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Prevalence of obesity and overweight and factors associated with it among medical students of Bundelkhand region: A cross-sectional study

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ABSTRACT

Background: Due to their sedentary lifestyle, abnormal eating habits, and increased reading and technology use, our medical students are more likely to be obese. **Aims and Objectives:** The objective of the study was to estimate the prevalence of overweight and obesity and its association with demographic characteristics, family history, and dietary habits in medical students of our tertiary care teaching institute. **Materials and Methods:** This institutional-based cross-sectional study comprised 260 medical students from all professional years of the M.B.B.S. course. Weight and height of participating students were recorded. Participants were then categorized based on Asia-Pacific classification of BMI. A pre-designed, pre-tested, semi-structured questionnaire was utilized for obtaining demographic information, dietary habits, and family history of participant. Results were expressed in frequency and percentages, and the Chi-square test was applied to find out the association of dependent variables with overweight and obesity. **Results:** The majority of study participants were between ages of 18 and 21 (47.69%), males (53.46%) and hostellers (96.15%). The prevalence of overweight and obesity was 22.31% and 23.18%, respectively. Overweight and obesity were significantly associated with a family history of overweight and obesity, eating out frequency, and with the frequency of consumption of fast food and snacks (P = 0.001). **Conclusion:** The prevalence of overweight and obesity among medical students was found to be high in our tertiary care teaching institute located in Central India. This study concludes that behavior change communication programs should be designed to encourage the adoption of healthy habits such as Ashtanga yoga, regular exercise, a balanced diet, and the avoidance of junk foods.

Key words: BMI; Obesity; Overweight; Prevalence; Students

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INTRODUCTION

At least 2.8 million deaths occur annually on a global scale, and an estimated 35.8 million (2.3%) DALYs are attributable to overweight or obesity.[1] The prevalence of obesity in India ranges from 10% to 50%.[2] Our medical students are more prone to obesity due to their sedentary lifestyle, anxiety, and aberrant eating habits, as well as their increased time spent reading and using electronic devices. Later in life, obese individuals are susceptible to numerous complications, including hypertension, dyslipidemia, obesity, diabetes, coronary artery disease, infertility, stroke, and arthritis.[3-5]

Aims and objectives

This study was aimed at estimating the prevalence of overweight and obesity and its association with demographic characteristics, family history, and dietary habits in medical students of our tertiary care teaching institute.

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MATERIALS AND METHODS

This is an institution-based study undertaken at the Department of Community Medicine from May 2021 to January 2023 among medical students from all professional years of the M.B.B.S. course studying in our tertiary care teaching facility. The study was initiated after getting approval from the Institutional Ethics Review Committee and adhered to the principles of the Declaration of Helsinki.

The prevalence of overweight or obese (BMI ≥25.0 kg/m^2) according to national family health survey-4 data of Indian Men (15–49 years) is 18.9% and Indian Women (15–49 years) is 20.6%.[6] Combined prevalence of overweight or obese of Indians is 39.5 % (18.9%+20.6%). Hence, anticipated prevalence[7] of overweight or obese of Indians is 39.5/2=19.75%.

Sample size has been calculated using the formulae: $n=z^2pq/d^2$

Where z=confidence interval (CI) at 95% (standard value of z is 1.96≈2), where p is the prevalence for the study, i.e., 19.75%, q (100-p)=80.25%, and d (absolute precision)=kept at 5%. After substituting each value in the given formula, the sample size required for the study was n=253.59. We rounded off to 260. Hence, 260 was our final sample size for the study.

The study group was comprised 260 medical students from all professional years of the M.B.B.S. course. Inclusion criteria for the study were medical students of the M.B.B.S. course studying in our institute who gave written and informed consent to participate in the study and who were present at the time of data collection. Students who were not willing to participate in the study and who were absent at the time of data collection were excluded from the study. For data collection, medical students were approached in their class rooms during their academic sessions. From each professional year of the M.B.B.S. course, we selected 65 medical students randomly by lottery method from the roll number list provided for the respective professional year. We put 100 pieces of paper with roll numbers written on them in a bowl, mixed them up, and randomly selected one roll number. If the student met the inclusion criteria, we recorded the information about that person and kept that piece of paper aside rather than putting it back into the bowl. Hence, each person was selected once. Before participation, each selected participant was provided with a detailed explanation regarding the purpose and potential benefits of the study, and written and informed consent was obtained from each participant.

Anthropometric measurements recorded for the study were weight and height. The weight was determined using an analog scale. Each participant was required to stand barefoot and unsupported on the weighing machine, with feet level on the machine and arms at the sides of the body. The participant was instructed to maintain a steady gaze with eyes parallel to the ground. The body weight was measured in kilograms, to the nearest half kilogram.

For height, the participant was made to stand against a wall barefoot. It was ensured that the occiput, shoulders, buttocks, and heels touched the flat vertical surface of the wall. The participant was made to look straight ahead with the line of sight parallel to the floor and the hands by the side of the body. Measurement was read by placing the horizontally held wooden scale touching the highest point (vertex) of the head. Height was measured in centimeters using standard inflexible tape fixed to a vertical wall and recorded to the nearest 0.5 cm.

Study participants were then categorized based on BMI category (Asia-Pacific classification of BMI).[8] Participants with a BMI of ≤22.9 kg/m^2 fell into the normal (18.5–22.9) and underweight (<18.5) categories, whereas those with a BMI of ≥23 kg/m^2 were part of the overweight (23–24.9) and obese (≥25) categories.

The present study employed a face-to-face interviewing method to collect data from each student. A pre-designed, pre-tested, semi-structured questionnaire was utilized for the purpose of obtaining the demographic information, dietary habits, and family history of the participant. The questions for dietary habits were with regard to type of diet, according to habit of taking breakfast daily, eating out frequency, consumption of junk food items in the previous month, frequency of consumption of fast food or snacks, and watching TV or mobile while eating. For the purpose of the study, high-sodium, high-sugar, high-fat, and high-calorie foods that had little or no protein, vitamins, or minerals were considered junk food items. These include commercial products, such as candies, confectionary items, ice cream, salted munchies, and carbonated beverages, that have little to no nutritional value but are loaded with calories, sodium, and lipids.[9] The present study employed the definition of fast food as provided by the national institutes of health, which characterizes fast foods as expedient, readily available, and cost-effective substitutes for home-cooked meals. In addition, fast foods are known to be rich in saturated fats, sugars, salts, and calories.[10] A family history of diabetes and hypertension, along with a family history of overweight and obesity, was taken from each participant.

For the calculation of the prevalence of overweight and obesity, it was calculated by

Prevalence (%)=(Number of overweight and obese participants/Total number of participants covered)×100

Data were collected, compiled, tabulated, entered into Microsoft Excel sheet, and analyzed using Statistical Package for the Social Sciences version 23. Results were expressed in frequency and percentages (descriptive statistics). The Chi-square test was applied to find out the association of dependent variables with overweight and obesity. The association was considered statistically significant if $P<0.05$ at the 95% CI.

RESULTS

The majority of the 260 study participants, 124 (47.69%), were between the ages of 18-21, whereas 118 students (45.38%) were between the ages of 22–24, and 18 students (6.93%) were between the ages of 25–27. Of the total participants, 139 (53.46%) were males and 121 (46.54%) were females. Most of the students, 250 (96.15%), were hostellers, and the rest, 10 (3.85%), were day scholars (Table 1).

The Asia-Pacific BMI classification was used to determine the prevalence of overweight and obesity among the study subjects. The observation from the present investigation revealed that the prevalence of overweight and obesity combined was 45.38% in the study. The prevalence of overweight was 22.31%, whereas the prevalence of obesity was 23.18% in the study. The results of the study indicated that 3.07% of the participants were underweight, whereas 51.54% had a BMI within the normal range (Table 1).

Table 1: Demographic features of participants and Asia pacific classification of BMI of participants (n=260)

Parameter	n (%)
Age group (in years)	
18–21	124 (47.69)
22–24	118 (45.38)
25–27	18 (6.93)
Sex	
Male	139 (53.46)
Female	121 (46.54)
Place of Stay	
Day scholar	10 (3.85)
Hosteller	250 (96.15)
Asia pacific classification of BMI	
Underweight (<18.5)	8 (3.07)
Normal (18.5–22.9)	134 (51.54)
Overweight (23–24.9)	58 (22.31)
Obese (≥25)	60 (23.08)

The prevalence of overweight and obesity among males was 46.76%, whereas it was 43.80% among females, the difference was statistically insignificant (CI=95%, $\chi^2=0.228$, P=0.632). The prevalence of overweight and obesity was higher (79.17%) in those who have a family history of overweight and obesity than in those who do not have a family history of overweight and obesity (37.74%). The difference was statistically significant, revealing an association (CI=95%, $\chi^2=27.103$, P=0.001). The prevalence of overweight and obesity was 49.48% in those who have a family history of diabetes and hypertension compared to 42.94% in those who do not have a family history of diabetes and hypertension; the difference was of statistical insignificance (CI=95%, $\chi^2=1.049$, P=0.305). Based on type of diet, 47.06% of students having mixed diet were overweight, while the number was 43.55% in students having vegetarian diet with without any statistically significant association (Table 2) (CI=95%, $\chi^2=0.322$, P=0.570).

The prevalence of overweight and obesity was higher in those who do not have the habit of taking breakfast daily (59.04%) when compared to those who do (38.98%). It was found that there is a significant association between overweight and obesity and the habit of not taking breakfast daily (CI=95%, $\chi^2=9.166$, P=0.002). With regard to eating out habits, the proportion of overweight and obesity was highest, i.e., 79.10% in those who consumed outside food every day, followed by 46.37% in those who consumed outside food couple of times a week, and the proportion of overweight and obesity was 31.14% in students who consumed outside food once a week. The proportions of overweight and obesity were 31.25% and 19.04% in those who had outside food a couple of times per month and once a month, respectively. It was found that there is a significant association between overweight and obesity and the frequency of consumption of outside food (CI=95%, $\chi^2=49.513$, P=0.001). In relation to consumption of junk food items in the last month, 47.14% of students who were obese and overweight consumed junk food items in the last month, compared to 33.34% of those who did not consume junk food items in the last month. It was found that there is no statistically significant association between overweight and obesity and consumption of junk food items in the last month (CI=95%, $\chi^2=2.214$, P=0.136). When observing the students in relation to the frequency of consumption of fast food and snacks, we observed that 80.16% of students having fast food snacks more than once per day were in the obese and overweight category, followed by 43.95% of students who had fast food and snacks once per day who were obese and overweight. In students who had fast food and snacks once per week and once per month, the proportions of overweight and obese students were 27.36% and 21.42%, respectively (CI=95%,

χ^2=47.621, P=0.001). When the groups were compared for watching TV/mobile while eating, we observed that the proportion of overweight and obese students was 48.65% in those who were watching TV/mobile while eating, while those who were not watching TV/mobile while eating had 41.07% overweight and obese students. We found that there is no significant association between overweight and obesity and watching TV/mobile while eating (Table 3) (CI=95%, χ^2=1.476, P=0.224).

DISCUSSION

The focus of this study was on medical students, as they represent a crucial demographic as future physicians. The issue of weight and obesity among future physicians is a matter of concern, as it may lead to a negative perception of the general population.[11]

In our study, 124 students (47.69%) were between the ages of 18 and 21 years, 118 students (45.38%) were between the ages of 22 and 24 years, and 18 students (6.92%) were between the ages of 25 and 27. The majority of the students, 250 (96.15%), were hostellers, whereas 10 (3.85%) were day scholars. Similar to our study, Anupama et al.,[12] and Deotale et al.,[11] observed that a sizable portion of the participants were residing in hostel facilities.

In our study, a significant proportion of the participants were of the male gender; these results were comparable to those of a study conducted by Selvaraj and Sivaprakasam[13] according to which 54% males and 46% females

Table 2: Association of Overweight and obesity with gender, family history and type of diet in study participants (n=260)

Variable	Normal and under weight (n=142)		Over weight and Obese (n=118)		Total		χ^2	P-value
	n	%	n	%	n	%		
Gender								
Males	74	53.24	65	46.76	139	100.00	0.228	0.632
Females	68	56.20	53	43.80	121	100.00		
Family history of overweight/obesity								
Yes	10	20.83	38	79.17	48	100	27.103	0.001
No	132	62.26	80	37.74	212	100		
Family history of diabetes/hypertension								
Yes	49	50.52	48	49.48	97	100	1.049	0.305
No	93	57.06	70	42.94	100	100		
Type of diet								
Vegetarian	70	56.45	54	43.55	124	100	0.322	0.570
Mixed	72	52.94	64	47.06	136	100		

Table 3: Association of overweight and obesity with eating habits in study participants (n=260)

Variable	Normal and under weight (n=142)		Over weight and Obese (n=118)		χ^2	P-value
	n	%	n	%		
Habit of taking breakfast daily						
Yes	108	61.02	69	38.98	9.166	0.002
No/Skip	34	40.96	49	59.04		
Eating out frequency						
Once a month	17	80.96	4	19.04	49.513	0.001
Couple of times a month	32	78.05	10	31.25		
Once a week	42	44.21	19	55.79		
Couple of times a week	37	47.44	32	52.56		
Every day	14	70	53	30		
Consumption of junk food items in the last month						
Yes	120	52.86	107	47.14	2.214	0.136
No	22	66.67	11	33.34		
Frequency of consumption of fast food/snacks						
More than once per day	11	18.34	49	81.66	47.621	0.001
Once per day	51	56.05	40	43.95		
Once per week	69	73.41	25	26.59		
Once per month	11	73.34	4	26.66		
Watching TV/mobile while eating						
Yes	76	51.35	72	48.65	1.476	0.224
No	66	58.93	46	41.07		

participated in the study. The study shows that the prevalence of overweight and obesity among males was slightly higher than that among females (P>0.05), which was statistically not significant. A study conducted by Saxena et al.,[14] showed a lower prevalence of overweight and obesity among male and female students (12.6% male and 20.3% female). A study conducted by Rekha et al.,[15] showed a higher prevalence of overweight and obesity among male and female students (57.6% male and 49.7% female). In contrast, studies conducted by Thomas and Geethadevi[16] and Setu et al.,[17] concluded that there was a significant association between overweight and obesity and gender.

According to the WHO's Asia-Pacific BMI guidelines, the prevalence of overweight and obesity in the current study is 22.31% and 23.08%, respectively. A total of 118 individuals (or 45.38%) had both overweight and obesity. These findings nearly matched those of Dumpala et al.,[18] who reported that the prevalence of overweight and obesity in the Asia-Pacific region was 45% using the same guidelines. A prevalence of overweight and obesity of 15% was reported by Saxena et al.,[14] and 30.6% by Thomas and Geethadevi in 2020.[16] In other studies conducted by Rekha et al.,[15] and Pichandi et al.,[19] the proportions of overweight and obesity were 53.2% and 57%, respectively.

In our study, there is a statistically significant association between a positive family history of overweight and obesity and overweight and obesity in the present study (P=0.001). Similar to ours, studies conducted by Baruah et al.,[20] and Begum et al.,[21] concluded that there is a significant association between a positive family history of overweight and obesity and overweight and obesity. It was found in our study that there is no significant association between a family history of diabetes and hypertension and overweight and obesity (P>0.05). The study conducted by Baruah et al.,[20] and Begum et al.,[21] concluded that there is no significant association between family history of hypertension and overweight and obesity, which was the case in the present study. In contrast, a study conducted by Basu M et al.,[22] concluded that there was a significant association between family history of diabetes and hypertension and overweight and obesity.

It was found that there is no significant association between overweight and obesity and the type of diet consumed (P>0.05) from the results of the study. The studies conducted by Baruah et al.,[20] and Setu Y et al.,[17] concluded that there is no significant association between the type of diet consumed and overweight and obesity. In contrast, a study conducted by Saxena et al.,[14] concluded that there was a significant association between the type of diet consumed and overweight and obesity.

From our study, it can be observed that there is a significant association between overweight and obesity and the habit of taking breakfast daily (P=0.001). Studies conducted by Deotale et al.,[11] and Anupama et al.,[12] concluded that there is a significant association between skipping breakfast and overweight and obesity, which was similar to our study. In contrast, a study conducted by Veena et al.,[23] concluded that skipping breakfast was not associated with obesity.

In our study, we found that obesity and eating out were significantly associated (P=0.001). Eating out often results in overeating due to high-calorie foods. The rise in fast food and other high fat, high sugar meals have been associated with obesity.

We found a significant association between overweight and obesity and the frequency of consumption of junk food items (P=0.001). In line with our observations, studies conducted by Veena et al.,[23] and Setu Y et al.,[17] concluded that there was a significant association between overweight and obesity and the frequency of eating junk food.

The findings of the study indicated that there was no significant association between overweight and obesity and watching TV or mobile while eating (P>0.05). The studies conducted by Anupama et al.,[12] and Panda et al.,[24] concluded that there is no significant association between overweight and obesity and watching TV while eating. In contrast, a study conducted by Deotale et al.,[11] concluded that there was a significant association between overweight and obesity and the frequency of taking meals while watching TV or reading.

Limitations of the study

Our study has limitations pertaining to the study design. Being a cross-sectional study, it is unable to establish causality or determine the temporal relationship between variables. They merely provide information about the prevalence of obesity at a particular point in time, without accounting for the individuals' history or changes in their weight status over time. Additionally, cross-sectional studies rely on self-reported data, which can be subject to recall bias or social desirability bias, leading to under or overestimation of obesity rates.

CONCLUSION

The prevalence of overweight and obesity among medical students was found to be high in our tertiary care teaching

institute located in Central India. The present study suggests that medical students with a family history of overweight and obesity should receive aggressive counseling on lifestyle and diet modification. This study highlights the importance of promoting healthy lifestyles, including healthy dietary habits and regular physical activity, among medical students as a means of preventing obesity-related illnesses such as diabetes, hypertension, and stroke. This study concludes that behavior change communication programs should be designed to encourage the adoption of healthy habits such as Ashtanga yoga, regular exercise, physical activity, a balanced diet, and the avoidance of junk foods. This is particularly important among medical students as well as the general community. By emphasizing the importance of healthy living, behavior change communication programs can help improve overall health outcomes and reduce the incidence of chronic diseases.

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REFERENCES

1. Narahari P, Rao PN, Sharma N, Navukkarasu S, Navaneeth A, Prakash MO, et al. Predictors of overweight and obesity among medical students. Int J Sci Res Public. 2014;4(12):1-5.
2. Masoodi SR, Wani AA, Wani AI, Bashir MI, Laway BA and Zargar AH. Prevalence of overweight and obesity in young adults aged 20-40 years in North India (Kashmir Valley). Diabetes Res Clin Pract. 2010;87(1):e4-e6.
   https://doi.org/10.1016/j.diabres.2009.11.004
3. Serdula M, Ivery D, Coates R, Freedman D, Williamson D and Byers T. Do obese children become obese adults? A review of the literature. Prev Med. 1993;22(2):167-177.
   https://doi./org/10.1006/pmed.1993.1014
4. Whitaker R, Wright J and Pepe M. Predicting obesity in young adulthood from childhood and parental obesity. N Engl J Med. 1997;337(13):869-873.
   https://doi.org/10.1056/NEJM199709253371301
5. Campbell P, Katzmarzyk P, Malina R, Rao D, Perusse L and Bouchard C. Stability of adiposity phenotypes from childhood and adolescence into young adulthood with contribution of parental measures. Obes Res. 2001;9(7):394-400.
   https://doi.org/10.1038/oby.2001.51
6. NFHS 4 - Google Search. Available from: https://www.google.com/search?q=nfhs+4&rlz=1C1RXQR_enIN1038IN1038&oq=nfhs+4&aqs=chrome.69i57j0i512l9.588353636j0j15&sourceid=chrome&ie=UTF-8 [Last accessed on 2023 Jun 16].
7. Deshpande K, Patel S, Bhujade R and Deepak P. Lifestyle and obesity among college students in Ujjain, India. Natl J Community Med. 2013;4(2):291-293.
8. Matsuzawa Y. Obesity and metabolic syndrome: The contribution of visceral fat and adiponectin. Diabetes Manag. 2014;4(4):391-401.
9. (PDF) Encyclopedia of Junk Food and Fast Food Angelica Berleze - Academia.edu. Available from: https://www.academia.edu/5780572/encyclopedia_of_junk_food_and_fast_food [Last accessed on 2023 Jun 16].
10. Ali Y, Elkhateeb M, Aubeed SF and Alrshidi A. Assessment of knowledge about risk effects of fast foods and its relation to antioxidants among students of Hail University. Acta Sci Gastrointest Disord. 2018;1(2):16-20.
11. Deotale MK, Ranganathan U and Akarte SV. Prevalence of overweight and obesity among medical students and their knowledge, attitude and practices about obesity. Int J Sci Rep. 2015;1(1):74-79.
12. Anupama M, Iyengar K, Rajesh SS, Rajanna MS, Venkatesh P and Pillai G. A study on prevalence of obesity and life-style behaviour among medical students. Int J Community Med Public Health. 2017;4(9):3314-3318.
13. Selvaraj K and Sivaprakasam P. A study on the prevalence of overweight and obesity among medical students of Kanchipuram District. Natl J Res Community Med. 2013;2(2):140-144.
14. Saxena S, Srivastava K, Bajpai S, Pathak P, Bharti PP and Jain PK. Social and environmental correlates of obesity in medical students of UPUMS Saifai: A cross-sectional study. Int J Health Care Educ Med Inform. 2021;8(1):8-11.
15. Rekha C, Lalitha N, Paramaguru R and Paul C. Prevalence of overweight and obesity among medical student. Int J Sci Study. 2022;10(2):26-29.
16. Thomas E and Geethadevi M. Prevalence and determinants of overweight and obesity among medical students. Natl J Physiol Pharm Pharmacol. 2020;10(1):42-48.
17. Setu Y, Sulania A, Jha RP and Goel SK. Pattern and determinants of obesity among undergraduate medical students of Delhi. Int J Sci Rep. 2021;7(1):56-63.
18. Dumpala S, Chadaram B and Berad A. Prevalence of overweight/obesity among medical students at Suraram, India. Int J Community Med Public Health. 2018;5:5338-5342.
19. Pichandi S, Vasu G, Pichandi J and Perumal M. Study the association of body mass index and obesity in MBBS students with their family health status in a Tertiary Care Hospital, Puducherry. Asian J Med Sci. 2022;13(9):125-129.
20. Baruah C, Gupta K and Luthra M. Prevalence and risk factors of overweight and obesity among MBBS students. Int J Community Med Public Health. 2020;7(12):5152-5155.
21. Begum N, Shila JS, Mohtarin S, Sultana S, Parvin R and Khan AH. Prevalence of overweight and obesity among medical students of Enam Medical College, Savar, Dhaka. J Enam Med Coll. 2020;10(2):86-92.
22. Basu M, Sarkar K, Shahbabu B, Ray S, Barik G, Chatterjee S, et al. Pattern and determinants of overweight and obesity among medical students of Kolkata. Int J Pharm Sci Res. 2016;7(1):377-386.
   https://doi.org/10.13040/IJPSR.0975-8232
23. Veena V, Chandra SM, Shruthi MN and Khan SI. Junk food eating habits and obesity among medical college students in Bangalore: A cross-sectional study. Natl J Community Med. 2018;9(2):100-105.
24. Panda B, Bhoi S and Sathapathy DM. Prevalence of overweight and obesity among MBBS students of VIMSAR. J Med Sci Clin Res. 2018;6(2):1214-1220.

Authors' Contributions:
AN- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation; **AN and VA-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; **AP and NT-** Design of study, literature survey, statistical analysis and interpretation, manuscript preparation, review, and submission of article.

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