

# Association of Body Mass Index (BMI) with Diet, Physical Activity, and Lifestyle among Undergraduate Dental Students in a Private Dental College in Bangladesh.

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**ABSTRACT:**

**Background:** Obesity can lead to severe health problems and elevate the risk of diseases such as hypertension, dyslipidemia and diabetes due to metabolic changes. Undergraduate dental students often struggle to maintain a healthy lifestyle and eating habits due to academic pressures. BMI, a standard obesity measure, is simple to calculate and assess nutritional status, helping to identify and prevent obesity-related diseases in at-risk individuals. **Method:** A cross-sectional study was performed among 253 students of Sapporo Dental College, a private dental college in Uttara, Dhaka, Bangladesh, to reveal the prevalence of overweight and obesity according to BMI and its association with dietary habits, physical activities, and lifestyles among them. Data was collected using a self-written, anonymous, semi-structured questionnaire using the convenient sampling technique between July 2023 and September 2023. **Result:** Among the 253 participants, females (n = 190, 75.10%) are more than males (n = 63, 25%). The prevalence of normal weight, underweight, overweight, and obesity among the participants were 132 (37.93%), 31 (8.91%), 56 (16.09%), and 129 (37.07%), respectively, based on BMI. 84% of obese students was taken 1 meal from outside per day (p values < 0.05). 52% obese students did not engage in any form of physical activity on a weekly basis (p value 0.03). 55.5% obese students slept for < 6 hours every night (p-value 0.04). **Conclusion:** Early modifications of lifestyle improve health. Annual screenings help to prevent obesity. Fitness and diet programs can reduce dental students' chronic disease risk. Study participants are future physicians. Thus, dental students should be physically active and aware of their eating and sleep habits to reduce obesity, which might influence patients' outlooks.

**KEY WORDS:** Body Mass Index (BMI), Obesity, Undergraduate dental students,**INTRODUCTION**

In the 21st century, science, technology, and disease patterns are changing dramatically. Chronic diseases like cardiovascular issues, COPD, cancer, hypertension, and obesity are on the rise due to epidemiological shifts. Obesity has especially become widespread, affecting more people globally than any other chronic condition <sup>1</sup>.

"Globesity," a term coined by a writer at the World Health Organization, combines "global" and "obesity." Once limited to developed nations, it's now a worldwide problem, impacting our youth and potentially reducing their lifespans <sup>2</sup>. In the adult population, 23% are overweight and 9.8% are obese. By 2030, it's projected to rise to 2.16 billion overweight adults (38%) and 1.12 billion obese adults (20%) <sup>3</sup>. Around 115 million people in developing countries are affected by obesity and overweight. This could be due to the nutritional transition happening in these nations. The nutritional transition occurs due to rapid economic development and globalization, resulting in unhealthy dietary habits and sedentary lifestyles <sup>4</sup>. Obesity can cause severe health issues and increase the risk of many diseases, including hypertension, dyslipidemia, diabetes mellitus, orthopedic complications, gallstones, breast cancer, and psychological disorders, due to metabolic changes. The number of years a person lives with obesity correlates directly with the risk of mortality <sup>5</sup>.

An unhealthy diet, a major modifiable risk factor, heavily influences obesity. Various dietary recommendations aim to manage and prevent obesity <sup>6</sup>. Diet's role in obesity-related disorders is crucial for developing dietary guidelines <sup>7</sup>. Modern technology has dramatically enhanced living and working conditions, positively affecting daily activities. However, people often spend long hours in front of screens, burning fewer calories than engaging in physical activity <sup>8</sup>.

Sleep disruption impacts leptin levels, a hormone that signals fullness,

and ghrelin, which stimulates hunger. Lack of sleep reduces leptin and increases ghrelin, promoting weight gain and obesity<sup>9</sup>. BMI, a widely used measure of obesity, is easy to calculate and categorizes individuals as underweight, normal, overweight, or obese, aiding in the identification and prevention of obesity-related diseases in pre-obese individuals<sup>10</sup>. University students often struggle to maintain a healthy lifestyle due to limited access to physical activities, busy schedules, and unhealthy eating habits resulting from academic pressures. This leads to neglect of nutritious food choices and exercise<sup>11</sup>. Studies conducted on medical students and healthcare professionals throughout numerous nations indicate that obesity and overweight are issues for these populations<sup>12</sup>. In Bangladesh, the rate of urbanization and lifestyle changes is rising, which increases the possibility of a rise in overweight and obesity among young adults<sup>13</sup>. Undergraduate dental students in Bangladesh also have to endure academic pressure and hectic examination schedules, just like their medical counterparts. No studies have been conducted yet about the association between BMI and Bangladeshi undergraduate dental students' dietary habits, physical activities, and lifestyles. As a result, it is essential to identify the eating habits, lifestyles, and physical activities linked with overweight and obesity in Bangladeshi dentistry students. Early identification of risk factors for overweight and obesity in dental students would facilitate the development of interventions to reduce the prevalence of overweight and obesity in this population.

Therefore, the primary objectives of this study are to investigate the prevalence of overweight and obesity according to BMI and its association with the dietary habits, physical activities, and lifestyles of Bangladeshi dental students.

#### MATERIALS AND METHODS:

**Study Design:** A cross-sectional study was conducted from July 2023 to December 2023. **Study sites:** Sapporo Dental College, a private dental college in Uttara, Dhaka, Bangladesh, was selected as the study site. **Study Population:** Three hundred current, apparently healthy students of both sexes between the ages of 18 to 24 years of the study site from their first to fourth academic years were actively involved—finally, 253 dental students enrolled in the study. Participants, both male and female, suffering from metabolic disorders such as hypothyroidism, type 2 diabetes mellitus, Cushing's syndrome and students who are taking steroids and anti-obesity drugs and pregnant students were excluded.

**Sampling technique:** Data collection was conducted using a convenient sampling technique. **Study Questionnaire:** Data was collected using an anonymous, self-written, semi-structured questionnaire. The initial section of the questionnaire recorded the student's age, level of study, height, and weight after obtaining written consent. The questionnaire had three parts. The first covered eating habits, including meals eaten out, and consumption of snacks, sweets, and soft drinks. The second focused on physical activity, asking about weekly exercise, sports participation, daily walking, and reasons for not exercising.

The third section documented the participant's lifestyle, including daily sleep, study time, social interactions time, and screen time. Weight and height were accurately measured to calculate BMI for age. A digital scale on a hard surface was used, avoiding carpet and spring-loaded scales. Participants removed shoes and heavy clothing, and weight was recorded to the nearest decimal (e.g., 25.1 k)<sup>14</sup>.

Participants stood upright with arms at their sides, shoulders level, and head straight. They stood against a wall with heads, shoulders, buttocks, and heels touching it. A flat headpiece was lowered to the crown, and height was marked on the wall. Height was measured to the nearest 1/8 inch or 0.1 cm and then converted to meters<sup>15</sup>.

Body Mass Index (BMI), formerly the Quetelet index, assesses nutritional status by dividing weight in kilograms by height in meters squared. According to WHO, BMI ranges are: normal (18.5–24.99 kg/m<sup>2</sup>), overweight (25–29.99 kg/m<sup>2</sup>), and obese (30–34.99 kg/m<sup>2</sup>)<sup>16</sup>. A pretest was conducted on a selected group, and modifications were made before data collection.

**Data collection:** Data were collected from July to September 2023. Participants were informed about the study's objectives and gave written consent after ethical committee approval. Interviews were conducted during class breaks in the canteen and classrooms.

**Data Analyses:** Results were presented as mean  $\pm$  standard deviation, frequency, and percentage. The chi-square test assessed differences in food, exercise, and lifestyle responses by BMI. Statistical analysis was performed using STATA MP Version 16, with significance set at  $p < 0.05$ .

#### RESULT:

Out of the 300 dental students approached, 253 students participated in the study, resulting in a response rate of 84.33%. Among the 253 participants, 75.10% were female and 25% were male. Background information of the study participants is presented in **Table 1**. In males, 27.42% were over-weight and 6.45% were obese. Similarly, among females 21.43% were over-weight, and 11.54% were obese. The prevalence of over-weight was found to be high in males as compared to females and prevalence of obesity was found to be high in females compared to males. This comparison of BMI categories between male and female are shown in **Figure 1**. Response to questions about dietary habits, physical activities, and lifestyle by BMI were presented in **Table 2, Table 3 and Table 4** respectively.

**Table 1: Background information of study participants (n=253)**

Variables	Frequency	Percentage
Age (in years), Mean (SD)	21.81 $\pm$ 1.41	
Weight (Kg), Mean (SD)	61.94 $\pm$ 12.59	
Height (Meter), Mean (SD)	1.61 $\pm$ 0.10	
<b>Gender</b>		
Male	63	24.90
Female	190	75.10
<b>BMI</b>	23.83 $\pm$ 4.48	
<b>BMI category</b>		
Normal weight	132	37.93
Underweight	31	8.91
Overweight	56	16.09
Obese	129	37.07

\*BMI: Body mass index

**Table 1** shows the mean age of the study participants was 21.81 years (SD  $\pm$  1.41), a mean weight of 61.94 kg (SD  $\pm$  12.59), a mean height of 1.61 meters (SD  $\pm$  0.10), and a mean BMI of 23.83 (SD  $\pm$  4.48).

The prevalence of normal weight, underweight, overweight, and obesity among the participants was 132 (37.93%), 31 (8.91%), 56 (16.09%), and 129 (37.07%), respectively, based on BMI.

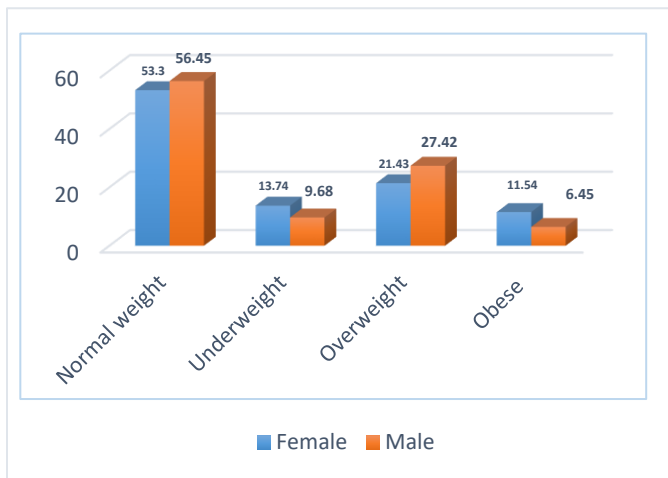


Fig 1: Comparison of BMI categories between male and female

Table 2: Response to questions related to dietary habits.

	0	1	2	3	>3	P-value
<b>Q1: Number of meals per day</b>						
Normal weight %	0.00	1.52	27.27	70.45	0.76	0.99
Underweight %	0.00	0.00	25.81	74.19	0.00	
Overweight %	0.00	1.79	25.00	71.43	1.79	
Obese %	0.00	0.00	28.00	72.00	0.00	
	0	1	2	3	>3	P-value
<b>Q2: How many meals you take outside per day?</b>						
Normal weight %	32.58	59.85	7.58	0.00	0.00	0.04
Underweight %	32.26	61.29	6.45	0.00	0.00	
Overweight %	23.21	62.50	14.29	0.00	0.00	
Obese %	16.00	84.00	0.00	0.00	0.00	
	0	1	2	3	>3	P-value
<b>Q3: How many snacks do you take per day?</b>						
Normal weight	8.33	67.42	22.73	1.52	0.00	0.75
Underweight	12.90	58.06	29.03	0.00	0.00	
Overweight	8.93	62.50	25.00	1.79	1.79	
Obese	20.00	56.00	24.00	0.00	0.00	
	0	1	2	3	>3	P-value
<b>Q4: How many times do you take soft drinks per day?</b>						
Normal weight	71.97	25.76	0.76	1.52	0.00	0.60
Underweight	70.97	25.81	3.23	0.00	0.00	
Overweight	75.00	19.64	1.79	3.57	0.00	
Obese	56.00	40.00	0.00	4.00	0.00	

	0	1	2	3	>3	P-value
<b>Q5: How many times do you take sweets per day?</b>						
Normal weight	50.00	46.21	3.79	0.00	0.00	0.30
Underweight	67.74	25.81	6.45	0.00	0.00	
Overweight	58.93	35.71	5.36	0.00	0.00	
Obese	40.00	52.00	8.00	0.00	0.00	

Table 2 shows 84% of obese students was taken 1 meal from outside per day, which was statistically significant (p values < 0.05). Obese students had a much higher soft drink intake rate of 40% compared to other groups

Table 3: Response to questions on physical activities

	0	1	2	3	>3	P-value
<b>Q1: How many times you do physical exercises per week?</b>						
Normal weight	13.5	17.56	52.27	16.67	0	0.03
Underweight	80.65	9.68	6.45	3.22	0	
Overweight	65.67	19.02	13.01	2.3	0	
Obese	52	26.5	12	9.5	0	
	0	1	2	3	>3	P-value
<b>Q2: How many hours do you spend exercising per session?</b>						
Normal weight	59.09	36.36	0.76	3.79	0.00	0.34
Underweight	80.65	19.35	0.00	0.00	0.00	
Overweight	60.71	33.93	3.57	1.79	0.00	
Obese	68.00	28.00	4.00	0.00	0.00	
	0	1	2	3	>3	P-value
<b>Q3: How many times do you sport per week? (Swimming, football, volleyball, etc.)</b>						
Normal weight	84.09	11.36	1.52	3.03	0.00	0.13
Underweight	93.55	6.45	0.00	0.00	0.00	
Overweight	78.57	7.14	8.93	5.36	0.00	
Obese	92.00	0.00	4.00	4.00	0.00	
	0	1	2	3	>3	P-value
<b>Q4: How many hours do you walk daily other than routine walking?</b>						
Normal weight	37.88	53.79	5.30	3.03	0.00	0.55
Underweight	45.16	51.61	3.23	0.00	0.00	
Overweight	46.43	42.86	8.93	1.79	0.00	
Obese	48.00	36.00	8.00	8.00	0.00	

Q5: Is/are there any reason/s you cannot or should not do physical exercise?

	Lack of time due to					P-value
	Lazy	Medical	Academics	Finance	Others	
Normal weight%	12.12	3.79	65.15	1.52	17.42	
Underweight %	35.48	0.00	72.00	0.00	22.58	0.12
Overweight %	17.86	3.57	67.86	0.00	10.71	
Obese %	20.00	0.00	41.94	0.00	8.00	

Table 3 illustrates the statistically significant difference in the number of times spent on physical exercise each week based on the questions asked. More than half of the obese students (52%) did not engage in any form of physical activity on a weekly basis (p value 0.03), according to BMI categories. Remarkably, 92% of obese students reported not participating in any sports activities like swimming, football, volleyball, etc., and 40% did not engage in daily walking beyond routine activities.

Table 4: Response to questions on lifestyle

	<6 hours	6 to 8 hours	8 to 10 hours	10 to 12 hours	>12 hours	P-value
	<b>Q1: How many hours do you sleep per day?</b>					
Normal weight %	32.5	45.8	20.5	1.2	0	0.04
Underweight %	25.6	51.61	3.23	12.2	7.36	
Overweight %	18.2	12.85	63.4	5.55	0	
Obese %	55.5	12.5	12.7	16.6	2.7	

	0	1	2	3	>3	P-value
	<b>Q2: How many hours do you study per day? (Other than college hours)</b>					
Normal weight	1.52	8.33	14.39	28.03	47.73	0.94
Underweight	0.00	0.00	16.13	29.03	54.84	
Overweight	0.00	8.93	14.29	28.57	48.21	
Obese	0.00	4.00	16.00	24.00	56.00	

	0	1	2	3	>3	P-value
	<b>Q3: How many hours do you spend with your friends per day?</b>					
Normal weight	18.18	43.18	13.64	5.30	19.70	0.66
Underweight	29.03	25.81	6.45	6.45	32.26	
Overweight	17.86	48.21	12.50	5.36	16.07	
Obese	24.00	48.00	12.00	0.00	16.00	

	0	1	2	3	>3	P-value
	<b>Q4: How many hours do you spend watching TV, Internet surfing per day?</b>					
Normal weight	3.79	30.30	34.85	12.12	18.94	0.30
Underweight	0.00	19.35	41.94	22.58	16.13	
Overweight	0.00	19.64	44.64	14.29	21.43	
Obese	8.00	20.00	32.00	8.00	32.00	

Table 4 includes lifestyle-related questions; significant associations were observed in the daily sleep duration. In terms of BMI categories, 55.5% of students who were obese slept for < 6 hours every night, which is statistically significant (p-value 0.04). About 45% of overweight students reported spending 2 hours per day on screens, while 32% of obese students reported spending more than 3 hours.

## DISCUSSIONS:

As a result of their reduced physical activity and inappropriate eating patterns, dental students are more susceptible to obesity and overweight-related issues. In the present study, the prevalence of overweight and obesity among dental students was 16% and 37%, respectively. In a cross-sectional study of medical students in Dhaka, Akhter et al. discovered that 20.5% were overweight and 4.5% were obese<sup>13</sup>. Gupta et al. observed a similar outcome, with 17.5% overweight and 3.4% obese among Medinipur and West Bengal undergraduate medical students<sup>17</sup>. A study of medical students in Lahore found a higher prevalence of obesity among males than females<sup>18</sup>. In the current study, the prevalence of overweight was found to be higher in males than in females, while the prevalence of obesity was higher in females. According to Ali et al., female university students in Bangladesh have a slightly greater frequency of obesity than males. However, the difference was not statistically significant<sup>19</sup>. Male students (14.8%) had a greater frequency of overweight and obesity compared to female students (11.8%) at three Bangladeshi public universities<sup>20</sup>.

In a study in Saudi Arabia, it was found that the percentage of dining out, snacking, consuming cold beverages, and consuming sweets is greater among overweight and obese students than among students of normal weight<sup>21</sup>. In our study, it was found that 84% of obese students were taken 1 meal from outside per day, which was statistically significant, and obese students had a much higher soft drink intake rate of 40% compared to other groups.

According to Habib et al., more than half of the participants claimed that they did not exercise because they did not have enough time owing to academic obligations. Another important reason why overweight and obese student do not exercise is laziness<sup>21</sup>. Academic stress and curriculum overload are likely to be fundamental causes of becoming overweight and obese among this study's students, as they do not have enough time for regular exercise and tend to consume irregular meals<sup>21</sup>. In their study, Akhter et al. discovered that overweight and obese people had lower levels of physical activity and a higher prevalence of sedentary lifestyles<sup>13</sup>. In our study, according to BMI categories, more than half of the students (52%) did not physically exercise at least once a week, which is significant. 92% of obese students said they didn't play sports like football, volleyball, swimming, etc., and 40% said they didn't walk daily due to routine tasks in the present study. A study in Bangladesh by Begum et al. showed that exercise was not associated with BMI among medical students<sup>22</sup>. According to a study conducted on medical students at the University of Dammam in the Kingdom of Saudi Arabia, most students (75.3%) had never exercised consistently before attending college, and 62% of them said their regularity had reduced. "Lack of time" is the most frequently mentioned obstacle to exercise (57%). 58.6% of the 140 students do physical exercise less than once a week<sup>23</sup>. Medical students in Lahore exhibited low levels of physical exercise, and most students did not regularly participate in college sports or exercise<sup>18</sup>.



In our study, about 45% of overweight students reported spending 2 hours per day on screens, while 32% of obese students reported spending more than 3 hours. According to Baker et al., the most critical factor responsible for obesity among medical students at Ain Shams University in Egypt was spending a lot of time on computers<sup>24</sup>. Begum et al. in Bangladesh discovered no association between the prevalence of being overweight and sedentary behaviors, including using cell phones, TVs, and the internet<sup>22</sup>.

Sleep deprivation may contribute to obesity by reducing energy expenditure and increasing calorie consumption. As the students slept for a brief time, they were more likely to eat while they were awake. Short sleep duration causes serum ghrelin to rise and serum leptin to decrease, which causes unusually high hunger and overindulgence in food. Once more, the person experiences fatigue from less sleep, which leads to reduced physical activity and increased rest, which may be linked to TV watching or other sedentary behaviors<sup>25</sup>. In their study, Taheri et al. discovered an association between sleep restriction and decreased leptin levels, increased ghrelin levels, and elevated body mass index<sup>26</sup>. In the present study, in terms of BMI categories, 55.5% of students who were obese slept for < 6 hours per day, which is statistically significant (p-value 0.04). A study on dentistry students in Karachi revealed that lack of sleep may contribute to weight gain. More obesity was seen in those who slept for less than six hours<sup>2</sup>. In Bangladesh, Rasul et al. found that medical students who slept less than 7 hours per day were more likely to be overweight (p-value < 0.01)<sup>4</sup>.

#### LIMITATIONS:

The study used a small sample size and was conducted at Sapporo Dental College in Dhaka. The study's results may not accurately reflect the entire country. This is an institution-based cross-sectional study; hence, its findings may not apply to the community. Further research is needed throughout dental colleges across the country to address the issues raised in the current study.

#### CONCLUSION:

This study emphasizes the need for a healthy lifestyle, healthy eating habits, and physical activity among dental students of Bangladesh. Changing one's lifestyle at an early age can lead to better health habits. Screening for overweight and obesity on an annual basis is an effective way to prevent it and its consequences. Implementing programs promoting physical exercise and healthy diets can reduce dental students' future risk of chronic diseases. As future doctors made up the study's participants, physical exercise should be incorporated into the dental curriculum at a predetermined period, and dental students should be aware of their dietary habits and sleeping time to reduce the growing obesity rate since it could affect patients' outlooks.

**CONFLICT OF INTEREST:** The authors declare no conflict of interest.

**FUNDING:** This research received no external funding.

#### INSTITUTIONAL REVIEW BOARD STATEMENT AND ETHICAL APPROVAL:

The study was carried out following the principles outlined in the Declaration of Helsinki. It received approval from the Research Ethics Committee of Sapporo Dental College and Hospital, Dhaka, Bangladesh, on May 17, 2023 (Ref. No: SDC/C-8/2023/1035).

#### INFORMED CONSENT STATEMENT:

All of the study's subjects provided informed consent.

**DATA AVAILABILITY STATEMENT:** The data presented in this study are available on reasonable request from the corresponding author.

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