

ORIGINAL ARTICLE

Awareness of Micronutrients among College Students and their Dietary Habits

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ABSTRACT

Background: Micronutrients play a crucial role in sustaining immunity, metabolism, and overall health. Despite this, many young adults fail to achieve recommended intakes due to irregular food habits and limited nutritional awareness. College students, in particular, form a vulnerable group where nutrition knowledge and actual dietary behavior may not correspond.

Aim: The study aimed to assess micronutrient awareness among college students and to explore its association with dietary practices.

Objectives: The objectives of the study to examine students' knowledge regarding micronutrient functions, their dietary behaviors related to breakfast, fruit and vegetable intake, and fast-food consumption, and to analyses the relationship between awareness levels and dietary habits.

Material and Methods: A cross-sectional survey was conducted among 200 students from varied academic backgrounds using a pretested questionnaire. Data were analyzed with descriptive statistics, while associations between awareness and dietary practices were tested using the chi-square method.

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Results: Of the participants, 35% rated their knowledge as high, 45% as moderate, and 20% as low. However, only 32.5% could correctly identify more than 75% of vitamin functions, while 27.5% scored below 50%. Daily breakfast consumption was reported by 42.5%, only 20% met the WHO fruit and vegetable intake guidelines, and 45% consumed fast foods three or more times per week. Higher awareness was significantly associated with regular breakfast intake ($p = 0.002$), fruit and vegetable consumption ($p = 0.001$), and use of supplements ($p = 0.007$). Low awareness correlated with frequent fast-food consumption ($p < 0.001$). **Conclusion:** Although many students perceive themselves as knowledgeable, actual understanding of micronutrients is limited. Stronger awareness is linked to healthier food choices, underscoring the need for structured nutrition education and supportive dietary environments in college settings.

KEYWORDS

• Micronutrients • Awareness • Dietary habits • College students • Nutrition education • Public health

INTRODUCTION

Micronutrients, comprising essential vitamins and minerals, are indispensable for maintaining optimal health and preventing chronic disease. These nutrients play vital roles in enzymatic reactions, hormonal balance, immune system regulation, and neurological function.⁹ Deficiencies, even subclinical, can impair cognitive performance, immunity, and physical well-being key factors for academic success and quality of life in young adults. College students represent a unique demographic undergoing a transition toward independence, often marked by irregular eating schedules, financial constraints, and exposure to readily available convenience foods.¹⁴ This life stage is critical for establishing lifelong dietary habits, yet it is also vulnerable to nutritional inadequacies. Recent studies show that despite increased access to health information, students' understanding of micronutrient needs remains incomplete, leading to suboptimal dietary choices.^{6,9} Understanding the intersection of micronutrient knowledge and dietary habits in this group is essential for developing targeted interventions. This study investigates the extent of micronutrient awareness among college students and examines its relationship with their dietary patterns, aiming to inform institutional and public health strategies.

Theoretical Framework

The study draws on three primary models:

- Social Cognitive Theory (SCT) – Highlights how personal factors

(knowledge, attitudes), environmental influences (food availability, peer norms), and behaviors interact to shape dietary patterns.

- Health Belief Model (HBM) – Suggests that students' perceived susceptibility to health problems and perceived benefits of nutrient-rich diets influence their willingness to adopt healthier eating behaviors.
- Socio-Ecological Model (SEM) – Emphasizes multi-level influences individual, interpersonal, organizational, community, and policy on dietary behaviors, underscoring the need for interventions that address environmental as well as personal determinants.

HYPOTHESIS

- **Null Hypothesis (H_0):** There is no significant association between the awareness of micronutrients among college students and their dietary habits.
- **Alternative Hypothesis (H_1):** There is a significant association between the awareness of micronutrients among college students and their dietary habits, such that higher awareness is positively correlated with healthier dietary choices.

REVIEW OF LITERATURE

Recent studies have increasingly focused on the relationship between micronutrient

awareness and dietary behaviour among young adults. Francis *et al.* (2023) observed that although many students report familiarity with vitamins and mineral supplements, their objective knowledge regarding functions and safe usage is often limited. This discrepancy between perceived and actual knowledge mirrors the challenges identified in the present study.

In a focused review, Wagner, Taylor, and Johnson (2022) highlighted persistent misconceptions about vitamin D, despite widespread health campaigns. They noted that a lack of practical guidance on dietary sources and safe sun exposure contributes to continuing deficiencies, suggesting that awareness programs must extend beyond information dissemination.

The World Health Organization (2021) reiterated that low fruit and vegetable intake remains a global concern, contributing significantly to chronic disease risk. WHO emphasised that knowledge must be supported by environmental and policy-level interventions to ensure sustainable dietary improvements.

Intervention research by Al-Qahtani *et al.* (2020) demonstrated that structured nutrition education programs improved both micronutrient knowledge and selected dietary behaviours among adolescents and young adults. However, they noted that sustained changes required repeated exposure and supportive environments.

Campus-based surveys have shown similar concerns. Greaney *et al.* (2020) reported moderate use of dietary supplements among college students, influenced by peer norms and marketing rather than evidence-based practice. Keski-Rahkonen *et al.* (2020) further associated breakfast skipping with poor metabolic outcomes, underscoring the role of lifestyle patterns in nutritional status.

Epidemiological evidence from Bailey, West, and Black (2019) confirmed that micronutrient deficiencies continue to pose significant global health challenges, particularly iron, vitamin D, and B12. Likewise, Bauer *et al.* (2019) and Stea and Torstveit (2019) noted increasing fast-food consumption among youth, displacing nutrient-rich foods and heightening risks of deficiency and obesity.

From a methodological perspective, Trakman *et al.* (2019) systematically reviewed nutrition knowledge in young adults and found that most assessments emphasised declarative knowledge (factual recall) rather than procedural knowledge (application skills), despite evidence that the latter better predicts behaviour. Similarly, Spronk *et al.* (2014) reported a modest but positive correlation between nutrition knowledge and dietary intake, noting that the effect was often reduced after adjusting for socioeconomic and environmental variables.

At a policy level, the NIH Office of Dietary Supplements (2016) and the NUTRI-KAP Survey (2016) highlighted persistent gaps in public awareness of micronutrients, calling for targeted educational campaigns and monitoring systems.

Earlier work by Wardle and Steptoe (2003) provided foundational insights into the role of socioeconomic and psychosocial factors in shaping dietary behaviours. Their findings underline the importance of interpreting nutrition knowledge within broader social and environmental contexts.

METHODOLOGY

Study Design and Participants

A cross-sectional survey design was used. The structured questionnaire was administered to a convenience sample of students from various disciplines and campus locations of leading university of Madhyapradesh.

The questionnaire comprised four sections:

- **Demographics** – Age, gender, academic major, socioeconomic status, and living arrangements.
- **Dietary Habits** – Meal frequency, consumption of fruits/vegetables, fast food intake, supplement use.
- **Nutrition Knowledge** – Understanding of general nutrition concepts, dietary guidelines, and nutrient sources.
- **Micronutrient Understanding** – Knowledge of vitamins/minerals, their functions, deficiency diseases, and sources.

Data Collection

The survey was distributed in person and via online platforms. Participation was voluntary, and informed consent was obtained.

Data Analysis

- **Descriptive statistics:** Frequencies, percentages, and mean scores for dietary habits and knowledge levels.
- **Inferential statistics:** Chi-square tests to examine associations between demographics and dietary habits.
- **Qualitative analysis:** Thematic coding of open-ended responses to identify common misconceptions and barriers.

RESULTS

Demographics

Participants represented diverse age groups (18–24 years), academic backgrounds, and living situations. Gender distribution was balanced.

Table 1: Demographic Profile of Respondents ($N = 200$)

Variable	Frequency (n=200)	Percentage (%)
<i>Age group (years)</i>		
18–20	85	42.5
21–23	70	35.0
24–26	45	22.5
<i>Gender</i>		
Male	95	47.5
Female	105	52.5
<i>Academic major</i>		
Science	80	40.0
Commerce	65	32.5
Arts/Humanities	55	27.5
<i>Living arrangement</i>		
Hostel	110	55.0
With family	80	40.0
Rented/PG accommodation	10	5.0

This table presents the **socio-demographic profile** of study participants, which is critical in understanding the context of the research population. Socio-demographic characteristics often act as **determinants, confounders, or**

effect modifiers in health, nutrition, and behavioral studies (Patton *et al.*, 2021). The age group distribution shows that the majority of participants were 18–20 years (**42.5%**), followed by 21–23 years (**35.0%**), and the least in 24–26 years (**22.5%**). This indicates that the sample is largely composed of late adolescents and young adults, typical of a college-going population. Previous studies highlight that this stage is a critical transitional phase influencing lifestyle behaviors, mental health, and academic performance (Sawyer *et al.*, 2018; Singh *et al.*, 2022).

The gender distribution shows a nearly balanced sample, with (**52.5%**) females and (**47.5%**) males, enhancing the generalizability of the findings. Research frequently reports gender-based differences in health behaviors, stress levels, and coping mechanisms, with females often being more health-conscious yet experiencing higher stress and anxiety compared to males (Matud, 2019; Kumari *et al.*, 2021). The academic distribution shows that participants were from Science (**40.0%**), Commerce (**32.5%**), and Arts/Humanities (**27.5%**), ensuring heterogeneity in the dataset. Academic disciplines are often associated with varying study patterns, stress levels, and career pressures, with science students in particular reported to experience higher academic stress due to competitive exams and career expectations (Dahal *et al.*, 2019).

The living arrangement data indicates that over half of the participants reside in **hostels (55.0%)**, followed by those living with family (**40.0%**), and a small proportion in rented/PG accommodations (**5.0%**). Living arrangements significantly influence dietary patterns, lifestyle, independence, and mental health. Research shows that hostel-living students often have irregular eating habits, higher stress levels, and limited social support compared to those staying with family (Ansari *et al.*, 2019; Alzahrani *et al.*, 2021).

This **demographic profiling** highlights the diversity and representativeness of the study sample. It allows for **sub-group analyses** (e.g., comparing stress levels between hostel residents vs. family-living students). Understanding demographic factors ensures that future interventions can be **tailored according to age, gender, academic major, and living arrangement**.

Table 2: Dietary Habits among College Students (N =200)

Parameter	Frequency (n-200)	Percentage (%)
Breakfast frequency		
Daily	85	42.5
3–5 times/week	60	30.0
≤2 times/week	55	27.5
Fruit & vegetable intake		
≥5 servings/day	40	20.0
2–4 servings/day	100	50.0
<2 servings/day	60	30.0
Fast food consumption		
≥3 times/week	90	45.0
1–2 times/week	80	40.0
Rarely/never	30	15.0
Self-rated nutrition knowledge		
High	70	35.0
Moderate	90	45.0
Low	40	20.0
Correctly identified vitamin functions		
≥75% correct answers	65	32.5
50–74% correct answers	80	40.0
<50% correct answers	55	27.5
Supplement use (per week)		
≥3 times	50	25.0
1–2 times	40	20.0
Rarely/never	135	55.0

The findings on breakfast frequency reveal that **42.5%** of participants consumed breakfast daily, **30.0%** reported intake 3–5 times per week, while **27.5%** regularly skipped it (≤2 times/week). Breakfast skipping has been widely recognized as a risk factor for poor academic performance, obesity, and metabolic disturbances (Keski-Rahkonen *et al.*, 2020; Adolphus *et al.*, 2019). These results suggest that more than half of the students are not adhering to the recommended daily breakfast practice, highlighting a critical area for targeted nutritional intervention. The analysis of fruit and vegetable intake shows that only **20.0%** of participants met the WHO recommendation of ≥5 servings/day, while **50.0%** consumed 2–4 servings/day, and **30.0%** reported <2 servings/day. This finding is

consistent with global evidence that young adults often fail to meet recommended intake levels, thereby increasing their risk of chronic diseases (WHO, 2021; Stea & Torstveit, 2019). The moderate consumption pattern highlights the need for targeted nutrition education and behavioral interventions. In terms of fast-food consumption, **45.0%** of participants reported intake ≥3 times/week, **40.0%** consumed it 1–2 times/week, while only **15.0%** rarely or never consumed fast food. Such high consumption has been strongly linked with obesity, cardiovascular risk, and micronutrient deficiencies (Bauer *et al.*, 2019; Lipoeto, 2020). These results align with existing literature indicating that urban youth are increasingly shifting toward high-calorie convenience foods at the expense of healthier traditional diets.

Regarding self-rated nutrition knowledge, most participants assessed themselves as having **moderate knowledge (45.0%)**, followed by **high (35.0%)** and **low (20.0%)**. While this perception is encouraging, self-assessment may not always correspond to actual nutrition literacy (Trakman *et al.*, 2019). Strengthening practical nutrition education could help bridge this gap and support healthier dietary practices. For the correct identification of vitamin functions, only **32.5%** of participants achieved ≥75% correct answers, **40.0%** fell within the moderate range, and **27.5%** scored <50%. This points to limited functional nutrition knowledge, particularly concerning micronutrient roles, which may negatively affect dietary quality (Spronk *et al.*, 2014; Abdel Megeid *et al.*, 2021).

These findings emphasize the importance of incorporating nutrition education into higher education curricula. Lastly, supplement use was reported as relatively low, with **55.0%** rarely or never using supplements, **20.0%** using them 1–2 times per week, and **25.0%** consuming them ≥3 times per week. This trend reflects findings from other studies where supplements are underutilized despite the presence of nutritional inadequacies (Greaney *et al.*, 2020; Pouchieu *et al.*, 2021). With the growing popularity of sports supplementation and functional foods, these results highlight the need for evidence-based awareness on the role and safe use of supplements in maintaining health.

Table 3: Micronutrient Awareness Levels (N=200)

Indicator	Frequency (n -200)	Percentage (%)
Self-rated nutrition knowledge		
High	70	35.0
Moderate	90	45.0
Low	40	20.0
Vitamin function accuracy		
≥75% correct answers	65	32.5
50–74% correct answers	80	40.0
<50% correct answers	55	27.5

The results of Table 3 highlight a **moderate level of awareness** among students, with gaps in both perceived and actual knowledge. While 35% rated their nutrition knowledge as high, only 32.5% were able to correctly identify ≥75% of vitamin functions. This discrepancy is

consistent with findings from global studies where students demonstrate a mismatch between *self-perceived competence* and *objective test results* (Twinkle *et al.*, 2023). In particular, the fact that over 27% scored below 50% on vitamin knowledge mirrors international trends. A recent study from the U.S. and Europe reported poor understanding of Vitamin D's role, despite widespread public campaigns (Wagner *et al.*, 2022). Similarly, inadequate knowledge about iron and its functions has been linked to poor dietary practices and higher risk of anemia in young adults (Bailey *et al.*, 2019). These findings underscore the importance of integrating **nutrition education modules** within higher education settings. Evidence from intervention trials suggests that targeted awareness programs significantly improve both self-rated and tested knowledge of micronutrients, leading to better dietary choices and reduced deficiency risks (Al-Qahtani *et al.*, 2020; NUTRI-KAP, 2016).

Table 4: Association between Micronutrient Awareness and Dietary Habits (Chi-square Test)

Variable	Awareness Level	Healthy Habit (%)	Unhealthy Habit (%)	χ^2 Value	p-value
Breakfast frequency	High	70.0	30.0	12.45	0.002*
Fruit & vegetable intake	High	65.0	35.0	15.10	0.001*
Fast food consumption	Low	25.0	75.0	18.56	0.000*
Supplement use	High	55.0	45.0	9.87	0.007*

* $p < .005$ is significant

The association between micronutrient awareness and dietary habits was examined using Chi-square analysis to test the stated hypotheses.

- **Breakfast frequency:** Students with high awareness demonstrated significantly healthier breakfast practices (70% vs. 30%), $\chi^2 = 12.45$, $p = 0.002$.
- **Fruit & vegetable intake:** High awareness was associated with greater intake (65% vs. 35%), $\chi^2 = 15.10$, $p = 0.001$.
- **Fast food consumption:** Low awareness was strongly associated with unhealthy fast-food intake (75% unhealthy vs. 25% healthy), $\chi^2 = 18.56$, $p < 0.001$.
- **Supplement use:** Students with higher awareness reported healthier supplement use (55% vs. 45%), $\chi^2 = 9.87$, $p = 0.007$.

- Across all tested variables, the p-values were below the 0.05 threshold, leading to the **rejection of the null hypothesis (H_0)**. Thus, the findings support the **alternative hypothesis (H_1)**: higher micronutrient awareness is significantly associated with healthier dietary behaviours.

DISCUSSION

The study findings provide clear evidence that micronutrient awareness is a significant determinant of dietary practices among college students. Students with higher awareness were more likely to consume regular breakfasts and adequate fruits and vegetables, reflecting healthier eating behaviours. These results align with previous studies indicating that nutritional knowledge is positively correlated with dietary quality, particularly in young

adult populations where lifestyle and peer influences often undermine healthy eating.

Conversely, low awareness was linked with higher fast-food consumption, a finding consistent with earlier research showing that inadequate nutritional literacy predisposes students to increased consumption of convenience and processed foods, which are often energy-dense and nutrient-poor (Wardle & Steptoe, 2003; Twinkle *et al.*, 2023). This highlights the dual role of knowledge and environment: while awareness promotes healthier decisions, external factors such as affordability, time, and food availability strongly influence student food choices (Arnett, 2000; NIH, 2016).

The significant but moderate association between awareness and supplement use reflects the complexity of this behaviour. Although greater knowledge may encourage informed supplement practices, other studies suggest that supplement intake is also driven by peer influence, media exposure, and misconceptions about the sufficiency of diet alone (Francis *et al.*, 2023). Thus, while awareness can guide appropriate use, it does not uniformly translate into healthier supplementation patterns.

Overall, the rejection of the null hypothesis (H_0) and acceptance of the alternative (H_1) indicates that awareness plays a pivotal role in shaping dietary behaviours. These findings are supported by recent intervention-based studies showing that nutrition education programs significantly improve fruit and vegetable intake and reduce fast-food consumption among young adults (NUTRI-KAP survey, 2016). However, awareness alone is insufficient; practical strategies such as improving food accessibility, embedding nutrition education into curricula, and creating supportive food environments are equally important to sustain behavioural change.

CONCLUSION

This study investigated micronutrient awareness and its association with dietary habits among 200 college students in Madhya Pradesh. Results showed that while 35% of students self-rated their nutrition knowledge as high, only 32.5% achieved $\geq 75\%$ accuracy on vitamin function questions, revealing a clear gap between perceived and actual knowledge,

consistent with previous reports.^{6,12} Dietary patterns indicated that more than half of students skipped breakfast regularly, only 20% met the WHO recommendation of five or more servings of fruits and vegetables per day, and nearly half consumed fast food at least three times per week, similar to earlier findings.^{1,5,8,15} Chi-square analysis demonstrated significant associations between awareness and dietary behaviours: students with higher awareness were more likely to eat breakfast regularly, consume fruits and vegetables, and use supplements appropriately, while those with lower awareness consumed fast food more frequently. These results support earlier evidence that improved nutrition knowledge is positively linked with healthier food choices.^{2,7,10} The findings confirm that although students recognize the importance of nutrition, their practical knowledge and behaviours remain inadequate.^{4,13} Strengthening nutrition education, improving access to healthy foods on campuses, and embedding nutrition literacy into university curricula are recommended, in line with international calls for supportive policy and environmental changes.^{9,14,15}

Limitations

Limitations include the cross-sectional design, reliance on self-reported data, and convenience sampling, which restrict causal inference and generalizability. Nevertheless, findings highlight the critical role of awareness in shaping dietary behaviours and call for multi-level interventions to foster healthier eating among young adults.

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