

Original Research Article

Dietary behaviour and body composition among young adults aged 18-25 years: a cross-sectional study using bioelectrical impedance analysis

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ABSTRACT

Background: Dietary behaviour and body composition are closely interrelated determinants of nutritional and metabolic health. Young adulthood (18-25 years) is a critical transition period during which lifestyle changes predispose individuals to unfavourable eating patterns and adverse shifts in body composition. This study examined dietary behaviour, nutrient intake, and body composition among young adults using bioelectrical impedance analysis.

Methods: A cross-sectional study was conducted among 138 undergraduate and postgraduate students (18–25 years) selected through stratified random sampling. Anthropometric measures, body composition (via BIA) and habitual dietary intake (via a validated food frequency questionnaire) were assessed. Data were analyzed using descriptive statistics and chi-square tests with statistical significance set at $p < 0.05$.

Results: Meal skipping was more common among males (37.1% vs. 19.4%, $\chi^2=9.12$, $p < 0.05$), while low protein intake was more common among females (60.2% vs. 8.6%). Elevated percent body fat was observed in 60.9% of participants, with higher prevalence among females (71.9% vs. 28.6%, $\chi^2=20.61$) and older students aged 22–25 years (70.6% vs. 55.2%, $\chi^2=6.98$). Fat control was poorer among females and older students, while muscle control was favourable overall (89.1%). Segmental lean and fat distribution showed no significant age-group differences.

Conclusions: Despite generally favourable muscle control, female and older students demonstrated elevated body fat, inadequate protein and micronutrient intake and unhealthy eating behaviours. These findings underscore the need for targeted nutrition education and lifestyle intervention among university students with particular attention to female and older sub-groups.

Keywords: Bioelectrical impedance analysis, Body composition, Dietary behaviour, Dietary intake, Young adults

INTRODUCTION

Understanding an individual's nutritional status, metabolic health, and vulnerability to chronic diseases requires a comprehensive evaluation that includes dietary assessment and body composition analysis. Dietary intake provides the macro and micronutrients necessary for growth, energy metabolism and physiological function, while body composition reflects how these nutrients are utilized and stored in the body. While Body Mass Index

(BMI) is a common estimate of weight relative to height, it is limited in its ability to distinguish among fat mass, lean muscle mass, bone mineral content, and body water.¹ Bioelectrical Impedance Analysis (BIA) and other techniques provide a more precise evaluation of these parameters.² Young adulthood (18-25 years) is a critical period where lifestyle changes significantly influence long-term health behaviours and body composition.³ Identifying nutritional inadequacies, excesses and habitual eating patterns during this phase is vital for evidence-based nutritional planning.⁴ Recent multi-region

assessments of Indian university students report that up to 35% of this population faces malnutrition, with a high prevalence of micronutrient deficiencies such as vitamin D and anemia, particularly among females.⁵ A major contributor to this trend is the rising consumption of ultra-processed foods, which is significantly associated with increased visceral fat accumulation and higher body fat percentages among college students.^{4,6} For university students, this period is often characterised by a shift toward sedentary behaviours and the adoption of poor eating habits due to the challenges of living away from home, including limited financial resources, time constraints and reliance on campus “mess” or canteen facilities.⁶ Furthermore, studies in regional cohorts have highlighted that mean nutrient intakes often fall below the recommended dietary allowances (RDA), accompanied by widespread chronic energy deficiency.⁷ Despite the evident risks, the nutritional status and body composition of young adult students remain among the least explored research areas in India.⁸ Identifying these patterns in specific population contexts, such as student populations, remains a priority.^{3,9}

The relationship between dietary habits and body composition is well established in scientific literature, with higher protein intake supporting lean muscle mass and diets rich in saturated fats and refined carbohydrates correlating with increased fat mass and central adiposity.

Studies have shown a significant association between poorer diet quality and obesity among undergraduates.¹⁰ This highlights the critical importance of early intervention strategies that target nutritional education and dietary modification in this demographic to mitigate the long-term health consequences of poor dietary habits.¹¹ The study highlights significant dietary inadequacies and unfavourable body composition patterns among young adults, underscoring the association between poor dietary quality and increased adiposity, particularly among female students.

METHODS

Study design

This study utilized a cross-sectional observational design conducted by the Department of Clinical Nutrition and Dietetics, Padmashree Institute of Management and Sciences, Bengaluru. Data were collected from September 2025 to January 2026. The study population comprised undergraduate and postgraduate students aged 18-25 years enrolled at the institution. The overall study procedure is summarized in Figure 1.

Sample size and sampling technique

No formal a priori sample-size calculation was performed before data collection. A total of 150 eligible participants were initially recruited, of whom 138 completed all

components of the survey and were included in the final analysis. A total of 138 students were enrolled.

Participants were selected by stratified random sampling. The sampling frame was institutional enrollment lists of full-time students aged 18-25 years. Students were stratified by academic year and department; the sample was allocated in proportion to the size of each stratum.

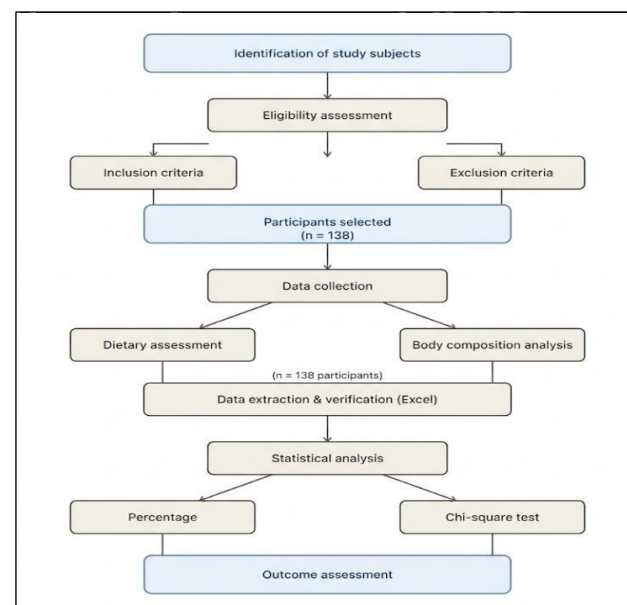


Figure 1: Flowchart of dietary behaviour and body composition assessment.

Inclusion criteria

Students aged 18-25 years who were currently enrolled as full-time undergraduate or postgraduate students at the institution and were willing to provide informed consent and participate voluntarily were included in the study.

Exclusion criteria

Students with a diagnosed chronic condition, such as diabetes mellitus, thyroid disorders, cardiovascular disease or renal disease and pregnant or lactating women were excluded¹³.

Ethical considerations

The Padmashree Institutional Ethics Committee (PIEC), Bengaluru, approved the study protocol (reference no. PIMS/MND/28/2025). The purpose and procedures of the study were explained to all participants and written informed consent was obtained from every participant before data collection. Participation was voluntary.

Data collection

Height, weight and body composition were assessed using bioelectrical impedance analysis (BIA), a validated,

non-invasive method for estimating body composition. Measurements included body protein and mineral content, fat-free mass, basal metabolic rate, recommended calorie intake, weight management indicators (target weight, weight control, fat control and muscle control), segmental lean and fat mass distribution.

Dietary assessment

Habitual dietary intake was assessed using a face-to-face interviewer-administered Food Frequency Questionnaire (FFQ), a method widely validated for capturing long-term dietary patterns in epidemiological studies.¹² The FFQ recorded the consumption frequency of major food groups cereals, pulses, fruits, vegetables, dairy, meat and processed foods with standard portion sizes estimated using visual aids and household measures to improve reporting accuracy.

Operational definitions

For the purposes of this study, undernutrition was defined as a BMI below 18.5 kg/m², normal weight as a BMI between 18.5-24.9 kg/m², overweight as a BMI between 25.0-29.9 kg/m² and obesity as a BMI of 30.0 kg/m² or above in accordance with the WHO classification.¹⁴

Statistical analysis

Descriptive statistics (mean±standard deviation and frequencies) were used to summarise demographic, anthropometric, body composition and dietary intake data. The chi-square test was used to compare categorical variables (meal pattern, percent body fat, target weight, fat control, muscle control and weight status) between sexes and age groups, and the independent-samples t-test was used to compare mean segmental lean and fat values between the two age groups. A p value <0.05 was considered statistically significant.

RESULTS

Comparison of age group

Respondents are classified by age and gender at baseline, with numbers and percentages divided into three age groups 18-20, 21-22, and 23-25. As shown in Figure 1, there are 138 participants, with 35 males and 103 females.

Dietary consumption pattern

The meal pattern, skipping meals and consuming food from outside (Table 2) are used to examine the behaviours that directly correlate with the impact on body composition. Analysis reveals that while gender doesn't significantly affect meal frequency or daily appetite, there is a notable difference in meal skipping habits. Specifically, 37.1% of males reported "often" skipping meals, compared to only 19.4% of females with $\chi^2=9.12$. Additionally, 42.9% of males eat outside food "often" or

"always" compared to 37.9% of females, creating a cycle of skipping meals and then consuming calorie-dense foods. Most respondents about 62.9% of males and 69.9% of females consume three meals a day with less than 4% eating four meals; the meal frequency revealed a χ^2 value of 3.36 (NS), indicating no significant gender difference. Appetite levels are generally similar with 31.4% of males and 30.1% of females reporting an "average" appetite. However, 23.3% of females report a "high" appetite compared to 14.3% of males, with no significant statistical difference ($\chi^2=1.81$). On the other hand, about 26% of respondents have a "very low" appetite, which increases their risk of being underweight or experiencing muscle loss. The lack of differences in daily meal patterns is overshadowed by the concerning trend of unhealthy consumption of external foods, especially among males, which negatively affects body composition. Building on this, dietary pattern and hydration status were further examined as additional determinants of body composition. Table 1 also presents the distribution of respondents (n=138) by diet type and daily water intake, both recognized determinants of body composition. With respect to dietary patterns, the majority followed a non-vegetarian diet (62.3%, n=86), followed by vegetarian (18.8%, n=26), eggetarian (13.0%, n=18), and pescatarian (5.8%, n=8) diets.

Table 1: Baseline characteristics of respondents by gender, age group, type of diet and daily water intake (n=138).

Characteristics	Category	Respondents	
		Number	Percent
Gender	Male	35	25.4
	Female	103	74.6
Age group (years)	18-21	87	63.0
	22-25	51	37.0
Type of diet	Vegetarian	26	18.8
	Non-vegetarian	86	62.3
	Eggetarian	18	13.0
	Pescatarian	8	5.8
Daily water intake (in glasses)	< 3	15	10.9
	3-5	42	30.4
	6-8	58	42.0
	9-11	7	5.1
	≥12	16	11.6
Total		138	100.0

Vegetarian and eggetarian respondents together accounted for nearly one-third of the sample (31.8%). While plant-based diets are typically associated with lower body mass index (BMI), they are also associated with lower fat and muscle mass when protein and essential amino acid intake are not met. Regarding daily water intake, a large proportion of respondents (42%, n=58) consumed 6-8 glasses of water, followed by 3-5 glasses (30.4%, n=42). A concerning 10.9% (n=15) consumed fewer than 3 glasses per day, placing them at

risk of chronic mild dehydration. Only 5.1% (n=7) consumed 9-11 glasses, while 11.6% (n=16) consumed 12 or more glasses daily. Beyond overall hydration patterns, a closer examination of food frequency data provides further insight into the dietary habits shaping body composition in this population. The analysis of food frequency data in Table 3 revealed distinct trends in staple consumption and snacking behaviours among the study participants. Daily staples, including rice and wheat were consumed by 100% of respondents, reflecting their central role in the regional diet. Cereals provide the

primary source of energy in the body, which is required for daily activities. In terms of vegetables, as shown in Table 3, coriander leaves, curry leaves, onions and tomatoes were consumed daily by all participants (100%). Other green leafy vegetables (GLV) and cucumber were primarily consumed weekly by 88.4% and 75.4% of respondents respectively. Beetroot (81.9%), beans (81.2%), radish (71.7%), and okra (70.3%) were among the veggies mostly consumed once in every 15 days, indicating a low frequency of intake. Bitter gourd intake was rather low.

Table 2: Respondents by meal pattern, skipping meals and food consumed from outside (n=138).

Characteristics	Category	Respondents						χ^2 test
		Male		Female		Combined		
		Number	Percent	Number	Percent	Number	Percent	
Number of Meals consumed per day	Two	10	28.6	29	28.2	39	28.3	3.36 NS
	Three	22	62.9	72	69.9	94	68.1	
	Four	3	8.6	2	1.9	5	3.6	
Range of daily appetite	Very low	9	25.7	27	26.2	36	26.1	1.81 NS
	Low	10	28.6	21	20.4	31	22.5	
	Average	11	31.4	31	30.1	42	30.4	
	High	5	14.3	24	23.3	29	21.0	
Frequency of skipped meals	Never	12	34.3	25	24.3	37	26.8	9.12*
	Rarely	3	8.6	27	26.2	30	21.7	
	Sometimes	7	20.0	31	30.1	38	27.6	
	Often	13	37.1	20	19.4	33	23.9	
Frequency of eating outside food.	Never	3	8.6	27	26.2	30	21.7	5.15 NS
	Rarely	9	25.7	21	20.4	30	21.7	
	Sometimes	8	22.9	16	15.5	24	17.4	
	Often	7	20.0	20	19.4	27	19.6	
	Always	8	22.9	19	18.5	27	19.6	
Total		35	100.0	103	100.0	138	100.0	

*Significant at 5% level; NS: non-significant. Critical χ^2 values at 0.05: 5.991 (2 df), 7.815 (3 df) and 9.488 (4 df)

Table 3: Frequency of consumption of cereals, pulses, fruits, vegetables, dairy products, egg and meat, processed foods, beverages, nuts and fats (n=138).

Food items	Frequency of consumption of respondents (%)				
	Daily	Weekly	15 Days	1 Month	Never
Cereals					
Rice	100.0	0.0	0.0	0.0	0.0
Ragi	4.3	34.1	37.7	13.0	10.9
Wheat	100.0	0.0	0.0	0.0	0.0
Rava	0.0	26.1	45.6	28.3	0.0
Millets	0.0	10.1	43.5	46.4	0.0
Pulses					
Moong dal	2.9	50.7	44.2	0.0	2.2
Green gram	8.7	46.4	37.7	7.2	0.0
Tur dal	53.6	34.1	10.9	1.4	0.0
Rajma	5.8	57.2	34.8	2.2	0.0
Bengal gram	0.0	49.3	44.2	6.5	0.0
Chick pea	0.0	47.8	47.1	5.1	0.0
Horse gram	0.0	31.9	55.1	13.0	0.0
Fruits					
Apple	3.7	65.2	27.5	3.6	0.0

Continued.

Food items	Frequency of consumption of respondents (%)				
	Daily	Weekly	15 Days	1 Month	Never
Banana	92.8	7.2	0.0	0.0	0.0
Orange	0.0	81.9	13.8	4.3	0.0
Pomegranate	6.5	29.0	55.1	9.4	0.0
Grapes	2.9	15.2	74.7	7.2	0.0
Watermelon	36.2	46.4	14.5	2.9	0.0
Papaya	0.0	9.4	79.7	10.9	0.0
Vegetables					
Carrot	86.2	7.2	6.6	0.0	0.0
Cucumber	9.4	75.4	13.0	2.2	0.0
Potato	73.9	15.2	8.7	2.2	0.0
Onion	100.0	0.0	0.0	0.0	0.0
Beet root	1.4	15.3	81.9	1.4	0.0
Tomato	100.0	0.0	0.0	0.0	0.0
Beans	1.4	15.3	81.9	1.4	0.0
GLV	0.0	88.4	11.6	0.0	0.0
Brinjal	1.4	13.8	81.2	3.6	0.0
Bitter gourd	0.0	15.0	70.5	14.5	0.0
Radish	0.0	23.2	71.7	5.1	0.0
Okra	0.0	26.8	70.3	2.9	0.0
Dairy products					
Milk	82.6	0.0	0.0	0.0	17.4
Curd/yogurt	81.9	0.0	0.0	0.0	18.1
Chocolates	1.5	76.8	15.9	5.8	0.0
Butter milk	100.0	0.0	0.0	0.0	0.0
Egg and meat					
Egg	100.0	0.0	0.0	0.0	0.0
Chicken	9.4	69.6	18.1	2.9	0.0
Mutton	0.0	0.0	73.9	26.1	0.0
Fish/sea food	0.0	0.0	27.5	72.5	0.0
Processed foods					
Papad	0.0	72.5	27.5	0.0	0.0
Pastries	0.0	5.8	79.0	15.2	0.0
Beverages					
Tea/coffee	87.0	1.4	0.0	0.0	11.6
Nuts and fats					
Almonds	100.0	0.0	0.0	0.0	0.0
Walnuts	100.0	0.0	0.0	0.0	0.0
Dried fig	0.0	80.4	10.1	9.5	0.0
Pistachio	0.0	14.5	73.2	12.3	0.0
Ash nuts	0.0	15.9	68.8	15.2	0.0
Dates	10.1	52.2	24.7	13.0	0.0
Raisins	10.1	52.2	24.6	13.0	0.0
Ghee	71.7	5.1	0.7	1.5	21.0

Alongside vegetable consumption patterns, dairy intake represented another key component of the participants' dietary habits. All respondents in the dairy products group (Table 3) consumed buttermilk daily (100%). A large majority also reported daily intake of milk (82.6%) and curd/yogurt (81.9%) notably. However, 17.4% and 18.1% of respondents, respectively, reported never consuming these items. Chocolates also classified under milk products were consumed most frequently on a weekly basis (76.8%), with a smaller proportion consuming them

once every 15 days (15.9%) or monthly (5.8%). Beyond dairy, protein sources such as eggs, meat and pulses further characterized the dietary profile of the study population (Table 3). Eggs were a daily staple for 100% of respondents, while chicken, the most common meat source was consumed weekly by 69.6%. Pulses showed a more varied intake pattern with tur dal recording the highest daily consumption (53.6%). In contrast to these protein sources, junk food consumption emerged as a notable dietary concern. Cakes and biscuits were

consumed daily by 69.6% of the population, followed by a significant weekly intake (30.4%), indicating a regular reliance on sugary snacks. Despite this reliance on processed snacks, nuts and fats were also consumed with high regularity, particularly the nutrient-dense varieties. All respondents (100%) consumed almonds and walnuts daily, suggesting a strong preference for these nutrient dense foods. Pistachios (73.2%) and ash nuts (68.8%) were mostly ingested once every 15 days, whereas dried figs were mostly consumed weekly (80.4%). A mixed trend was observed for dates and raisins, with over half of the respondents consuming them weekly (52.2%) and almost one-tenth consuming them daily (10.1%). While 21.0% of respondents never consumed ghee, 71.7% said they consumed it every day, providing calories that can positively influence body composition when consumed in moderation.

Protein and mineral consumption

Figure 2a shows the distribution of protein consumption levels by gender. The majority of males (57.1%) reported medium protein consumption, followed by 34.3% with high consumption, while only a small fraction (8.6%) reported low protein intake, suggesting that most male respondents consumed an adequate to relatively high amount of protein. In contrast, the majority of females (60.2%) fell into the low protein consumption category, indicating that a substantial proportion failed to meet adequate protein intake levels; a further 35.9% reported medium protein consumption and only 3.9% reported high intake. Mineral consumption showed a similar gender pattern (Figure 2b): low mineral consumption was reported by 45.6% of females compared with 5.7% of males, whereas high consumption was reported by 37.2% of males and 14.6% of females; medium consumption was reported by 57.1% of males and 39.8% of females.

Taken together, these findings highlight a gender-based disparity in protein and mineral consumption, with male respondents demonstrating considerably higher adequacy than their female counterparts.

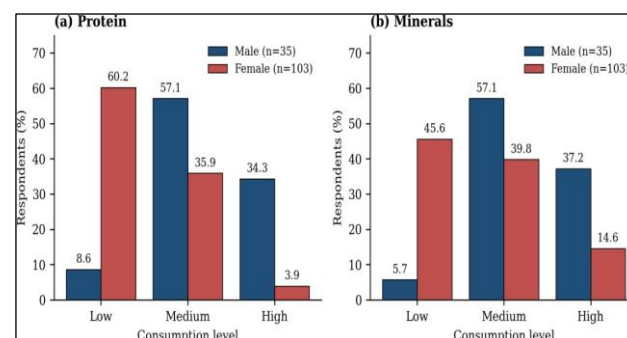


Figure 2: Consumption level of (a) protein and (b) minerals among male and female Respondents.

Body composition parameters

The body composition analysis shows significant differences in body parameters, including body fat percentage, fat control, muscle control, and weight status, among the respondents. As shown in Table 4, a majority of the respondents (60.9%) were classified under the high percent Body Fat (PBF) category. Female respondents had a higher prevalence of high PBF (71.9%) than males (28.6%). Similarly, respondents aged 22-25 years had a greater proportion of high PBF (70.6%) than those aged 18-21 years (55.2%). The values obtained for both gender ($\chi^2=20.61$) and age ($\chi^2=6.98$) indicate that body fat percentage was significantly associated with these variables. The findings on target weight presented in Figure 3a suggest that most respondents were within the medium target weight category.

Table 4: Response on PBF by gender and age group.

Characteristic	Category	Sample (N)	PBF (%)						χ^2 Test
			Low		Medium		High		
			N	%	N	%	N	%	
Gender	Male	35	12	34.3	13	37.1	10	28.6	20.61*
	Female	103	13	12.6	16	15.5	74	71.9	
Age (years)	18-21	87	21	24.1	18	20.7	48	55.2	6.98*
	22-25	51	4	7.8	11	21.6	36	70.6	
Combined		138	25	18.1	29	21.0	84	60.9	

*Significant at 5% level; χ^2 (0.05, 2 df) = 5.991

Total 62.9% of males are classified in the high target weight category, whereas 69.9% of females are classified in the medium target weight category. There is a statistically significant association between gender and target weight status ($\chi^2=58.31$, $p<0.05$); no significant relationship was found with age ($\chi^2=1.70$). This indicates that although body fat levels differed across age groups, the desired weight range remained relatively similar among respondents. Figure 3b shows the fat control status of the respondents. A greater proportion of males (37.1%)

demonstrated positive fat control compared to females (17.5%). The association between gender and fat control was statistically significant ($\chi^2=5.80$, $p<0.05$).

Likewise, respondents aged 18-21 years showed better fat control (28.7%) than those aged 22-25 years (11.8%). Age and fat control also showed a significant association ($\chi^2=5.32$, $p<0.05$), suggesting that older respondents were more likely to exhibit greater fat accumulation, consistent with the elevated PBF levels. Females similarly

demonstrated a greater likelihood of elevated fat accumulation, further reinforcing the pattern observed in Figure 3b. In contrast to this pattern of fat accumulation, Table 5 depicts muscle control status according to gender and age group and reveals a more favourable outcome. The majority of respondents (89.1%) exhibited positive muscle control with the proportion notably higher among females (93.2%) than males (77.1%). Gender showed a significant association with muscle control ($\chi^2=6.96$, $p<0.05$), whereas age showed no significant association ($\chi^2=0.10$), indicating that while older respondents were more prone to fat accumulation, muscle control was not similarly affected by age. The comparison between actual and target weight in Table 5 further supports these observations. More than half of respondents aged 18-21 years (52.9%) had a positive weight status, compared with 33.3% of respondents aged 22-25 years. The

significant association between age and weight status ($\chi^2=4.95$) indicates that younger respondents were more likely to maintain body weight closer to their target range.

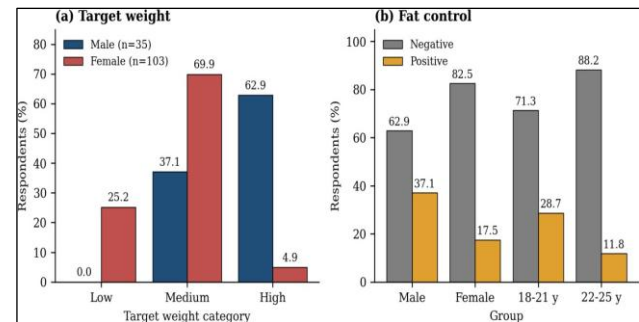


Figure 3: (a) Target weight category by gender and (b) fat control status by gender and age group.

Table 5: Muscle control and weight status (actual to target) by gender and age group (n=138).

Characteristic	Category	Sample (N)	Muscle control (kg)				χ^2 test
			Negative		Positive		
			N	%	N	%	
Gender	Male	35	8	22.9	27	77.1	6.96*
	Female	103	7	6.8	96	93.2	
Age (years)	18-21	87	10	11.5	77	88.5	0.10 ^{NS}
	22-25	51	5	9.8	46	90.2	
Combined		138	15	10.9	123	89.1	
Characteristic	Category	Sample (N)	Weight (actual to target)				χ^2 test
			Negative		Positive		
			N	%	N	%	
Gender	Male	35	17	48.6	18	51.4	0.63 ^{NS}
	Female	103	58	56.3	45	43.7	
Age (years)	18-21	87	41	47.1	46	52.9	4.95*
	22-25	51	34	66.7	17	33.3	
Combined		138	75	54.3	63	45.7	

*Significant at 5% level; NS: non-significant. Critical χ^2 (0.05, 1 df) = 3.841

Table 6: Segmental lean and segmental fat analysis by age group.

Age group (years)	Sample (n)	Measures	Segmental lean analysis (%)				
			Upper left	Upper right	Lower left	Lower right	Middle
18-21	87	Mean	84.02	85.14	92.97	92.94	92.81
		SD	12.3	12.6	10.0	10.0	15.9
22-25	51	Mean	85.45	86.08	90.40	90.78	93.64
		SD	10.5	10.9	9.0	9.0	8.5
Combined	138	Mean	84.55	85.49	92.02	92.14	93.12
		SD	11.65	11.97	9.69	9.67	13.61
‘t’ Test			0.72 ^{NS}	0.46 ^{NS}	1.55 ^{NS}	1.31 ^{NS}	0.38 ^{NS}
Segmental fat analysis							
18-21	87	Mean	179.90	185.88	146.36	147.41	196.49
		SD	110.2	111.5	57.3	58.6	96.7
22-25	51	Mean	172.85	167.68	146.43	150.65	202.33
		SD	77.5	76.2	44.5	48.7	70.8
Combined	138	Mean	177.29	179.15	146.39	148.61	198.65
		SD	99.13	100.01	52.76	54.99	87.79
‘t’ Test			0.44 ^{NS}	1.14 ^{NS}	0.01 ^{NS}	0.35 ^{NS}	0.41 ^{NS}

NS: non-significant. t (0.05, 136 df) = 1.96; SD: standard deviation

The segmental lean analysis in Table 6 showed that respondents aged 22-25 years had slightly higher mean lean values than those aged 18-21 years in the upper left (85.45%), upper right (86.08%) and middle (93.64%) segments, and slightly lower values in the lower left (90.40%) and lower right (90.78%) segments. However, the t-values obtained for all body segments (upper left (0.72), upper right (0.46), lower left (1.55), lower right (1.31), and middle segment (0.38)) were below the critical value of 1.96, indicating that none of these differences reached statistical significance. Table 6 also presents the segmental fat analysis among respondents by age group. Segmental fat distribution did not differ significantly between the two age groups. In the 18-21 years group, mean values were 179.90%, 185.88%, 146.36%, 147.41%, and 196.49% for the upper left, upper right, lower left, lower right, and middle segments, respectively, while the 22-25 years group showed mean values of 172.85%, 167.68%, 146.43%, 150.65%, and 202.33% for the corresponding segments. Since all t-values remained below the critical threshold ($p < 0.05$), regional fat distribution was found to be similar across both age groups.

DISCUSSION

The present study assessed dietary patterns, nutrient intake and body composition among 138 college students (35 males, 103 females) aged 18-25 years. The predominantly female sample reflects typical enrollment patterns commonly reported in health and nutrition-related programs in Indian institutions.¹⁵ Regarding meal frequency, the majority consumed three meals per day with no significant gender difference, consistent with earlier reports on dietary patterns among Indian university students.¹⁶ However, meal-skipping behaviour differed significantly by gender, with males skipping meals more often than females. A cross-sectional study among 498 university students found that those who skipped breakfast were 1.20 times more likely to report poor overall sleep quality with skipping breakfast and irregular mealtimes emerging as significant correlates of poor sleep on regression analysis.¹⁷ A finding that aligns with studies documenting male-predominant meal skipping in residential college settings due to irregular schedules and peer influence, which is clinically important given that meal skipping has been significantly associated with higher body fat percentage and lower fat-free mass in young adults.^{18,13} The higher proportion of males consuming calorie dense outside food regularly further compounds risk, as eating away from home has been consistently linked to higher total energy intake, greater fat contribution to the diet and increased risk of overweight and obesity in young adults.¹⁹ Most respondents followed a non-vegetarian diet, which supports lean mass maintenance and a favorable nitrogen balance, while the combined one-third following vegetarian diets risk lower protein intake and reduced bioavailability of key micronutrients including iron, zinc,

calcium and vitamin B12 from plant based sources, all of which can negatively affect body composition and muscle function.²⁰⁻²² Additionally, a minority of respondents consumed fewer glasses of water daily, a hydration level known to compromise BIA measurement accuracy by artificially elevating body fat content and impairing substrate metabolism.¹ Daily staple consumption and commonly used vegetables such as onion, tomato, coriander and curry leaves were near universal, reflecting the cereal and vegetable-dominant dietary pattern typical of South Indian populations and providing a consistent base of energy, dietary fibre and micronutrients.²³ Protein sources including tur dal, eggs and weekly chicken intake contributed to partial protein adequacy. However, the high frequency of junk food consumption, particularly baked goods and biscuits mirrors documented trends among Indian medical and dental college students, where obesity was significantly associated with poor dietary habits and a tendency to order or consume junk food²⁴ with regular high glycemic snack intake promoting fat accumulation especially when combined with meal skipping.¹⁸ A striking gender disparity in nutrient adequacy was evident; females reported low protein intake and low mineral consumption versus males. These disparities are consistent with cross-sectional evidence showing animal protein consumption is significantly higher in males, while females more often rely on plant-based protein sources associated with lower fat free mass and have practical implications since inadequate protein intake in females is directly associated with reduced fat free mass and impaired lean mass maintenance.²⁵ These nutritional inadequacies were reflected clearly in body composition outcomes. The majority of female respondents showed significantly greater PBF prevalence than males, consistent with established biological sex differences in adipose tissue distribution. Older respondents (22-25 years) showed higher PBF than younger ones, reflecting age-related fat accumulation documented in body composition studies of young adults.²⁶ Most of the respondents exhibited positive muscle control, with females performing better than males, likely because females have lower absolute muscle mass reference thresholds in BIA-based classification systems and 18-21 years respondents were more likely to maintain weight within target ranges compared to older counterparts, a decline consistent with increasing sedentarism and dietary shifts documented in later college years.^{27,28} This indicates no statistically significant differences in segmental lean or fat distribution across body segments, suggesting that regional muscle distribution remains stable within this narrow 18-25 year age range, as is expected given that significant age related declines in skeletal muscle mass typically manifest beyond the third decade of life.²⁹ However, the markedly elevated mean segmental fat values, particularly in the abdominal/middle segment, are clinically concerning, as visceral and central adiposity are well-established drivers of insulin resistance, dyslipidemia, and cardiovascular risk even in young, non-obese adults.³⁰ Furthermore,

psychological stress, which was not assessed in the present study, has been associated in college students with a greater tendency to overeat in response to emotional cues, higher BMI and larger waist circumference, and academic stress in particular has been linked to less healthy dietary profiles, greater emotional eating and increased consumption of fast food and high energy snacks; it may therefore be an important unmeasured contributor to the patterns observed here.^{31,32} Taken together, the findings reveal a complex nutritional risk profile marked by gender based disparities in protein and mineral intake, frequent meal skipping, high junk food consumption, and elevated body fat, which calls for targeted campus-based nutrition education, personalised dietary counselling and lifestyle intervention programmes, particularly for female and older students.

This study has several limitations. The cross-sectional design precludes causal or temporal inferences. Participants were recruited from a single institution in Bengaluru, and the sample was predominantly female (74.6%), which may limit generalisability and the precision of sex-specific comparisons. Dietary assessment using an interviewer-administered Food Frequency Questionnaire was subject to recall and social desirability bias, while protein and mineral intake were categorised rather than quantitatively assessed against recommended dietary intakes. Body composition measured using bioelectrical impedance analysis may have been influenced by hydration status and other short-term physiological factors. Physical activity, sleep, and perceived stress were assessed using self-reported measures and may therefore be subject to reporting bias. Future longitudinal studies with larger, more diverse populations, quantitative dietary assessment, and objective measures of physical activity are warranted to further clarify the relationships between lifestyle behaviours, dietary patterns, and body composition.

CONCLUSION

The present study evaluated dietary behaviour, nutrient intake, and body composition among 138 young adults aged 18-25 years. The findings revealed several nutritional concerns, including frequent meal skipping, regular consumption of outside foods, inadequate protein and mineral intake, and a high prevalence of elevated body fat, particularly among female and older participants. While most participants showed favourable muscle control, unhealthy dietary habits and poor nutrient intake may adversely affect body composition and increase the risk of future metabolic disorders. These results highlight the importance of promoting healthy eating habits during young adulthood through nutrition education, routine dietary assessment, and targeted strategies to improve protein and micronutrient intake, especially among female students. Encouraging balanced diets and reducing the intake of energy-dense processed foods may help maintain healthy body composition and support long-term health. Further longitudinal studies

involving larger and more diverse populations are needed to confirm these findings and better understand the relationship between dietary behaviour and body composition.

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