



Nutritional Health and Socio-Demographic Patterns of College Students in Assam: A Comprehensive Assessment

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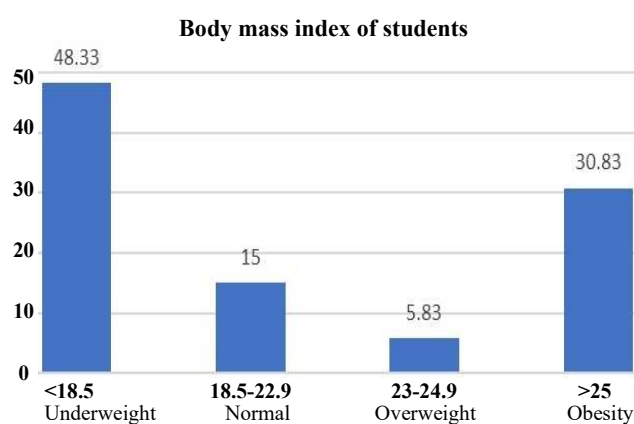
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HIGHLIGHTS

- Less than majority of respondents (48.33) were found as underweight, while 30.83 per cent were obese, indicating prevalent nutritional imbalances and raising concerns about dietary diversity and adequacy.
- The majority (58.33%) of respondents had a medium height, and 77.50 per cent showing adequate muscle and fat mass according to MUAC, yet significant proportions were underweight or obese.
- The socio-economic background, including parental education and family occupation, significantly influenced by dietary habits, emphasizing the importance of addressing economic constraints to improve students' overall nutritional health.

GRAPHICAL ABSTRACT



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ABSTRACT

Context: College students often face poor dietary choices, influenced by factors such as lifestyle, socio-economic conditions, and lack of nutritional knowledge. In Assam, this issue is compounded by the transition from traditional diets to fast food, leading to mass scale undernutrition and obesity.

Objective: The study aimed to assess the socio-demographic characteristics and nutritional health status of college students in Kamrup (Rural and Metro) districts of Assam, focusing on body weight, height, and BMI as key indicators.

Methodology: A total of 120 undergraduate students were selected from four Government-aided colleges. Data were collected through semi-structured interviews, and anthropometric measurements, including height, weight, and MUAC, were taken. BMI was calculated and respondents were categorized as underweight, normal, overweight, or obese by following WHO standards.

Results & Discussion: The findings showed that 48.33 per cent of respondents were underweight, while 30.83 per cent were obese, with only 15 per cent were found to be a normal BMI. Most students had medium height (58.33%) and medium body weight (55%). The MUAC (*Mid Upper arm circumference*) assessment indicated that 77.50 per cent of respondents had moderate nutritional status. There was a significant correlation between BMI and other variables.

Significance: This study reveals significant nutritional imbalances among college students, with high rates of both underweight and obesity. It highlights how socio-economic factors like family income and occupation influence dietary habits. The findings stress the need for targeted nutritional education to improve health outcomes and promote balanced dietary practices among young adults.

Nutrition is essential for maintaining a healthy and happy life by protecting against diseases and promoting overall well-being (WHO, 2020). Poor nutrition, on the other hand, is linked to conditions like cardiovascular disease, hypertension, diabetes, anemia, and certain cancers. It affects both physical and mental health, leading to lethargy, depression, and illness (Kiani *et al.*, 2022). College students, however, often prefer fast food over nutritious, homemade meals, neglecting the importance of a healthy diet for physical fitness. Many cannot afford expensive, nutritious food regularly, but locally available options can meet their dietary needs. Changing eating habits is challenging for students, influenced by factors such as being away from home, late-night snacking, and the appeal of dining hall food. Lack of knowledge about fruits, vegetables, and balanced diets, along with poor exercise habits, contributes to issues like obesity. Nutrition is vital for students' physical and mental development, and nutrition education is crucial for guiding them toward healthy decisions (Lassi *et al.*, 2017). Proper nutrition is essential for both personal health and professional development.

Nutrition is a fundamental need for all life on earth, as essential as any other basic right. Lack of nutrition leads to dangerous diseases, while proper nutrition helps build immunity, supports brain development, and enhances physical activity (Singh *et al.*, 2020). Health is often considered more important than wealth, and without a balanced diet, it's impossible to maintain good health. Lack of nutritional knowledge results in poor health outcomes, especially for students, who require nutrient-dense foods to stay attentive and productive (Husain *et al.*, 2021). Unhealthy eating habits like skipping meals and consuming nutrient-deficient foods cause various health issues, while a balanced diet contributes to both physical and mental well-being (Dragun *et al.*, 2020). College students are the future of a nation, and good nutrition helps them remain fit both mentally and physically. However, many students lack awareness about the importance of a balanced diet and how to prepare healthy meals (Sogari *et al.*, 2018; Mukherjee *et al.*, 2024). Avoiding fried or packaged foods and consuming more fruits, vegetables, and whole grains is vital. Proper nutrition improves cognitive function, memory, and focus, which are essential for academic success (McKinley *et al.*, 2005; Saikia *et al.*, 2023).

A healthy diet also supports physical activities

by providing energy, particularly from carbohydrates, and promoting muscle growth through protein intake (Purcell, 2013; Noopur *et al.*, 2023). It can also reduce the risk of chronic diseases such as cardiovascular disease, hypertension, and certain cancers (Cena and Calder, 2020). Recent lifestyle changes have contributed to both undernutrition and overnutrition, leading to malnutrition worldwide (Neumann *et al.*, 2004). Malnutrition, whether through under nutrition or over nutrition, is a significant global problem with long-term developmental, economic, and health consequences. In many countries, the focus has been primarily on children and mothers, often neglecting adolescents and adults, including college students (Singh and Sandhu, 2014; WHO, 2021). Addressing the nutritional needs of this group could help break the cycle of malnutrition and prevent related chronic diseases. Body Mass Index (BMI) serves as an important measure of nutritional status and can guide interventions to prevent diseases.

College students often face stress and hectic schedules, which can lead to poor food choices and overeating. Obesity, driven by these factors, increases the risk of chronic diseases like diabetes, cardiovascular issues, and even psychosocial problems, all of which can hinder academic and professional success (Sogari *et al.*, 2018; Yun *et al.*, 2018).

College students in Assam represent a dynamic and diverse demographic group influenced by a rich cultural heritage and traditional dietary practices. Assam, situated in the northeastern part of India, is known for its ethnic diversity and unique cuisine, which includes rice as a staple, a variety of fish preparations, green leafy vegetables, and an array of aromatic spices. As students embark on their academic journey, they blend Assamese culinary customs with regional and global influences (Anonymous, 2011). Assam's diet reflects the state's agrarian culture and proximity to water bodies, with rice as a dietary cornerstone, often accompanied by fish, pulses, and vegetables. However, upon leaving home for educational institutions, students encounter a broader spectrum of food choices influenced by neighbouring states and the westernization of diets, incorporating fast food and processed snacks rich in unhealthy fats and sugars (Anonymous, 2021). Despite the state's culinary richness, students may face nutritional deficiencies due to the transition from home-cooked meals to hostel or canteen food, leading to imbalanced

diets and insufficient intake of essential nutrients, including vitamins and proteins (Nag *et al.*, 2012). College life often introduces irregular eating patterns and a dependence on fast food, contributing to weight-related issues and lifestyle diseases like obesity and diabetes, compounded by limited awareness of healthy eating practices (Kakati *et al.*, 2017; Nag *et al.*, 2012). While Assam's traditional diet promotes seasonal, fresh, and unprocessed foods, the rapid urbanization and changing lifestyles have led to an increase in calorie-dense, nutrient-poor options (Nag *et al.*, 2012). To promote desirable changes in selective behaviour for improved nutritional health, it is important to raise awareness about the major prevalent diseases in rural India (Satyapriya *et al.*, 2020).

In this context, the study was conducted to assess the socio-demographic characteristics and nutritional status of the college students of Assam.

METHODOLOGY

The study was conducted during 2021–2022 in the Kamrup district of Assam (located at 26°20'N 91°15'E), targeting on both the rural and metro regions. Four provincialized colleges were purposively selected for this study, including Vidya Bharati College and Pub Kamrup College from Kamrup (Rural), and K.R.B. Girls College and L.C.B. College from Kamrup (Metro). The selected students were undergraduate students from a purely arts background, ensuring a balanced representation of both male and female students. In total, 120 students were randomly selected from the four colleges, with thirty students chosen from



Study area Kamrup district of Assam

each institution based on enrolment concentration. A semi-structured interview schedule was developed to gather relevant data, which was collected personally by the investigator. To ensure the accuracy and relevance of the data collection tool, a pilot study was conducted with a group of thirty students, leading to necessary modifications in the interview schedule. The research design for this study is exploratory cum descriptive, aimed at gathering comprehensive insights within the stipulated timeframe.

Nutritional status: Nutritional status refers to health condition of an individual as affected by the intake and utilization of nutrients (Todhunter, 1970). In this study, the nutritional status of college students was analyzed through anthropometric assessments, including height, weight, and MUAC measurements. BMI was also calculated to assess their nutritional condition. “Anthropometry”, widely used to assess health and nutritional risks, included height, weight, and MUAC measurements in this study. These were compared to reference standards to assess weight status and disease risk, following WHO guidelines for classifying overweight and underweight. Height was measured as the maximum distance from the floor to the highest point on the head, with respondents standing straight, heels, buttocks, and upper back against a wall, following precise protocols (Vijayaraghavan and Rao, 1998). An anthropometric rod was used, accurate to 0.1 m. Body weight, a commonly used anthropometric measure in which individual stood on a Krups Platform Balance, with feet apart and no external support. The balance was zeroed to ensure accuracy. MUAC, a useful indicator of nutritional status, was measured using a flexible tape on the left arm. The midpoint between the shoulder and elbow was marked, and the tape was gently placed without compressing the arm’s contours.

BMI, was calculated as weight divided by the square of height, is a good indicator of nutritional status and fatness (Vijayaraghavan and Rao, 1998). After calculating the BMI of all respondents, individuals were classified based on WHO (2010) guidelines:

Underweight:	<18.5
Normal:	18.5-25
Pre-obese:	25.0-29.9
Obese (Class I):	30-34.9
Obese (Class II):	35-39.9
Obese (Class III):	>40.0

For Asians, a BMI of 23-24.9 indicates overweight, and >25 indicates obesity.

RESULTS

Socio-demographic status of the respondent :A total of one hundred twenty college students were selected from Kamrup (rural and metro) district of Assam to carry out this investigation. From Table 1, it was clear that majority (45.00%) of the respondents were around 21 years. It was also observed from the same Table that a large majority of the respondents (66.67%) were female students. This finding is similar with the findings of Balyan (2018) where ratio of female (60.00%) is more than male students (40.00%).

Majority of the respondents belonged to (28.33%)

Table 1. Distribution of respondents according to socio-personal characteristics

Attributes	No.	%
<i>Personal factor</i>		
Age		
19 years	24	20.00
20 years	27	22.50
21 years	54	45.00
22 years	15	12.50
<i>Social factor</i>		
Gender		
Male	40	33.33
Female	80	66.67
Caste		
General	34	28.33
OBC	28	23.33
SC	31	25.83
ST	27	22.50
<i>Place of Residence</i>		
Hosteller	36	30.00
Day scholar	84	70.00
<i>Qualification of mother</i>		
H.S.LC pass	29	24.17
H. S pass	40	33.33
Graduate	29	24.17
P. Graduate	14	11.67
Any Other	8	6.67
<i>Family income</i>		
<20,000	69	57.50
20,000-35,000	15	12.50
35,000-45,000	13	10.83
>45,000	23	19.16
<i>Family occupation</i>		
Agriculture	62	51.67
Service	23	19.17
Business	19	15.83
Wage earner	10	8.33
Any other	6	5.00

general caste, 70.00 per cent were hosteller, educational qualification of respondent’s mother (33.33%) was H.S. passed, family income was below Rs.20,000 per month, agriculture was the main occupation for 51.67 per cent of family.

Majority of the respondents belonged to the agricultural family which was a great influencing factor for the respondents to make a habit of eating locally available low-cost vegetables or fruits to prevent their body from any kind of infection. It may have an impact on daily meal pattern of the respondents. Family income might influence nutritional status of college students.

Anthropometric assessment of respondents : The anthropometric data from Table 2 reveals that a significant proportion (48.33%) of respondents were underweight based on BMI, with 30.83 per cent classified as obese. The majority (58.33%) had medium height, and 55 per cent had medium weight. MUAC measurements showed that 77.5 per cent of students were in the medium range, indicating generally

Table 2. Anthropometric assessment of respondents

Variables	No.	%	
<i>BMI Score(Kg/m²)</i>			
<18.5 (Underweight)	58	48.33	Mean= 22.04 SD= 2.59
18.5-22.9 (Normal)	18	15.00	
23-24.9 (Overweight)	7	5.83	
>25 (Obesity)	37	30.83	
<i>Height category</i>			
Low height (<141.48cm)	20	16.66	Mean= 147.00 SD= 5.53
Medium height (141.48-152.53cm)	70	58.33	
High height (> 152.53cm)	30	25.00	
<i>Height category</i>			
Low height (<141.48cm)	20	16.66	Mean= 147.00 SD= 5.53
Medium height (141.48-152.53cm)	70	58.33	
High height (> 152.53cm)	30	25.00	
<i>Weight assessment</i>			
Low weight (<35.93kg)	18	15.00	Mean= 44.80 SD= 8.87
Medium weight (35.93-53.67Kg)	66	55.00	
High weight (>53.67kg)	36	30.00	
<i>MUAC assessment</i>			
Low (<8.57)	12	10	Mean= 9.41 SD= 0.832
Medium (8.57-10.24)	93	77.50	
High (>10.24)	15	12.50	

Table 3. Correlation between age, weight, height, MUAC with different level of BMI

Criteria	Under weight	Normal	Over weight	Obesity	p value
	n=58	n=18	n=7	n=37	
Age	20.83±0.65	20.44±1.15	20.14±1.35	20.08±1.01	0.003
Weight	36.66±2.00	45.78±4.67	53.71±4.15	55.41±2.13	0.005
Height	146.90±5.57	150.33±6.20	150.86±6.23	144.62±3.47	0.005
MUAC	8.98±0.66	9.86±0.95	9.43±0.79	9.86±0.79	0.001

adequate muscle and fat mass. However, the high percentage of underweight and obese students points to nutritional imbalances. These findings suggest the need for better nutritional education and interventions to promote healthier body weight among the students.

Correlation between Age, Weight, Height, MUAC with different level of BMI : Table 3 shows that there is a significant and positive relationship between age, weight, height and MUAC of respondents with different levels of BMI. The data reveals that a high majority of respondents (n= 58) were underweight having low height with low MUAC as compared to those respondents (n=37) who were found obese with normal height and MUAC. It is also clear from the findings that only a small percentage of respondents (n=18) have normal weight, height and MUAC. A negligible percent of respondents (n=7) was found overweight with height and MUAC.

DISCUSSION

The study highlights that most respondents were 21 years old, with a majority being female. The socio-economic background, including caste, family income, and parental education, significantly influenced their dietary habits. A large portion of students came from agricultural families with low household income, which likely led to reliance on locally available, low-cost food. While this could offer protection against infections, it raises concerns about the diversity and nutritional adequacy of their diets. Economic constraints and family occupation appear to impact their overall nutritional status. The findings of this study align with the results of Kehoe *et al.* (2014) and Agrawal *et al.* (2019).

A small percentage of respondents (15.00%) had a normal BMI range, followed by underweight (48.33%) and obesity (30.83%). Only 5.83 per cent of respondents were found obese with a higher BMI score. This may be attributed to a heightened awareness of health, prompting a conscious effort to manage

dietary habits and leading to underweight conditions (Uzogara, 2016). Furthermore, being the consequence of long-term energy deficit, it causes progressive tissue wasting, biochemical changes, functional disorders and finally shows clinical symptom of underweight (Soenen and Chapman, 2013). Differences in height among respondents were observed, with a high majority (58.33%) having medium height, followed by high height (25.00%) and low height (16.66%). This might be due to hereditary factor and difference of BMI, (Bouchard, 1989). In terms of body weight, 55.00 per cent of the respondents had medium body weight, 30.00 per cent had high body weight, and 15.00 per cent had low body weight, with variations possibly due to different physical structures. Due to regular use of fast food and inadequate dietary pattern, respondents were unable to maintain their normal weight and hence less than majority of the respondents were found in the category of medium weight (Yun *et al.*, 2018). Additionally, 77.50 per cent of respondents were in the medium MUAC category, while 12.50 per cent and 10.00 per cent were in the high and low categories, respectively.

The data in Table 3 highlights a relationship between age, weight, height, and MUAC with different BMI levels among the respondents. The p-values indicate strong statistical significance in these relationships. For age, there was a slight decline in average age from underweight (20.83 years) to obesity (20.08 years), which was statistically significant (p=0.003). This suggests that younger students tend to have higher BMI values, though the variation in age is not drastic across categories. In terms of weight, underweight respondents had a significantly lower average weight (36.66 kg) compared to those in the overweight (53.71 kg) and obese categories (55.41 kg). This difference in weight is highly significant (p=0.005), as expected, with weight being a critical factor in BMI classification. For height, respondents in the normal and overweight categories had higher

average heights compared to the underweight and obese groups, with a statistically significant correlation ($p=0.005$). This finding suggests that height plays a role in influencing BMI, with shorter respondents more likely to fall into the underweight or obese categories. MUAC values were also significantly correlated with BMI ($p=0.001$). The underweight group had a lower mean MUAC (8.98 cm) compared to the normal, overweight, and obese groups, reflecting a strong link between muscle and fat mass and BMI status. The study confirms the findings of Nelson *et al.* (2008) and Lai *et al.* (2018).

CONCLUSION

Based on the findings of the study, it can be concluded that the majority of the respondents were underweight, with only a small percentage maintaining a normal BMI. The prevalence of obesity was also significant, indicating a dual burden of malnutrition among the respondents. Height distribution showed that most respondents had medium height, and a substantial portion exhibited medium body weight. This suggests that while some students might be following healthy dietary habits, others, particularly those with lower weights, might be experiencing nutritional deficiencies. The MUAC assessment revealed that most respondents fell into the medium category, reflecting a moderate nutritional status. Furthermore, the correlation between age, weight, height, and MUAC with BMI levels showed a significant positive relationship, especially highlighting the lower weight, height, and MUAC among underweight respondents. Obese individuals displayed normal height and MUAC, while the small group of overweight respondents had higher values for both. The findings suggest that inadequate dietary patterns, possibly influenced by socio-economic factors such as family income and agricultural occupation, could be contributing to the observed nutritional imbalances. These results underscore the importance of nutritional education and improved dietary habits among young adults to promote a healthier BMI and overall well-being.

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Author's contribution: The first author of conceptualized and operationalized the research, second & third authors review and edited the study, and forth author format and interpreted the data, visualized the findings, and drafted the manuscript. The author was responsible for planning, analyzing, writing, reviewing, and executing this research.

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