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Association Between Nutritional Knowledge and Body Mass Index Among Indonesian Sports Science Students: A Cross-Sectional Study

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ABSTRACT

Objective: This study aimed to examine the association between nutritional knowledge and body mass index (BMI) among sports science and health students at Universitas Negeri Surabaya, Indonesia. Methods: A quantitative cross-sectional study was conducted involving 66 students selected from a reported population of 80. Nutritional knowledge data were collected using an online questionnaire, while BMI was used as an indicator of weight status. The association between nutritional knowledge and BMI was examined using Spearman's rank correlation, with statistical significance set at $p < 0.05$. Results: The analysis revealed a weak positive correlation between nutritional knowledge and BMI ($r_s = 0.124$), which was not statistically significant ($p = 0.319$). Additional comparisons of nutritional knowledge across BMI categories also showed no statistically significant differences ($p = 0.824$). Conclusion: Nutritional knowledge was not significantly associated with BMI among the students examined. These findings suggest that nutritional knowledge alone may be insufficient to explain variations in BMI. Further studies incorporating dietary intake, physical activity, and directly measured anthropometric indicators are warranted.

Keywords: nutritional knowledge, body mass index, sports science students, nutritional assessment; cross-sectional study.

INTRODUCTION

Nutritional status is an important component of health and physical well-being among university students, particularly during the transition to adulthood, when individuals increasingly develop independent dietary and lifestyle behaviors. This transitional period is frequently accompanied by changes in food consumption, physical activity, academic responsibilities, and living environments, potentially affecting energy balance and body weight. Previous research has documented changes in weight-related behaviors during the transition to higher education, while broader evidence has highlighted the influence of dietary habits and lifestyle characteristics on university students' nutritional health (Deforche et al., 2015; Teleman et al., 2015; Almoraie et al., 2025). Nutritional knowledge may contribute to informed dietary decisions by improving individuals' understanding of nutrient requirements, food composition, and dietary recommendations. Nevertheless, knowledge does not necessarily translate into healthier eating practices or favorable anthropometric outcomes. A systematic review by Spronk et al. (2014) demonstrated that associations between nutritional knowledge and dietary intake were generally positive but relatively weak, suggesting that nutritional understanding represents only one component of a broader network of determinants influencing dietary behavior.

The relationship between nutritional knowledge and nutritional outcomes is particularly relevant among sports science and health students, whose academic environment emphasizes physical activity, exercise physiology, and health-related

practices. Although exposure to nutrition-related information may improve theoretical understanding, students' dietary decisions can also be influenced by financial limitations, food accessibility, social interactions, personal preferences, and academic schedules. Qualitative investigations have identified multiple environmental and psychosocial determinants of eating behaviors among university students, indicating that nutritional practices cannot be explained exclusively by individual knowledge (Deliens et al., 2014; LaCaille et al., 2011). Evidence from sports populations similarly demonstrates that nutritional knowledge varies considerably and may not consistently correspond with dietary adequacy or performance-related nutritional practices (Heaney et al., 2011; Spronk et al., 2015). Furthermore, contemporary sports nutrition recommendations emphasize the importance of individualized dietary strategies that account for energy expenditure, training demands, and physiological requirements rather than relying solely on general nutritional awareness (Thomas et al., 2016).

Previous studies have increasingly examined nutritional knowledge, dietary practices, and related health indicators across university and athletic populations. Systematic reviews have highlighted substantial variability in nutritional knowledge levels, dietary associations, and assessment procedures, partly reflecting differences in participant characteristics and measurement instruments (Trakman et al., 2016; Janiczak et al., 2022). The methodological quality of nutritional knowledge assessment is particularly important because questionnaire content, scoring systems, and validation procedures may influence the interpretation of observed relationships. Several instruments have therefore been developed or refined to improve the assessment of general and sports-specific nutritional knowledge, including validated questionnaires for general populations and athletes (Kliemann et al., 2016; Trakman et al., 2017; Vázquez-Espino et al., 2020). More recent methodological reviews have further emphasized the need to select instruments that correspond to the nutritional competencies and characteristics of the target population (Jayawardena et al., 2023). Collectively, these findings indicate that investigating nutritional knowledge requires careful consideration of both the conceptual construct and the procedures used to measure it.

Despite growing evidence concerning nutritional knowledge and dietary behavior, its association with body mass index (BMI) remains less straightforward. BMI is commonly used as a practical anthropometric indicator of weight status; however, it does not directly differentiate fat mass from fat-free mass, which may complicate interpretation among physically active individuals (Santi et al., 2018). Moreover, nutritional knowledge may influence dietary choices without producing measurable differences in BMI because body weight is shaped by multiple behavioral, physiological, and environmental factors. Research among university students has reported associations between greater nutritional knowledge, healthier dietary patterns, and lower BMI, although these findings cannot automatically be generalized across different populations and educational settings (Elmskini et al., 2024; Songür Bozdağ et al., 2026). Nutrition-related interventions in university populations have also produced varied outcomes, reinforcing the importance of distinguishing improvements in nutritional understanding from changes in dietary behavior and anthropometric indicators (Deliens et al., 2016). Consequently, further investigation is warranted to determine whether nutritional knowledge is associated with BMI among Indonesian sports science and health students.

Accordingly, the present study aimed to examine the association between nutritional knowledge and BMI among students of the Faculty of Sports Science and Health at Universitas Negeri Surabaya, Indonesia. Using a quantitative cross-sectional

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design, the study evaluated nutritional knowledge scores and BMI among 66 students and compared nutritional knowledge across BMI categories. The research addresses a context-specific evidence gap by examining whether nutritional understanding corresponds with anthropometric differences within an Indonesian sports science and health education setting. Rather than assuming that greater nutritional knowledge necessarily indicates a more favorable BMI, the study evaluates the observed relationship empirically. The findings are expected to provide preliminary evidence for interpreting nutritional knowledge assessments in university populations and inform future investigations that incorporate dietary intake, physical activity, and body composition.

METHODS

Study Design and Setting

This study employed a quantitative cross-sectional design to examine the association between nutritional knowledge and body mass index (BMI) among students of the Faculty of Sports Science and Health at Universitas Negeri Surabaya, Indonesia. Nutritional knowledge and anthropometric information were assessed within the same observational study using questionnaire-based data collection. The study was designed to identify associations between the variables rather than establish causal relationships. No experimental intervention was implemented.

Participants and Sampling

The study population comprised 80 students from the Faculty of Sports Science and Health at Universitas Negeri Surabaya. A total of 66 students were included in the analysis. The original study reported the use of simple random sampling, with the sample size determined using Slovin's formula. However, the procedures used to implement random selection and the assumptions underlying the sample size calculation were not specified in the available documentation. Consequently, the reported sampling approach requires further clarification to establish its reproducibility. The final analytical sample consisted of 66 participants for whom nutritional knowledge and BMI data were reported.

Research Variables and Instruments

The study examined two principal variables: nutritional knowledge and BMI. Nutritional knowledge was evaluated using a questionnaire distributed through Google Forms. The questionnaire was intended to assess participants' understanding of nutrition-related information, and the resulting scores were used to represent their level of nutritional knowledge. However, the original documentation did not specify the number of questionnaire items, response format, scoring procedures, or evidence of instrument validity and reliability.

BMI was used as the anthropometric indicator of weight status. It is calculated by dividing body mass in kilograms by the square of height in meters (kg/m^2). The original study categorized BMI into underweight, normal weight, overweight, and obesity groups. Nevertheless, the available documentation did not clearly establish whether body mass and height were directly measured or self-reported. In addition, the BMI classification thresholds differed across the reported tables. Therefore, the measurement procedures and classification criteria require verification before the final interpretation of nutritional status categories.

Data Collection Procedures

Data collection was conducted among students at Universitas Negeri Surabaya using an online questionnaire administered through Google Forms. The questionnaire was used to obtain information.

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RESULTS AND DISCUSSION

Results

1. Participant Characteristics

The study included 66 students from the Faculty of Sports Science and Health at Universitas Negeri Surabaya, Indonesia. Participants were categorized according to age, body weight, height, and body mass index (BMI). As presented in Table 1, most participants were aged 21–25 years (75.8%), followed by those younger than 20 years (16.7%). Regarding anthropometric characteristics, 48.5% of participants had a body weight below 50 kg, while 56.1% had a height between 151 and 160 cm. The original participant characteristics table indicated that 66.7% of students were classified as having a normal BMI. However, a separate nutritional status distribution table reported a different proportion of participants in the normal BMI category. Therefore, the BMI classification data require verification before a definitive distribution can be established.

Table 1. Demographic and Anthropometric Characteristics of Participants (n = 66).

Characteristics	Category	n	%
Age (years)	<20	11	16.7
	21–25	50	75.8
	26–29	3	4.5
	>30	2	3.0
Body weight (kg)	<50	32	48.5
	51–60	18	27.3
	>60	16	24.2
Height (cm)	<150	6	9.1
	151–160	37	56.1
	161–170	19	28.8
	>170	4	6.1
BMI category — original Table 1	Underweight	7	10.6
	Normal weight	44	66.7
	Overweight	6	9.1
	Obesity	9	13.6

2. Nutritional Knowledge Across BMI Categories

Nutritional knowledge scores were compared across four BMI categories: underweight, normal weight, overweight, and obesity. As shown in Table 2, the underweight group demonstrated the lowest mean nutritional knowledge score (42.71 ± 2.87), whereas the overweight group recorded the highest mean score (44.50 ± 5.68). The normal-weight and obesity groups had mean scores of 43.91 ± 3.34 and 44.22 ± 4.94, respectively. Although numerical differences were observed, the analysis of variance indicated no statistically significant difference in nutritional knowledge scores across BMI categories

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($p = 0.824$). These findings suggest that the observed variation in nutritional knowledge scores was not statistically distinguishable across the reported BMI groups.

Table 2. Comparison of Nutritional Knowledge Scores Across BMI Categories

BMI Category	Mean Nutritional Knowledge Score	SD
Underweight	42.71	2.87
Normal weight	43.91	3.34
Overweight	44.50	5.68
Obesity	44.22	4.94
Overall ANOVA p-value	**0.824**	—

3. Post Hoc Comparisons of Nutritional Knowledge Scores

Bonferroni-adjusted pairwise comparisons were reported to examine differences in nutritional knowledge scores between BMI categories. As presented in Table 3, all adjusted p-values were reported as 1.000, indicating that none of the pairwise comparisons reached statistical significance. The largest reported mean difference was observed between the underweight and overweight groups (−1.786), whereas the smallest difference was identified between the overweight and obesity groups (0.278). These findings are consistent with the overall ANOVA result, which did not identify statistically significant differences in nutritional knowledge scores across BMI categories.

Table 3. Bonferroni-Adjusted Pairwise Comparisons of Nutritional Knowledge Scores

BMI category I	BMI category J	Mean difference (I − J)	Adjusted p-value
Underweight	Normal weight	−1.195	1.000
Underweight	Overweight	−1.786	1.000
Underweight	Obesity	−1.508	1.000
Normal weight	Overweight	−0.591	1.000
Normal weight	Obesity	−0.313	1.000
Overweight	Obesity	0.278	1.000

4. Association Between Nutritional Knowledge and BMI

Spearman's rank correlation analysis was performed to examine the association between nutritional knowledge and BMI among the 66 participants. As presented in Table 4, the analysis yielded a weak positive correlation ($r_s = 0.124$), which was not statistically significant ($p = 0.319$). The positive coefficient indicates that higher nutritional knowledge scores tended to correspond with slightly higher BMI values within the observed sample; however, the magnitude of the association was small and statistically inconclusive. Therefore, the findings do not provide sufficient evidence of a monotonic association between nutritional knowledge and BMI among the participating students.

Table 4. Spearman's Rank Correlation Between Nutritional Knowledge and BMI

Variables	n	Spearman's r_s	p-value	Interpretation
Nutritional knowledge and BMI	**66**	**0.124**	**0.319**	**Weak positive, not statistically significant**

Discussion

The present study examined the association between nutritional knowledge and body mass index (BMI) among sports science and health students at Universitas Negeri Surabaya, Indonesia. The findings revealed a weak positive correlation between nutritional knowledge and BMI ($r_s = 0.124$), which was not statistically significant ($p = 0.319$). Similarly, nutritional knowledge scores did not differ significantly across BMI

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categories ($p = 0.824$). These results indicate that no statistically significant association between nutritional knowledge and BMI was detected within the examined sample. This finding should not be interpreted as evidence that nutritional knowledge is unrelated to nutritional health, as the relationship between knowledge and anthropometric outcomes may involve multiple behavioral and physiological pathways. Spronk et al. (2014) reported predominantly positive but relatively weak associations between nutritional knowledge and dietary intake, suggesting that nutritional understanding alone may not sufficiently explain nutritional outcomes. Similarly, Heaney et al. (2011) identified considerable variation in nutritional knowledge among athletes, while Janiczak et al. (2022) highlighted the complexity of associations between nutritional knowledge and dietary intake. Collectively, these findings suggest that nutritional knowledge may contribute to dietary decision-making without necessarily corresponding to measurable differences in BMI.

The absence of a significant association may also reflect the distinction between nutritional knowledge and its practical application in everyday dietary behavior. Although students may understand the principles of balanced nutrition, their food choices can be influenced by financial resources, food availability, academic schedules, social environments, and individual preferences. Deliens et al. (2014) identified multiple interacting determinants of eating behavior among university students, while LaCaille et al. (2011) emphasized the contribution of psychosocial and environmental factors to dietary practices and weight-related behaviors. Furthermore, Spronk et al. (2015) reported a relatively weak positive association between nutritional knowledge and dietary quality among elite athletes, indicating that knowledge may support healthier food choices without fully accounting for dietary variation. Spendlove et al. (2012) also demonstrated the importance of evaluating nutritional knowledge in athletic populations using appropriate assessment procedures. These findings provide a theoretical basis for understanding why students with comparable nutritional knowledge may exhibit different BMI values. However, because the present study did not directly assess dietary intake, food environments, or related behavioral characteristics, these explanations remain plausible interpretations rather than mechanisms established by the study data.

The comparison of nutritional knowledge scores across BMI categories further demonstrated relatively small differences among the underweight (42.71 ± 2.87), normal-weight (43.91 ± 3.34), overweight (44.50 ± 5.68), and obesity groups (44.22 ± 4.94). The overall analysis of variance revealed no statistically significant differences between these categories ($p = 0.824$), suggesting that nutritional knowledge scores did not clearly discriminate among the reported BMI groups. This finding differs from research by Elmskini et al. (2024), which identified associations between greater nutritional knowledge, adherence to the Mediterranean diet, and lower BMI among university students. Research examining sports nutrition knowledge, lifestyle characteristics, and BMI among regularly exercising university students has also emphasized the relevance of considering nutritional understanding alongside lifestyle-related variables (Songür Bozdağ et al., 2026). Nevertheless, differences in participant characteristics, measurement instruments, dietary patterns, and analytical approaches may contribute to variation across studies. Furthermore, the absence of statistical significance in the present investigation does not exclude the possibility of associations that could be detected in larger or more heterogeneous populations. Therefore, the findings should be interpreted as sample-specific evidence rather than definitive confirmation that nutritional knowledge has no relevance to weight status.

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Another important consideration concerns the interpretation of BMI as an indicator of nutritional status among sports science and health students. Although BMI is widely used to classify weight status, it does not distinguish between fat mass and fat-free mass, potentially limiting its interpretation among physically active individuals. Santi et al. (2018) demonstrated that individuals with similar BMI values may exhibit different body composition characteristics depending on their physical activity profiles. This limitation is relevant to sports science populations because participation in exercise and resistance training may influence muscular development and body mass. However, the present study did not assess participants' training characteristics, physical activity levels, or body composition, and therefore cannot determine whether these factors contributed to the observed findings. Sports nutrition recommendations also emphasize that nutritional requirements and dietary strategies should be interpreted in relation to physiological demands and individual characteristics (Thomas et al., 2016). Accordingly, future studies should complement BMI with directly measured anthropometric indicators and body composition assessments. Such measurements may help distinguish variations in body mass attributable to adiposity from those associated with muscular development and other physiological characteristics.

From an educational perspective, the findings suggest that nutritional knowledge assessments should be interpreted alongside practical dietary behaviors and other health-related indicators. Although no significant association with BMI was observed, nutrition education remains relevant to the development of informed dietary decision-making among sports science and health students. Evidence from university-based dietary interventions indicates that nutrition-related educational strategies may influence dietary practices, although their effectiveness varies according to intervention characteristics and outcome measures (Deliens et al., 2016). Similarly, reviews of nutrition knowledge in athletic populations have emphasized the importance of assessment quality and the alignment between educational content and practical nutritional competencies (Trakman et al., 2016; Jayawardena et al., 2023). Validated instruments, including the revised General Nutrition Knowledge Questionnaire and sports-specific nutritional knowledge measures, provide methodological approaches for assessing nutritional understanding more systematically (Kliemann et al., 2016; Trakman et al., 2017; Vázquez-Espino et al., 2020). Therefore, future educational evaluations may benefit from combining knowledge assessments with dietary records, food-choice indicators, and anthropometric measurements rather than relying exclusively on questionnaire scores or BMI classifications.

Several methodological limitations should be acknowledged. First, the cross-sectional design prevents causal inference and does not establish the temporal relationship between nutritional knowledge and BMI. Second, the sample comprised 66 students from a single faculty, limiting statistical precision and the generalizability of the findings. Third, the original study documentation did not adequately describe the nutritional knowledge questionnaire, including its content, scoring procedures, validity, and reliability. This limitation is particularly relevant because previous methodological investigations have demonstrated the importance of using appropriately developed and validated nutritional knowledge instruments (Trakman et al., 2016; Kliemann et al., 2016; Jayawardena et al., 2023). Fourth, the method used to obtain body mass and height measurements was not clearly documented, and discrepancies between the reported BMI category distributions require verification against the original dataset. Fifth, potentially relevant factors, including dietary intake, physical activity, sex, socioeconomic

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circumstances, and body composition, were not incorporated into the association analysis. Longitudinal research has demonstrated that dietary and activity-related behaviors may change during the transition to university, emphasizing the importance of accounting for these characteristics when examining weight-related outcomes (Deforche et al., 2015). Future research should therefore employ validated instruments, standardized anthropometric procedures, larger multisite samples, and multivariable analytical approaches to investigate the relationships among nutritional knowledge, dietary practices, physical activity, and body composition more comprehensively.

CONCLUSION

This study found no statistically significant association between nutritional knowledge and body mass index (BMI) among sports science and health students at Universitas Negeri Surabaya, Indonesia (r_s = 0.124, p = 0.319). Similarly, nutritional knowledge scores did not differ significantly across BMI categories (p = 0.824). These findings indicate that nutritional knowledge alone may not adequately explain variations in BMI within the examined population. However, the cross-sectional design, limited sample size, and absence of dietary intake and physical activity measurements restrict the interpretation and generalizability of the results. The findings highlight the importance of evaluating nutritional knowledge alongside behavioral and anthropometric indicators rather than relying on knowledge assessments alone. Future research should incorporate validated nutritional knowledge instruments, standardized body composition assessments, and broader participant samples to better understand the relationships among nutritional knowledge, dietary practices, physical activity, and nutritional status.

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