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Knowledge and Practices Regarding Gut Health and Indian Thali as A Gut Health Promoter Among Urban Educated Adults: A Cross-Sectional Study

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ABSTRACT

Background: The gut microbiome has emerged as an important determinant of digestive, metabolic, and immune health. Traditional dietary patterns such as the Indian thali may support microbial diversity because of their balanced nutritional composition. **Objective:** To assess knowledge and practices regarding gut health and Indian thali among urban educated adults and identify predictors of healthy gut-related practices. **Methods:** A cross-sectional study was conducted among 282 urban educated adults in Delhi-NCR using a structured questionnaire. Knowledge and practice scores were calculated. Logistic regression was performed to identify predictors of good practices. Statistical significance was considered at $p < 0.05$. **Results:** The mean knowledge score was 8.4 ± 2.1 out of 12. Good knowledge was observed in 61.3% participants. Good practices were seen in 42.9%. Participants with good knowledge were 2.31 times more likely to have healthy gut-related practices (AOR = 2.31, 95% CI: 1.34–3.97). **Conclusion:** Awareness of gut health was moderate, but implementation remained limited. Better knowledge significantly predicted healthier dietary practices.

Keywords: Gut microbiome, Indian thali, knowledge, dietary practices, public health

INTRODUCTION

The human gut microbiome consists of trillions of microorganisms, including bacteria, fungi, viruses, and archaea, that inhabit the gastrointestinal tract. These microbes play a fundamental role in maintaining health by assisting in digestion, synthesizing vitamins, and supporting immune function. A balanced gut microbiome contributes to the breakdown of complex carbohydrates and the production of short-chain fatty acids, which provide energy to intestinal cells and help maintain the integrity of the gut lining.[1]

The gut microbiome is closely linked to the immune system. Beneficial microbes help regulate immune responses and prevent excessive inflammation by interacting with intestinal immune cells. They also compete with harmful pathogens for nutrients and attachment sites, thereby reducing the risk of infections. Disturbances in the composition of the gut microbiota, often referred to as dysbiosis, have been associated with impaired immune function and increased susceptibility to disease.[2]

Emerging research has demonstrated that the gut microbiome influences not only digestive health but also metabolic and neurological functions. Alterations in microbial diversity have been linked with obesity, diabetes, cardiovascular disease, and inflammatory bowel disease. In addition, the gut–brain axis highlights the role of gut microbes in modulating mood, stress responses, and cognitive function. This expanding body of evidence underscores the systemic importance of maintaining a healthy gut microbiome.[3]

Diet is one of the most important modifiable factors affecting gut microbiome composition. Diets rich in fiber, fruits, vegetables, whole grains, and fermented foods promote microbial diversity and support the growth of beneficial bacteria. Conversely, diets high in processed foods, refined sugars, and unhealthy fats may reduce microbial diversity and contribute to dysbiosis. Therefore, dietary interventions represent a practical strategy for improving gut health and overall well-being.[4]

The traditional Indian thali is a balanced meal

pattern that incorporates a variety of food groups in a single serving. A typical thali may include cereals or millets, pulses or legumes, vegetables, curd or other fermented dairy products, and small portions of healthy fats. This combination provides a broad spectrum of macronutrients and micronutrients, making the thali an excellent example of dietary diversity.[5]

Dietary diversity is important because it ensures the intake of multiple nutrients necessary for optimal physiological functioning. Different food groups contribute distinct vitamins, minerals, antioxidants, and phytochemicals that support growth, immunity, and metabolic health. The inclusion of colorful vegetables and fruits in a thali increases the intake of fiber and bioactive compounds, while pulses and legumes provide plant-based protein and resistant starch.[6]

The Indian thali also supports gut health through its high fiber content and inclusion of fermented foods. Fiber from whole grains, legumes, and vegetables serves as a substrate for beneficial gut bacteria, promoting microbial fermentation and the production of short-chain fatty acids. Fermented foods such as curd and buttermilk contribute probiotics that may enhance microbial balance and improve digestive function.[7]

Regional variations of the Indian thali further enhance dietary diversity by incorporating locally available ingredients and traditional cooking practices. For example, South Indian thalis may emphasize fermented rice-based dishes and coconut, while North Indian thalis often include whole wheat preparations and diverse lentils. These variations demonstrate the adaptability of the thali pattern and its potential to provide balanced nutrition across different cultural and geographical contexts.[8]

Traditional Indian diets are generally characterized by a high intake of plant-based foods, including whole grains, pulses, vegetables, fruits, nuts, and seeds. Such diets are naturally rich in dietary fiber, antioxidants, and phytochemicals, all of which have been associated with a reduced risk of chronic diseases. The emphasis on minimally processed foods and home-cooked meals further contributes to their protective health effects.[9]

Dietary fiber plays a central role in chronic disease prevention by improving glycemic control, lowering serum cholesterol levels, and promoting satiety. Whole grains and legumes commonly consumed in traditional Indian diets have a low glycemic index and provide sustained energy release. Regular consumption of these foods has been linked with a lower risk of type 2 diabetes, obesity, and cardiovascular disease.[10]

Traditional Indian dietary practices also include the use of spices such as turmeric, cumin, coriander, and fenugreek, which possess anti-inflammatory and antioxidant properties. Curcumin, the active component of turmeric, has been extensively studied for its potential role in reducing inflammation and oxidative stress. These culinary practices may contribute to the prevention of chronic diseases by modulating metabolic pathways and supporting overall health.[11]

However, the transition toward urbanized and Westernized dietary patterns has led to increased consumption of processed foods, refined carbohydrates, sugary beverages, and unhealthy fats. This shift has been associated with rising rates of obesity, hypertension, diabetes, and cardiovascular disease in India. Preserving and promoting traditional dietary patterns may therefore serve as an important strategy for reducing the burden of non-communicable diseases.[12]

The knowledge–practice gap refers to the discrepancy between awareness of healthy dietary practices and the actual implementation of those practices in daily life. Many individuals are aware of the importance of balanced nutrition, adequate fiber intake, and reduced consumption of processed foods. Despite this knowledge, adherence to healthy dietary habits often remains suboptimal.[13]

Several factors contribute to the knowledge–practice gap, including time constraints, convenience, taste preferences, economic considerations, and social influences. Urban lifestyles and demanding work schedules may encourage reliance on fast foods and ready-to-eat meals, even among individuals who understand the benefits of traditional, balanced diets. Additionally, aggressive marketing of processed foods can influence

food choices and undermine healthy eating behaviors.[14]

Cultural and behavioral factors also play a significant role in dietary practices. Family eating patterns, peer influence, and established food preferences may affect an individual's ability to adopt healthier habits. In some cases, individuals may perceive healthy foods as less convenient, less palatable, or more expensive, which can hinder the translation of knowledge into practice.[15]

Addressing the knowledge–practice gap requires multifaceted interventions that go beyond providing nutritional information. Public health programs should focus on improving accessibility and affordability of healthy foods, promoting practical meal planning skills, and creating supportive environments for healthy eating. Community-based education, behavior change communication, and policy measures aimed at reducing the availability of unhealthy foods can help bridge the gap between knowledge and practice.[15]

MATERIALS AND METHODS

Study design: Community-based cross-sectional study

Study population: Urban educated adults aged 18–65 years

Sample size: 282 participants

Sampling method: Convenience sampling

Inclusion criteria:

- Adults aged 18 years and above
- Minimum educational qualification of higher secondary school
- Willingness to participate

Exclusion criteria:

- Incomplete responses
- Unwilling participants

Study instrument: A structured questionnaire was developed after literature review and expert consultation. The questionnaire included:

- Sociodemographic profile
- Knowledge of gut health
- Knowledge of Indian thali
- Dietary practices related to gut health

STATISTICAL ANALYSIS

Data were entered into Microsoft Excel and analyzed using SPSS version 26.

The following analyses were performed:

- Frequency
- Percentage
- Mean ± standard deviation
- Chi-square test
- Binary logistic regression

Dependent variable:

Good gut health practice

Independent variables:

- Age
- Gender
- Educational level
- Knowledge score

A p value less than 0.05 was considered statistically significant.

RESULTS

Table 1. Sociodemographic characteristics

Variable	Frequency	Percentage
Gender		
Male	124	44.0%
Female	158	56.0%
Age		
18–24 years	142	50.4%
25–35 years	86	30.5%
>35 years	54	19.1%

Table 1 presents the demographic profile of the 282 participants included in the study. Among them, females constituted a slightly larger proportion (56.0%) than males (44.0%). This indicates relatively balanced gender representation, although women were more willing or available to participate in the survey.

Regarding age distribution, over half of the participants (50.4%) belonged to the 18–24

years age group, followed by 30.5% aged 25–35 years and 19.1% older than 35 years. Thus, the study population was predominantly composed of young adults. Since younger individuals generally have greater exposure to digital health information and social media, they may possess better awareness regarding gut health and nutrition. However, awareness does not necessarily translate into healthier dietary practices, making this population particularly relevant for assessing the knowledge–practice gap.

Overall, the findings indicate that the study primarily represents educated urban young adults, which aligns with the study objectives.

Table 2. Knowledge score distribution

Knowledge level	Frequency	Percentage
Poor	34	12.1%
Moderate	75	26.6%
Good	173	61.3%
Mean knowledge score = 8.4 ± 2.1		

Table 2 summarizes participants' knowledge regarding gut health, gut microbiota, and the role of the Indian thali in promoting digestive health. The majority of participants (61.3%) demonstrated good knowledge, whereas 26.6% had moderate knowledge and only 12.1% exhibited poor knowledge.

The mean knowledge score of **8.4 ± 2.1** (out of a maximum score of 12) suggests that participants possessed a reasonably good understanding of gut health concepts. This relatively high level of awareness may reflect increasing public exposure to nutrition-related information through healthcare professionals, educational institutions, mass media, and social media platforms.

Despite satisfactory knowledge levels, nearly two-fifths of participants still lacked comprehensive understanding, indicating opportunities for further public health education. These findings suggest that awareness campaigns should continue emphasizing the importance of dietary diversity, probiotics, prebiotics, and traditional dietary practices for maintaining a healthy gut microbiome.

Table 3. Practice score distribution

Practice level	Frequency	Percentage
Poor	161	57.1%
Good	121	42.9%
Mean practice score = 3.8 ± 1.6		

Table 3 illustrates participants' dietary practices related to gut health. Although knowledge levels were generally high, only 42.9% of participants demonstrated good dietary practices, while the majority (57.1%) reported poor practices.

The mean practice score of **3.8 ± 1.6** indicates only moderate adherence to recommended gut-friendly dietary behaviors. This finding suggests that awareness alone is insufficient to promote healthy eating habits. Factors such as busy lifestyles, food preferences, availability of processed foods, economic considerations, convenience, and lack of motivation may contribute to poor implementation of healthy dietary practices.

These results highlight a substantial knowledge–practice gap, emphasizing the need for interventions that focus not only on education but also on behavior change

strategies and supportive environments that facilitate healthier food choices.

Table 4. Association between knowledge and practice

Knowledge level	Good practice	Poor practice	p value
Poor/Moderate	31 (28.4%)	78 (71.6%)	0.002
Good	90 (52.0%)	83 (48.0%)	

Table 4 examines the relationship between participants' knowledge regarding gut health and their actual dietary practices. Among individuals with poor or moderate knowledge, only **28.4%** demonstrated good dietary practices, whereas **71.6%**had poor practices. In contrast, among participants with good knowledge, more than half (**52.0%**) practiced healthy dietary behaviors. The association between knowledge and practice was statistically significant (**p = 0.002**), indicating that higher knowledge levels were significantly associated with better gut health practices.

Although improved knowledge increased the likelihood of healthy behavior, almost half of participants with good knowledge still failed to adopt healthy dietary practices. This observation reinforces the existence of a knowledge–practice gap and suggests that educational interventions should be complemented with behavioral counseling, motivation, and environmental support to facilitate sustainable lifestyle changes.

Table 5. Logistic regression analysis

Predictor	AOR	95% CI	p value
Good knowledge	2.31	1.34–3.97	0.002
Female gender	1.42	0.84–2.38	0.181
Age >30 years	1.76	1.01–3.05	0.044

Table 5 presents the results of binary logistic regression analysis identifying independent predictors of good gut health practices.

Participants with good knowledge were **2.31 times more likely** to engage in healthy gut-related dietary practices compared with those having poor or moderate knowledge (**Adjusted Odds Ratio [AOR] = 2.31; 95% Confidence Interval [CI]: 1.34–3.97; p = 0.002**). Since the confidence interval does not include 1 and the p-value is below 0.05, knowledge is an independent and statistically significant predictor of healthy practices.

Female participants showed **1.42 times higher odds** of good practices than males; however, this association was not statistically significant (**p = 0.181**). Therefore, gender was not an independent predictor after adjusting for other variables.

Participants older than 30 years had **1.76 times greater odds** of following healthy gut-related practices compared with younger participants (**95% CI: 1.01–3.05; p = 0.044**). This statistically significant finding suggests that increasing age may positively influence dietary behavior, possibly because older adults are more health conscious or have greater concern about chronic disease prevention.

Overall, the regression analysis demonstrates that **good knowledge and older age were independent predictors of healthy gut-related dietary practices**, whereas gender did not significantly influence practice after adjustment for potential confounding factors.

These findings support the importance of strengthening educational interventions to improve dietary behaviors and promote gut health.

DISCUSSION

Previous studies have shown that although awareness regarding healthy eating may be adequate, translation into consistent dietary behavior often remains poor, reflecting a persistent knowledge–practice gap.[13–15]

This study demonstrated that while knowledge regarding gut health was relatively good, translation into actual dietary behavior was weaker. Similar findings have been reported in microbiome-related public health studies where awareness does not always lead to behavior change.[3]

The Indian thali, as a culturally acceptable dietary model, may provide a practical framework for promoting microbiome diversity.[1]

The strong association between knowledge and practice suggests that educational interventions may improve health behavior.

CONCLUSION

Knowledge regarding gut health and Indian thali among urban educated adults was satisfactory. However, actual implementation of healthy practices was limited.

Good knowledge significantly predicted healthier gut-related practices, indicating that educational strategies may improve adoption of beneficial dietary behaviors.

LIMITATIONS

- Convenience sampling limits generalizability
- Self-reported practices may introduce reporting bias
- Cross-sectional design prevents causal inference

RECOMMENDATIONS

- Community nutrition programs should emphasize gut microbiome health
- Traditional Indian dietary practices should be promoted
- Further multicenter studies should validate these findings
- Interventional studies should test educational strategies

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