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A Quasi-Experimental Study to Assess the Effectiveness of Self-Care Measures on Pulmonary Functions among Petrol Pump Workers at Selected Petrol Pumps, Muzaffarnagar

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ABSTRACT

Background: Petrol pumps in India instead of being self-serviced, employ workers, increasing the opportunity for ex-posture to petroleum vapors and vehicular exhaust. This causes various health problems, particularly within lungs.

Material and methods: Quasi Experimental with time series design was used to conduct this study, non-Probability convenient was adopted to select the petrol pump workers. 50 petrol pump workers were selected in experimental group and 50 petrol pump workers were selected in control group.

Result and findings: It is revealed that, FVC scores between the group (F=28.79, and p=0.001) and within the interventional group (F=61.80, and p=0.001) were statistically significant and in control group (F= 2.51, and p=0.11) were not statistically significant and FEV1 scores between the group (F=11.50, and p=0.001) and within the interventional group (F=58.17, and p=0.001) and within control group (F= 19.89, and p=0.001) were statistically significant. The findings indicated FVC and FEV1 among PPW, improved after the intervention. There was a significant association between selected demographic variables and pulmonary functions of PPW between the study and control group**.**

Conclusion: The comparison of pre & post test scores on pulmonary functions of experimental and control group showed that, in the experimental group the post test scores were increased. It proved that the SCM on pulmonary functions was effective.

Keywords: petrol fumes, pulmonary functions, Self-care measures, Petrol pump workers.

INTRODUCTION

Fast urbanization trends have resulted in an exceedingly tremendous rise within the range of transportation vehicles, thereby resulting in the raised want of fuel. This increase in demand of fuel has led to a gradual rise within the range of fuel pumps within the country.[1]

To meet current demand, there are numerous filling stations getting established and there is an increased recruitment of workers. At these filling station, like, foreign country, there is no facility of self-service and the fuel filling workers are employed to fuel the vehicles. These fuel dispensers work

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continuously for 8-12 hours each day without using any protective devices.[2]Apart from refueling vehicles, these workers also do all types of work like unloading of fuel and daily checking of fuel levels within the storage tanks, checking the pressure in vehicle tyres.[3]

Atmospheric concentration of gasoline vapor (approximately 2000 parts per million) is unsafe when inhaled even briefly. During fueling of vehicles, the concentration of gasoline vapor within the air is between 20 and 200 ppm.[4]The combined effects of the atmospherically concentration of hydrocarbon vapor and exhaust from vehicles could finish in accelerated decline of respiratory organ function.[5]

Review of literature revealed that lung function is decreased among petrol pump workers and have lack of knowledge on self-care measures to prevent respiratory problems due to occupational exposure to petrol. Many researchers suggested conducting awareness programmes of PPE. But interventions were not executed to find the effectiveness of PPE and diaphragmatic breathing on pulmonary functions among PPW. Therefore, the researcher felt that there was a need to implement self-care measures (SCM) like use of protective masks and diaphragmatic breathing exercise among Petrol Pump Workers (PPW) to scale back the impairment of pulmonary functions.

OBJECTIVES

1. To assess the level of pulmonary functions among PPW in both groups.
2. To assess the effectiveness of Self Care Measures on pulmonary functions among PPW
3. To find out the association of pulmonary functions among PPWwith their selected demographic variables in both groups.

HYPOTHESES

1. $\mathbf{H_1}$ -There will be a significant difference between pre-test and post-test score of pulmonary functions among PPW.
2. H_2 -There will be a significant association between selected demographic variables and pulmonary functions of PPW.

MATERIALS AND METHODS

Research Approach

Quantitative Research Approach

Research design

Quasi Experimental with time series design

Setting

The setting of the study is selected petrol pumps at Muzaffarnagar District.

Population

The population of the study is Petrol pumps workers.

Sample and Sample size

Sample

Petrol pumps workers who fulfil the sampling criteria are the samples.

Sample size

100 PPW who fulfilled inclusion criteria were allotted into 2 groups (50 PPW in Study group and 50 PPW in Control Group) conveniently.

Sampling technique

Non-Probability convenient sampling

Inclusion Criteria

- PPW who were available and willing to participate in study.
- PPW who had been working for more than one year and 8 -12 duty hours per day.
- PPW who knew Hindi to read, write, understand and speak.

Exclusion Criteria

- PPW who were not available and not willing to participate in study.

- PPW who had participated in pilot study.
- History of major cardiac, pulmonary and abdominal surgery
- History of Pulmonary tuberculosis and COVID-19
- History of chronic respiratory disease and cardiac disease
- History of smoking

Development of the tool

Tool for study were developed by personal and experts' opinions. A structured questionnaire, Spirometry and Pulse Oximetry were selected to assess the effectiveness of self-care measures on Pulmonary functions among petrol pump workers.

DESCRIPTION OF THE TOOL:

The tools used for the present study consist of three parts.

Part - I: Structured questionnaire for demographic variables

It includes Age, Gender, Education, marital status, Duration of work in years, Duty hours and Using of Personal Protective Equipments.

Part – II: Spirometry

Spirometry, a PFT, estimates a person's air exhalation rate and volume. The interpretation of spirometry data depends on two measurements particularly, **FVC** and **FEV1**, FVC reflects the amount of air that can be exhaled after taking a deep breath and measures the size of the lungs (in litres) and FEV1 measures the amount of air that can be expelled after a long intake in one second.

Table 1 : Gradation of the Severity according to American Thoracic society Guidelines

Severity	*FEV1*
Mild	>70%
Moderate	60% - 69%
Moderate to severe	50% - 59%
Severe	35% - 49%
Very severe	< 35%

The percentage of the lung volume that can be expelled in one second is represented by the FEV1/FVC ratio. Tables 1 and 2).

Table 2: Grading the severity of Restrictive Lung Disease

Severity	*FVC*
Mild	60% - 80%
Moderate	45% - 60%
Severe	<45%

According to the GOLD Guidelines, a ratio of FEV1/FVC < 70% (actual value) is termed as an Obstructive abnormality.

Part - III: Pulse oximeSEtry

Pulse oximetry is a noninvasive and painless test that measures the amount of oxygen being carried in blood, as a percentage.

Table- 3: Scores of Pulse Oximetry

Oxygen Saturation Level	
Interpretation	*SPO_2 %*
Normal	95 -100
Mild hypoxemia	91- 94
Moderate hypoxemia	86 -90
Severe hypoxemia	< 85

Validity of tool

The tool was validated after obtaining the valuable opinions and suggestions from the eight experts in the field of nursing and medicine.

Ethical Considerations

- Ethical clearance and permission were obtained from the institutional ethical committee, Bareilly international university.
- A written letter seeking permission to conduct the study was obtained from manager of petrol bank, Muzaffarnagar, Uttar Pradesh.
- A written informed consent was taken from participants for their participations in the study.
- Confidentiality was maintained.

Data Collection Procedure

The participants of researc04h study were explained about the purpose of research and objectives of the study. Written consent was taken from them for their participation in the study. In both groups structured demographic variables questionnaire, spirometry and pulse oximetry were administered to assess pre-test level of pulmonary functions. Self-care measures were demonstrated by researcher to study group through video assisted teaching for a week. After the intervention, follow up with reinforcement was given by the investigator every 15 days until post-test II till 6 months for study group. Control group did not receive any interventions throughout intervention period. The post-tests were carried out to study group and control study by the investigator at 3rd month and 6th month.

DATA ANALYSIS AND INTERPRETATION (Table 4 TO 7)

Table 4: Frequency and percentage distribution of baseline socio-demographic variables of PPW in the interventional group and control group (N = 100)

S. No	Socio-demographic VariableZs	Interventional group (n=100)		Control group (n=100)		Chi square (χ2) & p Value
1	**Age in years**					
	18-27	25	50.0	22	44.0	χ2=6.64 p=0.67 (NS)
	28-37	17	34.0	14	28.0	
	38-47	7	14.0	10	20.0	
	More than 47	1	2.0	4	8.0	
2	**Gender**					χ2=0.08 p=1.00 (NS)
	Male	48	96.0	48	96.0	
	Female	2	4.0	2	4.0	
3	**Education**					
	High School	26	52.0	27	54.0	χ2=3.62 p=0.45 (NS)
	Intermediate	20	40.0	20	40.0	
	Undergraduate	4	8.0	3	6.0	
4	**Marital status**					
	Married	39	78.0	36	72.0	χ2=1.76 p=0.77 (NS)
	Unmarried	10	20.0	13	26.0	
	Others	1	2.0	1	2.0	
5	**Duration of work in years**					
	≤ 5 Years	6	12.0	5	10.0	χ2=9.75 p=0.37 (NS)
	6-10	28	56.0	24	48.0	
	11-15	5	10.0	7	14.0	
	More than 15	11	22.0	14	28.0	

Continue table. 4.....

S. No	Socio-demographic VariableZs	Interventional group (n=100)		Control group (n=100)		Chi square (χ2) & p Value
6	**Duty Hours/day**					χ^2=10.49 p=0.31 (NS)
	<8	18	36.0	15	30.0	
	8-10	19	38.0	22	44.0	
	11-12	9	18.0	9	18.0	
	>12	4	8.0	4	8.0	
7	**Use of PPE**					χ^2=0.02 p =1.00 (NS)
	Yes	4 9	98.0	49	98.0	
	No	1	2.0	1	2.0	
8	**SPO2**	97.4 ± 1.0		97.1 ± 1.1		t=1.06, p=0.28(NS)
9	**Weight (Kgs)**	61.0 ± 10.6		59.5 ± 12.4		t=0.65, p=0.51(NS)
10	**Height (Cms)**	165.6±6.8		163.5±6.1		t=1.47, p=0.14(NS)

Table 5: Effectiveness of SCM on FVC gain scores among PPW in the interventional group and control group at Post-test 2 comparing with baseline. (N=100)

Groups	Assessment Time Points	FVC score Mean±SD	Mean differences in *FVC* gain score with 95% CI	Percentage of FVC gain score comparing with baseline
Interventional	Pre-test	76.5 ± 8.2	3.0 (3.6 2.4)	3.9% (4.7% - 3.1%)
	Post-test 2	79.5 ± 8.0		
Control	Pre-test	75.6 ± 6.5	0.4 (0.9 0.09)	0.5% (1.1% - 0.1%)
	Post-test 2	76.1 ± 6.3		

Table 5 shows that round 3.4% of the FVC gain score difference was found between the groups. The impact of SCM in improvement of the FVC score was more in the interventional group compared to that of control group.

Table 6: Effectiveness of SCM on FEV1 gain scores among PPW in the interventional group and control group at Post-test 2 comparing with baseline (N=100)

Groups	Assessment Time Points	FEV1 scores Mean ± SD	Mean differences in FEV1 gain score with 95% CI	Percentage of FEV1 gain score comparing with baseline
Interven-tional	Pre-test	77.4 ± 7.0	2.7 (3.2 2.2)	3.9% (4.7% - 3.1%)
	Post-test 2	80.1 ± 7.0		
Control	Pre-test	76.3 ± 7.6	1.1 (1.6 0.6)	1.4% (2.0% - 0.7%)
	Post-test 2	77.5 ± 7.8		

Table 6 shows that around 2.5% of the FEV1 gain score difference was found between the groups. The impact of SCM in improvement of the FEV1 score was more in the interventional group compared to that of control group.

Table 7: Repeated Measures of ANOVA on FVC at different time points among PPW in the interventional group and control group.

Study Time Points	N	Interventional group Mean ± SSD	N	Control group Mean ± SSD
Pre-test	50	76.5 ± 8.2	50	75.6 ± 6.5
Post-test 1	50	77.1 ± 8.3	50	75.7 ± 8.6
Post-test 2	50	79.4 ± 8.0	50	76.1 ± 6.3
Within the group *F* and *p* value		***F*=61.80, *p*=0.001 (S)**		***F*=2.51 *p*=0.11 (NS)**
Between the group *F* and *p* value		***F*=28.79, *p*=0.001 (S)**		

(p<0.05: Significant level) S: Significant, NS: Non-Significant

The findings of table 7, indicated Forced vital capacity (FVC) among petrol pump workers, improved after the intervention. Hence researcher accepted the research hypothesis (H1)

Table 8: Repeated Measures of ANOVA on Forced expiratory volume (FEV) at different time points among petrol pump workers in the interventional group and control group

Study Time Points	n	Interventional group Mean ± SD	n	Control group Mean ± SD
Pre-test	50	77.4±7.0	50	76.3±7.6
Post-test 1	50	78.1±7.3	50	76.4±7.7
Post-test 2	50	80.1±7.0	50	77.5±7.8
Within the group *F* and *p* value		***F*=58.17, *p*=0.001 (S)**		***F*=19.89, *p*=0.001 (S)**
Between the group *F* and *p* value		***F*=11.50, *p*=0.001 (S)**		

(p<0.05: Significant level) S: Significant, NS: Non-Significant

The findings of table 8, indicated Forced expiratory volume (FEV) among petrol pump workers, improved after the intervention. Hence researcher accepted the research hypothesis (H1)

Table 9: Association between Pre-test Pulmonary functions levels of FVC with baseline socio-demographic variables of PPW in the interventional group and control group

Socio-demographic Variables	Pre-test Pulmonary functions levels of FVC							
	Interventional group (n=50)			F & *P* value	Control group (n=50)			F & *P* value
	N	Mean	SD		N	Mean	SD	
Age in years				F=2.89, p=0.04(S)				F=5.20, p=0.004 (S)
18-27	25	78.2	6.9		22	77.8	4.6	
28-37	17	77.2	8.1		14	76.7	3.7	
38-47	7	70.4	9.8		10	73.1	8.1	
More than 47	1	63.0	--		4	66.2	10.9	
Gender				F=0.001, p=0.99 (S)				F=1.37, p=0.24 (NS)
Male	48	76.5	8.4		48	75.4	6.6	
Female	2	76.5	0.7		2	81.0	4.2	
Education				F=0.007, p=0.99 (NS)				F=0.54, p=0.58 (NS)
High School	26	76.4	9.6		27	75.0	6.7	
Intermediate	20	76.5	7.3		20	76.0	6.8	
Undergraduate	4	77.0	0.8		3	79.0	2.6	
Duration of work in years				F=45.0, p=0.001 (S)				F=21.90, p=0.001 (S)
≤ 5 Years	6	91.3	8.2		5	83.0	4.3	
6-10	28	77.6	1.0		24	77.8	2.1	
11-15	5	75.2	3.7		7	78.2	6.8	
More than 15	11	66.3	6.5		14	68.0	5.6	
Duty Hours/ day				F=1.08, p=0.36 (NS)				F=0.11, p=0.74 (NS)
<8	18	75.4	4.9		15	76.8	3.3	
8-10	19	79.0	8.9		22	76.2	8.6	
11-12	9	75.4	11.5		9	71.4	4.7	
>12	4	72.2	7.6		4	77.7	2.2	
(p<0.05 Significant level, S: Significant & NS: Non-Significant)								

Table 9 shows that,in Interventional group there was a statistically significant association (p<0.05) found between Pre-test Pulmonary functions levels of FVC with baseline socio-demographic variables like age in years, gender, and duration of work in years. In control group there was a statistically significant association (p<0.05) found between Pre-test Pulmonary functions levels of FVC with baseline socio-demographic variables like age in years and duration of work in years. Hence researcher accepted the research hypothesis (H_2)

Table 10: Association between Pre-test Pulmonary functions levels of FEV1 with baseline socio-demographic variables of PPW in the interventional group and control group

	Pre-test Pulmonary functions levels of FEV1							
Socio-demographic Variables	**Interventional group (n=50)**			**F & *P* value**	**Control group (n=50)**			**F & *P* value**
	N	**Mean**	**SD**		**N**	**Mean**	**SD**	
Age in years				F=4.6, p=0.006 (S)				F=15.56, p=0.001 (S)
18-27	25	79.3	5.5		22	79.3	5.1	
28-37	17	77.4	6.3		14	79.5	6.0	
38-47	7	73.0	8.9		10	71.1	5.5	
More than 47	1	59.0	---		4	62.0	5.7	
Gender				F=0.48, p=0.82 (NS)				F=0.47, p = 0 . 4 9 (NS)
Male	48	77.3	7.2		48	76.1	7.7	
Female	2	78.5	0.7		2	80.0	1.4	
Education				F=0.21, p = 0 . 8 0 (NS)				F=1.62, p=0.29 (NS)
High School	26	76.8	7.9		27	75.0	1.5	
Intermediate	20	77.8	6.6		20	77.2	1.6	
Undergraduate	4	79.0	2.1		3	82.6	2.9	
Duration of work in years				F=16.2, p=0.001 (S)				F=18.20, p=0.001 (S)
≤ 5 Years	6	84.6	6.0		5	79.8	5.3	
6-10	28	79.3	4.2		24	80.4	4.0	
11-15	5	76.8	5.7		7	77.4	8.9	
More than 15	11	68.7	6.1		14	67.5	4.9	
Duty Hours/day				F=1.06, p = 0 . 3 7 (NS)				F=1.76, p = 0 . 1 6 (NS)
<8	18	78.2	3.8		15	79.8	4.0	
8-10	19	78.4	7.4		22	75.6	7.8	
11-12	9	75.6	9.3		9	73.3	8.2	
>12	4	72.5	10.3		4	74.0	12.7	

(p<0.05 Significant level, S: Significant & NS: Non-Significant)

Table 10 shows that, in Interventional group there was a statistically significant association ($p<0.05$) found between Pre-test Pulmonary functions levels of FEV1 with baseline socio-demographic variables like age in years and duration of work in years**.** In control group there was a statistically significant association ($p<0.05$) found between Pre-test Pulmonary functions levels of FEV1 with baseline socio-demographic variables like age in years and duration of work in years. Hence researcher accepted the research hypothesis (H_2).

Recommendations for Future Research and Suggestion

Future research is needed to determine

- Authenticated survey to be done in India to find out the real statistics of impact on health effect related to petrol fumes among PPW.
- A study can be conducted to evaluate the effectiveness of SCM on pulmonary functions on large sample.
- Large scale prevalence study on pulmonary functions among PPW can be done in national level and global level.
- Similar study can be conducted by taking samples from two different settings like, urban and rural area.

CONCLUSION

The research's findings led to the following conclusions, which were presented. The comparison of pre & post test scores on pulmonary functions of experimental and control group showed that, in the experimental group the post test scores were increased. It proved that the SCM on pulmonary functions was effective. It was also seen that there was statistically significant association between pre-test score of FVC with baseline socio-demographic variables like age in years, gender, and duration of work in years in interventional group. In control group there was a statistically significant association ($p<0.05$) found between Pre-test score of FVC with baseline socio-demographic variables like age in years and duration of work in years. In Interventional group there was a statistically significant association ($p<0.05$) found between Pre-test score of FEV1 with baseline socio-demographic variables like age in years and duration of work in years. In control group there was a statistically significant association ($p<0.05$) found between Pre-test score of FEV1 with baseline socio-demographic variables like age in years and duration of work in years. It was determined that SCM on pulmonary function was effective among PPW.

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Conflict of Interest -Nil

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REVIEW ARTICLE

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Unleashing the Furry Beast: Exploring the Fascinating World of Hypertrichosis Lanuginosa

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ABSTRACT

Hypertrichosis lanuginosa is a rare medical condition characterized by the excessive growth of fine, soft, and unpigmented hairs all over the body, particularly inA the forehead, cheeks, ears, and nose. It can be either congenital or acquired, with the acquired type being more commonly associated with underlying malignancy. Congenital hypertrichosis lanuginosa is a genetic disorder that is inherited in an autosomal dominant manner, with some cases exhibiting spontaneous mutations. The condition manifests as an overproduction of lanugo hairs, the fine and unpigmented hair that covers the body of a fetus. This type of hypertrichosis often leads to difficulties in daily life and can cause emotional distress due to its unusual appearance. Acquired hypertrichosis lanuginosa, on the other hand, often occurs in adults and is frequently associated with malignancy, particularly adenocarcinomas. The exact mechanism of hypertrichosis lanuginosa is not yet fully understood, but it is believed to be due to the secretion of growth factors or hormones from cancer cells, which can stimulate the hair follicles to produce excessive amounts of hair. The diagnosis of hypertrichosis lanuginosa is mainly clinical, and a thorough physical examination is required. In cases where an underlying malignancy is suspected, further tests such as blood tests, imaging studies, and biopsy may be necessary. Treatment options for hypertrichosis lanuginosa are limited, and there is no definitive cure for the condition. Hair removal procedures such as laser therapy, electrolysis, and depilatory creams can provide temporary relief, but the hair usually grows back after some time. In cases of underlying malignancy, the treatment of the cancer may lead to the resolution of hypertrichosis lanuginosa. Overall, hypertrichosis lanuginosa is a rare medical condition that can occur either congenitally or acquired, and it is often associated with malignancy. The diagnosis of hypertrichosis lanuginosa can be challenging, and further testing may be required to identify any underlying malignancy. Although treatment options are limited, hair removal procedures and treating the underlying malignancy may provide temporary relief. Further research is needed to fully understand the underlying mechanisms of hypertrichosis lanuginosa and develop more effective treatment options.

Keywords: Acquired hypertrichosis lanugo-type, hypertrichosis lanuginosa acquisita, malignancy, paraneoplastic.

INTRODUCTION

Lanugo hairs are typically present from the third month of fetal development until just before birth, and are almost completely shed by then. Acquired hypertrichosis lanuginosa is an uncommon condition that causes rapid growth of long, fine, lanugo-like hair, mainly on the forehead, eyebrows, ears, and nose, during adulthood. This condition is similar to congenital hypertrichosis lanuginosa

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(see hypertrichosis), but it usually appears later in life and is commonly linked with an underlying cancer. Hypertrichosis is defined as excessive hair growth on any part of the body in either males or females. It's important to differentiate hypertrichosis from hirsutism, which is a term used to describe females who have excessive amounts of terminal hairs in androgen-dependent regions.[1]

Hypertrichosis refers to the excessive growth of hair on any part of the body in both males and females. It's crucial to differentiate hypertrichosis from hirsutism, which is a term used exclusively for females who develop an excessive amount of terminal hair in androgen-dependent areas.There are various ways to categorize hypertrichosis, including distribution (generalized versus localized), age of onset (congenital versus acquired), and hair type (vellus versus terminal). Generalized hypertrichosis has several forms, such as congenital generalized hypertrichosis (further divided into congenital hypertrichosis lanuginosa, hypertrichosis universalis, and hypertrichosis universalis congenita), prepubertal hypertrichosis, acquired generalized hypertrichosis, and acquired hypertrichosis lanuginosa. Each of these types has distinct clinical features and causes. It is worth noting that the etiology and clinical findings vary for each form.[2,3]

METHODOLOGY

This comprehensive review provides insightful information on Hypertrichosis Lanuginosa including updated details on possible treatments in all areas. The information was collected through a computerized search from various research articles and reputable websites.

BACKGROUND

Throughout history, there has been a notable fascination with the unusual and the unknown. In the past, people born with congenital disorders causing excessive body hair growth have been sensationalized and even romanticized to the point where those with rare hypertrichosis syndromes became popular attractions in 19th-century sideshow acts. One such individual, **Fedor Jeftichew**, also known as **Jojo the Dog-faced Boy**, gained notoriety after being exhibited by PT Barnum in the United States during the 1800s. These individuals were referred to by various names such as dog-men, hair-men, human Skye terriers, ape-men, werewolves, and Homo sylvestris. As far back as the Middle Ages, around 50 individuals with congenital hypertrichosis have been documented, with approximately 34 cases being adequately and definitively recorded in the literature.[4]

ETYMOLOGY

The term "hypertrichosis" derives from Greek roots (hyper-, meaning "excess"; trikhos, meaning "hair"; and -osis, meaning "formation"), and it refers to a medical condition characterized by excessive hair growth all over the body. In medieval times, people with this condition were not referred to using this term. Instead, they were often called "hairy men and women". Although they may have been mistaken for savages, who also have excessive hair, it's important to note that these two groups belong to different categories. Savages were associated with social or religious isolation and were deemed closer to animals than to humans due to their exceptional strength. In contrast, people with

hypertrichosis were not necessarily isolated and often lived in courts as entertainers, along with other "monster-like" subjects.[5]

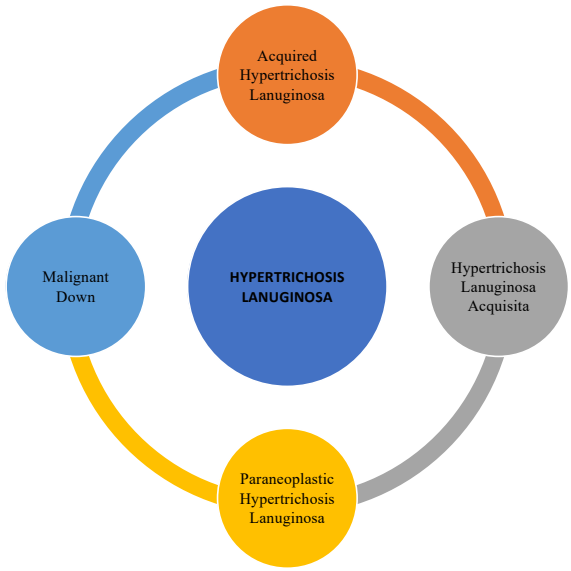
HISTORY

The first documented case of hypertrichosis was **Petrus Gonsalvus** from the Canary Islands, as noted by Ulisse Aldrovandi in his posthumous Monstrorum Historia cum Paralipomenis historiae omnium animalium in **1642**. Aldrovandi observed that Gonsalvus' family had a history of hypertrichosis, with two daughters, a son, and a grandchild also displaying excessive hair growth. This family became known as the Ambras family after the portraits of them found in Ambras Castle near Innsbruck. Over the next 300 years, approximately 50 cases of hypertrichosis were recorded. In 1873, Rudolf Virchow described a specific form of hypertrichosis that also caused gingival hyperplasia. In the summer of 2019, Spain's health ministry reported that 17 children had developed "werewolf syndrome" due to a medication error. Instead of receiving omeprazole for gastric reflux, the children were given minoxidil, a medication for hair loss. The laboratory responsible for the error, FarmaQuimica Sur in Malaga, has been closed as a precaution, although the details of how the mistake occurred are not yet clear.[5]

DEFINITION

Hypertrichosis is a medical condition that is characterized by excessive hair growth on any part of the body, regardless of the individual's gender. It is crucial to differentiate hypertrichosis from hirsutism, which is a term used specifically for females who experience excessive growth of terminal hairs in androgen-dependent areas. This article discusses the appropriate situations in which hypertrichosis should be considered in the differential diagnosis, outlines the proper evaluation methods for diagnosing the condition, and emphasizes the importance of an interprofessional healthcare team in providing optimal care for patients with hypertrichosis.[2]

OTHER NAMES



TYPES

Congenital

- Hypertrichosis lanuginose
- Generalized hypertrichosis
- Terminal hypertrichosis
- Circumscribed hypertrichosis
- Localized hypertrichosis
- Nevoid hypertrichosis

Acquired

- Hypertrichosis lanuginose
- Generalized hypertrichosis
- Patterned hypertrichosis
- Localized hypertrichosis

CAUSES

Hypertrichosis lanuginosa acquisita is a disorder of unidentified cause, but it is supposed to be a response to hormones or substances released by tumors. Typically, cases of acquired hypertrichosis lanuginosa are associated with an internal malignancy, such as lung, breast, uterine, colorectal, lymphoma, or bladder cancer. In some cases, the hypertrichosis may appear up to 2 years prior to cancer diagnosis, and is often a late sign of cancer. Non-malignant diseases, such as malnutrition from anorexia nervosa, hyperthyroidism, and HIV/AIDS, may also be associated with acquired hypertrichosis lanuginosa. Additionally, certain drugs, such as ciclosporin, phenytoin, interferon, spironolactone, and corticosteroids, may cause acquired generalized hypertrichosis.

- Antibiotics such as streptomycin
- Diuretics (acetazolamide)
- Antiseptic agents (hexachlorobenzene)
- Chelators (penicillamine)
- Interferon-alpha
- NSAID drugs such as benoxaprofen and corticosteroids
- Anticonvulsants (phenytoin)
- Immunosuppressives (cyclosporine, mycophenolate mofetil)
- Psoralens (methoxypsoralen, trimethylpsoralen)
- Vasodilators (diazoxide, minoxidil, prostaglandin E1)
- Fenoterol
- EGFR inhibitors (cetuximab, panitumumab, erlotinib, gefitinib)[6]

PATHOPHYSIOLOGY

Hypertrichosis can occur due to several mechanisms. One of the causes is related to the transition of vellus hair follicles to terminal hair follicles in certain areas of the skin. During puberty, vellus hair follicles in the groin and underarms mature into terminal hair follicles. However, in hypertrichosis, this switch occurs in areas that typically do not produce terminal hair. The exact process of this transformation is not fully understood. Another mechanism involves changes in the hair growth cycle, which consists of three stages: the anagen phase (hair growth), the catagen phase (hair follicle death), and the telogen phase (hair shedding). If the anagen phase is prolonged beyond the normal duration, excessive hair growth can occur in that area.[8]

CLINICAL FEATURES

Hypertrichosis lanuginosa acquisita is a medical condition characterized by the growth of fine, soft, and unpigmented hair all over the body except for the soles of the feet, palms of the hands, and mucous membranes. The growth of hair can occur rapidly, with significant changes noticeable within a few weeks to months. HLA is frequently linked with internal malignancies, especially breast, lung, and uterine cancers, with hypertrichosis often being the first indication of the tumour. HLA may also be associated with non-malignant ailments such as malnutrition, hyperthyroidism, and AIDS. The treatment of HLA includes dealing with the underlying condition, if present, and controlling excessive hair growth through techniques such as hair removal, topical hair inhibitors, or systemic medications.

DIFFERENTIAL DIAGNOSIS & PITFALLS

- **Hirsutism** – Hirsutism is a condition characterized by excessive hair growth in females, distributed in a male pattern. Unlike HLA, the hairs in hirsutism are thicker and are terminal in nature. Patients with hirsutism may also display physical characteristics indicative of virilization.
- **Hypertrichosis lanuginosa congenita** – The presence of an excessive number of

lanugo hairs is noticeable at or shortly after birth and does not resolve with age.

- **Acquired hypertrichosis** – This kind of hair growth is distinguished by the emergence of thick, coarse terminal hairs that occur as a result of medication use (such as cyclosporine, streptomycin, penicillin, phenytoin, spironolactone, diazoxide, minoxidil, interferon, and corticosteroids) or metabolic/endocrine disorders (including anorexia nervosa, HIV/AIDS, Cushing syndrome, and thyroid dysfunction).
- **Becker nevus** – A smooth muscle hamartoma, which is confined to a specific area, generally manifests as a sizable hyperpigmented patch with increased thick, terminal hairs on the upper extremities or trunk.

TREATMENT

There is no exact treatment for the disorder named acquired hypertrichosis lanuginosa. To advance the cosmetic advent the following hair exclusion techniques may be used:

- Eflornithine cream
- Laser hair removal
- Mechanical or chemical depilation

Treatment options for HLA depend on the underlying cause of the condition. For cases associated with internal malignancy, the mainstay of treatment is addressing the cancer through surgery, radiation therapy, and chemotherapy. In some cases, resolution of hypertrichosis may occur following treatment of the cancer. For cases associated with non-malignant causes, such as malnutrition, hyperthyroidism, or HIV, treating the underlying condition may lead to improvement or resolution of hypertrichosis. In cases where HLA is drug-induced, discontinuation or substitution of the offending medication may lead to resolution of the condition. There are limited reports of success with topical and systemic medications such as minoxidil, finasteride, spironolactone, and eflornithine, but more research is needed to establish their efficacy in treating HLA.

COMPLICATIONS

There are several potential complications associated with Hypertrichosis lanuginosa acquisita. One of the most significant is the underlying malignancy that is often associated with the condition. This can lead to a range of complications, including metastasis and other cancer-related symptoms. In addition, the excessive hair growth itself can cause discomfort and affect quality of life, leading to social and psychological difficulties. Treating the underlying cancer may also involve aggressive interventions such as chemotherapy and radiation, which can have their own set of side effects and complications. Furthermore, certain medications used to treat the condition may also have potential side effects, such as immunosuppression, which can increase the risk of infection.

PROGNOSIS

The prognosis for individuals with hypertrichosis varies based on the type of hypertrichosis they have. Those with hypertrichosis associated with genetic syndromes typically experience lifelong symptoms. In contrast, drug-induced hypertrichosis is typically reversible once the medication is discontinued.

REPORTED RENOWNED CASES

FIRST REPORTED CASE- Petrus Gonsalvus, the first recorded case of hypertrichosis.[5]

Case No. 1: A mediastinal mass-related chest discomfort and electrocardiographic abnormalities led to the hospitalisation of a 66-year-old woman with a history of breast and endometrial cancer. An erythematous plaque on the right breast areola was seen during examination, and mammary Paget's disease was identified. A right breast infiltrating ductal carcinoma that had progressed to the anterior mediastinum was discovered during a

subsequent examination. Due to the patient's excessive eyebrow and eyelash growth as well as the fine, whitish lanugo hair on the cheeks, chin, nose, and ears, pleural effusion was treated, and a dermatologist's opinion was sought. Leukocytosis, low haemoglobin levels, and high g-glutamyltransferase and prolactin levels were all discovered through blood tests. Dehydroepiandrosterone, basal 17OH-progesterone, and estradiol levels were abnormally high.[9]

Case No. 2: A 66-year-old woman with adenoacanthoma of the uterus received JCo therapy to the pelvis followed by total abdominal hysterectomy and bilateral salpingooophorectomy. Metastatic adenoacanthoma was detected in the left cervical lymph node 2 months postoperatively, and 4 months later, she developed downy hair growth on her face and later on her body. The patient was referred to Wayne State University Oncology Service, where physical examination revealed cervical lymphadenopathy, a large retroperitoneal mass, and extensive fine, soft, white downy hair growth. Metabolic, hematologic, and endocrine studies were normal except for elevated LDH, alkaline phosphatase, and CEA levels. Roentgenograms, including bone survey and liver and brain scan were normal, except for a positive gallium scan in the left supraclavicular fossa. Skin biopsy from the shoulder showed thin, unmedullated hair, and a small avascular dermal papilla. The diagnosis was "malignant fuzz." The patient did not respond to hormonal therapy or multiple chemotherapeutic agents and died in November 1973. Autopsy permission was not granted.[10]

Case No. 3: Patient B. B. was a 35-year-old woman who was stated to the Wayne State University Oncology Service in the month of September 1973, due to superior vena cava obstacle. Prior to the onset of cervical lymph node enlargement, she had noticed the onset of new facial and shoulder hair growth a year ago. The physical examination revealed facial edema, jugular venous distention, and a systolic murmur heard over the right second intercostal area radiating into the neck. Grayish-white lanugo hair was noted over the face and both shoulders, with a normal hair pattern over the trunk, arms, and legs. A superior mediastinal mass extending into the right hilar area was detected through a chest roentgenogram. The biopsy slides were reviewed and showed malignant lymphoma, diffuse histiocytic type. Extensive laboratory studies were normal, except for an elevated LDH. The patient was treated with 60Co therapy to the mediastinum and cervical area, which provided a dramatic relief of facial and cervical edema. However, subsequent celiotomy showed extensive mesenteric nodal involvement with lymphoma. In summary, Patient B. B. presented with superior vena cava obstruction and lymphoma, diffuse histiocytic type. The onset of new facial and shoulder hair growth a year prior to cervical lymph node enlargement was also noted. Despite the initial success of 60 Co therapy, the patient's subsequent celiotomy revealed extensive mesenteric nodal involvement with lymphoma.[10]

CONCLUSION

In conclusion, Hypertrichosis lanuginosa acquisita is a rare and poorly understood condition characterized by excessive growth of fine, unpigmented hair on the face, trunk, and extremities. It is most commonly associated with an underlying internal malignancy, with lung, breast, and uterine cancers being the most frequently reported. Early recognition of hypertrichosis lanuginosa acquisita and prompt investigation for an underlying malignancy is crucial. Although the condition can be cosmetically distressing, treatment of the underlying cancer is the most effective approach to manage the condition. Further research is needed to fully understand the pathophysiology of the condition and to improve diagnosis and management strategies. A collaborative, interdisciplinary approach is crucial to manage hypertrichosis lanuginosa acquisita and to optimize patient outcomes.

LIST OF ABBREVIATIONS

NSAID- Non-steroidal anti-inflammatory drugs

EGFR - Estimated glomerular filtration rate

HIV - Human immunodeficiency virus

AIDS - Acquired Immune Deficiency Syndrome

HLA - Hypertrichosis lanuginosa acquisita

LDH - lactate dehydrogenase

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Original Article

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Influence of Environment and Measurement Conditions on Blood Pressure During Self-Measurement Blood Pressure

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ABSTRACT

Background: Effective blood pressure (BP) monitoring outside medical office requires that each patient have validated sphygmomanometer. Due to their relatively high expense, these sphygmomanometers remain little or not accessible in our working context. When self-monitoring of blood pressure (SMBP) is prescribed in the office, most patients go to private pharmacies where BP measurements are influenced by environment and measurement conditions.

Aim: To determine influence of environment and measurement conditions on BP during SMBP in healthy sedentary people in order to describe reality of practice of this method in our working context.

Method: Prospective experimental transversal study including 174 volunteers (47 women), aged 18 to 25 years. Systolic BP (SBP), diastolic BP (DBP), and heart rate (HR) were measured by home SMBP according to international guidelines and by private "pharmacies SMBP". Information on environment and conditions of BP measurement was collected on form by each subject. Means and standard deviations of SBP, DBP, and HR were calculated and compared from the measurements obtained.

Results : The mean age of study population was 21.1±2 years (Table 1). Only 9.7% of pharmacy measurements were taken in quiet environment (Figure 1). In study population, SBP, DBP, and HR measured by home SMBP were significantly (p=0.00) higher than those measured by "pharmacies SMBP" (Table 2). However, no significant difference (p>0.5) was found between measurements obtained by home SMBP and those obtained by " pharmacies SMBP " in quiet environment (Table 3). All of the equipment used in pharmacies were validated electronic sphygmomanometers (Figure 2).

Conclusion: The environment significantly influenced measurements performed in pharmacies. Compared to home SMBP, "private pharmacies SMBP" in our working context does not follow international guidelines and is therefore influenced by environment and measurement conditions.

Keywords: blood pressure, blood pressure measurement environment and conditions, blood pressure self-measurement.

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INTRODUCTION

Blood pressure (BP) is impulse of blood on each unit area of arterial wall.[1] This propulsive force induced by heart to perfuse body tissues at an average value of 100 mmHg. As cardiac ejection is intermittent, BP oscillates between systolic maximum of 120 mmHg and diastolic minimum of 80 mmHg.[1] A persistent increase in these values, greater than or equal to 140 and/or 90 mmHg at medical office, is hypertension.[2,3] Hypertension, major cardiovascular risk factor, has established itself as public health problem in our developing countries.[4] In 2017, its prevalence was 24.8% in sub-Saharan Africa.[5] In Côte d'Ivoire, it was estimated at 20.4%.[6] Hypertension remains major contributor to morbidity and mortality worldwide.[5] Its management requires regular BP monitoring in and out of medical office[2,3]. Among methods of ambulatory BP monitoring, self-measurement of blood pressure (SMBP) is becoming increasingly significant in diagnostic evaluation and therapeutic management of hypertension[7]. It's defined as conscious and voluntary measurement of BP by a subject[8] outside the medical office, in his familiar environment.[9] SMBP provides many blood pressure values outside medical office to better estimate cardiovascular risk[7]. To be more effective, this method requires that each subject has reliable, validated and suitable sphygmomanometer.[9] However, in our working context, due to their relatively high cost, validated electronic sphygmomanometers remain little or not accessible considering the indigence of most patients[10]. This obliges them to go to private pharmacies when home SMBP is required. But according to the recommendations[2,3,9], home SMBP should be performed at home, by the subject himself, in a quiet environment, sitting with his feet flat, back and arms supported, after five minutes of rest, with validated sphygmomanometer and humeral cuff. In practice, these recommendations are not or only marginally followed in private pharmacies, some of which propose BP measurements in a noisy environment, sometimes in standing posture. Therefore, the aim of this work is to determine influence of environment and measurement conditions on resting BP values of healthy sedentary subjects during SMBP in order to describe reality of this method in our work context.

MATERIAL AND METHODS

Ethical approbation

This study was approved by the ethics committee of the Yopougon Hospital and University Center (Abidjan-Côte d'Ivoire) and followed the guidelines of Helsenki Declaration. The problematics, purpose, objectives and protocol of the study were explained to the subjects. Written informed consent was obtained from all study participating. The barrier precautions for Covid-19 were respected.

Study population

The target population consisted of student volunteers from the Félix Houphouët-Boigny University (FHBU) in Abidjan (Côte d'Ivoire), who were recruited orally in amphitheaters after receiving information on purpose and methodology of study. Subject inclusion for study was based on age between 18 and 25 years, black African origin, Ricci and Gagnon score of less than 35 (inactive and not very active subjects) and body mass index (BMI) of less than 30 kilograms per square meter. Subjects with any of following criteria were not included in study: hypertension, diabetes, smoking, obesity, regular alcohol consumption, cardiovascular or bronchopulmonary symptoms or pathology, hemoglobinopathy, recent (less than 1 week) or active infection, cardiovascular drug therapy, clinical anemia. Inclusion and non-inclusion criteria were determined by using survey questionnaire organized into interrogation section and recording of anthropometric parameters. Among 330 voluntary subjects, 294, including 80 women, were enrolled.

Study protocol

This was prospective experimental study conducted in physiology and functional

explorations laboratory, FHBU and in private pharmacies in Abidjan. The study was conducted between February 2022 and October 2022. The protocol was organized in two steps. A first steps where subjects were received according to predetermined program, by groups of twenty-five, in physiology laboratory, previous education on the self-measurement of blood pressure (SMBP) principle and methodology and of SMBP procedure. This latter consisted of two phases: home SMBP, according to international guidelines[2,3] and "pharmacies SMBP".

Seven OMRON (m3, Japan) electronic sphygmomanometer were used. The day subjects received electronic sphygmomanometer, they were reminded SMBP methodology. For both subjects, it was recommended to measure BP on the non-dominant arm, in quiet environment, in seated position after five-minute rest, with the cuff positioned at the semi-flexed arm, itself placed on table at heart level. Measurement should be done in morning on an empty stomach and in evening before bedtime, three times in a row, one to two minutes apart. Measurements were performed on three consecutive days[2,3].

Subjects visited private pharmacies for BP measurement in traditional pharmacy environment and working conditions. Participants went to private pharmacy of their choice in Abidjan for three days in a row. They were asked to perform three BP measurements, one or two minutes interval.

For both phases, the results of the BP and heart rate (HR) measurements were recorded on protocol datasheet given to each subject. On this protocol datasheet and for measurement in private pharmacies, subject should fill in information on measurement environment: noisy or quiet, availability or not of room or box designated for measurement of BP; conditions of measurement: measurement by himself or by pharmacy staff, respect or not of minimum of five minutes of rest, standing or sitting posture, back and arms supported or not (if measurement in sitting posture), mark of instrument used. To minimize methodological bias, the sequence of home SMBP and was randomized for each subject. At end of protocol, 120 subjects (33 women) whose were performed in the standing posture were excluded from study.

Statistical Analysis

In each subject, means and standard deviations of systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were calculated from different measurements obtained in overall population, according to gender and site of measurement. Statistical analysis was performed by IBM SPSS Statistics 20 software. Comparisons of means of anthropometric parameters as well as those of SBP, DBP, and HR between men and women were conducted using the independent samples t test. Comparisons of means of SBP, DBP, and HR by measurement site were obtained using paired-samples t test. Analyses were conducted for an acceptable type 1 error set at 0.05.

RESULTS

A total of 174 subjects (147 males and 47 females) comprised study population and its characteristics are reported in Table 1. The mean age of men was 21.3±2.1 years, significantly higher than that of women, which was 20.6±1.7 years. Table 2 compares means of SBP, DBP, and HR by measurement site in overall population and by gender. SBP, DBP, and HR measured by "pharmacies SMBP" were significantly higher than those measured in home SMBP. Table 3 compares means of SBP, DBP, and HR during home SMBP versus "pharmacies SMBP" in subject group where "pharmacies SMBP" was performed in a quiet environment. These means were statistically identical. Figure 1 and Figure 2 show data on environment and conditions of BP measurement in pharmacies, respectively. Ninety percent of pharmacies conducted measurements in a noisy environment. In all pharmacies visited, BP measurement was performed by staff present.

Table 1: Age and anthropometric characteristics of study population.

Characteristics	All (n=174)	Women (n= 47)	Men (n= 127)	p
Age (years)	21,1 ± 2	20,6 ± 1,7	21,3 ± 2,1	0,01
Weight (Kg)	61,8 ± 9,7	59,9 ± 12,6	62,5 ± 8,2	0,04
Size (m)	1,7 ± 0,1	1,6 ± 0,1	1,7 ± 0,1	0,00
BMI (kg/m^2)	21,5 ± 3,7	22,6 ± 5	21,1 ± 2,9	0,00

n = population size; kg/m^2 = kilogram per square meter; m = meter; BMI = body mass index; p = significance of test.

Table 2 : Comparative means of blood pressure and heart rate during home versus "pharmacies" self-measurement blood pressure.

		SELF-MONITORING OF BLOOD PRESSURE		
POPULATION	Characteristics	Home	Pharmacies	p
ALL (n= 174)	SBP (mmHg)	105,8 ± 4,7	109,5 ± 10,2	0,00
	DBP (mmHg)	65,8 ± 4,5	72,4 ± 2,9	
	HR (bpm)	67,3 ± 5,2	80,1 ± 10,9	
WOMEN (n= 47)	SBP (mmHg)	103,8 ± 4,8	110,4 ± 10,6	
	DBP (mmHg)	65,3 ± 5,3	72,4 ± 3,1	
	HR (bpm)	69,3 ± 6,8	82,2 ± 12,6	
MEN (n= 127)	SBP (mmHg)	106,6 ± 4,4	109,2 ± 10,1	
	DBP (mmHg)	66 ± 4,1	72,4 ± 2,9	
	HR (bpm)	66,6 ± 4,2	79,4 ± 10,1	

n = population size; SBP = systolic blood pressure; DBP = diastolic blood pressure, HR = heart rate; LmmHg = millimeter of mercury; p = significance of test.

Table 3: Comparative means of blood pressure and heart rate during home (H-SMBP) versus "pharmacies" (P-SMBP) blood pressure self-measurement in quiet measurement environment-.

QUIET MEASUREMENT ENVIRONMENT (n=17)			
	PARAMETRES	MOYENNES	p
H-SMBP Vs P-SMBP	SBP (mmHg)	108 ± 13	0,39
		109 ± 13	
	DBP (mmHg)	73 ± 6	0,05
		74 ± 6	
	HR (bpm)	79 ± 10	0,44
		80 ± 10	

n = population size; SBP = systolic blood pressure; DBP = diastolic blood pressure, HR = heart rate; mmHg = millimeter of mercury; p = significance of test.6

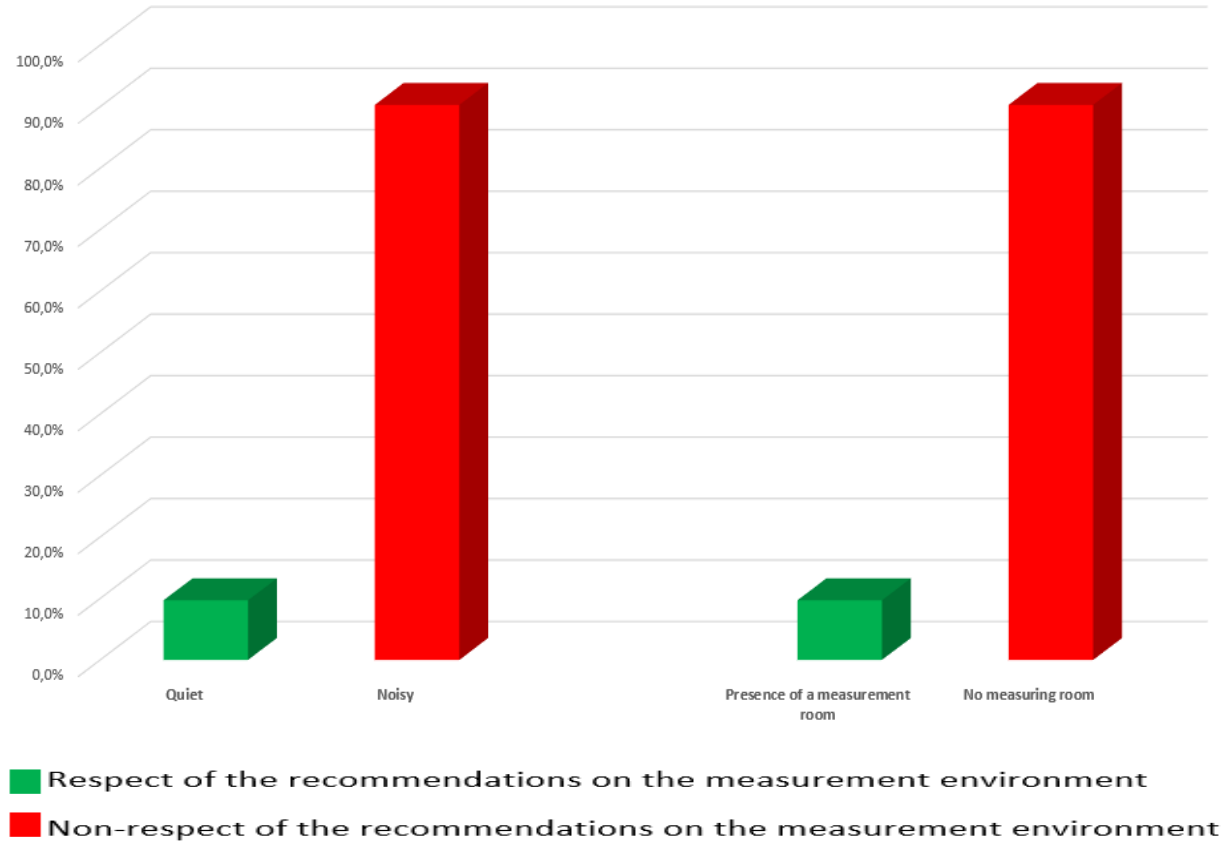

Figure 1: Blood pressure measurement environment in pharmacies.

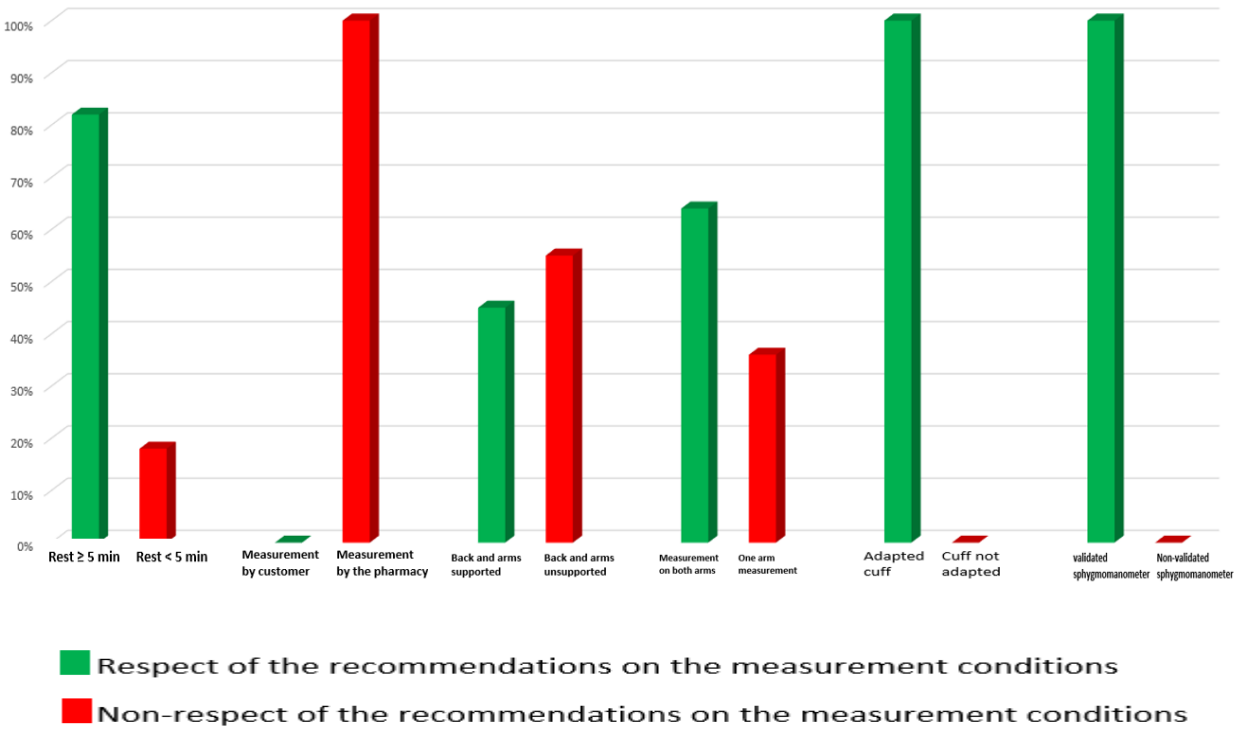

Figure 2: Conditions of measuring of blood pressure in pharmacies

DISCUSSION

The aim of this work was to determine influence of environment and measurement conditions on resting blood pressure (BP) values of healthy sedentary people during self-measurement of blood pressure (SMBP) in order to describe reality of this method in our work context. Systolic (SBP) and diastolic (DBP) BP and heart rate (HR) measured by "pharmacies SMBP" were significantly higher than those obtained by home SMBP.

Recommended since 2005, ambulatory BP measurements have been confirmed by European recommendations in 2007[11]. Home SMBP is routinely included in all international recommendations for management of adult hypertension[12,13]. Home SMBP blood pressure values better define basal blood pressure level than the conventional method, are more correlated with target organ damage, and better predict cardiovascular morbi-mortality[11]. Documentation on practice of home SMBP in Africa is almost non-existent. In our population, its practice was estimated at 36.3%[14]. In present study, differences observed between "pharmacies SMBP" and home SMBP blood pressure values could be attributed to non-adherence to the recommendations[2,3,9] in private pharmacies compared with home measurements. Indeed, in our work context, the pharmacy is place where the pharmacist stores and sells drugs. It is a relatively noisy trading environment because of many customers. Most do not have exclusively customer's rooms for SMBP. In addition, the measurement is not done by the customer himself but by staff present (figure 2). It is therefore not "true SMBP" because it does not hide, among other things, the white coat effect. The noisy measurement environment was main factor that affected the blood pressure values in pharmacies and explained difference observed (Table 3). In all the pharmacies visited, cuff size of blood pressure monitor used was adapted to the subject's arms. This could be explained as study population was composed of subjects who were neither obese or underweight. Actually, size of cuff is crucial for an accurate BP measurement. A lower cuff than necessary overestimates BP and a higher cuff underestimates it[9].

Management of hypertensive subject is strongly dependent on analysis of blood pressure values, reliable and accurate measurement of the BP thus appears fundamental[15]. While in developed countries initiatives have been made to remove barrier that affordability of blood pressure monitors may represent for practice of home SMBP[16], in Côte d'Ivoire, blood pressure monitors are not covered by universal health insurance. In such context, when home SMBP is prescribed, patients who do not have electronic sphygmomanometer at home go to private pharmacies. In Abidjan, the latter offer PA measurement at costs ranging from 200 to 500 XOF (between 0.4 and 1 dollar US). Home SMBP is preferential method for long-term follow-up of treated hypertensive patients. It's accepted by patients for long-term use and improves compliance and thus control of hypertension[9]. Considering many benefits of home SMBP[2,3,9], if it's to be realized outside home, it should be sufficiently supervised by previous education of subject on environment and conditions of measurement, including recording BP by patient himself with validated electronic sphygmomanometer, in room reserved for this purpose in pharmacy. Therefore, in order to reduce obstacle of financial accessibility to electronic sphygmomanometer validated in our context, health authorities should, firstly, through universal health coverage, grant a subsidy to make them more accessible and, secondly, create SMBP rooms or stations in public health establishments throughout the country.

CONCLUSION

This study confirms influence of environment and measurement conditions on resting blood pressure. It also shows reality of home self-monitoring of blood pressure in our work context. Compared with home self-measurement blood pressure, self-measurement blood pressure performed in pharmacies by most of subjects in our

work context does not follow international guidelines and is therefore influenced by environment and measurement conditions.

Conflict of interest: None

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