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RESEARCH ARTICLE

Prevalence and determinants of overweight and obesity among medical students

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ABSTRACT

Background: Obesity is one of the major lifestyle disorders in India and its incidence has rapidly increased during recent decades. Medical students are more prone for obesity, due to, their sedentary lifestyle, lack of exercise, disordered eating habits, increased stress, and vast topics to learn. **Aims and Objectives:** The objectives of the present study were to find the prevalence of overweight/obesity among medical students, identify the contributing/associated factors, and assess the risk of comorbidities in them. **Materials and Methods:** A cross-sectional study was done among 330 medical students aged 18–25 years. Height, weight, and waist circumference were measured. Body mass index (BMI) was calculated. International physical activity questionnaire was used to assess physical activity. Dietary habits such as regular/irregular diet, vegetarian/non-vegetarian, eating speed, frequency of consumption of fried snacks, and fast food and sleep duration were also assessed. Based on waist circumference, the risk of comorbidities was also assessed. **Results:** Increased prevalence of overweight/obesity (30.6%) was obtained among medical students. Statistically significant increase in the prevalence of generalized obesity was noted in males compared to females. However, waist circumference showed a statistically significant increase in females. There was no significant association between dietary factors, sleep, and physical activity with BMI. **Conclusion:** Medical students have a high prevalence of obesity and are thus more prone for obesity-related risks. This study might create a self-awareness among the medical students to adopt healthy lifestyles such as regular exercise, less frequent consumption of fast food, and thus assure that they have reduced cardiovascular risks.

KEY WORDS: Overweight; Obesity; Medical Students; Waist Circumference

INTRODUCTION

Obesity is one of the major lifestyle disorders in India and its incidence has rapidly increased during recent decades. According to the Indian Council of Medical Research-India Diabetes study 2015, the prevalence of obesity and central obesity among adults ranges from 11.8% to 31.3% and 16.9% to 36.3%, respectively. Kerala ranks second among Indian states with the increased prevalence of obesity in females. Medical students are more prone for obesity, due to their sedentary lifestyle, lack of exercise, disordered eating habits due to lack of leisure time, increased stress and vast topics to learn. Thus, they are prone to overweight/obesity-related complications such as hypertension, dyslipidemia, and impaired glucose tolerance. However, often it remains a neglected problem despite its consequences. This study was aimed at estimating the prevalence of overweight/obesity among medical students, determining the contributing/associated factors and assessing the risk of comorbidities in them.

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In recent years, obesity has become very common and an increasing health burden affecting both developed and developing countries like India. Overweight and obesity are the fifth leading risk for global deaths. The prevalence of obesity has nearly doubled between 1980 and 2008.[1] Obesity is one of the biggest challenges that Indians need to overcome because we are genetically predisposed to weight gain. There has been a nutritional transition from typical carbohydrate diet to high-calorie fast food dietary habits particularly affecting young adults, like medical students.[2]

Overweight and obesity are defined as excessive fat accumulation that may impair health. Obesity is a complex multifactorial disease. It develops from the interaction of several factors such as social, behavioral, genetic, psychological, and metabolic. The causes of adult obesity include a variety of factors such as diet, genetic predisposition, lack of physical activity, and other behavioral factors. The sedentary lifestyle includes watching television, playing computer games, using mobile phones for long time, reading, talking over phone, and listening to music.

Indians have a more centralized distribution of body fat, with thick trunk skin folds and markedly highest mean waist-hip ratios for a given level of body mass index (BMI) compared to Europids. Furthermore, in them, morbidity and mortality occur even with lower BMIs and smaller waist circumferences. Thus, they tend to accumulate intra-abdominal fat without developing generalized obesity.[3] In India, abdominal obesity is one of the major risk factors for cardiovascular complications. BMI generally correlates highly with adiposity.

The Western Pacific regional office of the World Health Organization (WHO) has recommended lower BMI cut off values for Asian people.[3]

Obesity is a risk factor for hypertension, type II diabetes mellitus, infertility, hyperlipidemia, coronary artery disease, stroke, and arthritis. Evidences have suggested that atherosclerosis also begins early, when cardiovascular risk factors also begin. Moreover, the social implications of obesity are often neglected. The obese, do less well academically, has poorer job prospects and lower self-esteem.[3]

Kokila and Sivaprakasam[2] have found a high prevalence of obesity and overweight among medical students in South India. They also concluded that sedentary lifestyle and frequency of eating food were high among overweight and obese individuals.

Kamath and D'Souza[4] in their study on the prevalence of obesity among medical students found a positive association between eating speed and BMI. In another study by Gupta *et al*.,[5] a high prevalence of obesity was found among medical students. Another study Manojan *et al*.[6] conducted in medical students also found an increased prevalence of overweight and obesity. They also found that increased prevalence of obesity was among those who are using unhealthy lifestyle, including fast food and fried snack consumption.

Another study by Girish and Koppad[7] also found an increased prevalence of obesity among the medical students and more in females. Furthermore, they found an increased prevalence of increased waist circumference which shows that more number of medical students are at risk of developing cardiovascular diseases. They also concluded an increasing need for awareness, motivation, and attitudinal change to eat balanced diet and to incorporate physical activity in their daily schedule. Ramesh[8] have found an increasing prevalence of obesity among adolescent high school students of Kerala. A community-based study has shown a high prevalence of overweight/obesity in urban population.[9]

As medical students are the future health-care providers for the community, it is necessary to prevent overweight/obesity among them by young adult based approaches such as changes in lifestyle, regular exercise, healthy food habits, and health education. This study was aimed at estimating the prevalence of overweight and obesity among the medical students of Government Medical College Kottayam, assessing the factors influencing the development of obesity and overweight and assessing the risk of comorbidities in them.

MATERIALS AND METHODS

A cross-sectional study was conducted among 330 medical students aged 18–25 years at Government Medical College

Table 1: Classification of weight by BMI in adult Asians

Classification	BMI (kg/m^2)	Risk of comorbidities WC <90 cm (males) WC <80 cm (female)	Risk of comorbidities WC >90 cm (males) WC >80 cm (female)
Underweight	<18.5	Low	Average
Normal range	18.5–22.9	Average	Increased
Overweight	>23		
At-risk	23–24.9	Increased	Moderate
Obese I	25–29.9	Moderate	Severe
Obese II	>30	Severe	Very severe

BMI: Body mass index, WC: Waist circumference

Kottayam, Kerala. Ethics Committee Clearance was obtained. Informed consent was obtained after introducing the objectives of the study. Each student was given a pre-tested questionnaire, which included name, age, sex, year of admission, type of diet (vegetarian/non-vegetarian), dietary habits (regular/irregular), speed of eating, consumption of fried snacks and fast food, and duration of sleep. Physical activity was scored according to international physical activity questionnaire (IPAQ) (short past 7 days self-administered version of the IPAQ. Revised August 2002). Anthropometric measurements were taken which include weight, height, and waist circumference. The height was measured on a vertical scale with heels, buttocks, and occiput against the wall. The weighing machine was checked with known weights every day before starting the survey. The participants were made to stand still on the weighing machine, and the weight in kilograms was recorded. For waist circumference, the subject was made to stand with feet 25–30 cm apart, weight evenly distributed. Measurement was taken midway between the inferior margin of the last rib and the crest of the ileum in a horizontal plane. BMI was calculated using Quetelet's index (BMI = Weight in kg divided by Height in m^2). The participants were categorized on the basis of BMI (criteria for Asian people) into underweight (BMI <18.5), normal (BMI 18.5–22.9), and overweight (BMI >23). The overweight group was further divided into at risk (BMI 23–24.9), obese Grade I (BMI 25–29.9), and obese Grade II (BMI >30). Furthermore, each group will be subdivided based on cutoff values of waist circumference (<90 cm [men], >90 cm [men], <80 cm [women], and >80 cm [women]) to assess their risk of comorbidities. All those who were absent during the time of study and were physically challenged were excluded from the study.

All data were entered into Microsoft Excel Sheet and statistical analysis was done using SPSS version 21. $P < 0.05$ was considered statistically significant. Association between overweight/obesity and various factors was done using Chi-square test Table 1.

Table 2: Frequency distribution of study subjects based on BMI categories

BMI categories	No. of students/percentage (%)
Underweight	56 (17)
Normal	173 (52.4)
Overweight – At risk	62 (18.8)
Obesity Grade I	32 (9.7)
Obesity Grade II	7 (2.1)

BMI: Body mass index

RESULTS

Of the 330 students enrolled in the study, there were 118 males and 212 females. The BMI categories were those underweight (<18.5), those who were normal (18.5–22.9), and those who were overweight (>23). The overweight group includes three subcategories, at risk (23–24.9), obese Grade I (25–29.9), and obese Grade II (>30) [Table 2]. Thus, overall prevalence of overweight/obesity which includes at risk and obesity Grade I and II was found to be 101 (30.6%).

Of the total boys, 11% were underweight, 49.2% were normal, and 39.8% were overweight/obese. Of the girls, 20.3% were underweight, 54.2% were normal, and 25.5% were overweight/obese. The percentage of boys with overweight/obesity was more when compared to girls, and this increase was found to be statistically significant ($P = 0.009$) [Table 3].

According to the waist circumference measured, 207 (62.7%) had normal waist circumference and 123 (37.3%) had increased waist circumference. Of the total 123 with increased waist circumference, only 29 were males and 94 were females. This increase in the number of females with increased waist circumference was found to be highly statistically significant ($P = 0.000$) [Table 4].

Of the 207 with normal waist circumference, 52 (25.1%) were underweight, 121 (58.5%) were of normal, and 34 (16.4%) were overweight/obese. Of the total 123 with increased waist circumference, 4 (3.3%) were underweight, 52 (42.3%) were normal and 67 (54.5%) were overweight and obese. Out of the total 101 overweight students, only 67 had abdominal obesity. Rest 34 had normal waist circumference [Table 4]. Furthermore, the risk of comorbidities was assessed as per the WHO classification for Asian population [Table 5].

Various contributing or associated factors were also assessed using questionnaire. Of the total population, majority, i.e., 277 (83.9%) had a regular diet and some, i.e., 53 (16.1%) had diet at irregular timings. Furthermore, majority (304) were non-vegetarians and only very few (26) were vegetarians. The total percentages of students consuming maximum amount of food during breakfast, lunch, and supper were 68 (20.6%), 158 (47.9%), and 104 (31.5%), respectively. Furthermore, the frequency of consumption of junk foods such as fried

Table 3: Distribution of study subjects based on BMI categories and gender

Gender	BMI categories (%)			Total (%)	*P* value
	Underweight	Normal	Overweight/obese		
Males	13 (11)	58 (49.2)	47 (39.8)	118 (100)	0.009
Females	43 (20.3)	115 (54.2)	54 (25.5)	212 (100)	

*For the purpose of analysis overweight at risk, obese I and obese II were clubbed together, BMI: Body mass index

snacks, fast foods such as pizzas and burgers was more than once per day for 137 students (41.5%), once per day for 40 students (12.1%), only once per week for 99 students (30%), and only once per month for 54 students (16.4%). Of the total, 182 students (55.15%) had their meals in <15 min, while 139 students (42.12%) had eating speed between 15 and 30 min followed by 30–45 min for 8 (2.42%) of them and only one (0.30%) had eating speed between 45 and 60 min [Table 6].

The IPAQ questionnaire showed that majority of the study population, i.e., 199 students (60.3%) were of low physical activity group, followed by 96 students (29.1%) coming under moderate physical activity and less students, i.e., 35 (10.6%) were of high physical activity group. Furthermore, regarding the duration of sleep, 26 (7.9%) students slept only for only <6 h, while, 131 (39.7%) students slept for 6–8 h, and majority, i.e., 173 (52.4%) slept for more than 8 h [Table 7].

There was no significant association between BMI categories and other factors such as diet, sleep duration, frequency of consumption of junk foods, and physical activity.

DISCUSSION

In the present study, the overall prevalence of overweight/obesity was found to be 30.6% in medical students. In males, it was 39.8% and in females, it was 25.5%. This increased prevalence of overweight/obesity in male students than female students was also statistically significant. However, to the contrary, when the waist circumference was measured to assess the abdominal obesity due to visceral fat deposition it was seen that 44.3% of females had abdominal obesity, whereas only 24.6% of males had abdominal obesity. This female preponderance in abdominal obesity was found to be statistically significant. Hence, due to the increased waist circumference, the risk of comorbidities also will be more in them. Furthermore, the overall prevalence of abdominal obesity in medical students was 37.3%. Among the total 101 overweight/obese students, 66.3% had increased waist circumference too which substantially increased their risk of comorbidities. Although there was no significant association between the contributing/associated factors such as dietary habits, sleep, and physical activity with BMI, we found that majority of students (41.5%) ate junk foods such as fried snacks, fast food items more than once per day and majority (55.15%) had eating speed <15 min for meal. Furthermore, 60.3% of total medical students were having low physical activity score in IPAQ questionnaire.

Results similar to ours, showing high prevalence of overweight/obesity, were also obtained in studies conducted in medical students.[10-12] Another study done by Fernandez *et al*.,[13] on medical students in Pune, also showed an increased prevalence of overweight/obesity. However, their study showed an increased prevalence in female students than male students, whereas we had obtained an statistically significant increase in prevalence in male students than in female students. In a study done by Priya *et al*.,[14] in female medical students, it was found that females perceived their body image correctly and attempted to change their body weight toward normal.

Similar to our results, Kokila and Sivaprakasam also found that among medical students, females were more abdominal obese than males.[2] Furthermore, 66.3% of total overweight/obese students in the present study had moderate to very severe risk of comorbidities due to coexistence of abdominal obesity in them. This is because; evidence has shown that abdominal obesity is associated with cardiovascular risks such as dyslipidemia, hypertension, and type II diabetes. Hence, it is not only the amount of fatness that is important but also its distribution that determines the risks associated with it. Furthermore, in a study done by Debnath[15] on female students of 16–22 years, he found a positive correlation between waist circumference and systolic blood pressure, diastolic blood pressure and mean blood pressures. Furthermore, a significant correlation between BMI and systolic and diastolic hypertension also has been noted.[16] In another study conducted by Vikram *et al*.,[17] even C-reactive protein (CRP) levels were also found to be higher in subjects with obesity and in subjects with increased waist circumference. CRP is found to be associated with

Table 4: Distribution of study subjects based on WC categories and gender

Gender	Normal WC (%)	Increased WC (%)	Total (%)	*P* value
Males	89 (75.4)	29 (24.6)	118 (100)	0.000
Females	118 (55.7)	94 (44.3)	212 (100)	
Total	207 (62.7)	123 (37.3)	330 (100)	

WC: Waist circumference

Table 5: Distribution of study subjects based on BMI categories and waist circumference categories

BMI category	Normal waist circumference		Increased waist circumference	
	No. of students (%)	Risk of comorbidities	No. of students (%)	Risk of comorbidities
Underweight	52 (25.1)	Low	4 (3.3)	Average
Normal	121 (58.5)	Average	52 (42.3)	Increased
Over weight/obese	34 (16.4)	Increased to severe	67 (54.5)	Moderate to very severe
Total	207		123	

BMI: Body mass index

Table 6: Distribution of study subjects based on dietary factors, duration of sleep, and physical activity against body mass index categories

Variable	Underweight (%)	Normal (%)	Overweight/obese (%)	*P* value
Diet (*n*=330) regular	47 (17)	143(51.6)	87(31.4)	>0.05
Irregular	9 (17)	30 (56.6)	14 (26.4)	
Diet (n=330) vegetarian	7 (26.9)	12 (46.2)	7 (26.9)	>0.05
Non-vegetarian	49 (16.1)	161 (53)	94 (30.9)	
Time during which more food is consumed (*n*=330)				
Break fast	7 (10.3)	37 (54.4)	24 (35.3)	>0.05
Lunch	28 (17.7)	84 (53.2)	46 (29.1)	
Dinner	21 (20.2)	52 (50)	31 (29.8)	
Speed of eating (*n*=330) min				
<15	22 (12.1)	100 (54.9)	60 (33)	>0.05
15–30	32 (23)	66 (47.5)	41 (29.5)	
30–45	2 (25)	6 (75)	0	
45–60	0	1 (100)	0	
Consumption of fast food/fried snacks (*n*=330)				
>Once per day	27 (19.7)	70 (51.1)	40 (29.2)	>0.05
Once per day	2 (5)	23 (57.5)	15 (37.5)	
Once per week	15 (15.2)	53 (53.5)	31 (31.3)	
Once per month	12 (22.2)	27 (50)	15 (27.8)	
Duration of sleep (*n*=330) (h)				
<6	7 (26.9)	13 (50)	6 (23.07)	>0.05
6	23 (17.55)	69 (52.67)	39 (29.77)	
>6	26 (15.02)	91 (52.60)	56 (32.36)	
Physical activity according to the international physical activity questionnaire (*n*=330)				
Low	42 (21.1)	104 (52.3)	53 (26.6)	>0.05
Moderate	9 (9.4)	51 (53.1)	36 (37.5)	
High	5 (14.3)	18 (51.4)	12 (34.3)	

Table 7: Distribution of study subjects based on physical activity groups and waist circumference categories

Physical activity as per international physical activity questionnaire	Normal waist circumference (%)	Increased waist circumference (abdominal obesity) (%)	*P* value
Low	126 (63.32)	73 (36.68)	>0.05
Moderate	57 (59.38)	39 (40.62)	
Severe	24 (68.57)	11 (31.43)	

There was no significant association between physical activity and waist circumference

endothelial dysfunction and increased risk of coronary heart disease. Studies.[18] have even shown that obese had high levels of major cardiovascular risk factors such as hypertension and dyslipidemia. In a community-based study done in adolescents by Harikrishnan and Kumar[19] in Chennai, he had found that low levels of physical activity, consuming junk foods and watching television are associated with high prevalence of obesity. They have also proved that prevalence of obesity was found to be lower in adolescents who performed household chores, played outdoor games and performed physical exercise. Hence, from this, we can assume that eating junk foods, low levels of physical activity could be few probable causes for obesity among our medical students also, though we could not establish a positive statistical correlation. Another study[20] has even proved that high burden of obesity is influenced by prevalent outlet density of food in the environment. Reports have also shown that due to the long-term consequences, overweight/obesity poses enormous[21] financial burden to the health-care system.

The present study has taken the WHO criteria for overweight/obesity for Asians and could estimate accurately the actual prevalence and risk status due to overweight/obesity in medical students. However, the coexistence of dyslipidemia, hypertension, and impaired glucose tolerance was not assessed, which if done could have actually assessed the comorbidities in them.

Our study suggests that primary prevention of obesity in young adults could be possible only by improving their lifestyle by initiating awareness in them, providing facilities for physical fitness, sparing leisure time for outdoor sports, training them in time management skills, and encouraging them for healthy food habits.

CONCLUSION

This study concludes that the prevalence of overweight/obesity is very high among medical students. Although males showed increased prevalence of overweight/obesity as per BMI, the prevalence of abdominal obesity as per waist circumference was higher among females. The higher prevalence of overweight/obesity could be due to low physical activity, high consumption of fried snacks or fast food items, though a significant association could not be established between BMI and these factors. However, the frequency of these factors was found to be very high among the medical students. Thus, this study could create a self-awareness among the medical students who are the future health-care providers to adopt healthy life styles such as regular exercises, less consumption of fast food, and thus assure that they themselves remain healthy and have reduced cardiovascular risks.

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