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ORIGINAL RESEARCH

Study of body composition and its relationship with obesity among medical students

Dr. Yusra Amin[1], Dr. Ambreen Nazir[2], Dr. Sonia Mushtaq[3], Dr. Sami Manzoor Magray[4]

[1,2,3]Senior Resident, Department of Physiology, GMC, Anantnag, India
[4]Associate Professor and Head, Department of Pharmacology, GMC Anantnag, India

Corresponding Author
Dr. Sonia Mushtaq
Senior Resident, Department of Physiology, GMC, Anantnag, India
Email: dryusraamin21@gmail.com

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ABSTRACT

Background: Obesity is on the rise worldwide and has been linked to numerous illnesses, including colitis, diabetes, cancer, and cardiovascular disease. **Aims and Objective**: The purpose of the study is to evaluate physical characteristics and determine the connection between obesity and body composition in medical students. **Method**: 200 people from Govt. Medical College Jammu, aged 17 to 25, took part in the survey over the course of a year (2019–2020). Following the normal process for measuring body parameters, the following data were calculated: height, weight, total body water (TBW), mineral mass (MM), protein mass (PM), fat mass (FM), fat free mass (FFM), mineral mass (FFM), and BMI. **Results**: With the exception of body fat mass, which was higher in female students, male students had mean values for all physical characteristics that were greater than those of female students. 76.3% of female participants and 75.58% of male participants exhibited low-risk body fat, while 23.68% of female subjects and 24.42% of male subjects exhibited high-risk body fat. **Conclusion**: Overall, there is a negative correlation between the BMI of both genders of Jammu medical students and their fat mass. However, among male students who were underweight, there was a favorable relationship between their BMI and fat mass.

Keywords: Obesity, Fat mass, Body composition, Body mass index, medical students.

INTRODUCTION

The body needs a specific amount of fat to function properly. While much fat can damage the body's function and disrupt essential processes, not all fat is harmful. Numerous vital hormones that impact a person's body are produced by fat. Critical hormone levels might be too high or too low to have beneficial effects that prevent normal bodily functions. Excess body fat has been shown in studies to interfere with these hormones' natural balance and action. Moreover, cytokines—proteins involved in cell communication that may raise the risk of cardiovascular disease—are released in response to body fat.

One significant indicator of general health is body fat. The most popular technique for estimating body fat is to use skin fold measurements. A considerably more practical approach that just needs a tape measure and a scale has been devised by the US Navy. Height and girth of neck and abdomen for men, and height and girth of neck, waist, and hip for women, are used in the widely used US Navy body fat formula to determine body fat.

Medical students are more likely to gain excess body fat due to their lifestyle choices and the demanding nature of their study. Studies have indicated that inadequate sleep can either directly or indirectly contribute to higher body fat percentages. People who are sleep deprived have been shown to have higher levels of the hormone ghrelin, which stimulates appetite, and lower levels of the hormone leptin, which induces satiety. However, because sleep deprivation disrupts sleep patterns, people may find that they have more time to eat and exercise **(1)**.

Obesity, on the one hand, increases the chance of developing long-term respiratory conditions such asthma, bronchitis, and chronic obstructive pulmonary disease (COPD) **(2,4)**. On the other hand, obesity has been shown to protect against the prognosis of many chronic respiratory disorders and to lower mortality in COPD **(5,6)**. Obesity may lower inflammatory cytokines, such as interleukin-6 and interleukin-8,

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according to certain research **(7,8)**. Furthermore, obese patients may have a survival advantage in the event of ARDS due to their larger energy reserves compared to people of normal weight **(9)**. Scholars have examined the conflicting outcomes of these two factors and have determined that one potential cause could be the inability of body mass index (BMI), the most popular measure of obesity, to accurately reflect body composition status **(10)**. As a result, the "obesity paradox" in those research is readily created. The components of body composition in humans are fat mass (FM), protein mass (PM), total body water (TBW), and mineral mass (MM) **(11)**. Determining one's body composition is directly linked to assessing one's own health. An increasing number of research conducted in the last few years have demonstrated the significance of body composition indicators in assessing obesity **(12,14)**. The advancement of body composition assessment technology has led to a gradual shift in the focus of obesity research toward body composition. Studies on cardiovascular function and body composition are currently mostly focused on high-risk populations, such as patients and the elderly **(15,16)**. In contrast, there are very few studies on healthy participants, particularly medical students who are in a unique stage of development. Young adults are probably more at risk of weight gain and changes in their body composition throughout their college years **(17)**.The aberrant alterations in cardiovascular function and body composition at this time are having a number of detrimental implications on individuals' physical health. It is necessary to conduct additional research on this group's obesity and body composition. In order to investigate the connection between body composition and obesity, this study was carried out utilizing body composition and body mass index (BMI) data that were gathered from medical students in Jammu.

MATERIAL AND METHODS

The current study was conducted from November 2019 to October 2020 over a one-year period in the Postgraduate Department of Physiology at Government Medical College Jammu. Via random sample, 200 healthy male and female students were chosen. Every eligible subject gave their written informed consent. Participants' information was gathered using a proforma that they had created themselves.

Assessment of body fat measurement: The US Navy Method was used to calculate body fat. All you need for this easy procedure is a tape measure and a scale. For males, the formula employs body height, neck circumference, and abdomen; for females, it uses height, neck circumference, waist, and hip.

Body fatMeasurementLocation: Using a non-stretchable measuring tape, the circumference of the neck was measured in centimeters at the spot directly below the larynx (Adam's apple). Midway between the bottom rib and the top of the hip bone, the narrowest waist level's circumference was measured in centimeters. Hip circumference is measured in centimeters and is comprised of the circumference of the waist at the point where the gluteal muscles protrude the most.

US Navy Body Fat Formula for men:

Body Fat Percentage(%)= 86.010xlog 10(abdomen-neck)-70.041xlog10(height)+36.76

US Navy Fat Formula for women:

Body Fat Percentage (%) =163.205xlog10 (waist+hip-neck)-97.684xlog10 (height)-78.387

Data Analysis: Microsoft Excel was used to enter the data, and SPSS statistical software, version 21.0, was used for analysis. The Student's t-test and the Chi Square test were used to compare the continuous and categorical variables, respectively. A difference was considered statistically significant if the p-value was less than 0.05.

Ethical Clearance: The Institutional Ethics Committee of the Government Medical College of Jammu was consulted for ethical permission prior to the commencement of the study.

RESULTS

Table 1: Age and Gender-wise Distribution of Students

Age (in years)	Males No. (%)	Females No. (%)	Total No. (%) N=200
19	10 (11.63)	9 (7.89)	19 (9.50)
20	18 (20.93)	27 (23.69)	45 (22.50)
21	14 (16.29)	31 (27.19)	45 (22.50)
22	25 (29.07)	36 (31.58)	61(30.50)
23	12 (13.95)	7 (6.15)	19 (9.50)
24	2 (2.32)	2 (1.76)	4 (2)
25	0 (0)	1 (0.87)	1 (0.50)
Total	86(100)	114(100)	200
Mean age ± Standard deviation = 21.07 ± 1.35 years			

The subject group was found to consist of 57% (114 out of 200) female individuals and 43% (86 out of 200) male subjects. The participants ranged in age from 19 to 25 years old, with a mean age of 21.07 ± 1.35 years (**table 1**).

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Table 2: Mean Distribution of Physical Parameters among the students

Parameters	Male (n=86) Mean ± Standard deviation	Female (n=114) Mean ± Standard deviation
Weight (Kg)	66.99 ± 8.22	56.23 ± 8.58
Height (cm)	171.41 ± 8.47	159.67 ± 7.38
BMI (Kg/m^2)	22.69 ± 2.74	22.53 ± 3.71
Neck Circumference (cm)	36.39 ± 4.53	32.30 ± 3.19
Hip Circumference (cm)	92.63 ± 7.42	89.99 ± 9.56
Waist Circumference (cm)	84.57 ± 8.23	77.96 ± 8.70
Waist-hip Ratio	0.91 ± 0.10	0.87 ± 0.14
Body fat percentage	20.02 ± 8.56	27.07± 9.24

Table 2 reveals that the average body weight of the study's male and female medical students was 66.99± 8.22 and 56.23± 8.58 kg, respectively. The average height measured in males was 171.41±8.47 cm, while the average height in females was 159.67±7.38 cm. In the same way, the average BMI for men was found to be 22.69±2.94 cm, while the average BMI for women was found to be 22.53±3.71 cm.

Males had a mean neck circumference of 36.39±4.53cm, with a range of minimum 28cm and maximum 48cm, and females had a mean neck circumference of 32.30±3.19cm, with a range of minimum 20cm and maximum 42cm. For men, the mean hip circumference ranged from 92.63±7.42 cm to 144.3±cm, with a minimum of 78 cm and a high of 106 cm. For women, the range was 89.99±9.56 cm to 106 cm. Males had an average waist circumference of 84.52±8.23 cm, with a range of minimum 28 cm and maximum 48 cm, while females had an average waist circumference of 77.96±8.70 cm, with a range of minimum 22.8 cm and maximum 42 cm.

Table 3: Prevalence and Gender- wise distribution of Body fat and BMI among the students

Variable		Males No. of Subjects (%)	Females No. of Subjects (%)	Total (%)	P-Value
Body Fat	High Risk	21 (24.42)	27 (23.68)	48 (24)	<0.05
	Low Risk	65 (75.58)	87 (76.32)	152 (76)	
BMI	<18.5	5 (5.81)	12 (10.52)	17 (8.5)	<0.05
	18.5-24.9	65 (75.58)	82 (71.93)	147 (73.5)	
	25-29.9	16 (18.61)	15 (13.17)	31(15.5)	
	≥30	0 (0)	5 (4.38)	5 (2.5)	

The distribution of participants by percentage of body fat is displayed in Table 3. A total of 75.58% of the male and 23.68% of the female patients were found to be at low risk, whereas 24.42% of the male and 76.33% of the female subjects were found to be at high risk.

Table 4:Relationship between Body fat percentage and BMI distribution

BMI	Body fat percentage		Total	P value
	High risk	Low Risk		
<18.5	0 (0%)	17 (8.5%)	17 (8.5)	< 0.001
18.5-24.9	30 (15%)	117 (58.5%)	147 (73.5)	
25-29.9	14 (7%)	17 (8.5%)	31(15.5)	
≥30	4 (2%)	1 (0.5%)	5 (2.5)	
Total	**48 (24%)**	**152 (76%)**	**200 (100)**	

The distribution of participants across BMI ranges for two categories of body fat % was found to differ significantly (p value<0.000). It was found that 58.5% of participants were at low risk for body fat percentage and 15% were at high risk within the BMI range of 18.5-24.9 kg/m2. 8.5% of respondents had a low risk of body fat percentage and 7% had a high risk, within the BMI range of 25–29.9 kg/m2. For body fat percentage, 8.5% had low risk and 0% had high risk for BMI<18.5 kg/m2. For body fat percentage, 0.5% of participants had low risk and 2% had high risk if their BMI was ≥30 kg/m2.

Table 5: Relationship between waist-hip ratio and BMI distribution

BMI	Waist-hip ratio		Total	P value
	Abdominal obesity	Normal		
<18.5	5 (2.5%)	12 (6%)	17 (8.5)	0.156
18.5-24.9	59 (29.5%)	88 (44%)	147 (73.5)	
25-29.9	18 (9%)	13 (6.5%)	31(15.5)	

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≥30	3 (1.5)	2 (1%)	5 (2.5)	
Total	85 (42.5%)	115 (57.5%)	200 (100)	

The relationship between waist hip ratio and BMI distribution is displayed in the above table. Within the BMI range of 18.5-24.9 kg/m2, it was found that 44% of people had a normal waist-hip ratio and 29.5% had abdominal obesity. 6.5 people had a normal waist-hip ratio and 9% had abdominal obesity between the BMI range of 25–29.9 kg/m2. 2.5 had abdominal obesity and 6% had a normal waist-hip ratio in people with BMI<18.5 kg/m2. 1.5% of those with BMIs less than 30 kg/m2 exhibited abdominal obesity, while 1% had normal waist-hip ratios. Additionally, it was noted that the distribution of patients across BMI ranges for abdominal obesity and normal waist-hip ratio showed statistically no significant difference (p value = 0.156).

DISCUSSION

Across the world, studying medicine is one of the most prestigious and challenging careers. In order to study about and comprehend the intricate workings of the human body, students enrolled in such a course must be committed and watchful at all times.

In order to assess the connections between medical students' obesity and body composition in Jammu, a cross-sectional study was carried out. The results of the comparison of body composition revealed that male students had higher FFM and BMI than female students, whereas female students had lower FM. This appears to be connected to the physiological differences between the sexes; for example, estrogen has a major role in the rise of FM in women, while testosterone plays a major part in the considerable increase of body FFM in men.

200 people participated in the current study, 114 of whom were female and 86 of them were male. The subjects' average age was twenty-one years old. The average age was 20.7 years, which was somewhat in line with another study's **(18)** findings. In our study, 75.00% of the individuals were between the ages of 20 and 23. The mean age in a different study **(19)** was 20.31 years, while the maximum individuals in a study **(20)** were between the ages of 18 and 29. In that study, the mean age was 21.55 years.

More calorie-dense meals are more readily available, which fosters the development of obesity and other metabolic disorders **(21)**. The individuals' mean heights were 171±8.47 for the male and 159.67±78 for the female, with mean BMI values of 22.69±2.174 and 56.23±8.58, respectively, and mean heights of 66.99±8.22 and 56.23±8.58. The BMI range used in this investigation was determined using WHO guidelines. Enrollment data indicates that 2.5% of participants were obese (BMI ≥30) and 15.5% of individuals were overweight (BMI: 25–29.9). The majority of individuals (73.5%) had BMIs in the normal range (18.52-24.9). Merely 8.5% of participants were classified as underweight (BMI<18.5).

According to a previous study **(22)**, the mean BMI of male students was 25.5 kg/m2, while the mean BMI of female students was 23.8 kg/m2. Additionally, students in their fifth year of graduation had a higher likelihood of being obese (13.3% vs. 11.7%) than students in the other years of graduation. Male body fat percentage in the current study was 24.42%, while female body fat percentage was 23.68%.as opposed to another study by Liang X et al. (2017), which found that males and women's body fat percentages were, respectively, 25.74% and 34.01%. According to one study **(23)**, the percentage of body fat in men was 26%, whereas the percentage in women was 37%.

A substantial connection (p value < 0.001) was found in the current study between body fat % and BMI. This study supports a study by Shabani M et al. (2015), who also found a strong relationship between BMI and body fat percentage**(24)**.

CONCLUSION

It is critical to raise awareness of obesity among parents and students alike. If obesity and underweight are addressed from an early age, particularly in students who are more likely to experience stress and anxiety, there will be no long-term negative effects and a decreased risk of acquiring non-communicable diseases.

REFERENCES

1. Israel M, Patil U, Shinde S. Obesity in Medical students and its Correlation with Sleep Patterns and Sleep Duration. Indian J PhysiolPharmacol. 2016; 6(1): 38-44.
2. Hanson C, Rutten EP, Wouters EF, Rennard S. Influence of diet and obesity on COPD development and outcomes. Int J Chron Obstruct Pulmon Dis. 2014; 9:723–33.
3. Peters U, Dixon AE, Forno E. Obesity and asthma. J Allergy ClinImmunol. 2018; 141(4):1169–79.
4. Lee YL, Chen Y-C, Chen Y-A. Obesity and the occurrence of bronchitis in adolescents. Obesity. 2012. https:// doi. org/ 10. 1038/ oby. 2012. 178.
5. Zewari S, Vos P, van den Elshout F, Dekhuijzen R, Heijdra Y. Obesity in COPD: revealed and unrevealed issues. COPD. 2017;14(6):663–73.
6. Spelta F, FrattaPasini AM, Cazzoletti L, Ferrari M. Body weight and mortality in COPD: focus on the obesity paradox. Eat Weight Disord. 2018; 23(1):15–22.
7. Yano C, Kawayama T, Kinoshita T, Tokunaga Y, Sasaki J, Sakazaki Y, Matsuoka M, Imaoka H, Nishiyama M, Matsunaga K, et al. Overweight improves long-term survival in Japanese patients with asthma. Allergol Int. 2021; 70(2):201–7.
8. Stapleton R, Dixon A, Parsons P, Ware L, Suratt B. The association between BMI and plasma cytokine levels in patients with acute lung injury. Chest. 2010; 138(3):568–77.

DOI: 10.69605/ijlbpr_13.11.2024.3

9. Maia L, Cruz F, de Oliveira M, Samary C, Fernandes M, Trivelin S, Rocha N, Gama de Abreu M, Pelosi P, Silva P et al: Effects of obesity on pulmonary inflammation and remodeling in experimental moderate acute lung injury. Front Immunol. 2019; 10: 1215 https://doi: 10.3389/fimmu.2019.01215
10. Ng P, Eikermann M. The obesity conundrum in sepsis. BMC Anesthesiol. 2017;17(1):147.
11. Kuriyan R. Body composition techniques. Indian J Med Res. 2018;148(5):648–58.
12. Gonzalez-Barcala FJ, Takkouche B, Valdes L, Leis R, Alvarez-Calderon P, Cabanas R, Rodriguez Suarez JR, Tojo R. Body composition and respiratory function in healthy non-obese children. Pediatr Int. 2007; 49(5):553–7.
13. Peralta G, Fuertes E, Granell R, Mahmoud O, Roda C, Serra I, Jarvis D, Henderson J, Garcia-Aymerich J. Childhood body composition trajectories and adolescent lung function findings from the ALSPAC study. Am J RespirCrit Care Med. 2019;200(1):75–83.
14. Skrypnik D, Bogdanski P, Madry E, Karolkiewicz J, Ratajczak M, Krysciak J, Pupek-Musialik D, Walkowiak J. Effects of endurance and endurance strength training on body composition and physical capacity in women with abdominal obesity. Obes Facts. 2015;8(3):175–87.
15. Karstoft K, Winding K, Knudsen SH, Nielsen JS, Thomsen C, Pedersen BK, Solomon TP. The effects of free-living interval-walking training on glycemic control, body composition, and physical fitness in type 2 diabetic patients: a randomized, controlled trial. Diabetes Care. 2013;36(2):228–36.
16. Park W, Jung WS, Hong K, Kim YY, Kim SW, Park HY. Effects of moderate combined resistance- and aerobic-exercise for 12 weeks on body composition cardiometabolic risk factors blood pressure arterial stiffness and physical functions among obese older men: a pilot study. Int J Environ Res Public Health. 2020;17(19):7233.
17. Deliens T, Clarys P, De Bourdeaudhuij I, Deforche B. Determinants of eating behaviour in university students: a qualitative study using focus group discussions. BMC Public Health. 2014;14:53.
18. Sreeramareddy CT, Shankar PR, Binu VS, Mukhopadhyay C, Ray B, Menezes RG. Psychological morbidity, sources of stress and coping strategies among medical students of Nepal.BMC Med Edu 7,2007;7(1):26.
19. Rahman AA, Al Hashim BN, Al Hiji NK, Al Abbad Z. Stress among medical Saudi students at college of medicine, King Faisal university. Journal of Preventive medicine and Hygiene 2013; 54(4):195.
20. Sherina MS, Rampal L, Kanaeson N. Psychological stress among undergraduate medical students.MedicalJournal of Malaysia.2004;59(2):207-11.
21. McEwen BS. Protective and damaging effects of stress mediators. New England Journal of Medicine 1998; 338(3): 171-9.
22. Abdelaziz SB, El Shafei M. Health and lifestyle assessment among medical students of El Aini, Faculty of medicin, Cairo university. J Am Sci 2012; 8(2): 35-45.
23. Ho-Pham LT, Lai TQ, NguyenMTT,Nguyen TV. Relationship between Body Mass Index and Percent Body Fat in Vietnamese: Implications for the Diagnosis of Obesity.PLoS One. 2015 May 27;10(5):e0127198
24. Shabani M, Shakerian S, Fatemi R. Study of body mass index (BMI), body fat percent (%BF), and waist to hip ratio (WHR) in male physical education students. Physical Education of Students. 2015;19(3):74-78