater family burden.[18] Thus female nurses are more likely to suffer from insomnia, sleep related daytime dysfunction, sleep related disorders.

Our study was cross sectional study, perspective study should be carried out on shift workers along with other confounding factors like age, workload at working place & at home and other stressors.

Conclusion

From our study it can be concluded that as female nurses work in rotating shift pattern for long duration have poor sleep quality with less sleep duration & more daytime dysfunction leading to occupational accidents. Also RSW can be additional risk factor for cardiovascular disorders, metabolic syndrome, diabetes mellitus & gastric ulcers.

In order to avoid harmful effects of shift work on mental and physical health of nurses certain measures can be done. Shifts of nurses can be adjusted to give them more time for adaptation to changing work timings. Also two days off can be given after night shift to improve sleep quality. Working hours especially at night shift can be reduced to cope up with fatigue, daytime sleepiness.[19] Good physical fitness can improve tolerance to shift work. Awareness about effects of RSW & supports from hospital should be increased. Support from family members & friends also can improve performance & tolerance to RSW. Regular health check-up should be carried out to access both physical & mental health. Those nurses suffering from insomnia, physical & mental health problems can be separated and shifted to fixed duty pattern.

Source of Funding – Self

Conflict of Interest - Nil

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