

Determination of different adiposity indices among students of a medical college of Nepal: A cross-sectional study

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ABSTRACT

Background : The prevalence of overweight and obesity is on an increasing trend these days. Adverse effect of obesity can be seen in different physiological functions. This study aimed to see the fat distribution among students using different markers of obesity.

Methods : A cross sectional observational study was carried out in the Department of Physiology, National Medical College, which included 250 students. Body fat percentage was measured using Omron body composition monitor and waist circumference was measured using non-stretchable tape. Body Mass Index, Body Adiposity Index, Fat Mass and Waist Hip Ratio were calculated.

Results : Among 127 male subjects 8.7% were overweight and 18.1%, 47.2%, and 33.1% had high and 7.9%, 15%, 10.2% had very high fat percentage which was obtained from Body Fat Percentage, Body Adiposity Index, and Fat Mass respectively. Similarly, 4.7% and 48.8% had high Waist Circumference and Waist Hip Ratio respectively. Among 123 female subjects 9.8% were overweight and 1.6% were obese. 21.1%, 5.7% and 28.5% had high and 4.1%, and 0.8% had very high fat percentage which was obtained from Body Fat Percentage, and Body Adiposity Index respectively. Also 5.7% and 38.2% had high Waist Circumference and Waist hip Ratio respectively.

Conclusion : The study showed high prevalence of overweight and obesity when measured by other adiposity indices than by body mass index.

Keywords: Body Adiposity Index (BAI); Body Fat Percentage (BIA-BFP); Body Mass Index (BMI); Waist Circumference (WC); Waist Hip Ratio (WHR)



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INTRODUCTION

The prevalence of overweight and obesity has increased three times since 1975 worldwide. According to World Health Organization (WHO), among adults of age 18 and above, 39% were overweight and 13% were obese in 2016.¹ A demographic and health survey done in Nepal in the year 2016 showed that 32.87% women and 28.77% men were overweight/obese.²⁻⁴

Adverse effect of obesity can be seen in different physiological functioning of the body. There is high risk of developing non communicable diseases like cardiovascular diseases, respiratory diseases and musculoskeletal diseases due obesity.⁵ Even though obesity is encountered in middle aged adults, it is increasing among young college going adults as well.⁶ This trend in increasing in developing countries due to the socioeconomic shifts leading to more availability of ready to eat food.⁷

There are different ways to determine body adiposity among which Body Mass Index (BMI), Body adiposity index (BAI), waist circumference (WC), waist hip ratio (WHR), body fat percentage (BFP) by bioelectrical impedance and fat mass are mostly used for field study.

This study aims to see the fat distribution among students using different markers of obesity.

MATERIALS AND METHODS

This is a descriptive cross-sectional study done in the Department of Physiology, National Medical College, Birgunj from September 2021 to January 2022. Ethical clearance was taken from the Institutional Review Committee (reference number: FNMC/539/078/79). The study was conducted in 250 students of age group 17-26 years from different disciplines (medical and dental) of National Medical College. Out of the total subjects 127 were males and 123 were females. Verbal consent was taken from the subjects and findings were recorded in a data collection sheet.

Systematic random sampling was done and the sample size was calculated using,

$$\begin{aligned} n &= Z^2 \times pq / e^2 \\ &= (1.96)^2 \times (0.81 \times 0.19) / (0.05)^2 \\ &= 243 \end{aligned}$$

Total of 250 students were included in the study

Where,

$$\begin{aligned} n &= \text{minimum required sample size} \\ p &= 0.197; \text{ taken from the survey done by Ministry of Health, Nepal 20162} \\ q &= 1-p = 0.803 \\ Z &= 1.96 \text{ at 95\% Confidence Interval (CI)} \\ e &= 0.05; \text{ margin of error} \end{aligned}$$

The height of the subjects was measured using a stadiometer and was recorded in centimeters. Bioelectric impedance analysis was used to record BFP using OMRON BF14 body composition monitor. Weight was also measured by same instrument. WC was measured with a non-stretchable tape in a standing position during end of expiration at the midpoint of the lower border of ninth rib and the iliac crest. HC was measured at the widest part of the hip.

BMI was calculated using the Quetelet's formula,

$$(\text{weight in kg}) / (\text{height in meter})^2$$

and classified using the category listed by World Health Organization.⁵

BAI was calculated using the formula

$$HC / (\text{height})^{1.5} - 18.8$$

The ratio of WC and HC was expressed as WHR.

The data was then transferred into Excel 2013. Statistical Analysis was done using SPSS 16 software. The continuous data were expressed in mean \pm standard deviation.

RESULTS

Among the participants 50.8% were male and 49.2% were female subjects. The mean age of the total subjects was 20.04 \pm 1.31 years.

Table 1 shows the means of different baseline characteristics of the subjects.

Table 2 shows the distribution of participants according to the different categories of adiposity indices. The study showed that among male participants 7.9%, and 15% have very high fat content according to BF, and BAI respectively. Similarly, among the female participants 4.1% and 0.8% had very high fat content according to BF, and BAI respectively.

The mean BAI, and BFP was higher among female

Table 1: Baseline characteristics of the subjects

Characteristics	Male (n=127)		Female (n=123)		Total (n=250)	
	Mean	SD	Mean	SD	Mean	SD
Age (years)	20.39	1.45	19.67	1.028	20.04	1.31
Weight (kg)	62.95	9.12	52.2	8.18	57.67	10.19
Height (cm)	170.92	6.76	156.1	6.48	163.63	9.94
Pulse (beats per minute)	75.63	8.18	77.83	8.670	76.71	8.48
Systolic blood pressure (mm Hg)	114.36	8.21	106.18	11.09	110.34	10.54
Diastolic blood pressure (mm Hg)	75.78	6.32	71.16	7.9	73.51	7.49

participants compared to male participants. This distribution is shown in table 3.

DISCUSSION

Our study showed that the mean BMI for both male (21.52±2.81) and female (21.48±2.95) subjects were within the normal range. Even though the

mean was normal, our study showed that 8.7% males were overweight and 9.8% and 1.6% females were overweight and obese respectively. In our study, among total study participants only 8% were overweight and 0.8% were obese which was less compared to study done by Purohit et al among medical students where 22.5% were overweight and 13.04% were obese.⁹ Another study done by Gudegowda et al¹⁰ which included Nepali medical

Table 2: Distribution of male and female subjects according to categories of adiposity indices

Characteristics		Male (n=127)		Female (n=123)	
		Number	Percentage (%)	Number	Percentage (%)
BMI	Underweight*	20	15.7	23	18.7
	Normal weight*	96	75.6	86	69.9
	Overweight*	11	8.7	12	9.8
	Obese*	-	-	2	1.6
BF	Low†	16	12.6	26	21.1
	Normal†	78	61.4	66	53.7
	High†	23	18.1	26	21.1
	Very high†	10	7.9	5	4.1
BAI	Low†	-	-	29	17.1
	Normal†	48	37.8	94	76.4
	High†	60	47.2	7	5.7
	Very high†	19	15	1	0.8
WC	Normal◇	121	95.3	116	94.3
	High◇	6	4.7	7	5.7
WHR	Normal	65	51.2	76	61.8
	High	62	48.8	47	38.2

Table 3: Distribution of adiposity indices of male and female subjects

Adiposity indices	Male (n=127)		Female (n=123)		Total (n=250)	
	Mean	SD	Mean	SD	Mean	SD
BMI	21.52	2.81	21.42	3.10	21.48	2.95
BAI	20.85	3.99	25.76	5.13	23.26	5.19
BFP	16.05	6.19	27.39	8.11	21.63	9.16
WC	76.95	8.03	69.69	7.59	73.38	8.60
WHR	0.89	0.07	0.83	0.10	0.86	0.09

students studying in Bangalore showed that 9.7% and 6.8% males had overweight and obesity respectively and that among females was 5% and 4.5% respectively. This finding was in accordance with our study.

When further analysed it was seen that 18.1%, 47.2% and 33.1% males had high and 7.9%, and 15% had very high fat percentage obtained from BIA-BFP, and BAI respectively. Similarly for female participants, 21.1%, 5.7% and 28.5% had high and (4.1%, and 0.8%) had very high fat percent obtained from BIA-BFP, and BAI respectively. Likewise, 4.7% and 48.8% males had high WC and WHR respectively and among females, 5.7% and 38.2% had high WC and WHR respectively. The findings of our study were in accordance with the study done by Amin et al.¹¹

The prevalence of abdominal obesity using WC was higher than using WHR in our study. The WHR detected more underweight and normal participants as being obese which may be due to the small hip circumference of the participants which leads to high WHR. Similar finding was seen in study done by Kurpad et al.¹²

In our study the percentage of overweight and obese subjects by BMI was similar to the percentage obtained from BIA-BFP among the male participants. Whereas among the female participants overweight by BMI was similar to high percentage of fat calculated by BAI but the percentage of obesity by BMI was similar to all three methods used to obtain fat percentage.

Overall fat distribution was well predicted by BIA-BEP whereas central or abdominal fat distribution was better represented by WC in our study.

Our study showed that even though the prevalence of overweight and obesity according to BMI was below 10% but the fat percentage was higher when calculated using different indices of adiposity. Different studies^{13,14} have shown that BMI alone might not be a better indicator of fat distribution which is also shown in this study. It might be helpful to explore other parameters to represent fat distribution.

CONCLUSION

The study showed high prevalence of overweight and obesity when measured by other adiposity indices than by body mass index. The use of just BMI to predict body adiposity might not be a better option. These days many other methods are being developed to measure and get better prediction on body adiposity which has direct and indirect effect on many health problems.

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CONFLICT OF INTEREST

None.

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