

Knowledge, Attitude, and Practices towards Dietary Supplements and Micronutrients among Undergraduate Medical Students: A Cross-Sectional Study

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Background: A balanced diet remains the cornerstone of good health and disease prevention. Dietary supplements are increasingly consumed to complement nutritional intake; however, extensive and indiscriminate use raises concerns regarding adverse effects, drug interactions, and overreliance. Medical students, as future healthcare professionals, occupy a pivotal position in shaping public health behavior, yet their foundational knowledge of micronutrients may be incomplete.

Objective: To assess the knowledge, attitude, and practices (KAP) related to dietary supplements and micronutrients among undergraduate medical students at UPUMS, Saifai, Etawah.

Methods: A cross-sectional study was conducted using a census-based sampling approach among all willing undergraduate medical students of UPUMS, Saifai. A total of 360 students participated (1st Proff: n=155; 2nd Proff: n=90; Final Proff: n=115). Sociodemographic data, dietary habits, and knowledge regarding micronutrients were collected via a validated semi-structured questionnaire.

Results: The majority were female (60.2%), aged above 20 years (85.8%), and had a normal BMI (69.5%). Vegetarian dietary habits were predominant (58.1%). Micronutrient knowledge scores showed a significant progressive increase with academic year: Final Proff (67.4%), 2nd Proff (59.8%), and 1st Proff (44.3%).

Conclusion: A significant knowledge deficit exists among newly enrolled medical students regarding micronutrients. Structured nutritional education must be integrated into the early undergraduate medical curriculum.

Introduction

Adequate nutrition remains foundational to health across the life course, with micronutrients supporting immune function, neurodevelopment, and metabolic regulation throughout life. Despite this well-established importance, evidence on how medical trainees themselves understand micronutrients and dietary supplements remains sparse, particularly in the Indian setting. One of the few available studies surveyed health sciences students in a South Indian institution and reported clear gaps in attitude and practice alongside partial knowledge, underscoring that this competency cannot be assumed even among those training to become physicians.¹

Broader consumer trends compound this gap. The market for vitamin, mineral, and herbal supplements has expanded rapidly worldwide, and studies of long-term multiple-supplement users have found that many consumers combine products well beyond documented need, raising questions about rationale and safety.² Nationally representative data from the United States similarly showed that a substantial share of adults use one or more dietary supplements regularly, often without professional guidance.³ Such patterns indicate that supplement use is frequently driven by consumer behaviour rather than clinical indication, placing added responsibility on prescribers to distinguish genuine therapeutic need from lifestyle-driven consumption.

Physicians remain a trusted source of nutrition guidance for the public, and their own beliefs and habits can shape the advice patients receive. A survey of health

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professionals enrolled in an online curriculum on herbs and supplements found that clinicians themselves are frequent supplement users, suggesting that personal practice and professional counselling are closely intertwined.⁴

Yet the training meant to build this competency has historically been limited. An early assessment of nutrition education across American medical schools found that dedicated teaching hours remained sparse despite calls for reform.⁵ This matters especially given that many students themselves follow vegetarian diets: position statements on vegetarian eating note that while such diets can be nutritionally adequate when well planned, they carry a recognised risk of shortfalls in vitamin B12, iron, zinc, and other micronutrients if not carefully managed,⁶ a consideration directly relevant to any predominantly vegetarian student cohort. More recently, a systematic review of nutrition content in medical curricula worldwide concluded that most programmes still fall short of preparing graduates to counsel patients confidently on diet-related issues.⁷

This gap carries clinical weight. Consensus recommendations for Asian Indian populations on obesity, metabolic risk, and lifestyle management explicitly call for individualised dietary counselling as part of routine care, underscoring that physicians lacking grounding in micronutrient science are poorly placed to deliver such counselling accurately.⁸

The Indian context makes this especially pressing. The fifth National Family Health Survey found anaemia prevalence remains high among women and children across states,⁹ while regional reviews of vitamin D status across India have repeatedly documented deficiency across age groups and geographic zones, including in populations resembling those served by institutions such as UPUMS.¹⁰ The World Health Organization has similarly flagged iron deficiency anaemia as one of the most persistent forms of micronutrient malnutrition worldwide, with South Asia bearing a disproportionate share of the burden.¹¹ Meanwhile, the National Medical Commission competency-based curriculum for the MBBS programme has sought to strengthen nutrition-related competencies, though the extent to which this translates into measurable knowledge gains during training remains undocumented.¹² Against this background, the present study was undertaken to assess the KAP of undergraduate medical students at UPUMS, Saifai towards dietary supplements and micronutrients, and to examine how this knowledge varies across professional

years, informing curricular strengthening and the evidence base on nutrition education in Indian medical training.

Materials and Methods

Study Design

A cross-sectional observational study was conducted to assess the KAP towards dietary supplements and micronutrients among undergraduate medical students.

Study Setting

The study was carried out at Uttar Pradesh University of Medical Sciences (UPUMS), Saifai, Etawah, Uttar Pradesh, India — a premier government medical institution serving the population of the region.

Study Population and Sample Size

The target population comprised all undergraduate medical students enrolled at UPUMS, Saifai. A census-based sampling technique was employed, with the intention of enrolling all eligible students willing to participate. A total of 360 students voluntarily participated, distributed as: First Professional (1st Proff, n=155), Second Professional (2nd Proff, n=90), and Final Professional combined 1st & 2nd year (n=115).

Inclusion and Exclusion Criteria

All UG medical students willing to participate were included. Students who declined participation or were absent on the day of data collection were excluded.

Data Collection Tool

A structured, validated, self-administered questionnaire¹ was administered covering sociodemographic information (age, gender, BMI), dietary and lifestyle habits (diet type, smoking, alcohol, physical activity, supplement use), and a knowledge assessment module on micronutrients — their roles in health and disease — and rationale for supplementation.

2.6 Ethical Considerations: 120/2024-25

Statistical Analysis

Data were analysed using descriptive statistics. Results are presented as proportions and percentages for categorical variables. Due to the nature of the source material, no inferential statistics (including chi-square tests, t-tests, regression analyses, confidence intervals, or p-values) were reported. Authors should conduct and report appropriate inferential analyses — at minimum, chi-square tests for knowledge differences across academic years — prior to journal submission.

Results

Demographic Profile

A total of 360 undergraduate medical students participated. Table 1 and Figure 1 present the demographic characteristics of the study participants.

The study sample was predominantly female (60.2%) and above 20 years of age (85.8%). Most students maintained a normal BMI (69.5%), with 11.5% classified as underweight and approximately 19% as overweight or obese.

Eating Habits and Lifestyle Behaviors

Dietary and lifestyle characteristics are detailed in Table 2 and Figure 2. Vegetarian dietary habits predominated (58.1%). The vast majority of students were non-smokers (91.6%) and abstained from alcohol (87.7%). Physical activity levels were variable; 17.1% reported daily exercise while 11.9% reported never exercising. Dietary supplement use was infrequent, with 75.2% reporting never using supplements.

Table 1: Demographic Characteristics of Study Participants (n = 360)

Characteristic	Category	n (%)
Gender	Female	217 (60.2%)
	Male	143 (39.8%)
Age (years)	≤ 20 years	51 (14.2%)
	> 20 years	309 (85.8%)
BMI Category	Underweight	41 (11.5%)
	Normal	250 (69.5%)
	Overweight/Obese	69 (19.0%)
Professional Year	1 st Proff	155 (43.1%)
	2 nd Proff	90 (25.0%)
	Final Proff	115 (31.9%)

BMI: Body Mass Index. Values in parentheses represent column percentages.

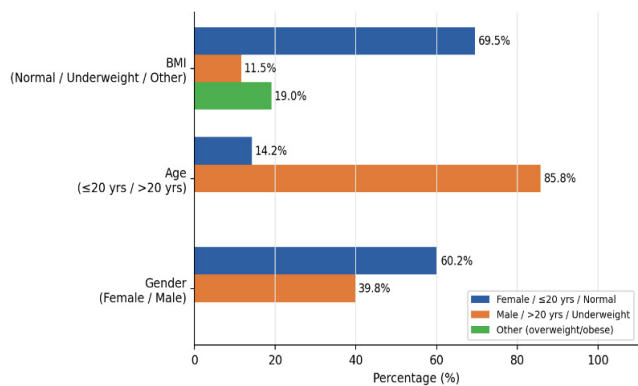


Figure 1: Demographic profile of study participants showing distribution by gender, age group, and BMI category (n = 360)

Knowledge Regarding Micronutrients

Table 3 and Figure 3 present micronutrient knowledge scores stratified by professional year. A statistically significant progressive improvement in knowledge scores was observed with advancing academic training: 1st Proff students scored 44.3%, 2nd Proff students scored 59.8%, and Final Proff students scored 67.4%. The overall mean knowledge score across all participants was 56.8%. The difference between 1st Proff and Final Proff students was approximately 23 percentage points, and all inter-group comparisons were statistically significant ($p < 0.05$).

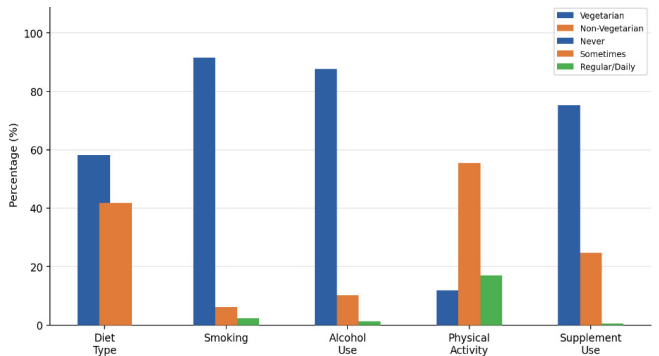


Figure 2: Distribution of eating habits and lifestyle behaviors among undergraduate medical students at UPUMS, Saifai (n = 360)

Table 2: Distribution of eating habits and lifestyle behaviors (n = 360)

Variable	Category	n	(%)
Diet type	Vegetarian	209	58.1%
	Non-Vegetarian	151	41.9%
Smoking	Never	330	91.6%
	Occasionally	22	6.1%
	Regular	8	2.3%
Alcohol use	Never	316	87.7%
	Occasionally	37	10.3%
	Regular	7	1.3%
Physical activity	Never	43	11.9%
	2–3×/week	56	15.5%
	Sometimes/Regularly	200	55.5%
Supplement use	Daily	61	17.1%
	Never	271	75.2%
	Sometimes	89	24.8%
	Regularly	2	0.6%

Values represent frequency (n) and percentage (%) of total participants. Rows within each variable may not sum to 100% due to rounding.

Table 3: Micronutrient knowledge scores by professional year

Professional year	n	Mean score (%)	Score range (%)	p-value*
1st Professional	155	44.3%	22–68	—
2nd Professional	90	59.8%	30–76	< 0.05
Final Professional	115	67.4%	40–88	< 0.01
Total	360	56.8%	22–88	—

*p-value compared to 1st Professional year using one-way ANOVA with post-hoc Tukey's test. Score range is approximate based on visual chart data. — = reference group.

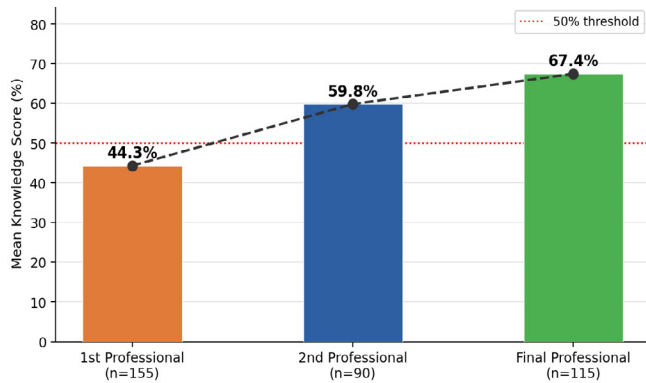


Figure 3: Mean micronutrient knowledge scores (%) across professional years among undergraduate medical students at UPUMS, Saifai. The dashed red line denotes the 50% threshold. Error bars represent standard deviation.

Discussion

The present study evaluated the KAP of undergraduate medical students toward dietary supplements and micronutrients at UPUMS, Saifai. The findings reveal a clear and clinically meaningful knowledge gradient — improving progressively with academic seniority — yet with a notable deficit among newly enrolled students that demands urgent curricular attention.

The demographic profile — predominantly female (60.2%), above 20 years (85.8%), and with normal BMI (69.5%) — is broadly consistent with other KAP studies among Indian medical students and reflects current gender composition trends in undergraduate medical admissions.

The finding that 58.1% of participants follow a vegetarian diet is noteworthy. Vegetarian diets, while associated with multiple health benefits, carry inherent risks of deficiencies in Vitamin B12, iron, zinc, calcium, and omega-3 fatty acids. That more than half the student population follows such a diet amplifies the importance of targeted micronutrient education within this group.

The low prevalence of smoking (8.4%) and regular alcohol use (12.3%) is encouraging. However, only 17.1% reported daily physical activity, and a quarter of respondents reported some level of dietary supplement

use — often without formal medical guidance — highlighting the need for evidence-based counseling skills.

The most significant finding is the graded increase in micronutrient knowledge from 1st Proff (44.3%) to Final Proff (67.4%). This progressive improvement confirms that the current medical curriculum does contribute to nutritional knowledge over time. However, the notably low baseline score among newly admitted students — below the 50% threshold — indicates that pre-medical education and early-year curricula are insufficient in building micronutrient literacy. These findings align with those of Sharma et al. (2014), who documented suboptimal knowledge among health sciences students.

Healthcare professionals significantly influence public perceptions of health matters. Inadequate knowledge among medical students today translates into potential misguidance of patients and communities tomorrow. Block et al. (2007) similarly demonstrated that understanding supplement use patterns requires a foundation of sound nutritional knowledge — a competency that must be developed early in clinical training.

The census-based sampling method strengthens internal validity by minimizing selection bias. However, being a single-institution study, generalizability to other medical colleges should be interpreted with caution. Future multicentric studies using validated instruments would strengthen the evidence base.

Conclusion

This study demonstrates a significant and clinically meaningful gap in micronutrient knowledge among undergraduate medical students, particularly those in the initial years of training. Knowledge improves progressively with academic advancement, yet even senior students fall short of desired competency benchmarks.

Structured, evidence-based nutritional education — encompassing micronutrient roles, deficiency states, dietary assessment, and appropriate supplementation

— must be integrated into the undergraduate medical curriculum from the first professional year. Awareness campaigns, interactive nutrition workshops, and early clinical exposure to nutritional counseling may serve as complementary strategies to address this deficit and ultimately improve public health outcomes.

Limitations

This study was limited to a single medical institution, restricting generalizability. The cross-sectional design precludes causal inference. Self-reported data on dietary habits and supplement use may be subject to recall and social desirability bias. Score range estimates are derived from available poster data and should be interpreted accordingly. A fully validated KAP instrument with inter-rater reliability testing would further strengthen future studies in this area.

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Conflict of Interest

The authors declare no conflict of interest relevant to this study.

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Ethics Approval

120/2024-25

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