A Cross-sectional Study on Determinants of Overweight and Obesity among College Students Perusing Selected Allied Health Courses at Jamnagar City, Gujarat.

Jimmy Kagathara[1], Samprada Tank[2], Monika Patel[1], Dipesh V Parmar[3], Niket Satapara[1], Mittal Rathod[4]

[1]Senior Resident, [3]Professor & Head, Department of Community Medicine, Shri M P Shah Government Medical College, Jamnagar, Gujarat, India.
[2]Senior Resident, Department of Pharmacology, Shri M P Shah Government Medical College, Jamnagar, Gujarat, India.
[4]Associate Professor, Department of Community Medicine, AIIMS, Vijaypur, Jammu, India.
Correspondence: Dr. Dipesh V Parmar, Email: parmardipesh@yahoo.com

Abstract:

Introduction: College students perusing health allied courses like Medical, Dental, Ayurveda and Physiotherapy are at a greater risk for overweight/obesity compared to their counterparts studying in other streams due to specific risk factors. **Objectives:** 1) The present study was conducted to find prevalence of obesity and overweight and their determinants in college-going students. 2) Internal comparison of obesity and overweight between students perusing selected health allied courses at Jamnagar City, Gujarat. **Method:** A cross-sectional study was conducted in 985 Medical, Dental, Ayurvedic and Physiotherapy college students using proportion of annual intake in each college. Data was collected using a pre-tested, structured questionnaire. Students were classified using Asian BMI cut-off. Chi-square test, ANOVA and Univariate logistic analysis were used as statistical tools. **Results:** Out of the total sample size of 985, 18.37% students were obese and 13.80% students were overweight. Higher mean BMI was seen in medical college students as compared to students of other colleges (F ratio = 3.58, p-value <0.01). Highest proportion of obesity was present in medical students (22.92%) and highest proportion of overweight was present in Dental students (19.02%). Increasing age is associated with higher prevalence of overweight/obesity (r = 0.70, p < 0.001, t = 30.29) **Conclusion:** Students who are older, male, have a positive family history of obesity or overweight, eat a mixed diet, consume more junk food, and spend more time sitting down than moving around are more likely to be overweight or obese.

Keywords: Allied health courses, Body Mass Index, Obesity, Overweight

Introduction:

Overweight and obesity have increased and evolved into a public health problem in the last century, particularly in developing countries.[1] Obesity can be defined as an abnormal growth of adipose tissue due to an enlargement of fat cell size (hypertrophic obesity) or an increase in fat cell number (hyperplastic obesity) or a combination of both.[2]

It has been observed that the period between youth and adulthood is crucial for the emergence of obesity and unhealthy lifestyles. Most university students have identified the main obstacles to participating in healthy activities as being a lack of

time, self-discipline, social support, and parental control.[3] An energy imbalance between calories consumed and expended is the primary cause of obesity along with positive history of obesity in parents and second-degree relatives. Increased consumption of foods high in energy, a lack of exercise, and urbanisation that promotes a sedentary lifestyle are the causes. [4,5]

Currently, the prevalence of obese college students in various courses is 20% in UK and Australia, 15.8% in Saudi Arabia, 15.6% in Thailand, 10% in Japan, and 7.8% in Iran.[6] Studies done on students pursuing health allied courses in India have shown wide variation in the prevalence of overweight and obesity. Similar studies from other cities of Gujarat medical students have reported obesity in the range of 6-11%.[7,8] Studies conducted on medical students in Kolkata have shown the prevalence of overweight and obesity as 47% and 13%, respectively whereas in Tamil Nadu it is 9% and 24%, respectively. [9]

Between 2010 and 2040, the incidence of overweight will more than double among Indian adults aged 20 to 69, but the prevalence of obesity will triple. Male prevalence of overweight and obesity is expected to increase to 30.5% (27.4%–34.4%) by 2040, while female prevalence is expected to increase to 27.4% (24.5%–30.6%). [10]

"Allied health courses" are specifically chosen for obesity study because they have predominantly sedentary lifestyle and gaps are present in training and education regarding obesity in young physicians. Most of the students have busy schedules due to which they have less time for physical activities. Gaps still exist in causation and training programmes of obesity for medical students. Along with medical students' other college students were taken to include all medical and para-medical students as most of them have similar lifestyle and paucity in literature of all the allied health courses. [11]

Considering the above facts, the present study was undertaken to detect the prevalence and determinants of overweight and obesity in students of selected health allied courses in study area.

Method:

A cross-sectional study was carried out in the study area between September 2021 and December 2022. The study was carried out in Medical (M.B.B.S, B.D.S & B.A.M.S) and Para-medical (B.P.T) students. The formula for sample size calculation is Z^2pq/l^2, where p is 11.53% prevalence of obesity taken from a previous study[8] and l is taken as 2% error with 95% Confidence Interval. The calculated sample size was 980. The total sample size was divided among four colleges by proportionate sampling method. The annual intake of different colleges is 250 for Medical college, 125 each for Dental and Ayurvedic college and 100 for Physiotherapy college. Hence, 41.66% samples were taken from Medical, 20.83% each from Dental and Ayurvedic colleges and 16.67% from Physiotherapy college. Thus, final sample size was 410 from Medical college, 205 each from Ayurvedic and Dental college and 165 from Physiotherapy college, hence total of 985 students were considered for the study. The total sample for each college was divided between 4 years equally.

Before conducting the study, an ethical approval letter (Project No:125/05/2021) was obtained from the Institutional Ethics Committee. Along with that approval letters from the Dean/Principal of concerned colleges were obtained beforehand.

Students who wished to give "Informed Consent" and were above 18 years of age were considered for the study. Exclusion criteria are students who were physically challenged, foreign nationality, having endocrine disorders and absent on the day of data collection.

By proper Review of Literature, a pre-designed and structured questionnaire was prepared. Pilot testing was done on nearly 10% of participants and some changes were made in the questionnaire. Data

collection was done in lecture halls and demonstration rooms post/pre-lectures. Students were selected in classroom by Simple Random Sampling Method using roll numbers. Data were collected by "Google Questionnaire forms" under the direct supervision of investigators after necessary instructions and assurance about ethical aspects of research and individual identification. Various factors considered in questionnaire were Socio-demographic characteristics, Dietary history, Sedentary and physical activity (including sports, walking or exercises in a gymnasium) and family history of obesity. Regarding socio-economic status classification –Modified Kuppuswami Scale[13] is used.

Weight and Height were recorded by the investigators. Weight was measured through Electronic Weighing Scale and Height was measured through a stadiometer. Weight was rounded off to 100 grams and height was rounded off to the nearest centimeter.

The weight and height were used to calculate the BMI of each student using the formula BMI= Weight (in kg) / Height (in m^2).[14]

BMI cut-off used was ASIAN BMI cut-off classification. [15] According to the classification underweight is classified as < 18.50 kg/m^2, normal as 18.50 to 22.99 kg/m^2, overweight as 23 to 24.99 kg/m^2, obese class 1 as 25 to 29.99 kg/m^2 and obese class 2 as > 30 kg/m^2.

Data was entered in Microsoft Excel and was analyzed using Microsoft Excel and SPSS (Statistical Package for Social Sciences) version 26.

Descriptive statistics in the form of percentages was applied to describe various variables under study for different study groups. The chi-square test was applied to detect the association between various variables among different study groups. ANOVA test was used to compare weight of students of selected colleges. Univariate logistic analysis was done for variables found positively associated by Chi-Square test.

Results:

A total of 985 students were included in the study out of which 410 were from Medical, 205 each from Dental and Ayurvedic and 165 from Physiotherapy. Males were 378 (38.37%) in number and females were 607 (61.62%). Most of the students were from 19, 20 and 21 years of age while only 27 (2.74%) were 24 or above. Majority of students were Hindus (89.34%). Hostel residing students were 716 (72.69%) while only 154 and 115 students were residing at home and paying guests respectively. Rural native was found in 307 (31.16%) students. Almost 2/3rd (64.87%) students belonged to nuclear family and 508 (51.57%) students belonged to upper middle socio-economic classification, followed by lower middle (31.57%) and none from lower class.

A positive history of parents for obesity/ overweight as perceived by study participants was present in 276 students (28.03%) and 366 students (37.15%) had a positive history of second-degree relatives as perceived by study participants being overweight/obese. Vegetarian diet was practiced by 81.01% students. Fruits were consumed by 436 students (44.26%) for 1-2 days in a week and 635 students consumed vegetables everyday (64.46%). Almost 85% of student had the habit of eating junk food / fast food every week. Groundnut oil as a cooking medium was used by 358 students (36.34%), while 204 students (20.71%) used cottonseed oil. About 205 students did not know about the type of oil consumed by them. Over 72% students had the habit of eating snacks in between meals.

As shown in Table 1, Mean weight (in BMI) is highest in medical students (Overall, boys and girls) and it is lowest among Physiotherapy students. On applying the ANOVA test for comparison of BMI of four colleges p-value is <0.05 which implies a statistical difference in BMI of the four colleges.

Figure 1 shows proportion of students having obesity/overweight along with underweight and normal BMI. The overall proportion was 32.18% and

Table 1: Gender wise distribution of mean BMI among study participants (N=985)

Course	BMI in kg/m^2 (Mean ± SD)		
	Overall	**Boys**	**Girls**
Medical	21.98 ± 4.23	21.95 ± 3.99	21.92 ± 4.23
Dental	21.37 ± 3.59	21.35 ± 3.77	21.68 ± 3.59
Ayurvedic	21.54 ± 3.77	21.21 ± 3.90	21.55 ± 3.79
Physiotherapy	20.81 ± 4.04	20.82 ± 4.08	20.81 ± 4.04
F ratio, d.f, p-value	3.58, 3, (0.013) *	1.26, 3, (0.28)	2.30, 3, (0.07)

Figure 1: Distribution of BMI in students of various health allied courses in Jamnagar city(N=985)
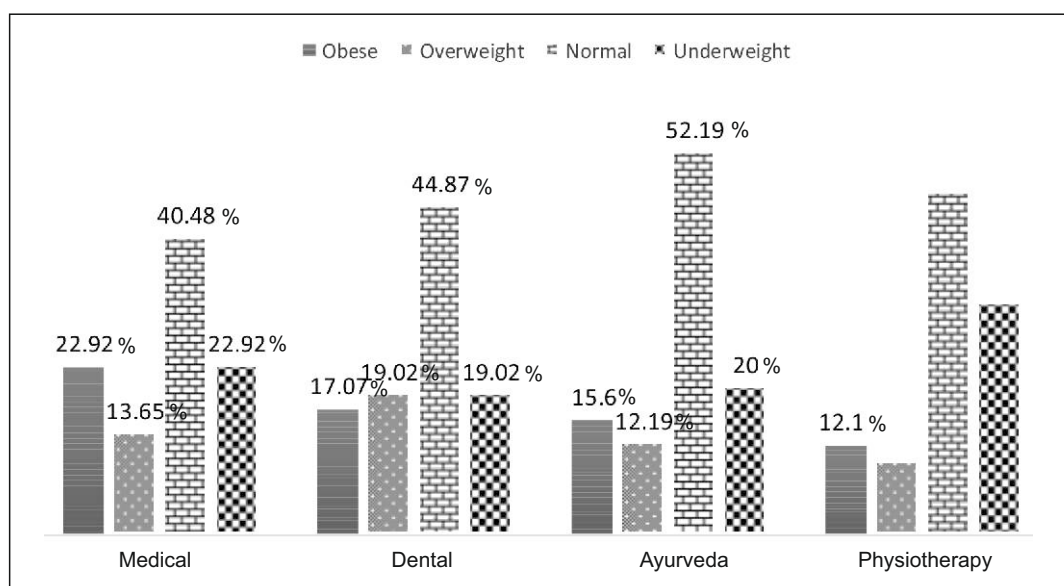
highest in medical students (36.58%) closely followed by Dental students (36.09%) and least being in Physiotherapy students (21.81%).

Out of 985 students, 442 students (44.87%) were in the normal category while 181 were in the obese category (18.37%) and 136 (13.80%) students were in overweight category. Total 226 students (22.94%) were in underweight category.

Socio-demographic factors and its association with overweight and obesity is shown separately for different colleges in table 2. Overweight was associated with pocket money per month, native and current residence in all 4 colleges. Obesity was associated with age, gender, pocket per month and current residence in all 4 colleges. There was gradual increase in obesity/overweight with age and was statistically significant (p-value = 0.03). Males have higher proportion of being overweight/obese (37.56%) as compared to females (28.82%) (p-value = 0.0014). Students having positive parent's history of obesity (39.85%) and second degree relative/ grandparents of obesity (37.97%) have higher chance of being obese/overweight and is statistically significant as compared with negative history (p-value = 0.001). Urban native (34.51%) students have higher chance of being obese/ overweight as compared to rural (27.03%) (p-value = 0.02).

Overweight and obesity for different colleges are compared with various dietary habits and physical activity of students (Table 3a and 3b). Overweight in college students was associated with daily intake of fruits, frequency of eating junk foods

Table 2(a): Socio-demographic factors and its association with overweight in different college students (N=136)

Variable	Overweight present				Total n=136	x^2, p value, d f
	Medical n=56 (%)	**Dental n=39 (%)**	**Ayurveda n=25 (%)**	**Physio-therapy n=16 (%)**		
A) Age Group (in completed years)						
18-19	18 (38.29)	13 (27.65)	9 (19.14)	7 (14.89)	47	0.79, 0.85, 3
20-21	22 (36.06)	26 (42.62)	8 (13.11)	5 (8.19)	61	
22-23	10 (47.61)	0 (0.00)	7 (33.33)	4 (19.04)	21	
24 and above	6 (85.71)	0 (0.00)	1 (14.28)	0 (0.00)	7	
B) Gender						
Male	31 (48.43)	17 (26.56)	13 (20.31)	3 (4.68)	64	7.12, 0.06, 3
Female	25 (34.72)	22 (30.55)	12 (16.66)	13 (18.05)	72	
C) Parents history of current/past obesity						
Present	15 (37.50)	8 (20.00)	9 (22.50)	8 (20.00)	40	5.42, 0.14, 3
Absent	41 (42.70)	31 (32.29)	16 (16.66)	8 (8.33)	96	
D) Second degree relative or grandparents' history of obesity						
Present	16 (33.33)	13 (27.08)	10 (20.83)	9 (18.75)	48	4.49, 0.21, 3
Absent	40 (45.45)	26 (29.54)	15 (17.04)	7 (7.95)	88	
E) Native						
Rural	23 (57.50)	5 (12.50)	8 (20.00)	4 (10.00)	40	9.06, 0.02*, 3
Urban	33 (34.37)	34 (35.41)	17 (17.70)	12 (12.50)	96	
F) Type of family						
Nuclear	40 (44.94)	22 (24.71)	19 (21.34)	8 (8.98)	89	5.21, 0.15, 3
Joint	7 (23.33)	11 (36.66)	6 (20.00)	6 (20.00)	30	
3rd Generation	9 (52.94)	6 (35.29)	0 (0.00)	2 (11.76)	17	

*p-value statistically significant

(in days) and consumption of snacks in between meals. Obesity in college students was associated with frequency of intake of junk foods, type of cooking oil used and consumption of snacks in between meals.

The chance of being obese/overweight was higher in students consuming mixed diet (40.10%) as compared to vegetarian (30.32%) and was statistically significant (p-value = 0.009). Students having junk food for 5-6 days (39.86%) have highest chance of being obese and not eating junk (24.66%) food has the least (p-value = 0.02). There is gradual increase in overweight/obesity with increase in sedentary hours. Similarly, there was decrease in overweight/obesity with increase in physical activity like walking, cycling, or running but is not statistically significant by Chi-square test.

Variables that are associated on applying Chi-square test for overweight/obesity are applied Binary Logistic Regression. Variables that are associated with Chi-square for total sample size of 985 are also positively associated on applying Binary logistic regression. (p-value < 0.05) (Table 4) Along with the variables shown in Table 4 other variables

Table 2(b): Socio-demographic factors and its association with obesity in different college students (N=181)

Variable	Overweight present				Total n=181	x^2, p value, d f
	Medical n=94 (%)	**Dental n=35 (%)**	**Ayurveda n=32 (%)**	**Physio-therapy n=20 (%)**		
A) Age group (in completed years)						
18-19	23 (39.65)	13 (22.41)	12 (20.68)	10 (17.24)	58	20.22, 0.002*, 6
20-21	32 (43.83)	17 (23.28)	16 (21.91)	8 (10.95)	73	
22-23	32 (76.19)	4 (9.52)	4 (9.52)	2 (4.76)	42	
24 & above	7 (87.50)	1 (12.50)	0 (0.00)	0 (0.00)	8	
B) Gender						
Male	46 (58.97)	10 (12.82)	17 (21.79)	5 (6.41)	78	8.30, 0.04*, 3
Female	48 (46.61)	25 (24.27)	15 (14.56)	15 (14.56)	103	
C) Parents history of current/past obesity						
Present	34 (48.57)	13 (18.57)	15 (21.42)	8 (11.42)	70	1.20, 0.75, 3
Absent	60 (54.05)	22 (19.81)	17 (15.31)	12 (10.81)	111	
D) Second degree relative or grandparents' history of obesity						
Present	43 (47.25)	16 (17.58)	22 (24.17)	10 (10.98)	91	5.47, 0.14, 3
Absent	51 (56.66)	19 (21.11)	10 (11.11)	10 (11.11)	90	
E) Native						
Rural	20 (45.45)	6 (13.63)	12 (27.27)	6 (13.63)	44	4.82, 0.18, 3
Urban	74 (54.01)	29 (21.16)	20 (14.59)	14 (10.21)	137	
F) Type of family						
Nuclear	63 (55.75)	22 (19.46)	18 (15.92)	10 (8.84)	113	9.58, 0.14, 6
Joint	15 (35.71)	9 (21.42)	9 (21.42)	9 (21.42)	42	
3rd Generation	16 (61.53)	4 (15.38)	5 (19.23)	1 (3.84)	26	

*p-value statistically significant

which are positively associated with overweight/obesity are increasing hours spent in sitting/reclining and increased frequency in eating junk food in a week or eating snacks in between meals.

Co-relation between age and obesity/overweight has been analyzed. There has been an increasing prevalence of obesity/overweight with age. On applying Pearson's Co-relation co-efficient (r) is 0.70 which implies a moderately strong positive correlation, t value for the same is 30.29 and p-value < 0.001 which implies a positive association.

Discussion:

The present study was done to detect the overall prevalence of overweight and obesity in medical and para-medical students of the area along with its associated factors. The overall Mean BMI of 985 students comprising all faculties is 21.63 ± 3.99 kg/m^2. Similarly, in a study conducted in Tamil Nadu[16] Mean BMI of students was 21.84 ± 2.55 kg/m^2. A previous study done in Karachi, Pakistan[17] and Saudi Arabia[12] reported higher BMI as compared to the present study. Overall, in present study, 317 (32.18%) students were found to have obesity or

Table 3 (a): Association of dietary habits & physical activity with overweight in students of different colleges (N=136)

Variable	Overweight present				Total n=136	x^2, p value, d f
	Medical n=56 (%)	**Dental n=39 (%)**	**Ayurveda n=25 (%)**	**Physio-therapy n=16 (%)**		
A) Type of diet						
Vegetarian	43 (43.43)	26 (26.26)	19 (19.19)	11 (11.11)	99	1.45, 0.69, 3
Mixed/ Non-Vegetarian	13 (35.13)	13 (35.13)	6 (16.21)	5 (13.51)	37	
B) Number of days eating fruits						
Not eating Fruits	11 (39.28)	8 (28.57)	5 (17.85)	4 (14.28)	28	33.22, <0.001*, 6
1-2	12 (19.35)	27 (43.54)	16 (25.80)	7 (11.29)	62	
3-4	14 (73.68)	2 (10.52)	3 (15.78)	0 (0.00)	19	
5-6	15 (88.23)	1 (5.88)	0 (0.00)	1 (5.88)	17	
Daily	4 (40.00)	1 (10.00)	1 (10.00)	4 (40.00)	10	
C) Number of days eating junk food/fast food						
Not eating Junk Food	5 (35.71)	4 (28.57)	3 (21.42)	2 (14.28)	14	34.06, <0.001*, 12
1-2	1 (2.85)	18 (51.42)	9 (25.71)	7 (20.00)	35	
3-4	30 (61.22)	10 (20.40)	6 (12.24)	3 (6.12)	49	
5-6	13 (59.09)	3 (13.63)	4 (18.18)	2 (9.09)	22	
Daily	7 (43.75)	4 (25.00)	3 (18.75)	2 (12.50)	16	
D) Number of days eating snacks in between meals or having late night snacks						
Not having snacks in between meals	9 (28.12)	11 (34.37)	9 (28.12)	3 (9.37)	32	19.03, 0.02*, 9
1-2	15 (36.58)	12 (29.26)	5 (12.19)	9 (21.95)	41	
3-4	13 (76.47)	2 (11.76)	2 (11.76)	0 (0.00)	17	
5-6	7 (58.33)	2 (16.66)	2 (16.66)	1 (8.33)	12	

*p-value statistically significant

overweight. A study done in Ujjain[17] on medical students reported that 44.9% as either obese/ overweight. A lower prevalence of obesity/ overweight was found in a study by Panchal et al[7] which was 18.1% and by Sarkar et al.[18] A higher proportion of obesity was seen in a study conducted by Nisar in Karachi. [17]

Obesity/overweight proportion increases with increase in age which is also found positive in other studies.[7,11,19] Males had a higher chance of being obese/overweight which may be due to their higher outings and consumption of fast food whereas females may be cautious about their weight. A similar finding is seen in a study by Geeta Mani[16] in which prevalence of obesity/overweight was higher in males as compared to females whereas in contrast to a study conducted in Saudi Arabia[12] in which females had a higher chance of being obese. In two other studies, no significant association was found between gender and obesity.[7,19]

Strong association of parental history with obesity has also been obtained in past from other studies in which the significance of p-value ranges from <0.05 to <0.00001[7,11,19,20,21,22] Such strong data on

TABLE 3 (b): Association of dietary habits with obesity in students of different health courses (N=181)

Variable	OBESITY PRESENT (n=181)				Total n=181	x^2, p value, d f
	Medical n=94 (%)	Dental n=35 (%)	Ayurveda n=32 (%)	Physio-therapy n=20 (%)		
A) Type of diet						
Vegetarian	73 (51.04)	28 (19.58)	23 (16.08)	19 (13.28)	143	4.18, 0.24, 3
Mixed/ Non-Vegetarian	21 (55.26)	7 (18.42)	9 (23.68)	1 (2.63)	38	
B) Number of days eating fruits						
Not eating Fruits	26 (46.42)	14 (25.00)	7 (12.50)	9 (16.07)	56	10.33, 0.58, 12
1-2	28 (48.27)	11 (18.96)	14 (24.13)	5 (8.62)	58	
3-4	13 (56.52)	2 (8.69)	6 (26.08)	2 (8.69)	23	
5-6	16 (59.25)	5 (18.51)	4 (14.81)	2 (7.40)	27	
Daily	11 (64.70)	3 (17.64)	1 (5.88)	2 (11.76)	17	
C) Number of days eating junk food/fast food						
Not eating Junk Food	12 (52.17)	5 (21.73)	3 (13.04)	3 (13.04)	23	29.81, 0.002*, 12
1-2	34 (69.38)	8 (16.32)	4 (8.16)	3 (6.12)	49	
3-4	31 (60.78)	7 (13.72)	9 (17.64)	4 (7.84)	51	
5-6	8 (20.51)	15 (38.46)	11 (28.20)	5 (12.82)	39	
Daily	8 (42.10)	2 (10.52)	5 (26.31)	4 (21.05)	19	
D) Number of days eating snacks in between meals or having late night snacks						
Not having snacks in between meals	15 (40.54)	10 (27.02)	8 (21.62)	4 (10.81)	37	19.26, 0.02*, 9
1-2	23 (38.98)	11 (18.64)	14 (23.72)	11 (18.64)	59	
3-4	17 (70.83)	2 (8.33)	4 (16.66)	1 (4.16)	24	
5-6	14 (82.35)	2 (11.76)	1 (5.88)	0 (0.00)	17	

 *p-value statistically significant

positive family history with BMI signifies that positive parental history of obesity plays a vital role in deciding the BMI status of child. Similarly, positive association has been found between second degree relative /grandparent's history of obesity with student's current obesity status in other studies also.[12,21]

The maximum proportion of overweight or obesity is seen in students staying at home (35.06%) and the least in staying as paying guests or rentals (27.82%). However, data is not statistically significant. In a study conducted by Das et al [20] in Kolkata current residence has been significantly associated with non-communicable diseases like obesity and Hypertension. Similar findings were also obtained by a study in Saudi Arabia. [12] Least prevalence of obesity/overweight is seen in Upper lower class (26.82%) and maximum is seen in upper middle class (34.05%). There is no role of socio-economic status in determining the BMI status of students. However, contradictory results have been obtained in other studies in which higher socio-economic status students have higher chance of being obese and data is significantly associated.[8,22]

The role of diet as vegetarian or non-vegetarian has been controversial as findings from Deshpande et

Table 4: Association between overweight/obesity with multiple independent factors using univariate logistic regression (N=985)

Variables	Overweight/Obesity		OR (95%CI)	P-value
	Present n (%)	Absent n (%)		
A] Faculty/Course				
Medical	150 (36.58)	260 (63.42)	2.03 (1.35-3.14)	(0.001)*
Dental	74 (36.09)	131 (63.91)	2.01 (1.26-3.22)	(0.001)*
Ayurveda	57 (27.80)	148 (72.20)	1.38 (0.85-2.22)	(0.18)
Physiotherapy	36 (21.81)	129 (78.19)	-	-
B] Gender				
Male	142 (37.56)	236 (62.44)	1.49 (1.13-1.96)	(0.004)*
Female	175 (28.82)	432 (71.18)	-	
C] Religion				
Hindu	268 (30.45)	612 (69.55)	-	-
Muslim	21 (44.68)	26 (55.32)	1.84 (1.02-3.33)	(0.04)*
Jain	24 (48.00)	26 (52.00)	2.10 (1.18-3.73)	(0.01)*
D] Parental history of overweight/obese				
Present	110 (39.85)	166 (60.15)	1.60 (1.20-2.13)	(0.001)*
Absent	207 (29.19)	502 (70.81)	-	-
E] Second degree relative/grandparents' history of obese/overweight				
Present	139 (37.97)	227 (62.02)	1.51 (1.15-1.99)	(0.003)*
Absent	178 (28.75)	441 (71.25)	-	-
F] Native				
Rural	83 (27.03)	224 (72.97)	0.71 (0.53-0.96)	(0.02)*
Urban	234 (34.51)	444 (65.48)	-	-
G] Type of diet				
Vegetarian	242 (30.32)	556 (69.68)	0.65 (0.46-0.90)	(0.01)*
Mixed/Non-Veg	75 (40.10)	112 (59.90)	-	-

*p-value statistically significant

al[18] and Das et al.[20] Both have reported type of diet as non-significant for BMI while Panchal et al[7] have found it significantly associated which is in line with the present study findings. As per the present study, there is gradual decrease in obesity with an increase in intake of fruits in a week. A multi-centric study conducted by Gulati et al[22] has shown significant difference between less fruit consumption and obesity. Similar findings have also been obtained in a cross-sectional study done in Tamil Nadu.[16] There is no significant association between number of days of eating vegetables with proportion of overweight or obesity whereas a prospective cohort study that was done for over 24 years it mentioned that increasing intake of vegetables is inversely related to weight of a person. However, starchy vegetables like potatoes, peas and corn were associated with increased weight gain but green leafy vegetables and vegetables with higher fibre content are responsible for lower weight in longer term.[23] The present study has found

positive association between obesity and increasing intake of junk food while a study conducted by Eway Makkay et al[12] by applying bivariate analysis reported no association between junk food and high BMI. However, from other studies conducted in India and Pakistan, significant positive association has been found between junk food eating frequency and BMI of students.[6,16,19,21]

There is a gradual increase in prevalence of obesity/overweight as the duration of sitting/reclining increases among students. The maximum prevalence of obesity/overweight is seen in students having > 4 hours of sitting time (37.20%) while least is seen in the 2-3 hours group of students (21.95%). In a study done on undergraduate medical students in Tamil Nadu[20] almost 50% obesity has been found in students sitting > 4 hours in a day and a study done by Panchal et al[7] on same study population found highly significant association between obesity and sitting/watching TV/relaxing for > 2 hours in a day. No significant association has been found between walking and BMI in students which is similar to findings of other studies.[7, 18, 24] Aerobic activities like cycling, gyming, or running is also not found to be associated with BMI and similar findings have also been found in other studies in different geographies like Kolkata, Gujarat, and Saudi Arabia.[7,12,20]

Conclusion:

Medical students have higher mean BMI as compared to students of other colleges. Increasing age is associated with increasing overweight/obesity. Male students have higher chance of being obese/overweight as compared to female students. Positive parental history, second-degree relative history of obesity, mixed diet and urban native are associated with higher obesity. Higher frequency of consumption of junk foods, consuming snacks in between meals and longer duration of sedentary hours have positive association with obesity in students.

Recommendations:

Students should be screened at the time of admission for high BMI and those screened positive should have regular follow-up and counselling for weight loss. Students with increasing age group have higher BMI hence health education should be imparted at younger age group to avoid increasing obesity in higher age group. Health education in the form of imparting knowledge regarding calorific value of junk foods and avoiding them should be given. Students should also be taught about increasing fruit intake along with decreasing late-night snack or snacks in between meals.

Limitations:

The present study is a cross-sectional study and all the limitations of cross-sectional study are applicable to it. Temporality of association cannot be established as no follow-up or backward history was taken. As data was collected by proforma/questionnaire there is a high chance of recall bias from the study participants. BMI is used which considers only weight, which can be in the form of muscle mass or fat and it cannot be differentiated by BMI. The present study is being done in the urban area of a specific district and hence findings cannot be generalized. Any one institute would not represent the proportions of obesity in community. Present study was done on selected health allied courses hence they were considered. Authors are not claiming the findings of this study on general community.

Declaration:

Funding: Nil

Conflict of Interest: Nil

References:

1.   World Health Organization. 10 years in public health: non-communicable diseases slow motion disaster [e-book]. Geneva: World Health Organization; 2017 Available from: http://www.who.int/publications/10-yearreview/ncd/en/ Accessed on June 2023

2.   K. Park, Preventive and Social Medicine, 26th edition, Banaridas Bhanot Publishers Jabalpur, 2021, page number 443.

3.   Deliens, T; Deforche, B.; De Bourdeaudhuij, I.; Clarys, P. Determinants of physical activity and sedentary behaviour in university students: A qualitative study using focus group discussions. BMC Public Health 2015, Volume 15, page 1-9

4.   World Health Organization; WHO Fact Sheet Available at: https://www.who.int/newsroom/fact-sheets/detail/obesity-and-overweight ; Accessed on June 2023

5.   Tamara S Hannon, Silva A Arslanian, Obesity in Adolescents, The New England Journal of Medicine, 2023, Vol 389 Issue (3), pg – 251-261

6.   Ghonge S, Bhambhani GD, Adhav PV, Thakor N. Determinants of obesity and overweight among college students of Pune city, Maharashtra, India: A cross sectional study. International Journal of Research in Medical Science. 2015; 3:3638-43

7.   Panchal SN, Akash Agrawal, Nilesh Thakor; Prevalence and determinants of overweight and obesity among college students of Gujarat, India; International Surgery Journal. 2019 Dec;6(12) page 1-5

8.   Mehta DP, Chauhan MG, Koria B, Singh M. Prevalence of obesity among first-year medical students of Government Medical College, Bhavnagar. International Journal of Medical Science & Public Health 2016; 5:59-63

9.   Shweta Goswami, Rekha Dutt, Sengupta S, Chaudhuri S, Ahmad S, Yadav AK. Prevalence of Non-Communicable Diseases' Risk Factors among Medical Students in South Kolkata, West Bengal. National Journal of Community Medicine, 2018; Vol 9 Issue (5): 334-339

10. Luhar S, Timaeus IM, Jones R, Cunningham S, Patel SA, Kinra S, et al. Forecasting the prevalence of overweight and obesity in India to 2040. PLoS ONE. 2020 Vol 15 Issue (2) page: 1-17

11. Vitolins MZ, Crandal S, Miller D, Ip E, Marion G, Spangler JG; Obesity educational interventions in U.S. medical schools: a systematic review and identified gaps. Teach Learn Medicine; 2012, volume 24, issue 3: p 267-72

12. Eyad Makkawy, Alrakha Almaali, Al-Mubarak Ameena, Altoibi Hanouf T, Altoibi Noor T, et al, Prevalence of overweight and obesity and their associated factors among health sciences college students, Saudi Arabia; Journal of family medicine and primary care; 2021, Vol 10 Issue 2: p 961-967

13. Parimal Patel & Khusboo Makadia, Golden Notes for Preventive and Social Medicine, Ch 2- Mastering the concepts of family study, 2nd edition, New Delhi, Jaypee brothers' medical publishers, 2021, p 8-9

14. K Park, Textbook of Preventive and Social Medicine, 26th edition, Banaridas Bhanot Publishers, Jabalpur, page 445

15. 2022 BMI Classification Percentile and cut-off point, Available at https://www.ncbi. nlm.nih.gov/books/NBK541070/ Accessed on June 2023

16. Geeta Mani, S Sai, Assessment of Body Mass Index and its Associated Nutritional Factors Among Undergraduate Medical Students in Tamil Nadu, India: A Cross Sectional Study; Journal of Pioneering Medical Sciences;2014, Volume 4, Issue 3.25-30

17. Hingorjo MR, Syed S, Qureshi MA. Overweight and obesity in students of a dental college of Karachi: lifestyle influence and measurement by an appropriate anthropometric index. J Pak Med Assoc. 2009;59(8):528–32.

18. Deshpande K, Patel S, Bhujade R, Deepak P. Lifestyle and Obesity among College Students in Ujjain, India. National Journal of Community Medicine 2013; 4(2): 291-293.

19. Sarkar P, Mahadeva, Raghunath H, Kruthi BN. A Cross Sectional Study to Determine Overweight and Obesity among Medical Students and to correlate it with Parameters of Metabolic Syndrome. International Journal of Clinical Biochemistry and Research 2015;2(4):210-215

20. Das P, Basu M, Chowdhury K, Mallik S, Dhar G, Biswas A. Observational assessment, and correlates to blood pressure of future physicians of Bengal. Niger J Clin Practice 2013; 16:433-8.

21. Corica D, Aversa T, Valenzise M, Messina MF, Alibrandi A, De Luca F et al. Does Family History of Obesity, Cardiovascular, and Metabolic Diseases Influence Onset and Severity of Childhood Obesity? Front Endocrinol (Lausanne). 2018 May 2; 9:187

22. Seema Gulati, Anoop Misra, Susan L Colles, Dimple Kondal, Nidhi Gupta, Kashish Gohel et al Dietary Intakes and Familial Correlates of Overweight/Obesity: A Four-Cities Study in India. Annals of Nutrition and Metabolism; 2013; 62:279–290.

23. Bertoia ML, Mukamal KJ, Cahill LE, Hou T, Ludwig DS, Mozaffarian D. Correction: Changes in intake of fruits and vegetables and weight change in United States men and women followed for up to 24 years: Analysis from three prospective cohort studies. PLoS Med [Internet]. 2016;13(1): e1001956.

24. Anita Garg Mangla, Neeru Dhamija, Urvashi Gupta, Meenal Dhall; Familial background as a hidden cause of obesity among college going girls; Journal of Biosciences and Medicines; Volume 07 Issue:04, 2019 page 1—13