Publishing Excellence
Inspiring Progress
ARISTON PUBLICATIONS

BioMed and BioSci Advances

ISSN: 3068-7314 www.aristonpubs.com/biomed-and-biosci-advances https://doi.org/10.69626/bba.2026.0051

RESEARCH ARTICLE

A Study on Nutritional Status and Dietary Patterns among Young Adults in South India

Poornima Jeyasekaran*, J. Thilshath Yamina, A. Sri Vishalini Rathanam, M. Arun Kumar

ABSTRACT: This study aimed to evaluate the anthropometric profile and dietary habits of young adults in a South Indian college setting. A cross-sectional assessment was conducted with a sample of 60 students (34 males, 26 females) aged 18-25 years, recruited from the departments of Psychology, Information Technology, and English at The American College, Madurai. Anthropometric measurements, including height, weight, and Body Mass Index (BMI), were collected. Dietary intake and habits were assessed using a structured questionnaire covering meal frequency, dietary preferences, water and protein consumption, snacking patterns, and intake of processed foods and sugary beverages. The results indicated that the majority of participants (63%) fell within the normal BMI range (18.6–24.9 kg/m²), while 17% were overweight, 15% underweight, and 5% classified with obesity. Height and weight distributions showed central clustering, with most students measuring between 151–180 cm and weighing 41–70 kg. Dietary assessment revealed that 60% consumed three meals daily, yet a significant 80% did not consciously follow a balanced diet. Non-vegetarian diets predominated (88%). While daily water intake was adequate for 52% of participants, nearly half reported suboptimal hydration. Protein consumption was generally low, with 57% consuming only one serving daily. Snacking patterns indicated a preference for processed items like chips and crisps (34%), and while processed food and sugary beverage consumption was mostly occasional, label-reading practices were inconsistent. These findings highlight a discrepancy between generally healthy anthropometric status and suboptimal dietary practices, pointing to a need for targeted nutritional education among young adults to bridge this awareness gap and promote sustained health.

Keywords: Anthropometric Assessment, Dietary Habits, Nutritional Status, Young Adults, Body Mass Index.

Received: 23 September 2025; Revised: 05 November 2025; Accepted: 05 December 2025; Published Online: 11 January 2025

1. INTRODUCTION

Human growth represents a fundamental biological process characterized by an increase in anatomical size, a complex phenomenon historically quantified in the scientific literature through key parameters such as magnitude, velocity, and direction [1-4]. Magnitude refers to the absolute linear dimensions of the body or its segments, while direction describes the spatial vector of growth within a three-dimensional framework. Velocity, a critical dynamic measure, is defined as the rate of dimensional change per unit of time, providing insight into the pace of development [5-9]. These concepts form the cornerstone of auxology, the science of growth, and extend beyond mere physical measurement to reflect underlying metabolic, endocrine, and nutritional states [5, 6, 9-13]. The attainment of adult stature is not merely a genetic inevitability but a cumulative record of net nutrition; it embodies the long-term equilibrium between dietary intake and the energetic costs of life, including expenditures from physical activity, the metabolic demands of psychological stress, and losses accrued through illness from the prenatal period through adolescence and into maturity [2]. Consequently, achieved height in populations is often utilized as a robust, historical indicator of public health and socioeconomic conditions [12, 13].

In clinical and public health practice, body weight

Department of Food Science & Nutrition, The American College, Tallakulam, Madurai-625002, Tamil Nadu, India.

*Author to whom correspondence should be addressed: poornima@americancollege.edu.in (P. Jeyasekaran)

© Ariston Publications 2026. All rights reserved.

serves as a more immediate and routinely monitored metric of nutritional status. Expressed in kilograms, it represents total body mass and functions as a sensitive, though nonspecific, indicator of acute and chronic energy balance. Tracking weight, particularly across developmental stages using standardized growth charts for the pediatric population, is essential for identifying deviations suggestive of undernutrition, eating disorders, or the trajectory toward obesity [3, 14]. For adults, the relationship between weight and height is standardized into the Body Mass Index (BMI), a heuristic tool originally developed by Adolphe Quetelet. As defined by the World Health Organization, BMI is calculated as an individual's weight in kilograms divided by the square of their height in meters (kg/m^2) and provides a widely adopted, if imperfect, classification system for categorizing weight status from underweight to obesity [4, 15]. Its utility lies in its simplicity and strong epidemiological correlation with adiposity-related health risks at a population level, making it a cornerstone of nutritional screening and global health surveillance, despite known measurement errors and limitations in capturing body composition [5, 16].

The comprehensive assessment of nutritional and health status, however, necessitates a dual-focus approach that integrates both anthropometric measurement and detailed dietary evaluation [6, 11]. Anthropometry, defined as the systematic measurement of the physical dimensions and composition of the human body, provides objective, non-invasive quantitative data that are profoundly informative. Measurements such as height, weight, waist circumference, and derived indices like BMI offer a snapshot of nutritional outcomes, reflecting the culmination of long-term dietary habits, genetic potential, and environmental influences [12]. Concurrently, dietary assessment seeks to characterize the qualitative and quantitative aspects of food and nutrient intake [17, 18]. This involves elucidating patterns such as meal frequency, dietary diversity, preferences, and the consumption of specific food groups, which are critical for identifying the behavioral and environmental drivers behind anthropometric outcomes and revealing gaps between energy sufficiency and dietary quality [19-21]. This is especially pertinent in the context of the global nutrition transition, marked by a shift towards diets high in energy-dense, ultra-processed foods and sedentary lifestyles, a trend increasingly observed in developing nations such as India [7, 8, 9, 22, 23].

The novelty of the present study lies in its targeted application of this integrated anthropometric and dietary methodology to a specific, under-examined demographic cohort: young adults enrolled in higher education within a South Indian context. This population represents a critical transitional life stage marked by increasing autonomy over lifestyle and dietary choices, significant academic stress, and often erratic living routines, all of which can detrimentally impact nutritional status and promote obesogenic behaviors [20, 21, 24]. Furthermore, while national data on malnutrition often focus on children, pregnant women, or the elderly, the young adult demographic, particularly students, is frequently overlooked despite being at a formative stage for establishing lifelong health behaviors [10]. By deliberately employing both objective biometric screening and subjective dietary recall within this group, this research aims to uncover potential dissonances, for instance, a prevalence of normal BMI masking poor dietary diversity, inadequate micronutrient intake, or high consumption of sugar-sweetened beverages and processed foods [23, 24, 25]. This approach provides a more nuanced picture of health than either method alone could offer, highlighting specific, actionable areas for targeted nutritional intervention and education within university settings, thereby contributing to the development of effective, context-specific public health strategies for this important population group [19, 21].

2. METHODS AND MATERIALS

2.1. Study Design and Setting

A cross-sectional observational study was conducted to assess the anthropometric and dietary profiles of young adults. The investigation was carried out at The American College, located in Tallakulam, Madurai district, Tamil Nadu, India. The institutional setting provided access to a defined population of undergraduate students, facilitating the recruitment of participants from distinct academic disciplines.

2.2. Sample Size and Recruitment

A total of 60 participants were enrolled in the study. Sample size determination was guided by pragmatic considerations of feasibility and resource availability within the academic timeframe. Participants were selected using a random sampling method to enhance the representativeness of the student body. The final cohort consisted of students from the Departments of Psychology, Information Technology, and English, all enrolled during the 2025 academic year. The sample comprised 34 male and 26 female students, yielding a gender distribution of 56.7% and 43.3%, respectively.

2.3. Data Collection Protocol

Data collection was executed in a controlled environment to ensure standardization and privacy. Prior to participation, all subjects were briefed on the study objectives, and written informed consent was obtained. The assessment protocol was administered in a single session for each participant and consisted of two primary components: anthropometric measurement and dietary evaluation.

2.4. Anthropometric Assessment

Anthropometric measurements were performed by trained personnel using calibrated instruments to ensure accuracy and reproducibility. Height was measured to the nearest 0.1 centimetre using a portable stadiometer (Seca 213).

© Ariston Publications 2026. All rights reserved.

Participants stood erect without footwear, with heels together, and their head positioned in the Frankfort horizontal plane. Body weight was measured to the nearest 0.1 kilogram using a digital floor scale (Seca 803), with participants wearing light clothing and no shoes. From these primary measures, the Body Mass Index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m²). Nutritional status was subsequently classified according to the World Health Organization standard cut-offs: underweight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), and obese (≥30.0 kg/m²) [4]. Anthropometry provides a non-invasive, quantitative assessment that is a valuable indicator of nutritional status and general health [12, 13].

2.5. Dietary Assessment

Dietary intake and habits were evaluated using a pre-tested, structured questionnaire administered via personal interview. The instrument was designed to capture comprehensive data on habitual consumption patterns rather than a single day's intake. It incorporated both qualitative and quantitative elements, including a food frequency questionnaire (FFQ) component for key food groups and a structured 24-hour dietary recall to anchor portion size estimates. The questionnaire gathered detailed information on meal frequency, dietary preference (vegetarian, eggetarian, non-vegetarian), self-reported practice of a balanced diet, daily consumption of water and protein-rich foods, snacking patterns, frequency of consumption of processed foods and sugar-sweetened beverages, and habits regarding the reading of food package labels. This multi-faceted approach aligns with established dietary assessment methodology, which utilizes tools such as FFQs and recalls to obtain a thorough evaluation of nutritional intake and habits [17, 18, 19].

2.6. Data Analysis

All collected data were coded and entered into a structured database. Anthropometric data were analyzed descriptively, with results presented as means, standard deviations, and frequency distributions across BMI categories. Dietary data from the questionnaires were analyzed to determine the proportion of participants reporting specific habits or consumption frequencies. The analysis aimed to describe the prevailing nutritional status and dietary patterns within the sample.

3. RESULTS AND DISCUSSION

3.1. Anthropometric Assessment

Height Distribution: The analysis of height measurements, presented in Figure 1, revealed a distribution ranging from 131 cm to 190 cm within the sample. The data demonstrated a central clustering, with the largest proportions of students falling into the 151-160 cm (28%, n=17) and 161-170 cm (28%, n=17) categories. This was closely followed by the 171-180 cm range, which accounted for 27% (n=16) of participants. A smaller segment of the cohort was represented in the 181-190 cm (8%) and 141-150 cm (7%) brackets, while only one individual (2%) was categorized within the 131-140 cm range. This distribution indicates that the majority of the sampled young adults (83% collectively for the 151-180 cm ranges) exhibit stature within what can be considered a moderate height band for this demographic and regional context. The pattern suggests a relatively normal biological variation without significant skewing towards extreme percentiles, potentially reflecting a degree of homogeneity in genetic potential and past nutritional exposures among this collegiate population [12, 13]. However, the presence of individuals at both the lower and upper extremes underscores the inherent variability and the influence of diverse genetic and environmental factors on linear growth, even within a relatively narrow age and socioeconomic group.

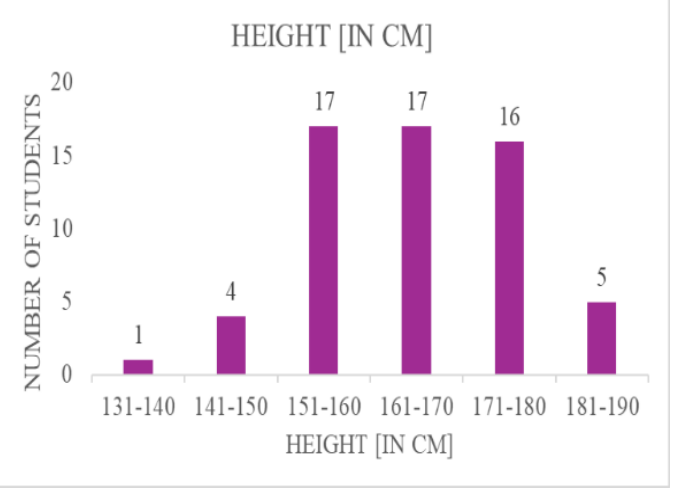


Fig. 1. Distribution of height (in centimeters) among the study participants (n=60).

Weight Distribution: The weight analysis, detailed in Figure 2, showed a span from 31 kg to 90 kg. The modal weight category was 51-60 kg, comprising 32% (n=19) of the sample. This was followed by the 41-50 kg range (23%, n=14) and the 61-70 kg range (22%, n=13). A gradual decline was observed in the higher weight categories, with 15% (n=9) in the 71-80 kg range and 6% (n=4) in the 81-90 kg range. Only one participant (2%) was recorded in the 31-40 kg category. This distribution illustrates that the preponderance of students (77% collectively for the 41-70 kg ranges) present with body mass concentrated in the central intervals. The tapering frequency at both the lower and higher extremes suggests a lower prevalence of severe underweight or pronounced overweight within this specific group when assessed by raw weight metrics alone. The concentration of weight in these middle ranges provides a foundational

© Ariston Publications 2026. All rights reserved.

context for interpreting subsequent Body Mass Index (BMI) data, as weight must be evaluated in conjunction with height to derive meaningful health insights [4, 15].

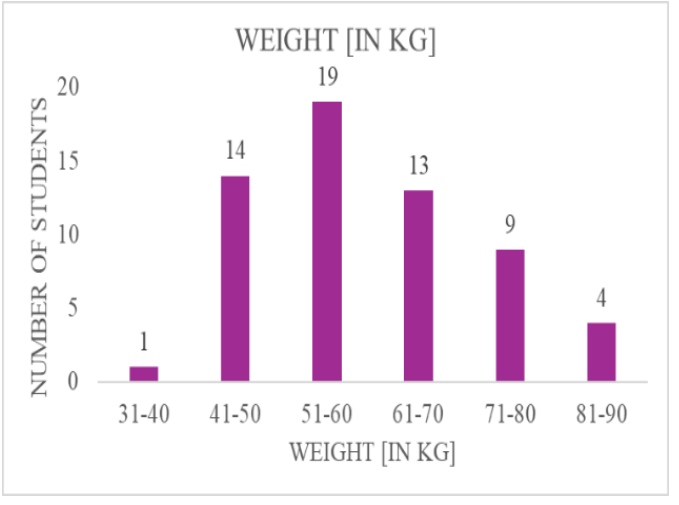


Fig. 2. Distribution of body weight (in kilograms) among the study participants (n=60).

Body Mass Index (BMI) Classification: The synthesis of height and weight data into BMI, as visualized in Figure 3, offers a more standardized assessment of nutritional status. The findings indicate that 63% (n=38) of respondents possessed a BMI within the normal range of 18.5–24.9 kg/m². A notable 17% (n=10) were classified as overweight (BMI 25.0–29.9), while 15% (n=9) were categorized as underweight (BMI <18.5). Within the spectrum of obesity, 5% (n=3) of students met the criteria for Class I obesity (BMI 30.0–34.9). No participants were classified under Obesity Class II (35.0–39.9) or Class III (≥40). This distribution presents a primarily favorable profile, with a clear majority maintaining a healthy weight. Nevertheless, the combined prevalence of underweight (15%) and overweight/obesity (22%) signifies a dual burden of malnutrition, a phenomenon increasingly documented in populations undergoing nutritional and economic transitions, including within India [7, 9]. The underweight percentage is of particular concern, as it may reflect inadequate energy intake, high metabolic demands, or underlying health issues. The overweight and obesity figures, while currently lower than rates seen in many Western cohorts, signal an emerging public health consideration, especially as this young adult demographic ages and faces reduced metabolic flexibility [22].

3.2. Dietary Assessment

Meal Frequency and Pattern: The evaluation of fundamental eating patterns, summarized in Figure 4, found that 60% of participants reported consuming three meals per day. A substantial minority of 38% indicated a pattern of only two daily meals, while a mere 2% consumed more than three meals. The high proportion adhering to a tri-daily meal structure is encouraging, as regular meal patterning is associated with better nutrient distribution and metabolic regulation. However, the significant share consuming only two meals may reflect lifestyle factors common to student populations, such as academic schedules, skipped breakfast, or irregular routines, which can compromise overall nutrient and energy intake [20].

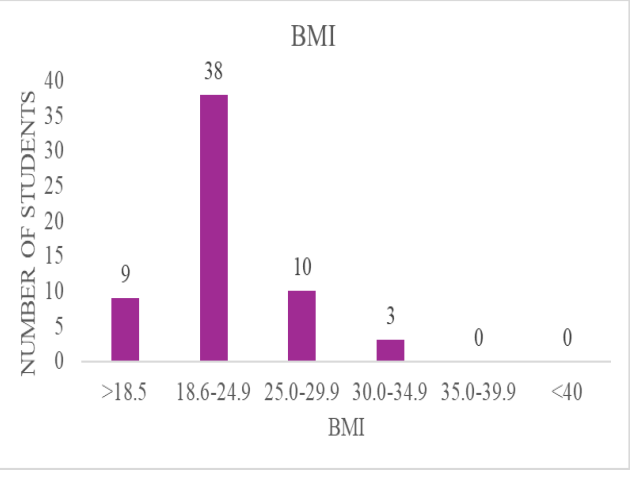


Fig. 3. Classification of participants according to Body Mass Index (BMI) categories (n=60).

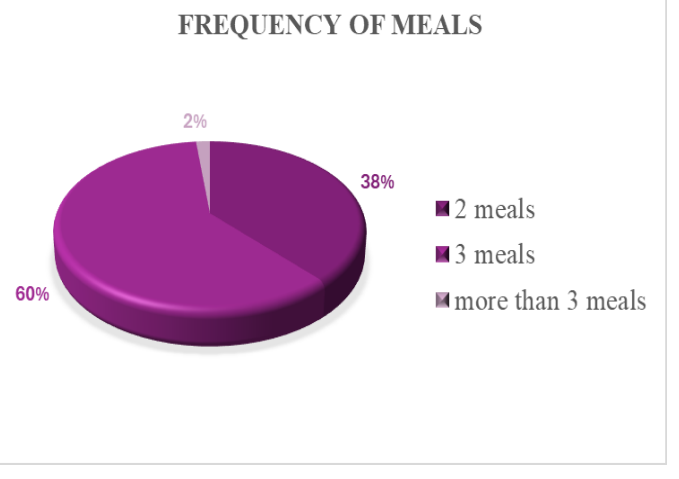


Fig. 4. Reported daily meal frequency among the student sample (n=60).

Dietary Preference and Balance: As shown in Figure 5, dietary preference was heavily skewed towards non-vegetarianism, reported by 88% of the sample. Eggetarian and vegetarian diets were followed by 7% and 5% of students, respectively. This predominance of non-vegetarian diets in this South Indian cohort aligns with regional culinary practices but does not inherently speak to diet quality. More critically, data in Figure 6 reveal a stark disparity in

© Ariston Publications 2026. All rights reserved.

conscious nutritional practice: only 20% of students reported actively following a balanced diet, contrasted with 80% who did not. This finding is paramount. It suggests that while most students consume regular meals and a variety of food types, there is a profound lack of intentionality or knowledge regarding the composition of a nutritionally complete diet. This gap between consumption and conscious balance underscores a critical area for intervention, as a diverse diet is not synonymous with an adequate one, and poor dietary quality can persist even within a normal BMI range [19, 25].

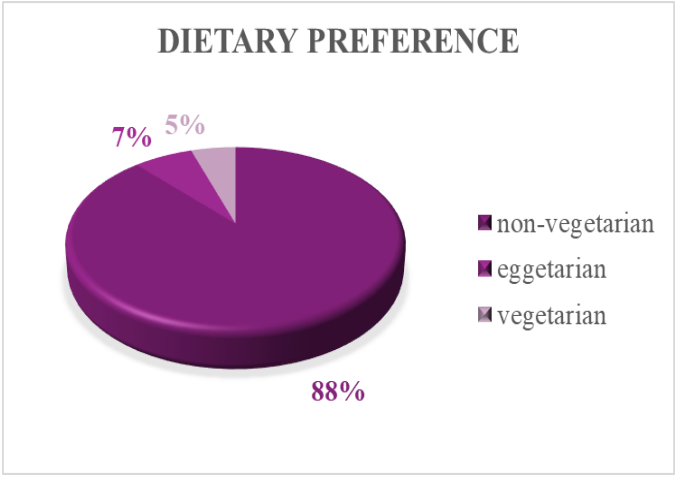


Fig. 5. Distribution of primary dietary preferences (vegetarian, eggetarian, non-vegetarian) (n=60).

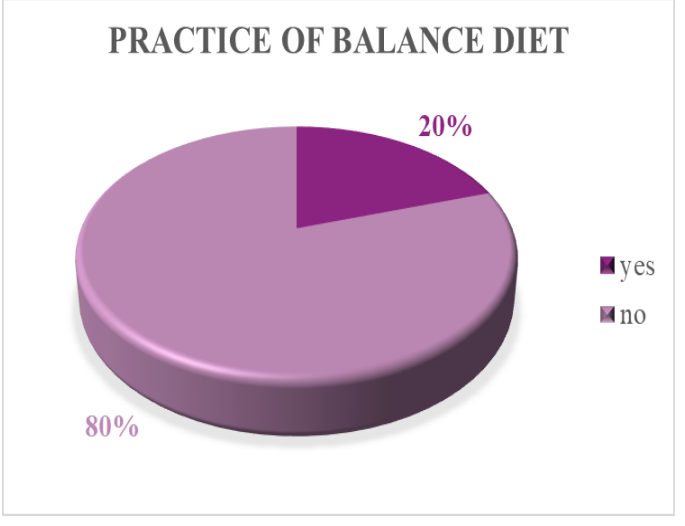


Fig. 6. Proportion of students reporting the conscious practice of a balanced diet (n=60).

Water and Protein Intake: Hydration status, assessed in Figure 7, showed that 52% (n=31) of students consumed 1.5–2.5 liters of water daily, a range often aligned with general health recommendations for moderate climates and activity levels. However, 25% (n=15) reported intake below 1.5 liters, which may pose risks for suboptimal hydration affecting renal function, cognition, and physical performance. Conversely, 23% (n=14) consumed above 2.5 liters daily. Protein consumption patterns, illustrated in Figure 8, indicated that 57% (n=34) of students consumed just one serving per day. A further 15% (n=9) reported consuming no dedicated protein serving, while 25% (n=15) had two servings and only 3% (n=2) had three. Given that young adulthood is a period for consolidating lean body mass and that protein is crucial for satiety and immune function, the prevalence of low intake (one serving or less for 72% of the sample) is concerning. It may reflect dietary choices centered on carbohydrates and fats, or economic constraints affecting access to quality protein sources like pulses, dairy, eggs, and meat [10].

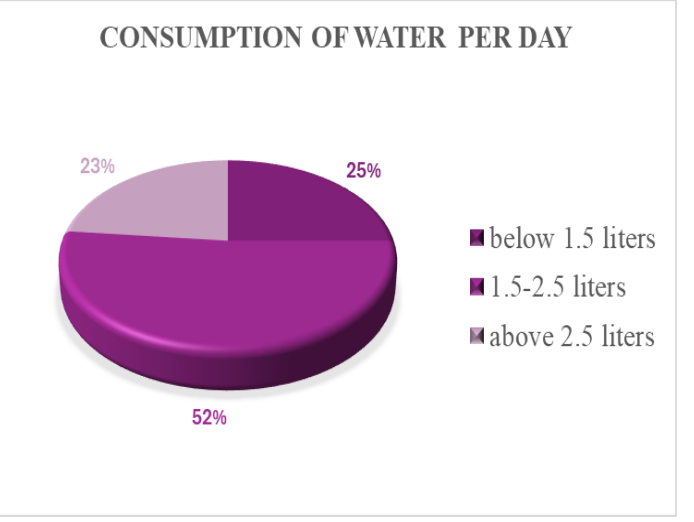


Fig. 7. Self-reported daily water intake ranges among participants (n=60).

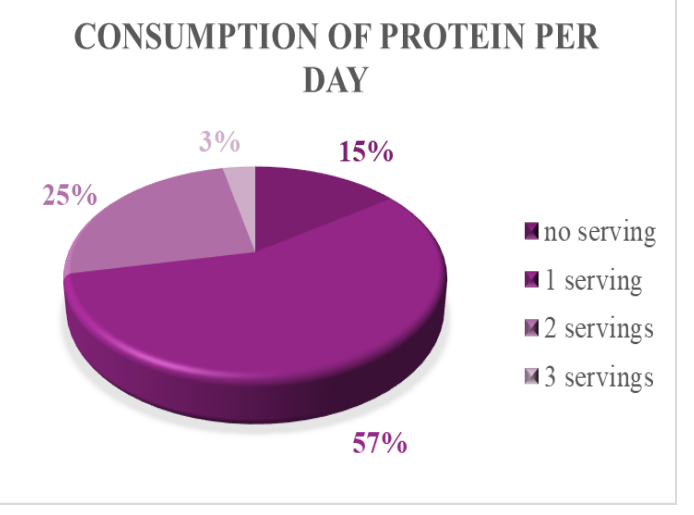


Fig. 8. Self-reported daily number of protein servings consumed (n=60).

© Ariston Publications 2026. All rights reserved.

Snacking Behavior: The analysis of snacking habits provided insights into food choices between meals. Figure 9 details snack type preferences: chips and crisps were the most frequently selected option (34%), followed by fruits and vegetables (23%), sweets and desserts (17%), dairy products (13%), nuts and seeds (9%), and sugary beverages (4%). The high preference for energy-dense, nutrient-poor processed snacks like chips is indicative of a global shift towards ultra-processed food consumption, driven by convenience, palatability, and marketing [23]. While nearly a quarter opt for fruits and vegetables, a positive finding, the dominance of low-quality snacks is a dietary risk factor.

Figure 10 shows that 48% of students snack once daily, with 18% snacking twice, 17% more than twice, and 17% rarely snacking. The high frequency of snacking, coupled with the poor nutritional quality of commonly chosen snacks, contributes to excessive intake of unhealthy fats, refined carbohydrates, and sodium, while providing minimal vitamins, minerals, or fiber.

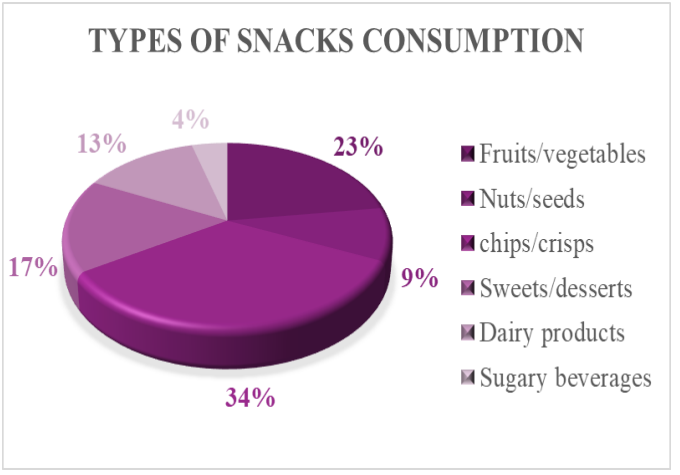


Fig. 9. Preference for types of snacks consumed by participants (n=60).

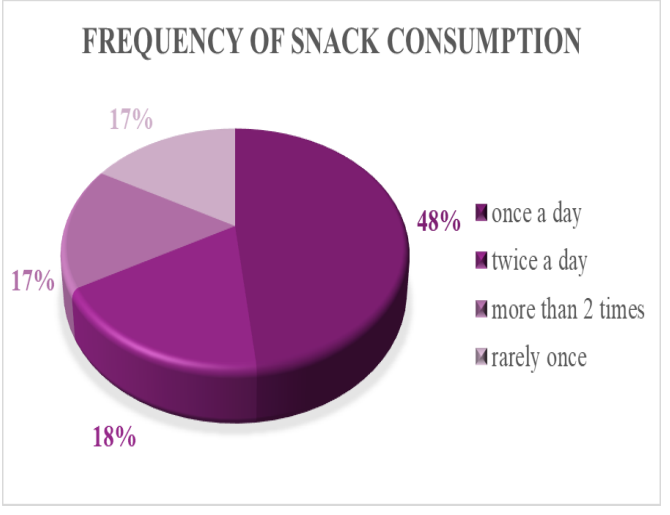


Fig. 10. Reported frequency of daily snacking (n=60).

Processed Food and Sugary Beverage Consumption: The frequency of consuming broader categories of less-healthful foods is depicted in **Figures 11** and **12**. For processed foods, 57% of students reported occasional consumption, 28% rare consumption, 13% daily consumption, and 2% avoidance. For sugary beverages, 45% consumed them sometimes, 41% rarely, 7% daily, and 7% avoided them entirely. These patterns suggest a generally moderate, but not absent, intake of these items. The low percentage of daily consumers is encouraging and may reflect some health awareness. However, the large "occasional" or "sometimes" categories represent a substantial exposure over time. The cumulative effect of regular, even if not daily, consumption of processed foods and sugar-sweetened beverages is strongly linked in epidemiological literature to increased risk of weight gain, metabolic syndrome, and cardiovascular disease [23, 24]. The data suggest that while overtly excessive habits are uncommon, a pattern of moderate but consistent intake of low-quality foods is prevalent.

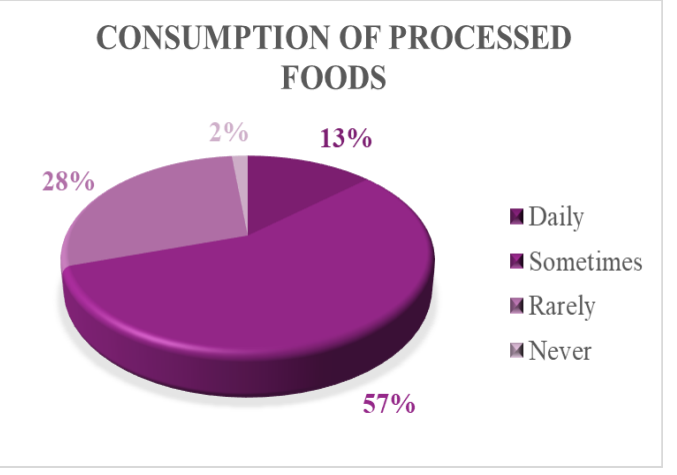


Fig. 11. Frequency of consumption of processed foods (n=60).

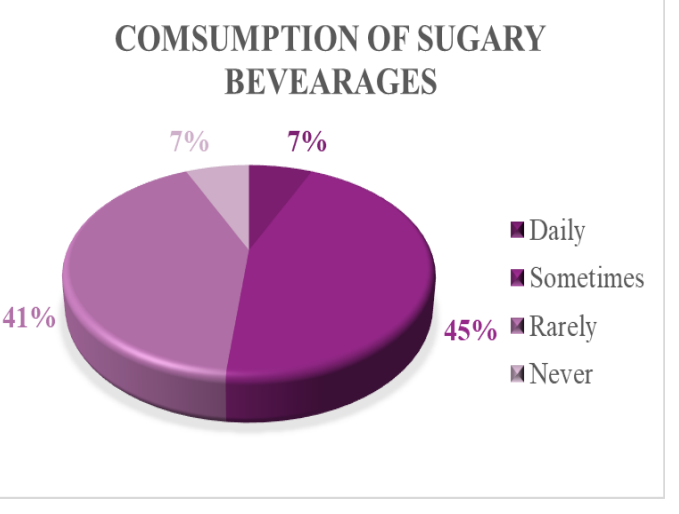


Fig. 12. Frequency of consumption of sugar-sweetened beverages (n=60).

© Ariston Publications 2026. All rights reserved.

Nutritional Label Reading: A final key behavioral metric, presented in Figure 13, assessed engagement with nutritional information. Only 11% of students reported always reading food package labels. The largest groups were those who sometimes (40%) or rarely (32%) read labels, while 17% never did. This indicates a low level of consistent consumer vigilance regarding the nutritional content of purchased foods. In a food environment saturated with processed options, the ability and willingness to critically evaluate labels is a crucial skill for making healthier choices. The general neglect of this practice suggests a significant barrier to improving dietary quality, as students may be selecting foods based on habit, price, or taste alone, without considering sugar, saturated fat, or sodium content [19].

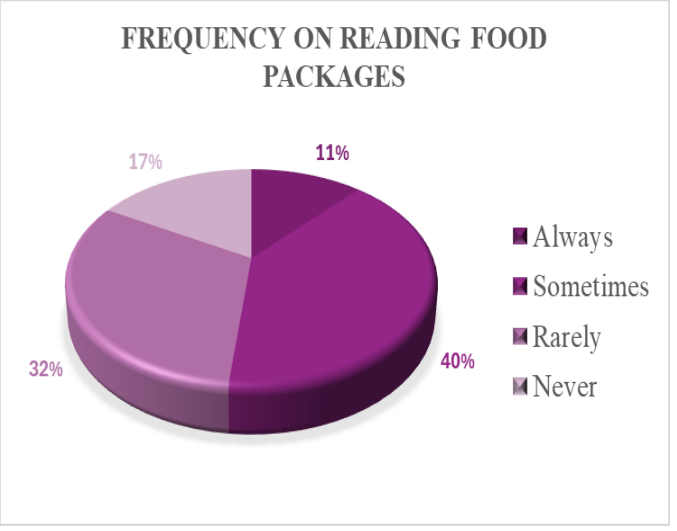


Fig. 13. Reported frequency of reading nutritional information on food packages (n=60).

Synthesis and Implications: Collectively, the results paint a picture of a population in nutritional transition. The anthropometric data are largely reassuring, with a normal BMI predominating. However, this seemingly healthy aggregate metric masks significant dietary vulnerabilities revealed by the detailed assessment. There exists a clear dissonance: a population largely of normal weight, yet largely not consuming a consciously balanced diet, with modest protein intake, frequent consumption of unhealthy snacks, and low engagement with nutritional information. This supports the concept of "hidden hunger" or poor dietary quality independent of energy balance. The findings resonate with studies noting the rapid nutrition transition in India, where traditional diets are being supplanted by more processed foods, often without a concurrent increase in nutritional knowledge [7, 8, 22]. The young adult, student demographic is particularly susceptible to these shifts due to lifestyle factors and newfound dietary autonomy [20, 21]. The study underscores that public health strategies targeting this group must move beyond weight-centric messages. Interventions should focus on enhancing practical nutritional literacy, teaching how to build a balanced plate, understand protein needs, identify healthier snacks, critically read labels, and hydrate adequately. Educational programs within academic institutions are ideally positioned to deliver such interventions, aiming to instill lifelong healthy eating behaviors that can mitigate future chronic disease risk in this generation [25].

4. CONCLUSION

This study provides insight into the nutritional status and dietary behaviors of South Indian young adults. The anthropometric data indicate that the majority of participants maintain a normal BMI, which may superficially suggest satisfactory health. However, the dietary assessment reveals concerning patterns, including low consumption of balanced meals, inadequate protein and water intake for a significant minority, prevalent snacking on processed foods, and minimal engagement with food label information. This divergence between healthy weight and suboptimal dietary practice points to a critical gap in nutritional literacy and application. Emerging research underscores that a diet rich in whole foods, including fruits, vegetables, whole grains, and fermented products, supports a balanced gut microbiome, which is increasingly linked to mental and physical well-being. Conversely, diets high in processed foods and low in fiber can contribute to dysbiosis, potentially influencing mood, cognition, and metabolic health. Therefore, simply maintaining a normal weight is insufficient for long-term wellness; dietary quality plays a fundamental role in physiological and psychological resilience. To address these findings, targeted nutritional education programs are recommended within academic institutions. Interventions should focus on practical knowledge, such as constructing balanced meals, understanding protein and hydration needs, interpreting food labels, and choosing wholesome snacks. Encouraging the intake of functional foods, such as those containing probiotics, omega-3 fatty acids, and dietary fiber, could further support gut health and overall well-being. Future studies should consider longitudinal designs and biochemical measures to better understand the causal relationships between dietary habits, gut health, and anthropometric outcomes in this population. Fostering dietary awareness and skills during young adulthood is essential for establishing lifelong healthy behaviors and mitigating future health risks.

DECLARATIONS

Ethical Approval

We affirm that this manuscript is an original work, has not been previously published, and is not currently under consideration for publication in any other journal or

© Ariston Publications 2026. All rights reserved.

conference proceedings. All authors have reviewed and approved the manuscript, and the order of authorship has been mutually agreed upon.

Availability of data and material

All of the data obtained or analyzed during this study is included in the report that was submitted.

Conflicts of Interest

The authors declare that they have no financial or personal interests that could have influenced the research and findings presented in this paper. The authors alone are responsible for the content and writing of this article.

Authors contributions

All authors contributed equally to this work.

REFERENCES

[1] Strandwitz, P., Kim, K.H., Terekhova, D., Liu, J.K., Sharma, A., Levering, J., McDonald, D., Dietrich, D., Ramadhar, T.R., Lekbua, A. and Mroue, N., **2019.** GABA-modulating bacteria of the human gut microbiota. *Nature Microbiology*, *4*(3), pp.396-403.

[2] Gentzke, A.S., **2020.** Tobacco product use among middle and high school students—United States, 2020. *MMWR. Morbidity and Mortality Weekly Report*, *69*.

[3] Caslini, M., Bartoli, F., Crocamo, C., Dakanalis, A., Clerici, M. and Carrà, G., **2016.** Disentangling the association between child abuse and eating disorders: a systematic review and meta-analysis. *Psychosomatic Medicine*, *78*(1), pp.79-90.

[4] World Health Organization (WHO). **2010.** *Global Recommendations on Physical Activity for Health*. Geneva: WHO Press.

[5] Ulijaszek, S.J. and Kerr, D.A., **1999.** Anthropometric measurement error and the assessment of nutritional status. *British Journal of Nutrition*, *82*(3), pp.165-177.

[6] Gibson, R.S., **2005.** *Principles of nutritional assessment*. Oxford University Press.

[7] Popkin, B.M., Adair, L.S. and Ng, S.W., **2012.** Global nutrition transition and the pandemic of obesity in developing countries. *Nutrition Reviews*, *70*(1), pp.3-21.

[8] Shetty, P.S., **2002.** Nutrition transition in India. *Public Health Nutrition*, *5*(1a), pp.175-182.

[9] Kassi, E., Pervanidou, P., Kaltsas, G. and Chrousos, G., 2011. Metabolic syndrome: definitions and controversies. *BMC Medicine*, *9*(1), p.48.

[10] Livingstone, M.B.E. and Black, A.E., **2003.** Markers of the validity of reported energy intake. *The Journal of Nutrition*, *133*(3), pp.895S-920S.

[11] Willett, W. (**2013**). *Nutritional Epidemiology* (3rd ed.). New York: Oxford University Press.

[12] De Onis, M. and Habicht, J.P., **1996.** Anthropometric reference data for international use: recommendations from a World Health Organization Expert Committee. *The American Journal of Clinical Nutrition*, *64*(4), pp.650-658.

[13] James, W.P., Ferro-Luzzi, A. and Waterlow, J.C., **1988.** Definition of chronic energy deficiency in adults. Report of a working party of the International Dietary Energy Consultative Group. *European Journal of Clinical Nutrition*, *42*(12), pp.969-981.

[14] Sawaya, A.L., Martins, P., Hoffman, D. and Roberts, S.B., **2003.** The link between childhood undernutrition and risk of chronic diseases in adulthood: a case study of Brazil. *Nutrition Reviews*, *61*(5), pp.168-175.

[15] Prentice, A.M. and Jebb, S.A., **2001.** Beyond body mass index. *Obesity Reviews*, *2*(3), pp.141-147.

[16] Rothman, K.J., **2008.** BMI-related errors in the measurement of obesity. *International Journal of Obesity*, *32*(3), pp.S56-S59.

[17] Cafiero, C., Melgar-Quiñonez, H.R., Ballard, T.J. and Kepple, A.W., **2014.** Validity and reliability of food security measures. *Annals of the New York Academy of Sciences*, *1331*(1), pp.230-248.

[18] Steyn, N.P., Nel, J.H., Nantel, G., Kennedy, G. and Labadarios, D., **2006.** Food variety and dietary diversity scores in children: are they good indicators of dietary adequacy?. *Public Health Nutrition*, *9*(5), pp.644-650.

[19] Cespedes, E.M. and Hu, F.B., **2015.** Dietary patterns: from nutritional epidemiologic analysis to national guidelines. *The American Journal of Clinical Nutrition*, *101*(5), pp.899-900.

[20] Story, M., Neumark-Sztainer, D. and French, S., **2002.** Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association*, *102*(3), pp.S40-S51.

[21] Bhargava, M., Bhargava, A., Ghate, S.D. and Rao, R.S.P., **2020.** Nutritional status of Indian adolescents (15-19 years) from National Family Health Surveys 3

 © Ariston Publications 2026. All rights reserved.

and 4: Revised estimates using WHO 2007 Growth reference. *PlOS One*, *15*(6), p.e0234570.

[22] Swinburn, B.A., Sacks, G., Hall, K.D., McPherson, K., Finegood, D.T., Moodie, M.L. and Gortmaker, S.L., **2011.** The global obesity pandemic: shaped by global drivers and local environments. *The Lancet*, *378*(9793), pp.804-814.

[23] Monteiro, C.A., Moubarac, J.C., Cannon, G., Ng, S.W. and Popkin, B., **2013.** Ultra-processed products are becoming dominant in the global food system. *Obesity Reviews*, *14*, pp.21-28.

[24] Malik, V.S., Schulze, M.B. and Hu, F.B., **2006**. Intake of sugar-sweetened beverages and weight gain: a systematic review. *The American journal of clinical nutrition*, *84*(2), pp.274-288.

[25] Mozaffarian, D. and Ludwig, D.S., **2010.** Dietary guidelines in the 21st century—a time for food. *JAMA*, *304*(6), pp.681-682.

© Ariston Publications 2026. All rights reserved.