

Mapping Body Composition and Metabolic Risk Patterns Among Late Adolescents and Young Adults Using BIA

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ABSTRACT

Background: Lifestyle behaviours during late adolescence and young adulthood significantly influence body composition and future metabolic health. This study evaluates lifestyle, body composition and metabolic risk indicators in late adolescents and examines the influence of age and gender.

Methods: A total of 138 participants aged 18 to 25 years were enrolled in this cross-sectional study. Lifestyle data along with a structured questionnaire and body composition, were assessed. Statistical analyses included the chi-square test, considered statistically significant ($p < 0.05$).

Results: Among participants, 74.6% were females and 63.0% were aged 18- 21 years. Non-vegetarian dietary habits were predominant (62.3%) and lack of time was the major barrier to physical activity (50.0%). Most participants consumed 6-8 glasses of water daily (42.0%), while 88.4% reported sleeping less than 6 hours per night. Body composition assessment revealed high body fat mass in 61.6% of participants, with 64.5% having normal BMI and 18.1% having elevated BMI. Significant gender differences were observed in total body water ($\chi^2=52.01$, $p<0.05$), waist-to-hip ratio ($\chi^2=7.51$, $p<0.05$), body score ($t=2.13$, $p<0.05$) and body composition-related health conditions ($\chi^2=5.58$, $p<0.05$). Females showed higher body fat mass, obesity grade, and waist-to-hip ratio, whereas males had higher total body water, basal metabolic rate, and body scores. Age was significantly associated with BMI distribution ($\chi^2 = 7.94$, $p < 0.05$).

Conclusion: Body composition varied significantly by age and gender among young adults. This highlights the importance of early screening and lifestyle interventions. BIA may be useful for identifying individuals at risk of future metabolic disorders.

Keywords: Body composition, Bioelectrical impedance analysis, Metabolic risk, Late adolescents, Lifestyle

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1. Introduction

Body composition significantly affects an individual's lifestyle and refers to the relative proportions of fat mass, lean muscle mass, bone and body water. Daily behavioural choices, including dietary patterns, physical activity levels, sleep duration and stress management, substantially influence these components of physical health. Previous research suggests that individuals who adhere to balanced dietary practices and engage in regular physical activity tend to exhibit healthier body composition profiles than those with unhealthy eating habits and sedentary lifestyles (Stefan et al., 2013). Among lifestyle factors, physical activity is one of the most influential determinants of body composition. Regular exercise engagement promotes muscle hypertrophy and enhances fat oxidation, thereby improving the balance between lean body mass and adipose tissue. Activities such as walking, running, swimming, and resistance training have been shown to produce favourable changes in body composition over time (Brach et al., 2004). Dietary intake also plays a critical role, as it directly affects energy balance, metabolic efficiency and fat storage. Frequent consumption of energy-dense and highly processed foods rich in sugars and unhealthy fats has been linked to increased body fat accumulation (Hall et al., 2019). In contrast, healthier dietary choices support optimal metabolic function and body composition. Sleep and stress, though often overlooked, are equally important lifestyle determinants of body composition. Insufficient sleep has been associated with reduced metabolic efficiency, increased appetite, and enhanced fat storage. Additionally, individuals experiencing depression, anxiety, or emotional distress may struggle with motivation, which can negatively affect eating behaviours and physical activity levels. Emotional eating or meal skipping may emerge as coping mechanisms, contributing to weight gain,

particularly central adiposity, largely due to elevated cortisol levels (Adam & Epel, 2007; Kivimäki et al., 2023). Furthermore, socio-cultural factors such as family practices, peer influence, and social norms play a key role in shaping attitudes toward diet, physical activity and body image. Awareness of these influences can enable individuals to make more informed and healthier lifestyle choices that support favourable body composition outcomes. Overall, body composition is closely linked to everyday lifestyle behaviours, including physical activity, dietary habits, sleep patterns, stress management, mental health and socio-cultural influences. Minor, eco-friendly adjustments to everyday habits can lead to considerable improvements in physical well-being over time. Hence, the present study assesses the impact of lifestyle factors on body composition among late adolescents.

2. Materials and Methods

Experimental Study Design

A cross-sectional study was conducted in April 2024 at the Department of Clinical Nutrition and Dietetics, Padmashree Institute of Management and Sciences, Bengaluru, Karnataka. The study aimed to assess body composition and its association with lifestyle behaviours among young adult students. A total of 138 participants were enrolled and all data collection procedures, including questionnaire administration and body composition assessment, were completed during the study period.

Study Participants

Inclusion Criteria

Students of both genders aged 18-30 years, currently enrolled at Padmashree Institute of Management and Sciences, Bengaluru, were included in the study. Only apparently healthy individuals free from chronic health conditions and those who provided voluntary informed consent were eligible to participate.

Exclusion Criteria

Participants were excluded if they were over 30 years of age, pregnant or lactating or had implanted electronic devices that could interfere with bioelectrical impedance measurements. Individuals with metallic implants, a history of recent metal surgeries or those wearing metal jewellery at the time of

assessment were also excluded. Additionally, participants whose date of birth could not be verified were excluded to ensure accurate age-based eligibility.

Body Composition Analysis

Body composition was evaluated using the InBody 270 body composition analyser (InBody, Bengaluru, India), which utilises bioelectrical impedance analysis (BIA). This non-invasive approach estimates body composition metrics by measuring the electrical resistance of bodily tissues. Evaluations were performed under standardised conditions to maintain consistency and reliability of measurements among participants. Parameters obtained included body fat percentage, fat-free mass, and other body composition indices. The methodology was adopted in accordance with previously published protocols (Kyle et al., 2004a).

Questionnaire Construction and Data Collection

Lifestyle behaviour data were collected using a standardised structured questionnaire administered individually to each participant. Participants were informed of the study's voluntary nature and their right to withdraw at any time without consequences. The questionnaire collected information on diet type, lifestyle challenges, water intake, sleep habits and stress levels. The instrument was pre-tested for clarity and all responses were recorded confidentially to ensure data reliability.

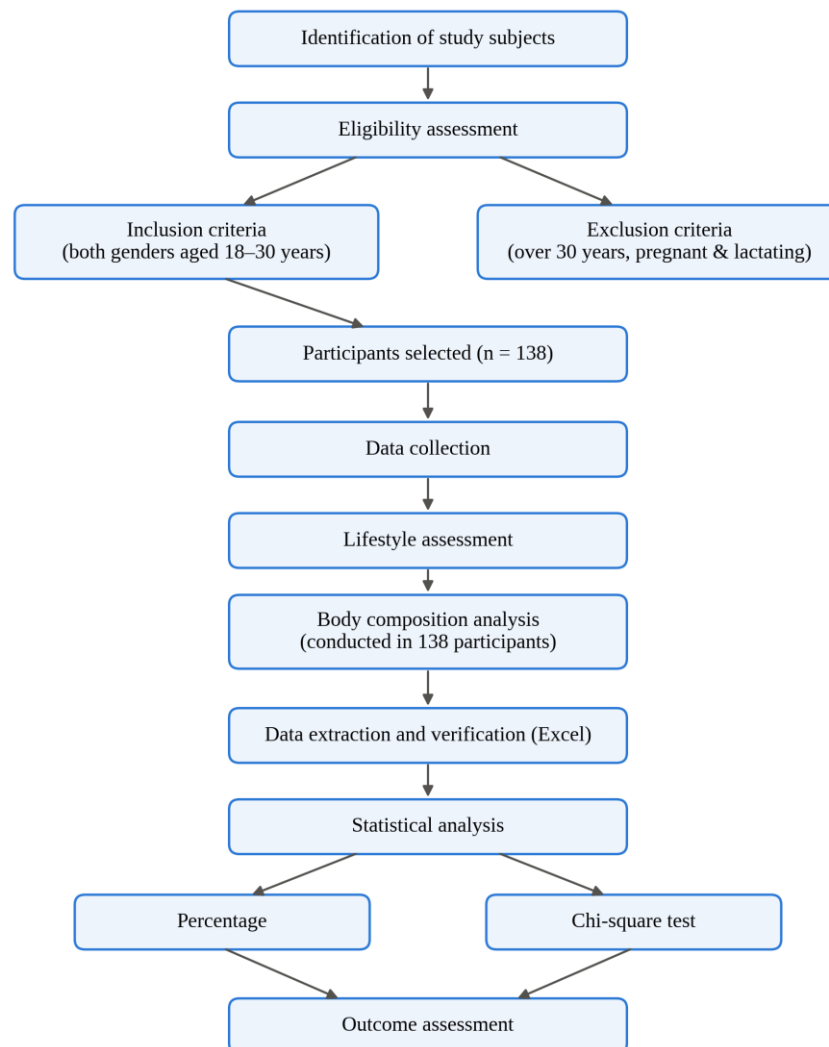
Data Verification

Completed questionnaires were systematically reviewed to ensure completeness and accuracy of responses. Verified data were coded and compiled for statistical analysis. This structured approach enabled the assessment of potential associations between lifestyle behaviours and body composition outcomes.

Statistical Analysis

Data were analysed using descriptive and inferential statistical methods. Categorical variables were summarised as frequencies and percentages, whereas continuous variables were presented as mean $\pm$ standard deviation (SD). The Chi-square (χ^2) test was used to determine associations between categorical variables. Statistical significance was established at $p < 0.05$. Variables included dietary pattern, lifestyle challenges, water intake, sleep habits, stress levels and body composition parameters. The results were interpreted to assess the

influence of dietary and lifestyle factors on body composition among young adults aged 18-25 years.



Flow Chart 1. Integrated Body Composition Assessment Framework

3. Results

3.1 Lifestyle and Health-Related Risk Factors

A total of 138 respondents participated in the study. The majority of participants were in the 18-21 age group (63.0%), while 37.0% were aged 22-25 years. Females constituted 74.6% of the study population, whereas males accounted for 25.4%, as depicted in Figure 1. As shown in Table 1, non-vegetarian dietary habits predominated among the respondents, accounting for 62.3% (n=86) of the study population. Vegetarian diets were followed by 18.8% (n=26) of

respondents, whereas vegetarian and pescatarian dietary patterns were reported by 13.0% (n=18) and 5.8% (n=8), respectively. As shown in Table 2, lack of time was the most frequently reported barrier to maintaining an active lifestyle, accounting for 50.0% (n=69) of respondents. Not seeing satisfactory results was reported by 21.7% (n=30), followed by lack of motivation (18.1%, n=25). Lack of knowledge and other reasons were each reported by 5.1% (n=7) of respondents, as presented in Table 3; the majority of respondents consumed 6–8 glasses of water per day (42.0%, n=58). 3–5 glasses per day were reported by 30.4% (n=42), while 10.9% (n=15) consumed fewer than 3 glasses daily. Consumption of 9–11 glasses and 12 glasses per day was reported by 5.1% (n=7) and 11.6% (n=16) of respondents, respectively. Overall, 72.4% (n=100) of respondents reported consuming between 3 and 8 glasses of water per day. As illustrated in Figure 2, 77.1% of males and 92.2% of females reported sleeping less than 6 hours per day, while 22.9% of males and 7.8% of females reported sleeping more than 6 hours. Age-wise, 93.1% of respondents aged 18–21 years reported sleeping less than 6 hours compared with 80.4% of those aged 22–25 years. As shown in Table 4, 37.7% (n=52) of respondents reported sleeping between 10:00–11:00 pm, while 28.3% (n=39) reported sleeping between 11:00 pm and 12:00 am. A further 34.0% (n=47) reported sleeping after midnight. Regarding wake-up time, 49.3% (n=68) reported waking between 8:00–9:00 am, 33.3% (n=46) between 6:00–7:00 am, and 17.4% (n=24) before 6:00 am. As presented in Table 5, high stress was the most frequently reported stress category, accounting for 29.0% (n=40) of respondents. Moderate stress was reported by 22.4% (n=31), while 20.3% (n=28) reported no stress. Low stress and very high stress were reported by 16.7% (n=23) and 11.6% (n=16) of respondents, respectively. No significant association was observed between age group and stress level ($\chi^2 = 1.23$, $p > 0.05$). As depicted in (Figure 3), among males, 25.7% reported no stress, 22.9% reported high stress, 20.0% reported low stress, 17.1% reported moderate stress, and 14.3% reported very high stress. Among females, high stress was reported by 31.1%, followed by moderate (24.3%), no stress (18.4%), low (15.5%) and very high (10.7%), which in turn affects clinical conditions affecting body composition were reported by 15.9% (n=22) of respondents, while 84.1% (n=116) reported no such conditions. Clinical conditions were reported by 28.6% of males and 11.7% of females, with a significant association observed between gender and clinical conditions ($\chi^2=5.58$, $p<0.05$), as shown in Table 6. Receipt of medical advice related to body composition was reported by 17.4% (n=24) of respondents, whereas 82.6%

(n=114) had not received such advice. No significant association was observed between gender and receipt of medical advice ($\chi^2=0.22$, $p>0.05$). As depicted in Figure 4, a positive family history was reported by 54.3% of males and 33.0% of females, whereas 45.7% of males and 67.0% of females reported no family history.

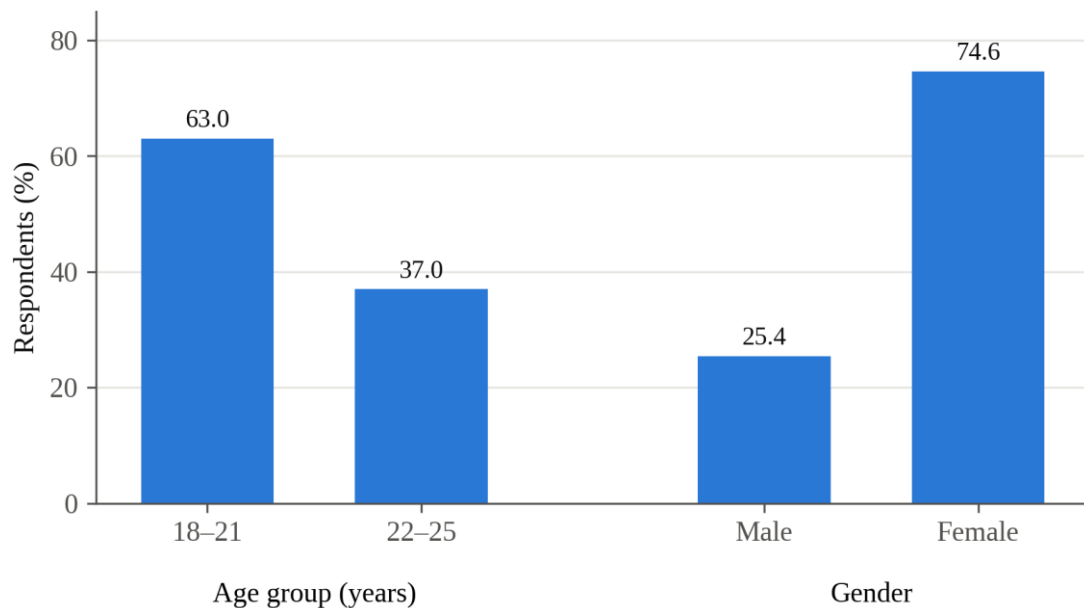


Figure 1. Classification of Respondents by Age and Gender

Table 1. Dietary Consumption Pattern (N = 138)

Characteristics	Category	Respondents	
		Number	Percent
Dietary type	Vegetarian	26	18.8
	Non-vegetarian	86	62.3
	Eggetarian	18	13.0
	Pescatarian	8	5.8
Total		138	100.0

Table 2. Lifestyle Constraints of Respondents (N = 138)

Characteristics	Category	Respondents	
		Number	Percent
Key Barrier to an Active Lifestyle	Of time	69	50.0
	Lack of motivation	25	18.1
	Not seeing results	30	21.7
	Lack of knowledge	7	5.1
	Others	7	5.1

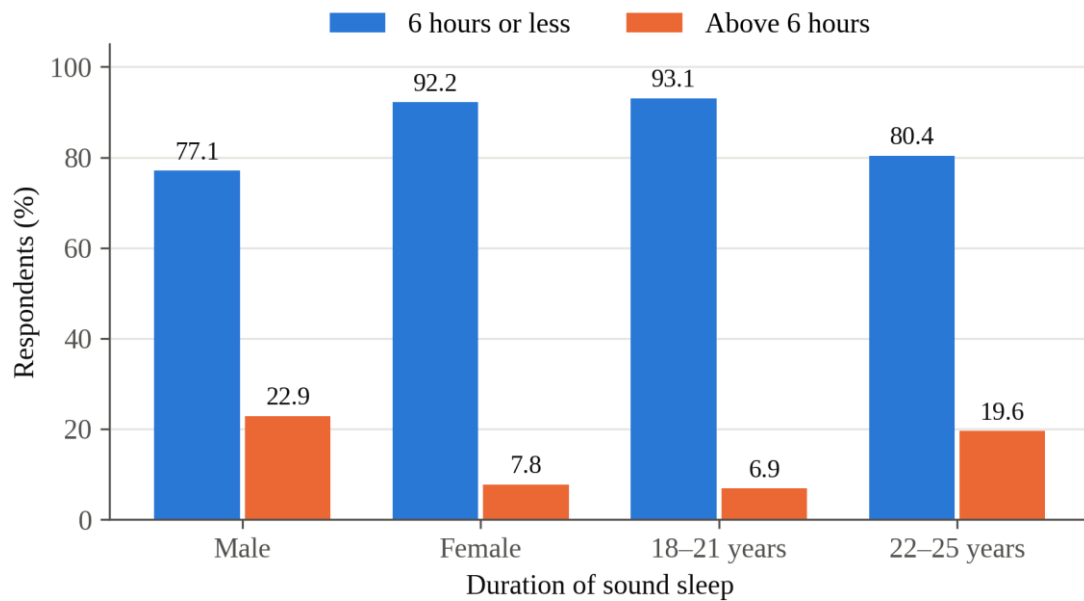


Figure 2. Respondents' Duration of Sound Sleep by Gender and Age Group

Table 3. Hydration Habits of Respondents (N = 138)

Daily Water Consumption (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

Table 4. Sleep Profile of Respondents (N = 138)

Characteristics	Category	Respondents	
		Number	Percent
Typical Weekday Bedtime	10-11 pm	52	37.7
	11-12 pm	39	28.3
	After 12 pm	47	34.0
Typical Weekday Wake Up Time	Before 6 am	24	17.4
	6-7 am	46	33.3
	8-9 am	68	49.3
Total		138	100.0

Table 5. Age-Associated Stress among Respondents (N = 138)

Variation in Stress by Age	Respondents						χ^2 Test
	18-21 years		22-25 years		Combined		
	N	%	N	%	N	%	
Low	14	16.1	9	17.6	23	16.7	1.23 ^{NS}
Moderate	18	20.7	13	25.5	31	22.4	
High	25	28.7	15	29.4	40	29.0	
Very high	10	11.5	6	11.8	16	11.6	
None	20	23.0	8	15.7	28	20.3	
Total	87	100.0	51	100.0	138	100.0	

NS: Non-significant; $\chi^2 (0.05, 4 df) = 9.488$

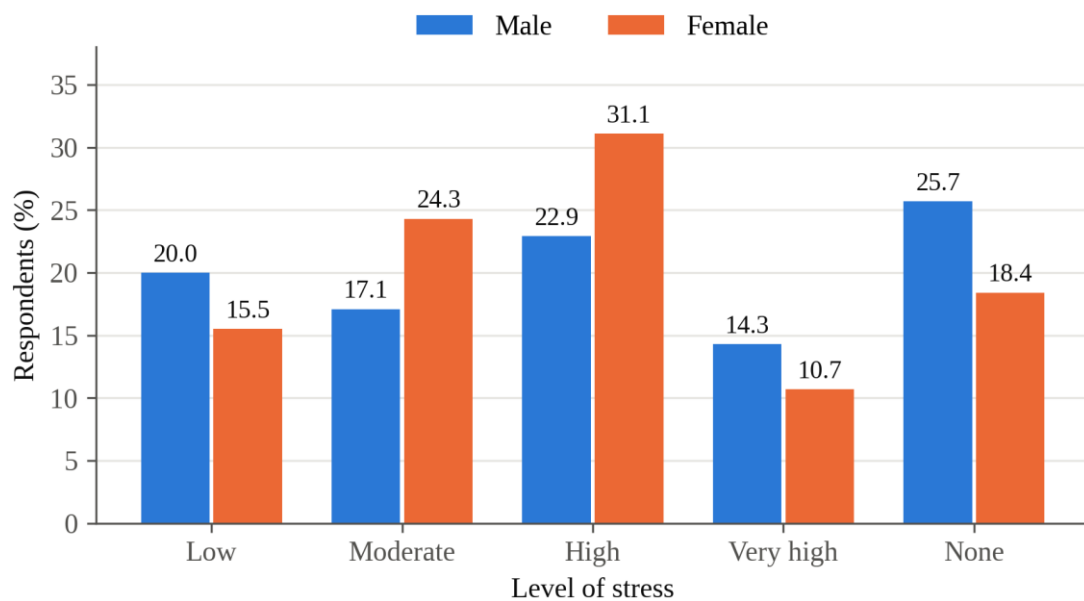


Figure 3. Level of Perceived Stress by Gender

Table 6. Prevalence of Health Conditions Influencing Body Composition (N = 138)

Characteristics	Response	Respondents						χ^2 Test
		Male		Female		Combined		
		N	%	N	%	N	%	
Clinical Factors	Yes	10	28.6	12	11.7	22	15.9	5.58*
	No	25	71.4	91	88.3	116	84.1	
Medical Advice	Yes	7	20.0	17	16.5	24	17.4	0.22 ^{NS}
	No	28	80.0	86	83.5	114	82.6	
Total		35	100.0	103	100.0	138	100.0	

* Significant at 5% level; NS: Non-significant; $\chi^2 (0.05, 1 df) = 3.841$

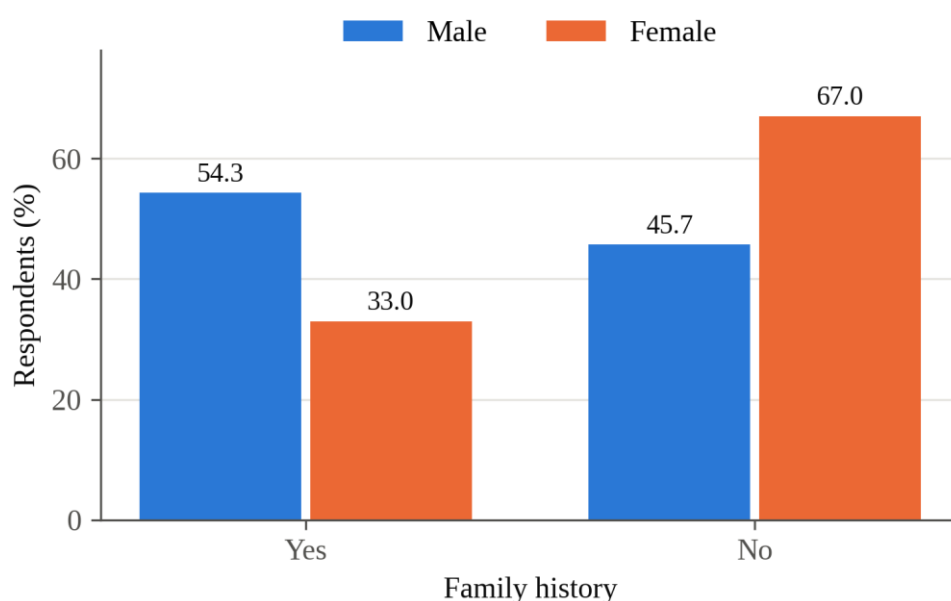


Figure 4. Clinical and Family History Characteristics

3.2 Body Composition Profile Using Bioelectrical Impedance Analysis (BIA)

3.2.1 Total Body Water

As depicted in Figure 5, total body water status varied across gender categories. Among male respondents, medium total body water levels were observed in 48.6% of participants, followed by high levels (42.8%) and low levels (8.6%). Among female respondents, low total body water levels were observed in 62.1%, medium in 35.9%, and high in 2.0%. The distribution indicated that medium total body water was the most frequently observed category among males, whereas low total body water was the predominant category among females. High total body water levels were reported by 42.8% of males and 2.0% of females, as shown in Figure 5.

3.2.2 Anthropometric and Metabolic Health Indicators: Body Fat Mass

High body fat mass was observed in 61.6% (n=85) of respondents, while 31.2% (n=43) and 7.2% (n=10) were categorised as having medium and low body fat mass, respectively. Among males, 54.3% had high body fat mass, 42.9% had medium body fat mass and 2.8% had low body fat mass. Among females, 64.1% had high body fat mass, followed by 27.2% with medium body fat mass and 8.7% with low body fat mass, as shown in Table 7. The association between gender and body fat mass distribution was not statistically significant ($\chi^2=3.71$, $p>0.05$). With respect to age, 58.6% of respondents aged 18-21 years and 66.7%

of those aged 22-25 years were classified as high body fat mass. The association between age group and body fat mass distribution was not statistically significant ($\chi^2 = 3.46$, $p > 0.05$). Table 8 indicates that the majority of respondents belonged to the medium BMI category (64.5%, $n = 89$). The high BMI category comprised 18.1% ($n = 25$) of participants, whereas 17.4% ($n = 24$) were classified within the low BMI category. Among males, 71.4% had a medium BMI, 17.2% had a high BMI, and 11.4% had a low BMI. Among females, 62.1% had medium BMI, 18.5% had high BMI, and 19.4% had low BMI. The analysis revealed no statistically significant association between gender and BMI distribution ($\chi^2 = 1.33$, $p > 0.05$). The age-wise distribution indicated that 60.9% of respondents aged 18-21 years and 70.6% of those aged 22-25 years had a medium BMI. High BMI was observed in 15.0% of respondents aged 18-21 years and 23.5% of those aged 22-25 years. A statistically significant association was observed between age group and BMI distribution ($\chi^2 = 7.94$, $p < 0.05$), which was compared with waist-to-hip ratio as shown in Table 9; 54.3% ($n=75$) of respondents had lower waist-to-hip ratio values, whereas 45.7% ($n=63$) had higher values. Among males, 74.3% had lower WHR and 25.7% had higher WHR. Among females, 47.6% had lower WHR and 52.4% had higher WHR. The association between gender and WHR distribution was statistically significant ($\chi^2=7.51$, $p<0.05$). According to age group, 57.5% of respondents aged 18-21 years and 49.0% of those aged 22-25 years had lower WHR values. Higher WHR was observed among 42.5% and 51.0% of respondents in the respective age groups. No significant association was observed between age group and WHR distribution ($\chi^2=0.93$, $p>0.05$), which determines BMR, as depicted in Figure 6; the mean basal metabolic rate (BMR) was 1325 kcal among male respondents and 1154 kcal among female respondents. Age-specific analysis revealed a mean BMR of 1262 kcal among respondents aged 18–21 years, compared with 1210 kcal among those aged 22–25 years. Male respondents recorded higher mean BMR values than female respondents. Among the age groups, respondents aged 18-21 years exhibited a higher mean BMR than those aged 22-25 years. The distribution of mean BMR values according to gender and age group. As presented in Table 10, the overall average obesity grade among respondents was 103.7%, with a maximum value of 170.0%. The average obesity grade was higher among female respondents (104.7%) than among male respondents (100.7%). The maximum obesity grade was 166.0% among females and 170.0% among males. Among females, the average obesity grade ranged from 95.0% to 116.3%, with the highest average

observed among 25-year-olds (116.3%) and the lowest among 19-year-olds (95.0%). Among males, the average obesity grade ranged from 90.5% to 113.6%, with the highest average observed among 24-year-olds (113.6%) and the lowest among 19-year-olds (90.5%).

The highest maximum obesity grade among females was 166.0%, recorded in the 21-year age group, whereas the highest maximum obesity grade among males was 170.0%, recorded in the 21-year age group.

3.2.3 Body Score

Body score varied according to gender and age group (Figure 7). The mean body score among male participants was 69.11 ± 6.2 , whereas among female participants, it was 66.63 ± 5.1 . A significant difference in body score was observed between genders ($t = 2.13$, $p < 0.05$). The mean body score among participants aged 18-21 years was 66.86 ± 5.8 , and among those aged 22-25 years, 67.45 ± 5.7 . No significant difference in body score was observed between the age groups ($t = 0.58$, $p > 0.05$).

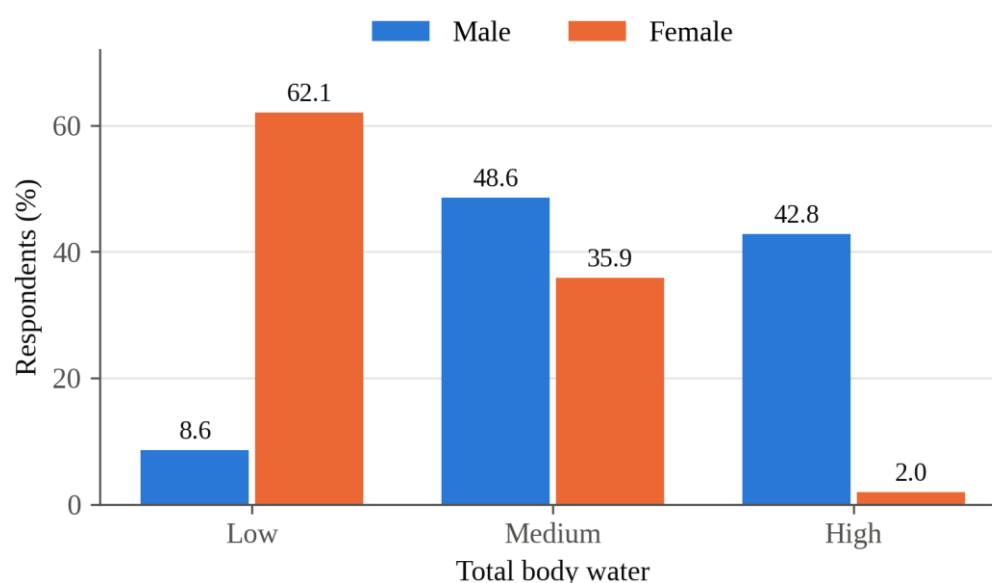


Figure 5. Total Body Water by Gender

Table 7. Body Fat Mass by Gender and Age Group (N = 138)

Characteristic	Category	Sample (n)	Body fat mass (Kg)						χ^2 Test
			Low		Medium		High		
			N	%	N	%	N	%	
Gender	Male	35	1	2.8	15	42.9	19	54.3	3.71 ^{NS}
	Female	103	9	8.7	28	27.2	66	64.1	
Age (years)	18-21	87	9	10.4	27	31.0	51	58.6	3.46 ^{NS}
	22-25	51	1	1.9	16	31.4	34	66.7	
Combined		138	10	7.2	43	31.2	85	61.6	

NS: Non-significant; χ^2 (0.05, 2 df) = 5.991

Table 8. Body Mass Index by Gender and Age Group (N = 138)

Characteristic	Category	Sample (n)	Body mass index (kg/m ²)						χ^2 Test
			Low		Medium		High		
			N	%	N	%	N	%	
Gender	Male	35	4	11.4	25	71.4	6	17.2	1.33 ^{NS}
	Female	103	20	19.4	64	62.1	19	18.5	
Age (years)	18-21	87	20	24.1	53	60.9	14	15.0	7.94*
	22-25	51	4	5.9	36	70.6	11	23.5	
Combined		138	24	17.4	89	64.5	25	18.1	

* Significant at 5% level; NS: Non-significant; χ^2 (0.05, 2 df) = 5.991

Table 9. Waist/Hip Ratio by Gender and Age Group (N = 138)

Characteristic	Category	Sample (n)	Waist/Hip ratio				χ^2 Test
			Less		More		
			N	%	N	%	
Gender	Male	35	26	74.3	9	25.7	7.51*
	Female	103	49	47.6	54	52.4	
Age (years)	18-21	87	50	57.5	37	42.5	0.93 ^{NS}
	22-25	51	25	49.0	26	51.0	
	Combined	138	75	54.3	63	45.7	

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

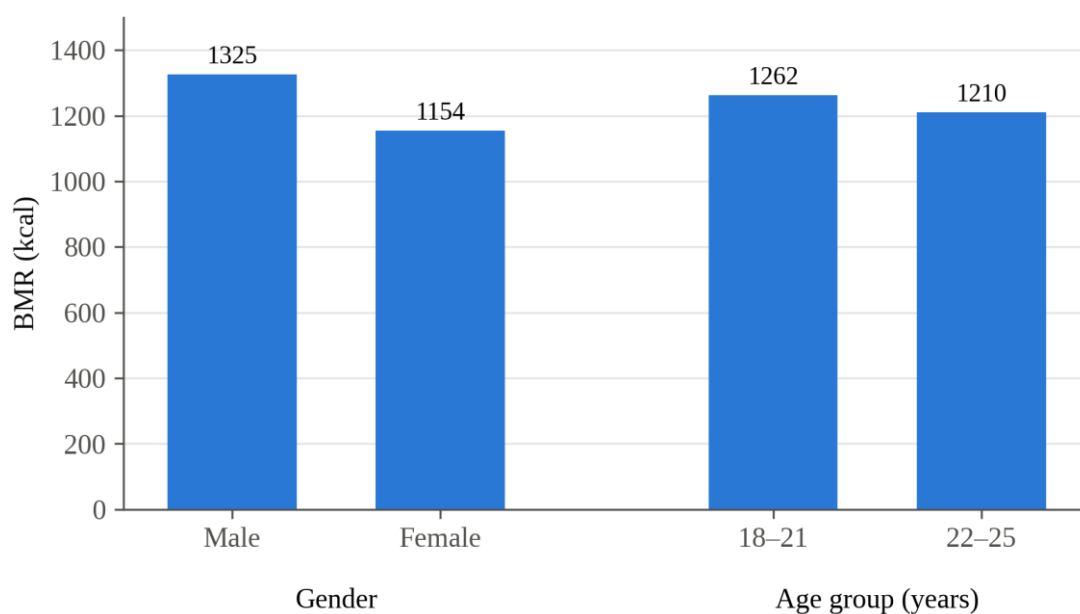


Figure 6. BMR by Gender and Age Group

Table 10. Obesity Grade of Respondents

Group/Age	Average of obesity (%)	Maximum of obesity (%)
Female	104.7	166.0
17	99.0	99.0
18	107.0	118.0
19	95.0	121.0
20	105.0	160.0
21	111.8	166.0
22	105.9	144.0
23	103.3	136.0
24	109.0	118.0
25	116.3	119.0
Male	100.7	170.0
19	90.5	110.0
20	95.8	109.0
21	102.7	170.0
22	99.5	118.0
23	94.0	109.0
24	113.6	127.0
Grand total	103.7	170.0

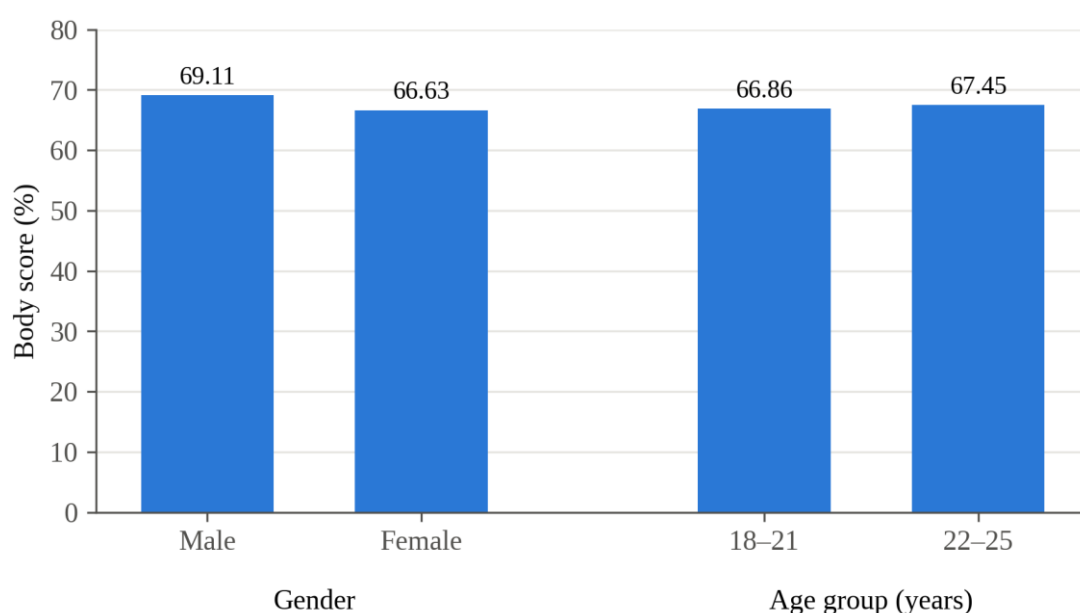


Figure 7. Body Score by Gender and Age Group

4. Discussion

The present study investigated lifestyle-related risk factors and body composition characteristics among young adults using bioelectrical impedance analysis (BIA). The findings revealed a high prevalence of behavioural risk factors, including non-vegetarian dietary habits, physical inactivity, inadequate sleep duration, and elevated stress levels, alongside unfavourable body composition parameters, including high body fat mass, elevated obesity grade, and increased waist-to-hip ratio, among a substantial proportion of respondents. These findings emphasise the growing burden of lifestyle-related health risks among young adults and support existing evidence that early adulthood is a critical period for the development of obesity and metabolic disorders. The predominance of non-vegetarian dietary practices observed in the present study is consistent with reports describing ongoing dietary transition among Indian youth. Urbanisation, changing food environments, and increased availability of energy-dense foods have contributed to greater consumption of animal-based and processed foods among young adults (Gupta et al., 2020; Popkin, 2017). Prior research has indicated that diets high in saturated fats and processed foods are associated with greater body fat accumulation and adverse metabolic effects. (Hall et al., 2019; Willett et al., 2019). Although dietary intake was not quantitatively assessed in the present study, the predominance of non-vegetarian dietary habits may partly explain the elevated levels of adiposity observed

among respondents. Lack of time emerged as the most important barrier to maintaining an active lifestyle. Similar findings have been reported among university students worldwide, where academic workload, prolonged screen time, and competing responsibilities reduce participation in physical activity (Keating et al., 2005; Vadeboncoeur et al., 2015). Lack of physical activity reduces energy expenditure and promotes an energy surplus, increasing the risk of accumulating excess fat. The high prevalence of body fat mass and obesity indicators observed in the present study may therefore reflect, at least in part, insufficient engagement in regular physical activity. The hydration assessment revealed that the majority of participants drank between 3 and 8 glasses of water each day. Proper hydration is crucial for supporting metabolic processes, regulating body temperature, transporting nutrients, and maintaining cellular balance. Furthermore, bioelectrical impedance analysis relies on body water distribution to accurately estimate body composition. Previous studies have demonstrated that inadequate hydration can influence impedance measurements and affect estimates of fat mass and lean tissue mass (Kyle et al., 2004a, 2004b). Therefore, hydration status should be considered when interpreting body composition outcomes. Sleep-related findings revealed that the majority of respondents slept less than 6 hours per day. This prevalence of short sleep duration is considerably higher than recommended sleep guidelines for young adults and is consistent with findings reported among university populations globally (Buysse, 2014; Lund et al., 2010). Numerous studies have established a strong relationship between inadequate sleep and obesity-related outcomes. Sleep restriction influences endocrine regulation by reducing leptin secretion and increasing ghrelin production, thereby increasing appetite and energy intake (Patel & Hu, 2008). In addition, chronic sleep deprivation has been associated with insulin resistance, impaired glucose metabolism, and increased visceral adiposity (Chaput et al., 2023). The widespread occurrence of inadequate sleep among participants may therefore represent an important contributor to the elevated body fat levels identified in the present study. Psychological stress was another prominent characteristic of the study population. High and moderate stress levels together accounted for more than half of the respondents. Similar observations have been reported among university students in both developed and developing countries (Saleh et al., 2017). Chronic stress activates the hypothalamic-pituitary-adrenal axis, resulting in prolonged cortisol secretion. Elevated cortisol promotes abdominal fat deposition, alters appetite regulation, and contributes to metabolic dysfunction (Adam & Epel, 2007; Torres &

Nowson, 2007). Consequently, the combination of inadequate sleep, elevated stress, and limited physical activity may have collectively influenced body composition outcomes among the respondents. Collectively, the lifestyle-related factors identified in the present study, including dietary habits, physical inactivity, hydration practices, sleep patterns, and stress levels, may influence body composition and metabolic health. Previous research has demonstrated that these behavioural factors interact to affect energy balance, fat accumulation, muscle mass maintenance, and overall physiological functioning (Chaput et al., 2023; Hruby & Hu, 2015). Assessment of total body water demonstrated marked gender differences. Male participants largely showed medium to high levels of total body water, while female participants were mainly found in the low total body water category. These results align with known physiological distinctions in body composition. Lean body mass has a considerably higher water content than fatty tissue; thus, individuals with greater muscle mass typically have higher total body water levels. (Wells, 2007). Similar gender differences have been reported in BIA studies conducted among young adults and university populations, in which males consistently exhibit higher hydration status due to greater skeletal muscle mass and lower body fat percentages (Kyle et al., 2004b). An analysis of body fat mass indicated that over sixty percent of the participants fell into the high body fat category. While no significant relationship was found with gender or age, a higher prevalence of increased body fat mass was noted among females and older individuals. This trend is consistent with the findings of Gallagher et al. (2000), who reported that females generally have higher body fat percentages than males due to physiological and hormonal factors. The absence of statistical significance might indicate issues with the sample distribution rather than a lack of biological variations. Similar findings have been observed among university students, in whom increased body fat mass was often noted despite seemingly normal BMI values (Jackson et al., 2002). These results emphasise the necessity of directly evaluating body composition rather than relying solely on anthropometric measurements. Most respondents fell into the medium BMI category; however, a notable association was observed between age and BMI status. Participants aged 22–25 years demonstrated a greater prevalence of high BMI compared with those aged 18–21 years. This finding supports previous longitudinal evidence indicating progressive increases in body weight and adiposity during the transition from adolescence to adulthood (Ng et al., 2014; Vadeboncoeur et al., 2015). The significant age-related variation observed in the present study may reflect the cumulative effects

of dietary practices, reduced physical activity, and lifestyle changes that occur during university years. Waist-to-hip ratio findings showed a significant association with gender, with females having a higher prevalence of elevated WHR values than males. Waist-to-hip ratio is widely recognised as an important indicator of central adiposity and cardiometabolic risk. Previous investigations have demonstrated that central fat accumulation is more strongly associated with metabolic syndrome, cardiovascular disease, and insulin resistance than overall body weight alone (Ashwell et al., 2012; Janssen et al., 2004). The higher prevalence of elevated WHR among female respondents suggests increased susceptibility to future metabolic complications and highlights the importance of monitoring abdominal fat distribution in addition to general obesity indicators. While anthropometric indicators such as body fat mass, body mass index, and waist-to-hip ratio provide important information regarding adiposity and fat distribution, metabolic indicators offer additional insight into energy expenditure and obesity-related risk. Therefore, basal metabolic rate and obesity grade were evaluated to provide a more comprehensive assessment of respondents' metabolic and nutritional status. Male respondents had higher mean basal metabolic rates than female respondents. Basal metabolic rate represents the energy required to maintain essential physiological functions at rest and is strongly influenced by fat-free mass. Previous research has shown that skeletal muscle tissue contributes substantially to resting energy expenditure, explaining the consistently higher BMR values observed among males (Cunningham, 1980; Johnstone et al., 2005). The higher total body water levels observed among male respondents further support the presence of greater lean tissue mass and consequently higher metabolic activity. The overall obesity grade exceeded 100%, indicating a tendency toward excess body weight relative to standard reference values. Female respondents had slightly higher average obesity grades than male respondents. Similar findings have been reported by Gallagher et al. (2000), who observed higher adiposity among females despite comparable BMI values. Furthermore, the highest obesity grades were observed in older age categories, suggesting a gradual increase in adiposity during early adulthood. This trend is consistent with global epidemiological evidence indicating increasing obesity prevalence among young adults as a consequence of behavioural and environmental changes (Ng et al., 2014). Body score analysis revealed significantly higher scores among males than females. Since body score reflects the combined influence of body fat, muscle mass, hydration status and metabolic characteristics, the higher scores observed among males may reflect

their comparatively favourable body composition profile. Similar gender-related differences have been documented in studies utilising BIA-derived health indices among young adults (Kyle et al., 2004b).

Overall, the findings of the present study demonstrate that adverse lifestyle behaviours and unfavourable body composition characteristics are common among young adults. The combination of insufficient sleep, high stress levels, lack of physical exercise, increased body fat, a higher degree of obesity, and an elevated waist-to-hip ratio suggests a significant risk for the development of metabolic disorders in this group. These results emphasize the necessity of introducing early lifestyle changes aimed at fostering healthy eating habits, maintaining regular physical activity, ensuring proper hydration, managing stress, and promoting good sleep habits to enhance body composition and support long-term metabolic health.

5. Conclusion

This study evaluated lifestyle behaviours and body composition characteristics among young adults aged 18-25 years using a structured questionnaire and bioelectrical impedance analysis (BIA). The findings revealed a high prevalence of lifestyle-related risk factors, including short sleep duration, elevated stress levels, inadequate hydration practices and barriers to maintaining an active lifestyle. These factors are known to influence body composition and metabolic health and may contribute to the development of obesity-related disorders over time. Body composition assessment demonstrated significant variations according to gender and age. Male participants exhibited higher total body water levels, body scores and basal metabolic rates, whereas female participants showed a greater prevalence of elevated body fat mass, higher waist-to-hip ratio and higher average obesity grade scores. Although the majority of respondents were classified in the medium BMI category, a substantial proportion exhibited high body fat mass and obesity-related indicators, suggesting adiposity that may not be fully reflected by BMI alone. Age-related differences further indicated a higher prevalence of elevated BMI among participants aged 22-25 years compared with those aged 18-21 years. The findings also highlighted the potential influence of hereditary and clinical factors on body composition, as a notable proportion of respondents reported a family history of obesity, diabetes, or related metabolic conditions. These observations support the concept that body composition is determined by the interaction of lifestyle behaviours,

metabolic characteristics, and genetic predisposition. Overall, the study emphasises the importance of early identification of adverse body composition patterns among young adults. The application of BIA provided a comprehensive assessment of body composition beyond conventional anthropometric measures. Promoting healthy dietary practices, adequate hydration, sufficient sleep, regular physical activity and effective stress management may contribute to improved body composition and reduced metabolic risk. Early preventive interventions and health promotion strategies are therefore essential to support long-term metabolic health and well-being among young adults.

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Conflict of Interest Statement

The author declares no conflicts of interest.

Ethical Approval and Informed Consent

This study received ethical clearance from the Padmashree Institutional Ethics Committee (PIEC), Bangalore, India PIMS/MND/28/2025. The submitted research protocol was reviewed and approved by the committee before the study commenced. All research activities were carried out in compliance with the applicable institutional ethical standards. Informed written consent was obtained from each participant prior to data collection and participation in the study.

Author Contributions

Akshatha K. contributed to the study's conception and design, supervised the research, reviewed the manuscript, and provided critical revisions and final corrections. Akhitha Kangoju, Stanzin Wangmo and Saniya siddiqua contributed to the study's implementation, data collection, data analysis, literature review, and preparation of the manuscript draft. All authors reviewed, approved and agreed to be accountable for the final version of the manuscript.

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