

Body Weight Patterns and Lifestyle Behaviors Among Male College Students in Kangra District, Himachal Pradesh: A Cross-Sectional Study

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Abstract

Abnormal body weight in young adults is a major public-health concern, particularly in low- and middle-income settings where undernutrition and excess weight may coexist. The college period often involves changes in diet, physical activity, sedentary behavior, and sleep, all of which influence nutritional status and future disease risk. This study assessed the prevalence of underweight and overweight/obesity among college-aged male students in Kangra District, Himachal Pradesh, India, and examined the distribution of BMI across lifestyle factors including dietary habits, physical activity, sedentary time, sleep duration, and body-weight perception. A cross-sectional survey was conducted among 300 male students (17–25 years) at a government degree college, with height and weight measured to calculate BMI using WHO adult cut-offs, and lifestyle data collected via a structured online questionnaire; results were analyzed descriptively. Of the participants, 59.7% had normal BMI, 30.3% were underweight, 7.3% were overweight, and 2.7% were obese. Less favorable behaviors – such as breakfast skipping, low fruit intake, frequent fast-food consumption, lower physical activity, higher sedentary time, irregular sleep, and inaccurate weight perception – were more common at BMI extremes. The findings indicate a dual burden of malnutrition, with underweight as a prominent concern, highlighting the need for college-based strategies integrating nutrition education, physical activity promotion, sleep hygiene, and weight-status awareness.

Keywords: Body mass index, college students, lifestyle factors, nutrition, obesity, overweight, underweight

INTRODUCTION

Body weight is a key determinant of health across the life course, and BMI remains the most widely used indicator to classify underweight, normal weight, overweight, and obesity using standard cut-offs

[1, 2]. Both extremes of BMI are clinically important: underweight is associated with nutritional deficiencies, impaired immunity, anaemia, low bone density, and infection risk, while overweight and obesity increase the risk of cardiometabolic diseases and certain cancers [3, 4]. Although overweight and obesity have increased globally [5], undernutrition persists in many low- and middle-income countries, resulting in a dual burden of malnutrition within the same populations [6, 7], increasingly affecting young adults undergoing rapid lifestyle changes.

Beyond diet and activity, body-weight perception influences health decisions. Weight-status misperception among adolescents and young adults can delay appropriate behavior change or

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Received Date: February 02, 2026

Accepted Date: February 23, 2026

Published Date: February 24, 2026

Citation: Nandini Rana, Anuradha Sharma, Bovinder Chand. Body Weight Patterns and Lifestyle Behaviors Among Male College Students in Kangra District, Himachal Pradesh: A Cross-Sectional Study. Research & Reviews: A Journal of Life Sciences. 2026; 16(1): 31–38p.

encourage unhealthy weight-control practices [8, 9]. Sleep has also gained attention as a factor associated with weight regulation; short sleep is associated with obesity risk through endocrine and behavioral pathways, whereas very long sleep may reflect low energy availability or poorer general health [10–12].

College students are a critical group for nutritional surveillance, as college life is often associated with irregular meals, energy-dense food intake, reduced physical activity, prolonged sitting, and disrupted sleep, all linked to unhealthy weight trajectories [13, 14]. While studies from high-income countries report higher overweight/obesity, evidence from Asia and developing regions shows underweight remains common and may be overlooked when health programmes focus mainly on obesity [15, 16].

In India, student-focused research has often emphasized overweight and obesity, whereas underweight has received comparatively less integrated attention despite potential impacts on immunity, physical capacity, and academic functioning [17, 18]. Regional evidence from hilly areas, such as Himachal Pradesh remains limited, even though dietary patterns, access to diverse foods, physical terrain, and socioeconomic characteristics can shape lifestyle behaviors.

Against this background, the present study assessed the prevalence of underweight and overweight/obesity among college-aged male students in Kangra District, Himachal Pradesh, and examined how BMI categories were distributed across key lifestyle-related factors, including dietary habits, physical activity, sedentary behavior, sleep duration, and body-weight perception.

MATERIALS AND METHODS

Study Area and Study Population

The study was carried out at Shaheed Captain Vikram Batra Government College, Palampur, located in Kangra District, Himachal Pradesh, India. The college enrolls students from rural, semi-urban, and urban backgrounds and represents a typical government college setting in the hilly region of northern India. The study population comprised undergraduate and postgraduate male students enrolled during the academic session 2024–2025.

Sample Size and Sampling Technique

A total of 300 male students aged 17–25 years were selected through simple random sampling from eligible students present on campus during the data-collection period in March 2025 who provided informed consent. Inclusion criteria comprised male students within the specified age group who were currently enrolled at the institution and willing to participate. Students with known chronic medical conditions likely to affect body weight (such as endocrine disorders or chronic systemic illnesses) and those unwilling to provide consent were excluded from the study.

Anthropometric Measurements

Anthropometric measurements were obtained following standard procedures to improve accuracy and reproducibility.

- Body weight was measured using a calibrated digital weighing scale. Participants wore light clothing and no footwear. Measurements were recorded to the nearest 0.1 kg.
- Height was measured using a stadiometer with participants standing upright and barefoot, heels together, and head positioned in the Frankfurt plane. Measurements were recorded to the nearest 0.1 cm.

All measurements were recorded by trained investigators to minimize inter-observer variability and measurement error.

Body Mass Index Calculation and Classification

- BMI was calculated using the standard formula:

$$\text{BMI} = \text{Weight (kg)} / [\text{Height (m)}]^2.$$

- BMI categories were defined using World Health Organization (WHO) adult cut-offs [1, 2]:
 - *Underweight*: < 18.5 kg/m².
 - *Normal Weight*: 18.5–24.9 kg/m².
 - *Overweight*: 25.0–29.9 kg/m².
 - *Obese*: ≥ 30.0 kg/m².

Questionnaire and Lifestyle Assessment

Lifestyle and behavioral data were collected using a structured, pre-designed questionnaire developed after reviewing relevant literature on student health and nutrition. The questionnaire assessed demographic variables (age, year of study, and place of residence), dietary habits (number of meals per day, breakfast regularity, fruit and vegetable intake, and fast-food consumption frequency), physical activity (weekly exercise or sports participation), sedentary behavior (average daily sitting time), sleep patterns (average nightly sleep duration), and body-weight perception and weight-related practices, including self-perceived weight status, perceived need for weight-management guidance, and current weight-management strategies such as exercise and dietary modification. The questionnaire was administered electronically using a secure online platform. Participants were informed of their measured BMI category after data collection to promote transparency and ethical feedback.

Ethical Considerations

The study adhered to established ethical guidelines, with voluntary participation and informed consent obtained after explaining study procedures, confidentiality, and the right to withdraw. Data were anonymized and no personal identifiers were used in analysis or reporting. As per institutional policy, formal ethics approval was not required for this non-invasive, questionnaire-based student study, but the principles of the Declaration of Helsinki were strictly followed.

Statistical Analysis

Data were entered, cleaned, and analyzed using SPSS version 26.0 and Microsoft Excel. Descriptive statistics were used to summarize participant characteristics, BMI categories, and lifestyle variables. Results are reported as means, frequencies, and percentages. In the present study, analyses were limited to descriptive statistics in keeping with the study objectives and cross-sectional design. Findings are presented conservatively, and no causal inferences are made.

RESULTS

Participant Characteristics

A total of 300 male students aged 17–25 years participated in the study. The mean age of participants was 19.9 years. Mean height and body weight were 171.8 cm and 61.0 kg, respectively. The mean body mass index (BMI) of the study population was 20.6 kg/m², which lies within the WHO-defined normal range.

Prevalence of Underweight and Overweight/Obesity

Based on BMI classification, 59.7% (n = 179) of participants were categorized as normal weight. A substantial proportion, 30.3% (n = 91), were underweight (Table 1). Overweight and obesity were less prevalent, accounting for 7.3% (n = 22) and 2.7% (n = 8) of participants, respectively.

Table 1. Distribution of study participants according to BMI category.

BMI category	BMI range (kg/m ²)	Number (n)	Percentage (%)
Underweight	< 18.5	91	30.3
Normal weight	18.5–24.9	179	59.7
Overweight	25.0–29.9	22	7.3
Obese	≥ 30.0	8	2.7
Total	–	300	100.0

Note: n = 300.

Meal Consumption Patterns and BMI

Regular consumption of three meals per day was the most frequently reported pattern across all BMI categories. Among normal-weight students, 54.7% reported consuming three meals daily, with similar proportions among underweight (52.7%) and overweight (40.9%) students (Figure 1). A higher proportion of obese students (75.0%) also reported three daily meals. Consumption of more than three meals per day was more commonly reported among overweight students (27.3%). Students reporting one or two meals per day were more frequently represented within underweight and overweight categories.

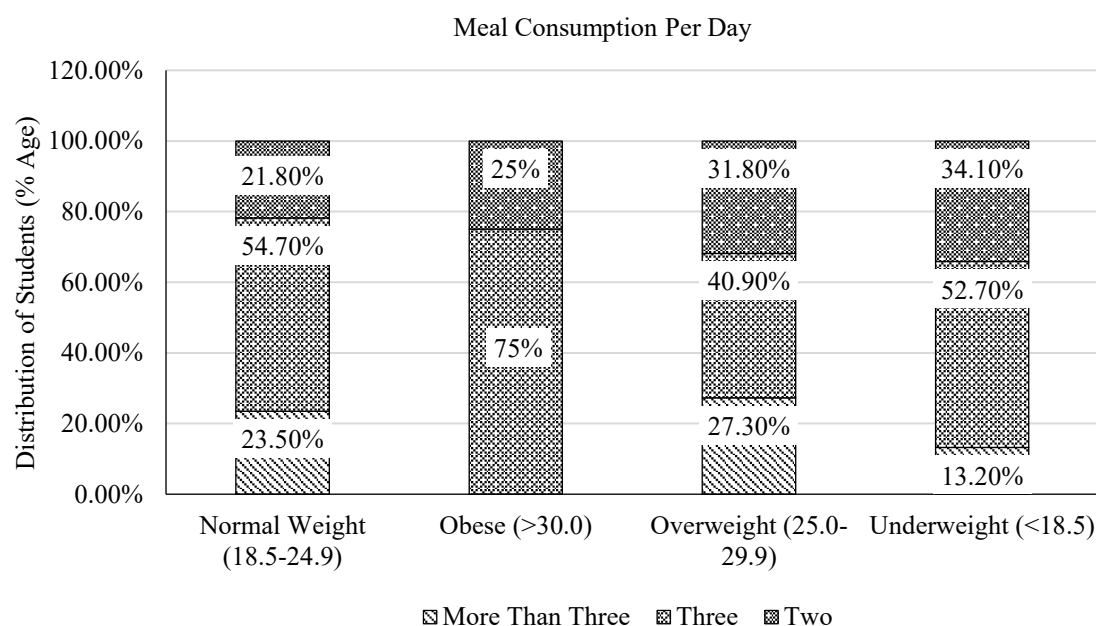


Figure 1. Percentage of meal consumption with BMI classification.

Regular breakfast consumption was reported by 79.9% of normal-weight students. In contrast, breakfast skipping was more prevalent among overweight (45.5%) and obese (37.5%) students. Among underweight students, 70.3% reported regular breakfast intake, while 29.7% reported skipping breakfast.

Daily intake of 1–2 servings of fruits and vegetables was the most common pattern across all BMI categories, reported by 58.6% of normal-weight, 65.9% of underweight, 68.2% of overweight, and 62.5% of obese students (Table 2). A notable proportion of participants reported no daily fruit intake, particularly among obese (37.5%) and underweight (37.4%) groups. Intake of three or more servings per day was uncommon across BMI categories.

Table 2. Daily fruit and vegetable intake according to BMI category.

Intake pattern	Underweight n (%)	Normal weight n (%)	Overweight n (%)	Obese n (%)
No fruit intake	34 (37.4)	36 (20.1)	5 (22.7)	3 (37.5)
1–2 servings/day	50 (54.9)	118 (65.9)	14 (63.7)	5 (62.5)
≥ 3 servings/day	7 (7.7)	25 (14.0)	3 (13.6)	0 (0.0)

Daily fast-food consumption was reported most frequently among obese students (12.5%), followed by underweight students (6.6%). Fast-food consumption one to two times per week was most commonly reported among overweight students (54.5%). Occasional fast-food intake was most frequently reported among normal-weight (60.3%) and obese (62.5%) students.

Physical Activity and Sedentary Behavior

Daily physical activity was reported by 48.0% of normal-weight and 54.5% of overweight students, whereas none of the obese students reported daily physical activity. Absence of any regular physical activity was reported by 62.5% of obese students and 20.9% of underweight students (Table 3). Sedentary behavior exceeding five hours per day was reported by 37.5% of obese and 31.8% of overweight students, compared with 20.6% of normal-weight students.

Table 3. Physical activity frequency according to BMI category.

Physical Activity Frequency	Underweight n (%)	Normal weight n (%)	Overweight n (%)	Obese n (%)
Daily	33 (36.3)	86 (48.0)	12 (54.5)	0 (0.0)
3–5 times/week	12 (13.2)	31 (17.3)	6 (27.3)	0 (0.0)
1–2 times/week	27 (29.7)	45 (25.2)	2 (9.1)	3 (37.5)
Never	19 (20.9)	17 (9.5)	2 (9.1)	5 (62.5)

Sleep Duration

Short sleep duration (<5 hours/night) was more frequently reported among overweight (27.3%) and obese (12.5%) students. Longer sleep duration (>7 hours/night) was most commonly reported among underweight students (51.7%). Sleep duration of 5–7 hours/night was reported by most participants across all BMI categories.

Body-Weight Perception and Weight-Management Behavior

Correct self-perception of body weight was highest among normal-weight students (84.9%). Among obese students, only 12.5% correctly identified their weight status; 50.0% perceived themselves as overweight and 37.5% as normal weight (Figure 2). Among overweight students, 45.5% perceived their body weight as normal.

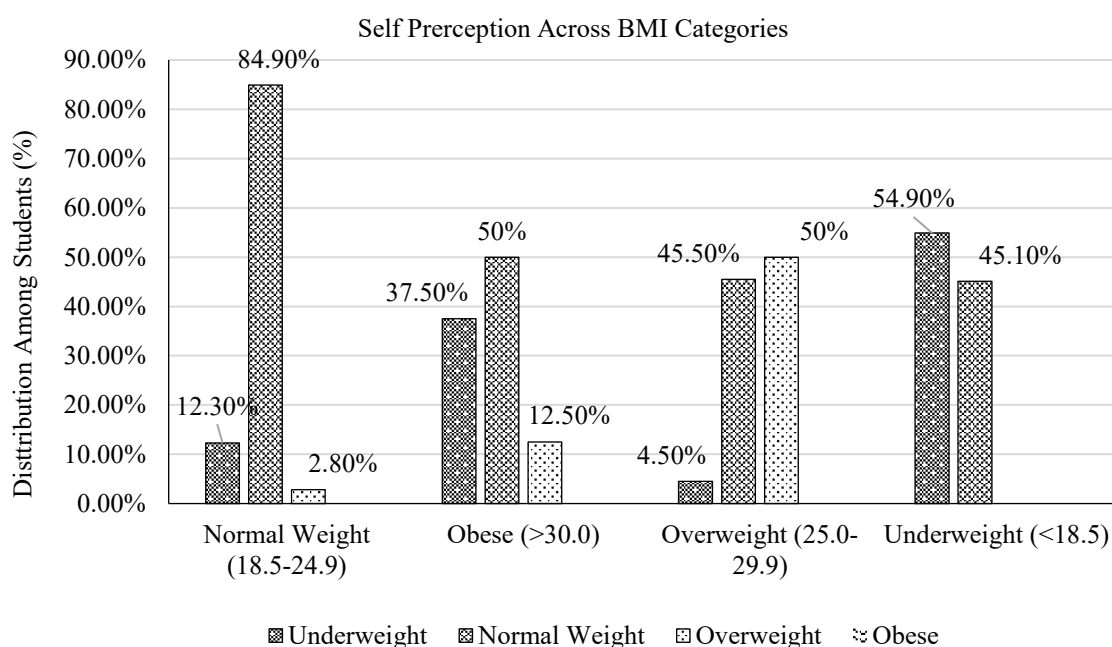


Figure 2. Body weight perception across BMI categories (in percentage).

Regarding weight-management practices, exercise was the most commonly reported strategy among overweight students (86.4%), whereas dietary modification was more frequently reported among obese students (50.0%). Across all BMI categories, most students (71–88%) expressed a perceived need for professional guidance to maintain or improve body weight.

DISCUSSION

The study demonstrates a dual burden of malnutrition among college-aged male students in Kangra District, with underweight more prevalent than overweight and obesity, a pattern typical of populations undergoing nutritional transition in low- and middle-income settings [6, 7]. Most students had normal BMI, about one-third were underweight, and fewer were overweight or obese, contrasting with trends in high-income countries [13, 14] but consistent with Asian and Indian reports where undernutrition remains common due to dietary inadequacy and related factors [15, 16]. Although obesity prevalence was low, even modest excess weight in young adulthood increases future cardiometabolic risk [3–5].

Dietary patterns varied by BMI, with regular meals and breakfast more common among normal-BMI students, while breakfast skipping was more frequent among overweight and obese students and is linked to higher BMI [8, 18, 19]. Fruit and vegetable intake was low across all groups, particularly among underweight and obese students, highlighting the role of diet quality in nutritional status and cardiometabolic risk, like findings in other student populations [20, 21]. Fast-food consumption was higher among overweight and obese students, consistent with links to excess weight [22], and its presence among some underweight students suggests reliance on nutrient-poor diets that do not support healthy weight gain.

Physical activity varied by BMI, with daily activity more common among normal-weight and overweight students and inactivity highest among obese students, supporting the role of activity in weight control [4, 23]. Sedentary time (>5 hours/day) was also more frequent among overweight and obese students and is independently linked to metabolic risk [24]. Sleep patterns differed across BMI groups, with short sleep more common among overweight and obese students and longer sleep among underweight students; short sleep is associated with obesity through hormonal and metabolic mechanisms and confirmed by meta-analyses, while prolonged sleep has been linked to poorer health in some populations [10–12].

A high prevalence of inaccurate body-weight perception was observed, especially among overweight and obese students, most of whom did not correctly identify their weight status, a pattern widely reported among adolescents and young adults and linked to delayed weight-management behaviors [13, 14]. Accurate self-assessment is essential for lifestyle change, as underestimation may reduce motivation while overestimation among underweight individuals may promote unhealthy restriction [14]; however, most students across BMI categories expressed willingness to receive professional guidance, indicating receptiveness to campus-based interventions.

The findings highlight the need for institution-based programmes addressing both underweight and overweight, promoting balanced diets, adequate fruit and vegetable intake, physical activity, reduced sedentary behavior, and healthy sleep practices [20]. As colleges are strategic settings for shaping lifelong behaviors, integrated interventions, such as nutrition education, physical activity opportunities, and counselling services, can yield sustained public-health benefits.

CONCLUSION

This study documents a clear dual burden of malnutrition among college-aged male students in Kangra District, Himachal Pradesh, with underweight emerging as a more prevalent concern than overweight and obesity. Although most students were classified within the normal BMI range, a substantial proportion were underweight, while a smaller yet clinically relevant fraction were overweight or obese.

Distinct lifestyle patterns were observed across BMI categories. Less favorable behaviors – including irregular meal patterns, breakfast skipping, low fruit and vegetable intake, frequent fast-food consumption, physical inactivity, prolonged sedentary behavior, irregular sleep duration, and inaccurate body-weight perception – were more commonly observed at BMI extremes. These findings underscore the role of modifiable lifestyle factors in shaping nutritional status during young adulthood.

Given that behaviors established during the college years often persist into later life, early identification and intervention during this period are critical. Academic institutions represent a key setting for preventive strategies aimed at improving nutritional status and reducing future risk of non-communicable diseases.

Limitations of the Study

Several limitations should be considered: the cross-sectional design does not allow causal inference, the single-institution male-only sample limits generalizability, and self-reported lifestyle data may be affected by recall or social desirability bias; additionally, inferential statistical testing was not performed. Despite these limitations, the study provides valuable baseline data on student nutritional status from a region with limited existing evidence.

Future Scope and Recommendations

Future research should include multiple institutions, both genders, longitudinal designs, and objective measures of lifestyle behaviors to improve generalizability and causal understanding. Based on the findings, campuses should implement integrated wellness programmes focusing on nutrition education, regular physical activity, reduced sedentary behavior, sleep hygiene, weight-management counselling for all weight categories, and awareness to promote accurate body-weight perception.

Acknowledgments

The authors sincerely acknowledge the Principal, Shaheed Captain Vikram Batra Government College, Palampur, for granting permission and providing institutional support to conduct this study. The authors are also grateful to all student participants for their voluntary participation and cooperation, without which this research would not have been possible.

Conflict of Interest Statement

The authors declare no conflict of interest.

Funding Statement

This research received no external funding.

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