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Original Research Article

Pattern and determinants of obesity among undergraduate medical students of Delhi

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ABSTRACT

Background: Obesity is one of the most serious public health challenge of 21st century. Overweight and obese children are more likely to develop non-communicable diseases (NCDs) like diabetes and cardiovascular diseases (CVDs) in their adolescent age group. For the last few years prevalence of obesity among adolescent has risen dramatically. According to few recent studies, prevalence of obesity is high among medical students. Aims and objectives of the research was to study the prevalence of obesity among undergraduate medical students and to assess the determinants of obesity.
Methods: A cross-sectional study was conducted among 200 undergraduate medical students in a medical college of Delhi. A pre-designed, pretested and semi-structured interview schedule was used. And for anthropometric measurements, digital weighing scale for weight measurement, stadiometer for height measurement and non-stretchable inch tape for waist-circumference/hip-circumference (WC/HC) measurement.
Results: A total of 200 medical students were surveyed for a period of 6 months. It was observed that according to World Health Organization (WHO) Asian – pacific classification of body mass index (BMI), 21% (42/200) were overweight and 29% (58/200) were obese. Among the study participants, socio demographic variables which were found to be associated with increased BMI were mother's education (p value=0.02), father's education (p value=0.01) and type of the area (p value=0.03). Occupation of mothers and father was not found to be significantly associated with the BMI.
Conclusions: Medical students are our future doctors and role model for the community, so it is very important to modify the dietary and lifestyle factors in order to decrease the prevalence of overweight and obesity among medical students.

Keywords: Overweight, Obesity, Physical activity, Medical students

INTRODUCTION

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. Apart from high-income countries, there is marked increase in overweight and obesity in low and middle income countries (LMICs). While the burden of overweight and obesity is continuously rising, it has been observed that it not rising equally at a same rate in all persons or in all age groups.[1] In a study Agrawal et al conducted in New Delhi to assess the multi-morbidity in LMICs, they included 6 countries LMICs and found that the prevalence of overweight was 13% and obesity was 24%.[2]

Approximately 3.4 million deaths, overweight and obesity were estimated to cause 3.4 million deaths, 3.9% of years of life lost, and 3.8% of disability-adjusted life-years (DALYs) were occurred worldwide because of obesity.[3] According to WHO, 39% of adults were overweight and 13% were obese in 2016.[4] Most of the world's population

live in countries where overweight and obesity kills more people than underweight. Since 1980, the prevalence of obesity has doubled in more than 70 countries and it is still increasing. High BMI, causes 4.0 million deaths globally and more than 2/3rd of the deaths related to high BMI, had occurred due to cardiovascular diseases.[5]

According to a study by Shannawaz and Arokiasamy, from 1998-1999 to 2015-2016 the prevalence of obesity has been doubled and it is significantly rising in both urban and rural areas of India.[6]

In India, the prevalence of overweight and obesity is 20.6% (NFHS 4) which has been increased from 12.6% (NFHS 3) among women, 18.9% (NFHS 4) which has been increased from 9.3% (NFHS 3) among men. The prevalence of overweight and obesity, has been found to be higher in urban areas (31.3% in women, 26.6% in men) as compared to rural areas (15% in women, 14.3% in men). In Delhi, the prevalence of overweight and obesity is 33.5% (NFHS 4) which has been increased from 26.4% (NFHS 3) among women, 24.6% (NFHS 4) which has been increased from 16.8% (NFHS 3) among men.[7]

In previous studies, variable prevalence of overweight and obesity among young medical students across different institutions in the country was observed. Medical students are the budding doctors of the nation. It is important that they should aware of the factors or unhealthy lifestyle that leads to overweight and obesity. With this background the present study was carried out to assess the prevalence and determinants of overweight/obesity among undergraduate medical students.

METHODS

Study design and study participants

A cross-sectional descriptive study was conducted among undergraduate medical students of medical college of Delhi in 2018. The study was carried out for 6 months.

Selection criteria

Inclusion criteria

Undergraduate medical students, both sex, not seriously ill, present during days of data collection and gave informed written consent to participate in the study.

Exclusion criteria

Medical students suffering from any chronic diseases or under long term medication.

Study tool

A predesigned and pretested semi-structured questionnaire was used for this study. And for anthropometric measurements, digital weighing scale for weight measurement, stadiometer for height measurement and non-stretchable inch tape for WC/HC measurement.

Questionnaire has three parts: 1stpart of questionnaire consists of few basic socio-demographic detail including age, gender, residence, 2nd part consist questions regarding general habits such as frequency of fruit and vegetable consumption, alcohol intake, smoking, exercise and sleep habits etc. and the 3rd part consist of anthropometric measurements of study population.

Study variables

Age, gender, place of resident at the time of study, type of area from which originally a study participants belong to, parent's education, parent's occupation, consumption of vegetables and fruits in the diet, routine exercise, sleep duration, internet use, mobile use, weight, height, BMI and waist/hip ratio.

Data collection

Data collection was done for each batch separately. Before giving the questionnaire, students were briefed about the purpose of the study and given option to withdraw at any stage of the interview. The informed written consent was taken.

Several parameters mentioned below were considered for the anthropometric measurement.

Weight

It was recorded by digital weighing scale corrected to nearest zero. The participants were made to stand after removing heavy jackets and footwear with standing straight.

Height

It was measured by stadiometer with adjustable sliding horizontal head piece.

Waist and hip circumference

They were measured by non-stretchable inch tape. For waist circumstance the mid- point between costal margins and the iliac crests was taken. For hip-circumference the area with maximum bulge or contour was taken as a reference point.

Statistical analysis

The data was analyzed using statistical software, statistical package for social sciences (SPSS) version 21. The Mann-Whitney U test was used in the analysis of the quantitative independent non-parametric data and chi-square test was used in the analysis of qualitative independent data. P value less than 0.05 was considered as significant.

Working definitions

Body mass index

It is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). Asian-Pacific classifications was used with the following cut-offs- Underweight (<18.5 kg/m^2), normal weight (18.5-22.9 kg/m^2), overweight (23-24.9 kg/m^2), and obese (≥25 kg/m^2).[8]

Waist circumference

It is measured at the mid-point between the lower border of the rib cage and the iliac crest (park)

Hip circumference

Measured around the widest portion of the buttocks, at the level parallel to the floor.[9]

Waist–hip ratio

Ratio of the circumference of the waist to that of the hips, calculated as waist measurement divided by hip measurement (W/H). High Waist–hip ratio (>1.0 in men and >0.85 in women) indicates abdominal fat accumulation.[10]

Sleep

More than 8 hours of sleep per day was considered as good practice.[11]

Exercise/physical activity

Minimum of 30 minutes or more duration of moderate intensity per day was considered healthy.

Mobile use

Usage of ≤4 hours per day were considered as healthy practice.

Internet use

Usage of ≤2 hours per day were considered as healthy practice.

Fruit consumption

The number of fruit intake per week was asked and minimum 7 times per week considered normal.

Vegetable consumption

The number katori of vegetable consumed per day was asked and minimum 2 times per day was considered healthy.

RESULTS

Table 1 depicts socio-demographic characteristics of study population. Out of 200 medical students 60% were males and 40% were females. Majority (56.5%, 113/200) were in the group 22-25 years followed by 43.5% (87/200) were in age group 18-21 years. Approximately 50% of study participants each were hostellers and day scholars. Majority of the study participants belongs to Delhi i.e. 61.5% (123/200) and from urban areas i.e. 87.5% (175/200).

Table 1: Distribution of study participants according to socio-demographic details.

Variables	Study participants (n=200)	Percentage
Age in years*		
18-21	87	43.5
22-25	113	56.5
Current residence		
Day scholar	101	50.5
Hosteller	99	49.5
Native state		
Delhi	123	61.5
Outside Delhi	77	38.5
Types of area		
Urban	175	87.5
Rural	25	12.5
Literacy of mother#		
Upto 10th	45	22.5
11th and above	155	77.5
Literacy of father		
Upto 10th	17	8.5
11th and above	183	91.5
Occupation of mother		
Home-maker	140	70
Private	06	03
Govt.	54	27
Occupation of father		
Self-employed	63	31.5
Private	22	11
Govt.	115	57.5
Total	200	100

*Mean age 21.81 with SD 1.71, #just 7 women were found to be illiterate, for the purpose of calculations they are added to up to-10th class group

Table 2 depicts prevalence of overweight and obesity among study participants. According to Asian-pacific guidelines of WHO for BMI, it was observed that majority of study participants belongs to normal BMI category i.e. 40% (80/200) having 32.5% (39/120) males and 51.2% (41/80) females. Twenty percentage (42/200) were overweight, 24% (48/200) were pre-obese and only 05% (10/200) were obese. In all abovementioned BMI categories, in each category majority were males i.e. 22.5% were overweight, 28.3% were pre-obese and 6.7%

were obese, but statistically no association was seen between different BMI categories and gender of study participants (p=0.73).

Table 2: Distribution of study participant's nutritional status according to BMI categories.

BMI (kg/m^2)*	Sex		Total (%)
	Male (%)	Female (%)	
<18.4	12 (10)	08 (10)	20 (10)
Normal (18.5-22.9)	39 (32.5)	41 (51.2)	80 (40)
Overweight (23-24.9)	27 (22.5)	15 (18.8)	42 (21)
Pre-obese (25-29.9)	34 (28.3)	14 (17.5)	48 (24)
Obese (≥30)	08 (6.7)	02 (2.5)	10 (05)
Total	120 (60)	80 (40)	200 (100)

*WHO Asian-Pacific BMI cut-offs used (p value=0.73)

Table 3 depicts association of BMI with different socio-demographic factors. Place of residence if we take column total the for BMI normal in place of residence categories it has been found that the those who are residing with their parents or family are falling in normal BMI categories 45.5% (46/101) as compared to those who are residing in hostels 34.3% (34/99). Among the study participants, socio demographic variables which were found to be associated with increased BMI were mother's education (p value=0.02), father's education (p value=0.01) and type of the area (p value=0.03) where the study participants were living .i.e. those who were living in urban area, have more percentage of obesity, the association were found to be statistically significant with p values less than 0.05. Occupation of mothers and father is not found to be significantly associated with the BMI (not mentioned in the tables).

Table 4 depicts association of BMI categories with dietary and lifestyle factors. It was found that those who were not doing daily routine exercise (>30 min), have more percentage of obesity and those who sleeps for less than 8 hours in a day have more percentage of obesity. It was observed that 49% (98/200) of study participants consumes fruits ≥7 times/ week, 37% (74/200) consumes vegetables ≥2 servings/day and only 45.5% (91/200) perform daily routine exercise.

The Mann-Whitney test was applied for analysis of quantitative independent non-parametric data and it was found that mean BMI measurement was significantly different across both genders (p=0.383). There was no statistically significant difference between WHR and gender (p=0.595), WHR and mobile usage pattern (p=0.610) and WHR and internet usage pattern (p=0.383).

The Kruskal-Wallis test was applied of quantitative independent non-parametric data and it was found that between BMI categories (below normal BMI, normal BMI and above normal BMI) and Internet usage pattern, between BMI categories (below normal BMI, normal BMI and above normal BMI) and mobile usage pattern. There was no statistically significant difference between the variables (p=0.833) and (p=0.104).

Table 5 is divided into two categories: the first category depicts comparisons between normal category and below normal category. In this only residence was a significant predictor (b=-1.430, S.E.=0.618, p=0.021) in the model, as persons scoring higher on this variable were less likely to be in below normal category (odds ratio=0.239).

The second category depicts comparisons between normal category and above normal category. In this sex and daily exercise was a significant predictor (b=-1.162, S.E.=0.382, p=0.002) and (b=0.801, S.E.=0.354, p=0.023) respectively in the model. So, from this we conclude that females are less likely to belong in above normal category (odds ratio=0.313) whereas persons who are not doing exercise daily for 30 minutes are 2.23 times more likely to belongs in the above normal category.

In Table 6 only sex, father's education and Internet usage was found to be a significant predictor. As compared to females, male are 4.6 times more likely to be fall in the high risk category of waist-hip ratio, study participant's having father's education up to 10th are 7.3 times more likely to fall in the high risk category of waist-hip ratio as compared to study participant's having father's education 11th and above. And students with internet usage of more than 4 hours in a day are 1.1 times more likely to fall in the high risk category of waist-hip ratio.

Table 3: Association of BMI with socio-demographic factors.

Variables	BMI categories			Total (%)	Chi-square value and p value
	Underweight (%)	Normal (%)	Obese (%)		
Age distribution (years)					
18-21	07 (8)	36 (41.4)	44 (50.6)	87 (43.5)	χ^2 =0.671
22-27	13 (11.5)	44 (38.9)	56 (49.6)	113 (56.5)	p value= 0.715
Sex distribution					
Male	12 (10)	39 (32.5)	69 (57.5)	120 (60)	χ^2=7.594
Female	08 (10)	41 (51.2)	31 (38.8)	80 (40)	p value=0.022
Place of residence					

Continued.

Variables	BMI categories			Total (%)	Chi-square value and p value
	Underweight (%)	Normal (%)	Obese (%)		
Hosteller	15 (15.2)	34 (34.3)	50 (50.5)	99 (49.5)	χ^2=6.781 p value=0.034
Day scholar	05 (5)	46 (45.5)	50 (49.5)	101 (50.5)	
Type of area from where the study participants belongs to					
Urban	14 (8)	73 (41.7)	88 (50.3)	175 (87.5)	χ^2=6.652 p value=0.036
Rural	06 (24)	07 (28)	12 (48)	25 (12.5)	
Mother's education					
<10 class	09 (20)	13 (28.9)	23 (51.1)	45 (22.5)	χ^2=7.613 p-value=0.022
≥11 class	11 (7.1)	67 (83.8)	77 (49.7)	155 (77.5)	
Father's education					
<10 class	05 (29.4)	07 (41.2)	05 (29.4)	17 (8.5)	χ^2=0.014 p value=0.014
≥11 class	15 (8.2)	73 (39.9)	95 (51.9)	183 (91.5)	
Total	20 (10)	80 (40)	100 (50)	200 (100)	

Table 4: Association of BMI with dietary and lifestyle factors.

Variables	BMI categories			Total (%)	Chi-square value and p value
	Underweight (%)	Normal (%)	Obese (%)		
Consumption of fruits in diet per week					
7 times or more	07 (9.8)	40 (40.8)	51 (52)	98 (49)	χ^2=1.761 p value=0.415
Less than 7 times	13 (12.7)	40 (39.2)	49 (48)	102 (51)	
Consumption of vegetables in diet					
≥2 servings/day	09 (12.2)	25 (33.8)	40 (54.1)	74 (37)	χ^2=2.070 p value=0.355
<2 servings/day	11 (8.7)	55 (43.7)	60 (47.6)	126 (63)	
Exercise daily for more than 30 minutes					
Yes	10 (9.1)	41 (36.4)	40 (45.5)	91 (45.5)	χ^2=2.450 p value=0.294
No	10 (9.2)	39 (35.8)	60 (54.5)	109 (54.5)	
Sleep duration (hours)					
≥8	07 (7.6)	37 (30.4)	32 (38)	76 (38)	χ^2=3.916 p value=0.141
<8	13 (10.5)	43 (34.7)	68 (54.8)	124 (62)	
Internet usage pattern (hours/day)					
<2	12 (11)	43 (40)	54 (60)	109 (54.5)	χ^2=0.272 p value=0.873
≥2	08 (8.8)	37 (40.7)	46 (50.5)	91 (45.5)	
Mobile usage pattern (hours/day)					
<4	15 (10.9)	53 (38.7)	69 (68.5)	137 (68.5)	χ^2=0.591 p value=0.744
≥4	05 (7.9)	27 (42.9)	31 (49.2)	63 (31.5)	
Total	20 (10)	80 (40)	100 (50)	200 (100)	

Table 5: Multinomial logistic regression model showing the influence of demographic and other background characteristics variable on body mass index.

Background characteristics	Category I (below normal)				Category II (above normal)			
	Adjusted odds ratio	P value	95% C.I.		Adjusted odds ratio	P value	95% C.I.	
			Lower	Upper			Lower	Upper
Sex	0.530	0.316	0.153	1.836	0.313	0.002	0.148	0.662
Residence	0.239	0.021	0.071	0.804	0.593	0.123	0.305	1.152
Type of area	2.320	0.241	0.568	9.472	1.151	0.799	0.390	3.396
Type of family	0.497	0.357	0.112	2.200	1.444	0.342	0.676	3.081
Mother's education	0.399	0.165	0.109	1.461	0.714	0.461	0.292	1.748
Mother's occupation	0.928	0.826	0.476	1.808	0.827	0.316	0.571	1.199
Father's education	0.438	0.329	0.083	2.302	3.230	0.092	0.825	12.656
Father's occupation	1.332	0.382	0.700	2.532	1.116	0.548	0.779	1.599
Diet	1.230	0.620	0.542	2.789	0.967	0.886	0.611	1.531
Fruit consumption	1.491	0.504	0.462	4.817	0.862	0.661	0.446	1.669

Continued.

Background characteristics	Category I (below normal)				Category II (above normal)			
	Adjusted odds ratio	P value	95% C.I.		Adjusted odds ratio	P value	95% C.I.	
			Lower	Upper			Lower	Upper
Vegetable consumption	0.638	0.461	0.193	2.106	0.695	0.310	0.344	1.403
Exercise daily for 30 minutes	1.042	0.947	0.313	3.468	2.229	0.023	1.114	4.457
Sleep duration	1.465	0.516	0.463	4.637	1.380	0.359	0.693	2.748
Mobile usage	0.490	0.346	0.111	2.164	0.874	0.764	0.363	2.104
Internet usage	1.160	0.834	0.290	4.649	0.864	0.737	0.369	2.024
Intercept		0.177				0.748		

*Reference category is normal

Table 6: Binary logistic regression showing risk of fall in high waist hip ratio group.

Background characteristics	Adjusted odd's ratio	P value	95 % C.I.	
			Lower	Upper
Sex				
Female	1.00			
Male	4.561	0.000	2.163	9.621
Residence				
Day scholar	1.00			
Hosteller	0.678	0.252	0.349	1.318
Type of area				
Rural	1.00			
Urban	1.054	0.917	0.390	2.850
Type of family				
Joint	1.00			
Nuclear	0.980	0.959	0.457	2.103
Mother's education				
11th and above	1.00			
Up to 10th	0.762	0.525	0.330	1.762
Father's education				
11th and above	1.00			
Up to 10th	6.008	0.008	1.590	22.701
Father's occupation				
Self employed	1.00			
Private	0.464	0.207	0.141	1.530
Government	0.735	0.410	0.354	1.527
Diet				
Vegetarian	1.00			
Non-vegetarian	0.968	0.930	0.472	1.986
Eggitarian	0.920	0.869	0.341	2.479
Fruits consumption				
Less than 7	1.00			
7 or more	0.760	0.410	0.396	1.459
Vegetable consumption per day				
Less than 14	1.00			
14 or more	0.766	0.458	0.379	1.547
Exercise daily for 30 mins				
Yes	1.00			
No	0.652	0.207	0.336	1.266
Sleep duration				
Less than 8 hours	1.00			
8 hours or more	0.818	0.571	0.407	1.642
Mobile usage (hours)				
<4	1.00			

Continued.

Background characteristics	Adjusted odd's ratio	P value	95 % C.I.	
			Lower	Upper
>4	0.672	0.273	0.330	1.367
Internet usage (hours)				
<4	1.00			
>4	2.688	0.011	1.251	5.692

DISCUSSION

Guleri et al conducted a study among 300 medical students at Sagar district, Madhya Pradesh, similarly they found 26.7% of medical students were overweight or obese based on BMI cut off value 23.00 kg/m^2.[12]

Similar results were found in a study conducted by Pandit and Kishore among 101 medical students at VMMC, Delhi. They found 19.8% (20/101) were overweight and 30.7% (31/101) were obese.[13] Similar results were seen in a study conducted by Basu et al among 278 medical students at Kolkata. They found that 40.65% (113/278) of medical students were normal and 19.78% (55/278) of medical students were overweight.[14]

In contrast to the present study, a study was done by Deotale et al among 300 medical students at Grant Medical College, Mumbai.[15] They found the prevalence of overweight and obesity was 9.3% and 18.4% (according to Asia-pacific guidelines). Contrast results were also found in a study conducted by Sarkar et al among 304 medical students at Mandya, Karnataka had found 15.2% overweight and 0.9% obese.[16]

Also in a study contrast results were found in a study conducted by Mahmood et al among 428 medical students at Karachi, Pakistan. Prevalence of overweight and obesity among medical students was found to be 14.7%, 12.4% respectively.[17]

Similarly in a study conducted by Sree and Srujana among 207 medical students at Andhra Pradesh, had found that more than 55% of medical students were not involved in any sort of exercise.[18] Yilmaz et al conducted a study among 564 medical students also found that 70% of medical students did not care about gaining weight and not involved in any sort of exercise.[19]

Similar to our study, a study conducted by Anand et al among 161 students at central Delhi, it was found that statistical significant association was found between BMI measurements and gender variable ($p<0.001$).[20]

In our study no association was found between consumption of fruits/vegetables and overweight/obesity. In a similar study from Tumkur, Karnataka no significant association was seen between diet and obesity.[21] Similarly in a study conducted by Hameed et al among 320 subjects at Srinagar. They had also found the association between sleep duration and obesity.[22]

In contrast to our present study, a study conducted by Inam-ul-Haq et al at Islamabad medical college among 149 medical students, had found the statistically significant association between BMI categories and gender variables. ($p=0.000$).[23]

CONCLUSION

The prevalence of overweight and obesity is increasing among medical students and in our study it was found is 50% combined. The main determinates for overweight and obesity were native place, place of residence, mother's education, father's education, daily routine exercise and sleep duration. This highlights the need of healthy lifestyle, Healthy food habits and adequate physical activity as part of their daily routine.

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