

ORIGINAL ARTICLE

Date of submission: 15 Nov 2025

Date of acceptance: 23 Dec 2025

Date of Publication: 31 Dec 2025

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How to cite:

Jha RK, Shah B, Mishra AK. Study of body adiposity index among medical students: A descriptive cross-sectional study. J Gen Pract Emerg Med Nepal. 2025 Dec;12(20):53-56.

Online information**DOI:**

<https://doi.org/10.59284/jgpeman387>



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Study of body adiposity index among medical students: a descriptive cross-sectional study

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Abstract

Introduction: Obesity among young people is increasing due to major lifestyle changes, leading to serious health problems. Thus, this study aimed to determine the prevalence of the body adiposity index among medical students at a medical college in Nepal.

Method: A descriptive cross-sectional study was conducted in Kathmandu University School of Medical Sciences from August to September 2025 after taking ethical clearance from Institutional Review Committee. Two hundred sixty-eight medical students were enrolled in study using convenience sampling. Body height in meters and hip circumference in centimeters were measured for each participant using measuring tape, and body adiposity Index was calculated as $\{[(\text{hip circumference in cm})/(\text{height in m}) 1.5] - 18\}$.

Result: Out of 268 participants, 65 (24.3%) had high fat percentage and 47 (17.5%) had very high fat percentage, with mean body adiposity index of 26.18 ± 4.82 and 28.81 ± 2.00 , respectively. The mean body adiposity index of males was 23.83 ± 4.88 , and that of females was 23.70 ± 7.16 . The majority of male participants, 51(38.05%), had high, and 47 (35.03%) had very high body fat percentage; however, majority of female participants, 80 (59.70%), had healthy body fat percentage, and some 14 (10.44%) had high fat percentage.

Conclusion: Compared with a previous similar study conducted in Nepal, our study found higher prevalence of very high body fat percentage among medical students. However, majority still had body fat levels within normal or healthy range. Further investigation is needed to identify the factors influencing body adiposity index.

Keywords: Height; Obesity; Nepal; Prevalence

INTRODUCTION

Globally, in 2022, 2.5 billion adults aged 18 years and older were overweight.¹ Of these, over 890 million were obese. This corresponds to 43% of adults aged ≥ 18 years, mainly due to unhealthy diets and lack of physical activity.¹

In the 19th century, the body mass index (BMI) was introduced by Quetelet and is the most commonly used anthropometric measure for evaluating obesity.² Yet, BMI has notable limitations; it does not differentiate between fat mass and lean mass and can be influenced by several factors such as age, sex, and ethnicity.³ Moreover, adipose tissue is responsible for the majority of obesity-associated diseases; therefore, complex and expensive methods, such as dual-energy X-ray absorption (DXA) or magnetic resonance imaging, must be used to measure body fat accurately.⁴ In 2011, Bergman and colleagues introduced a new anthropometric measure called the Body Adiposity Index (BAI).⁵ The BAI uses hip circumference and height to estimate body fat percentage, which was proposed as an alternative to the BMI. Hip circumference is directly and positively related to BAI. Maximum subcutaneous fat is present in the gluteal region. This type of fat is a major component of total body fat, and its measurement is thought to correlate better with actual adiposity than total body weight, which is used in BMI.⁵

In the study by Haroun et al., BAI correlated well with body fat percentage in both males and females, unlike BMI.⁶ In clinical settings, BAI is a rapid and cost-effective method for determining body fat percentage. Thus, this study was undertaken to find out the body adiposity index of medical students.

METHOD

This descriptive cross-sectional study was conducted among medical students, aged 18 to 30 years, at the Kathmandu University School of Medical Sciences (KUSMS), Dhulikhel, from August to September 2025, after obtaining ethical clearance from the Institutional Review Committee, KUSMS (IRC, KUSMS 150/25). Participants who consumed alcohol, smoked, and suffered from diabetes, hypertension, and other cardiovascular illnesses were excluded from the study. The sample size was calculated using the formula as given below:

$$n = Z^2 \times (p \times q) / e^2 \\ = (1.96)^2 \times 0.5 \times (1-0.5) / (0.05)^2 \\ = 384$$

Where, n = required sample size, Z = 1.96 at 95% Confidence Interval (CI), p = prevalence of obesity among medical students of a medical college in Nepal taken as 50% for maximum sample size, e = margin of error, 5% in this study.

$$\text{Total Medical students from MBBS and BDS were (N)} = 820 \\ \text{Adjusted sample size} = n / [1 + \{(n-1)/N\}] \\ = 384 / [1 + \{(384-1)/820\}] = 268$$

Thus, 268 participants were enrolled in the present study using convenience sampling. First, the participants were informed of the procedure, and consent was obtained in writing.

Height was measured without shoes, to the nearest 0.5cm, with the participant standing erect against the wall with heels together and touching the wall, and head held in an upright position. Weight was measured without footwear on a standardized weighing machine marked from 0 to 130 kg and recorded to the nearest 0.5 kg. The hip circumference (HC) was measured with a measuring tape at the widest point on the greater trochanter. Body adiposity index (BAI)⁵ was computed using the following standard equations: $BAI = \{\text{hip circumference (cm)} / (\text{height in meters})^{1.5}\} - 18$. BAI results were interpreted according to the classification proposed by Bergman et al, namely⁵

- Low body fat: < 8% (Male); < 21% (Female)
- Normal body fat: 8% – 21% (Male); 21% – 33% (Female)
- Overweight body fat: 22 % – 26% (Male); 30% – 35% (Female)
- Obese body fat: > 26% (Male); > 36% (Female)

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 22. The data were analyzed using descriptive statistics and presented as means, standard deviations, frequencies, and percentages.

RESULT

Of the 268 participants, the mean body adiposity index was 23.81 ± 6.08 . Of them, 134(50%) males and 134(50%) females, aged between 18 and 30 years, were included in this study. Sixty-five participants (24.3%) had high body fat, and 47(17.5%) had very high body fat, with a mean body adiposity index of 26.18 ± 4.82 and 28.81 ± 2.00 , respectively. One hundred sixteen (43.3%) participants had a normal body fat percentage, and 40(14.9%) had a low body fat percentage (Table 1).

Table 1. BAI categories of all participants

BAI Categories	n (%)	BAI Mean \pm SD
Low body fat	40(14.9%)	15.07 \pm 3.88
Normal body fat	116(43.3%)	23.47 \pm 5.12
High body fat	65(24.3%)	26.18 \pm 4.82
Very high body fat	47(17.5%)	28.81 \pm 2.00

Age, Height, and hip circumference of male participants were higher than those of female participants (Table 2).

The majority of male participants, 51 (38.05%), had a high fat percentage, and 47 (35.03%) had a very high fat percentage (Table 3). However, the majority of female participants, 80(59.70%), had a normal body fat percentage, while 14 (10.44%) had a high fat percentage (Table 3).

DISCUSSION

This was a cross-sectional descriptive study in which we assessed the body adiposity index among medical students.

Table 2. Demographic data of the participants

Parameter	Total (n =268)	Male (n = 134)	Female (n = 134)	p-value
	Mean ± SD	Mean ± SD	Mean ± SD	
Age (years)	21.04 ± 2.28	21.50 ± 2.27	20.57 ± 2.20	0.00
Height (Meter)	1.61 ± 0.08	1.67 ± 0.06	1.56 ± 0.07	0.00
Hip Circumference (Centimeter)	58.86 ± 9.45	90.34 ± 10.14	81.10 ± 13.37	0.00
BAI (%)	23.81 ± 6.08	23.83 ± 4.88	23.70 ± 7.16	0.96

Table 3A. BAI categories of male and female participants

BAI Groups (%)	Male		Female	
	n (%)	BAI Mean ± SD	n (%)	BAI Mean ± SD
Low body fat	0	0	40(29.85%)	15.07 ± 3.88
Normal body fat	36 (26.86)	17.40 ± 2.73	80(59.70%)	26.20 ± 3.24
High body fat	51 (38.05)	23.78 ± 1.23	14(10.44%)	34.52 ± 1.22
Very high body fat	47 (35.07)	28.81 ± 2.00	0	0

Table 3B. BAI categories of male and female participants

BAI Groups (%)	Male	Female	p-value
	BAI Mean ± SD	BAI Mean ± SD	
Normal body fat	17.40 ± 2.73	26.20 ± 3.24	0
Overweight/Obese body fat	26.19±3.01	34.52 ± 1.22	0

The prevalence of obesity is increasing continuously worldwide, affecting all ages, sexes, and races, and becoming a major risk factor for non-communicable diseases.¹ In our study, we found 65(24.3%) medical students had high body fat percentage which was less compared to study done by Aryal et al among medical students where the researchers found 26.8% had high body fat percentage.⁷ however, we found 47(17.5%) medical students had very high body fat percentage which was more compared to study done by Aryal et al among medical students where the researchers found only 8% had very high body fat percentage.⁷ This may be because medical students are busy with their studies, have little time for exercise, and often consume junk foods high in salt, sugar, and fat.¹

Upon further analysis, 38.05% of males had high body fat percentage, and 35.07% had very high body fat percentage; however, only 10.44% of females had high body fat percentage. In contrast, our study found that 47.2% of males had high body fat percentage, and 15% had very high body fat percentage. Similarly, among female participants, 5.7% had high body fat percentage, and 0.8% had very high body fat percentage.⁷ Another study by Lategan et al, which included an urban, black population, showed that 73.7% (n = 56) of the men and 77.1% (n = 202) of the women had body fat percentages in the high/very high category.⁸

Our study showed that the mean height, hip circumference, and body adiposity index were higher in male participants. This is in agreement with several other studies.⁹⁻¹¹ Males are more frequently classified as overweight or obese and tend to have higher hip circumference. The BAI is directly proportional to hip circumference and inversely proportional to height.¹² Its core premise is that body fat is disproportionately stored in the hip region, and that adjusting for height yields a more accurate estimate of body

fat percentage. Maximum subcutaneous fat is present in the gluteal region. This type of fat is a significant component of total body fat, and its measurement is thought to correlate better with actual adiposity than total body weight.¹²

Sine young males are physically active and are likely to have well-developed gluteal muscles (gluteus maximus, medius) and quadriceps. A larger hip measurement in this population may reflect greater muscle mass rather than adiposity. Since BAI misinterprets this muscle as fat, it will overestimate their body fat percentage.⁵

We conducted this study with a small sample size at a single institution. Our study design didn't permit measurement of associations between variables such as age and physical activity. Further studies at the community level, across different age groups, with a larger sample size, must be carried out to determine the true prevalence and mean body fat percentage of the Nepalese population.

CONCLUSION

Based on BAI, this study concludes that the majority of male medical students had high and very high body fat percentages. Like body mass index, BAI can't distinguish between fat and muscle.

DECLARATIONS

Acknowledgment

We want to thank all medical students who participated in this study.

Conflict of interest

None

Funding

None

Consent for Publication

All authors have approved the final version of the manuscript

Consent of Study

All participants gave consent before the study began.

Ethical Approval

Ethical clearance from the Institutional Review Committee, KUSMS (IRC, KUSMS 150/25).

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