

## Body Mass Index (BMI) status and relevant factors: A cross-sectional study in students of Tehran University of Medical Sciences in 2015

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### ABSTRACT

**Background and aims:** Obesity is one of the most important problems of modern society, and body mass index (BMI) is a tool to indicate overweight and obesity in adults. Obesity is directly associated with many non-communicable diseases. So for this reason, it was designed a study to assess overweight and obesity in Kooy dormitory students of Tehran University of Medical Sciences in 2015.

**Methods:** A cross-sectional study was conducted on 342 students (210 girls and 132 boys) selected by random cluster sampling. Students' height and weight were measured and other data were collected by questionnaire and finally analyzed using SPSS.

**Results:** The average age of girls and boys was  $23.27 \pm 3.09$  and  $22.58 \pm 5.08$ , respectively. Findings showed that girls' average BMI was  $21.40 \pm 3.32$  and boys' one was  $23.6 \pm 2.82$ , with significant difference between sexes ( $P < 0.001$ ). From all students who participated in the study 9.3% were underweight, 73.8% normal, 15.2% overweight and 1.5% obese. Smoking and sleeping hours were correlated positively with BMI, while that of meal frequency was negative.

**Conclusion:** Results indicate that university students would benefit from a nutrition and health promotion program to reduce the likelihood of overweight and obesity among them.

**Keywords:** Obesity, Overweight, Body mass index, Students, Tehran.

### INTRODUCTION

It's expected that in 2020, non-communicable and chronic diseases that are often associated with diet and lifestyle account for two thirds of diseases.<sup>1</sup> The most important diseases related to diet are obesity and cardiovascular diseases. According to studies, obesity and hyperlipidemia are proposed to be the most important health hazards to threaten humans in 21th century.<sup>2,3</sup> Statistics show that in Iran,

in the last two decades, CVD and associated deaths have increased and age for stroke incidence has decreased. Nutritional studies nowadays are focusing on preventing chronic disease in adolescents.<sup>4</sup> Body mass index (BMI) is a useful tool for displaying weight status and is an index used to state overweight and obesity. BMI is calculated by dividing weight (kg) by height (m) squared.<sup>5</sup>

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BMI less than 18.5, 18.5 to 24.9, 25.9 to 30 and more than 30 are considered underweight, normal, overweight and obese respectively according to WHO.<sup>6</sup> Increases in BMI are associated with increase in some diseases, for instance, overweight and obesity are associated with CVD, hypertension, type 2 diabetes, stroke, gallbladder disease, osteoarthritis, apnea and respiratory disorders and some cancers (breast, endometrium, prostate and colorectal).<sup>7,8</sup> There's not a clear sign for obesity in the adolescent time. So, adolescents without sign of the disease, continue the lifestyle related to diet and long term health problems.<sup>3</sup>

Based on a study about BMI in students of Zahedan University of Medical Sciences, average BMI in girls and boys  $21.6 \pm 3.1$  and  $21.7 \pm 2.9$ , respectively.<sup>9</sup> In another study of girl students in city of Tonekabon, 12% of students had lower than normal BMI, 17% were overweight and 6% were obese.<sup>10</sup> Considering the magnitude of obesity and overweight issue and the imposed burden of disease due to complication in community and with respect to the age of adolescents in which people should work and be productive, epidemiological studies are necessary in the field. So, the current study has been done to assess BMI and relevant factors in students' Kooy dormitory in Tehran University of Medical Sciences.

## METHODS

This research was a cross-sectional study that applied to students (boys and girls) in Kooy dormitory in Tehran University of Medical Sciences in the April of 2015.

The sample size was calculated based on obesity prevalence in the students dormitory in similar studies with (prevalence= 0.17, Level of the confidence interval=95% and precision= 4%). 342 students (210 girls and 132 boys) for this study were selected. It was used a randomized cluster sampling method to collect participants whom were recruited from

boys' Bosstan dormitory and four girls' Golestan dormitories. The questionnaires were anonymous. Self-structured questionnaire including questions about demographic features and additional questions for variables (physical activity, smoking, sleeping hours, meal frequency and dieting) was prepared and validated before the main sampling. For validation, primary questionnaire was examined by university experts and after eliminating and adding some questions, some others applied twice as pilot to 30 students of the dormitory. The Chronbach alpha coefficient was calculated as 0.87. Height and weight measurements for girl students were done by a trained woman and similarly a man did this for boys. Weight was measured with light dressing without shoes and in a fixed time (about 8 pm) using a mechanical scale (Seca 761) with an accuracy of 500 gr. Height measured using a tape on the stand position while the shoulders were normally placed on the wall with an accuracy of 0.5 cm. Demographic data including age, education level, smoking status, exercise and physical activity, dieting and sleeping hours were collected by questionnaire using trained interviewer and recorded eventually. T-test and Pearson correlation coefficient tests were done. Moreover, a Multivariate analysis was used to control the possible confounding variable. Data analysis was done using SPSS software.

## RESULTS

Mean, standard deviation, mean difference and confidence interval for variables of weight, height and BMI were determined (Table 1). The mean for girls for boys was  $23.27 \pm 3.09$  and  $23.6 \pm 2.82$ , respectively. Ranges weight, height, BMI and age for girls were 39-84 (kg), 138-184 (cm), 13.21-38.05 ( $\text{kg}/\text{m}^2$ ), and 17-35 (yrs), respectively, and for boys were 50-103 (kg), 155-202 (cm), 18.5-32.39 ( $\text{kg}/\text{m}^2$ ) and 18-33(yrs) respectively.

**Table1:** Comparison of mean, standard deviation, mean difference and confidence interval of weight, height and BMI of students

Variable	Gender				P	MD	CI(95%)
	Girls		Boys				
	Mean	SD	Mean	SD			
<b>Weight</b>	56.64	9.12	70.96	9.39	<0.001*	14.31	(12.21-16.33)
<b>Height</b>	162.8	7.60	173.47	8.83	<0.001*	10.65	(8.88-12.42)
<b>BMI</b>	21.40	3.32	23.60	2.82	<0.001*	2.19	(1.51-2.88)

\*Difference is statistically significant at 0.05 level; SD: Standard Deviation; MD: Mean difference; CI: Confidence Interval

Degree of underweight, overweight and obesity was determined in students (Table 2).

Mean BMI for girls was  $21.40 \pm 3.32$  and for boys was  $23.6 \pm 2.82$  and there was a significant difference between sexes ( $P < 0.001$ ). There was a significant difference between those who had physical exercise and those who did not ( $P = 0.002$ ). A significant difference of BMI was observed in smokers and non-smokers ( $P = 0.004$ ). There was a significant correlation between sleeping hours and BMI ( $r = 0.205$ ,  $P = 0.002$ ) with saying that increase in sleeping hours was correlated with increase in BMI. Meal frequency and BMI were negatively correlated ( $r = -0.102$ ,  $P > 0.05$ ), but it was not statistically significant. The more cigarettes were smoked, the higher BMI

was observed ( $r = 0.143$ ) that supports aforementioned significance between smoking and BMI. To determine the effect of confounding variables, multivariate analysis was used. For this purpose, the effect of some variables (gender, age, smoking, physical activity, residential area) with body mass index was measured by a separate linear regression and variables that had.

P-value less than 0.2 were entered into multivariate models. Gender, smoking and physical activity was entered to multiple regressions. Enter method used in multiple regressions. After removing of confounding variables, only gender was a significant effect in the model ( $P < 0.0001$ ). The results of multivariate analysis demonstrated in Table 3.

**Table2:** Distribution of Boys and Girls based on BMI category

BMI Class	Gender				Total	
	Girls		Boys		N	P(%)
	N	P(%)	N	P(%)		
Underweight	32	15.2	0	0	32	9.3
Normal	157	74.8	96	72.7	253	73.8
Overweight	17	8.1	35	26.5	52	15.2
Obese	4	1.9	1	0.8	5	1.5
Total	210	100	132	100	343	100

**Table 3:** The results of multivariate analysis of association between gender, physical activity and smoking with body mass index

Model	Unstandardized coefficients		Standardized coefficients	t	P
	B	SE	B		
Constant	25.04	0.933		26.85	<0.001
Gender	-1.94	0.390	-.286	-4.98	<0.001
Physical activity	-0.305	0.371	-.046	-0.822	0.411
Smoking	0.648	0.431	.079	1.50	0.134

*Dependent variable: body mass index.*

## DISCUSSION

In the current study, there was a statistically significant difference between BMI for both sexes and girls had lower BMI compared to boys. In addition boys didn't show any case of being underweight while 9.6 percent of girls were underweight. In a similar study to assess BMI for students of Zahedan University of Medical sciences, 720 students were studied. Girls' mean BMI was  $21.6 \pm 3.1$  and that of boys was  $21.7 \pm 2.9$  which there was not a significant difference between sexes, while in our study, BMI in sexes was significantly different.<sup>9</sup> Doostan in a similar study on 375 students of Kerman University of Medical Sciences showed similar results regarding BMI in students, but didn't find any difference between sexes.<sup>11</sup> Barzin et al. designed a study on 926 girls referring to premarital counseling centers of Tehran. The mean BMI was  $21.9 \pm 3.6$  that's also similar to what the present study showed.<sup>12</sup> In a study conducted among 749 students (68% females and 32% males) recruited from the State University of the Basque Country, prevalence rate of overweight and obesity was 25% in males compared to 13.9% in females.<sup>13</sup> In the study that Bjørnelv et al. did to assess BMI changes in Norwegian adolescents between 1966 to 1997. There was no changes in BMI of girls 14 to 17 years of age, but significant changes were observed in all other age groups in girls

and boys that may be attributed to lifestyle change in this country during the years.<sup>14</sup> Gropper et al. studied 131 college students who were followed for 4 years and results showed that mean BMI and weight increased 1 unit and 3 kg, respectively. Weight and BMI increase in boys were significantly higher than that of girls.<sup>15</sup>

Smokers had higher BMI compared to non-smokers. This finding was in coordinated with similar study in Lebanese university students and Canadian school youth that is possibly because smokers are less concerned with other aspects of health related issues.<sup>16,17</sup>

Higher sleeping hours was associated with sedentary lifestyle which was confirmed with higher BMI in this group. Serlachius et al. in the their study on university students in London found that more sleeping hours associated with weight gain Conversely, in another study sleeping less than 6 hours is associated with overweight and obesity.<sup>18,19</sup>

This study had several limitations. This was a cross-sectional study and the temporal relationships between risk factors and health status cannot be established in such studies. Limitations are inevitable and one of them in our study was relatively small sample size compared to other studies. University students are not representative of young adults in general; the overweight or obesity prevalence and its associated factors may be different in

other sectors of the population. Another factor would be the limited number of measured variables. If more variables were measured and accurate instruments were used, we could have come to better results.

## CONCLUSION

The study found a high prevalence of overweight/obesity among university students. Considering the approximately 17% overweight and obese individuals in the current study, it's necessary to implement proper nutritional programs and encourage a more active lifestyle for students of the university dormitories.

## CONFLICT OF INTEREST

The authors declare that there was no conflict of interest.

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