

## Trends of obesity and overweight among foreign students in Tbilisi, Georgia

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### Summary

We determined body weight increase among international students in Tbilisi, Georgia. The objective was to assess the prevalence of overweight and obesity among the students and find factors associated with it. Methods: Height and weight were measured in all participants and body mass index (BMI) of each individual was calculated. All participants completed a voluntary and anonymous semi-structured questionnaire which included questions regarding personal data, lifestyle and eating behaviours. 107 students were males (52.7%) and 80 females (43.7%) in the age range of 18-40 years. Mean age = 21 years. Results: 86% of sample population did not live with their family which affected their eating habits. 42.3% were overweight/obese, 38% overweight (BMI 25-29.9) and 4.3% were obese (BMI >30). 49.2% had normal weight (BMI 18.5-24.9) while 8.5% were underweight (BMI <18.5). 77% of students did not smoke while 85% did not use alcohol. 41.2% of the students slept less than 6 hours a day. Stress level was 82.3%. Reporting eating habits, only 20% had breakfast every morning and 64.3% had two to one meal a day. Students had less serving of fruits and vegetables than required. 53.3% had less than 1 liter of water daily. 48% engaged in fast food daily, 46% were having more than two snacks a day and 34% had sodas either daily or 2-4 times a week. More than 50% of students were not engaging in the required amount of physical activity. Conclusion: The study found a high prevalence of overweight and obesity. Several health risk practices are identified including: physical inactivity, inadequate intake of fruit and vegetables, skipping meals, inadequate sleep, high stress levels and inadequate water intake. Interventions to prevent overweight and obesity and promote healthy lifestyle practices among students should be initiated.

**Key words:** *overweight, obesity, BMI, lifestyle, eating habits.*

### Introduction

Obesity and overweight have both been described as anomalous accumulation of excessive body fat which may be harmful to health. There is no single cause to explain all cases of obesity and overweight but most studies implicate imbalance in the amount of calories consumed and those expended. (WHO, 2017)[1] Furthermore, Obesity has reached the level of epidemic proportions according to the World Health Organization, with an approximate number of 1.4 billion worldwide overweight and 300 million persons clinically obese. World health Organization affirms that obesity and overweight are leading global health problems (Doak et al., 2012, Rolland-Cachera, 2011). Those facts called our attention and led us to review published data regarding overweight and obesity among university foreign students around the world. (We will not review obesity on the general population).

In the past decade, lifestyle changes and possible predictors of weight changes during the transition have been studied. The sources stipulate the following factors as being the main cause that is stress, alcohol drinking, unhealthy eating and physical inactivity are thought to play key roles, and exposure to obesogenic environment where students are frequently exposed to and consume savory foods with hidden fats and sugars that can impair metabolism and lead to obesity [5].

Globally, there is rising prevalence of overweight and obe-

sity in both developing and developed countries. The rate of obesity has tripled in developing countries over the past 20 years as they rapidly become more urbanized, with increased consumption of high calorie foods and adoption of a more sedentary lifestyle.

International students offer a unique opportunity to study the extent to which environment causes obesity. Because international are less aware of the social and cultural conditions in and around the university campus we argue that the prevalence of obesity in the surrounding area is plausibly exogenous to international students' choice of university. In this study, we survey international students studying at two universities in Tbilisi, Georgia.

Dietary habits usually depend on lecture schedules attended by students and availability of food inside or in the vicinity of the university campus. As a result of the expansion in the fast-food market and lack of appropriate food courts, students usually face meal skipping, inadequate variety of foods, and unhealthy snacking. University population is divided into those who continue to live with their parent and those that are living with friends or alone.

Foreign students either live alone, with friends or with family members. For all, the beginning of the university matches with more freedom and independence and is often the first time that young people assume the responsibility to choose and prepare foods. Therefore, the aim of the current work was to assess the prevalence of overweight and

obesity among foreign university students in Tbilisi, Georgia and its associated factors.

### Study Design

Two universities were selected in Tbilisi, Georgia for this study; The University of Georgia, the biggest private university in the country and the Tbilisi State Medical University. These institutions were chosen respectively because they accommodate more international students.

In total 203 students who were chosen randomly to participate in the survey. 16 participants with missing information on nationality, age or gender, and those who didn't provide signature as a sign of consent were excluded, leaving 187 participants (107 males and 80 females) from 26 different countries.

A cross sectional survey using a semi structured questionnaire was given to participants to fill up. Data obtained through the questionnaire included: personal information, life style behaviors and eating behaviors.

### Methods

Height and weight were measured in all participants and the body mass index (BMI) of each individual was calculated. Body mass index classes were calculated according to the International Obesity Task Force standards (underweight  $\leq 18.5$ , normal weight [18.5-24.9], overweight [25-29.9] and obese  $\geq 30$ ).

Height and weight were measured using standardized protocols. Weight was measured without shoes to the nearest 0.1 kg using a single previously standardized portable weighing scale. Height was measured without shoes and recorded to the nearest 0.1 cm. The body mass index (BMI) of each individual was calculated as weight in kilograms divided by height in meters squared.

The students completed a voluntary and anonymous questionnaire. The questionnaire included 29 questions on their personal data, life style and eating behaviors.

The individual characteristics analyzed were: gender, age, nationality, major/bachelor, semester of studies, how long the student have been in Georgia, whom they live with, and weight before coming to Georgia.

The life style items analyzed were: smoking, alcohol drinking, physical activity, sleeping hours, working status, and stress levels.

The eating behaviors analyzed were: amount of fruits and vegetables intake, frequency of red meat, chicken, fish, sodas, fast food, snacks and of water intake.

The questionnaire was pre-tested by a pilot group of 13 students to assure its validity and reproducibility before the study was conducted.

Descriptive analysis of data; including the mean, frequencies, range and percentage was conducted using Microsoft Excel.

### Ethical Consideration

This research was conducted with approval from the heads of the selected Georgian universities. Informed consent forms were signed by each student, in order to be able to work with the data provided by them. Students were informed that their participation was both voluntary and anonymous.

### Results

Characteristic of participating students are presented in Table 1, 2 and 3. From 203 questionnaires received, only 187 were taken in consideration. Most of the participants included in the analysis were males (57.2%), while female participation was 42.8%. The mean age of participants was 21 years, and the age range was from 18 to 40 years. From the 187 participants, about 88% were freshmen, sophomores or junior students, 68.5%, 15.5% and 4.3%, respectively. 11.7% were senior students.

From the total sample more than 86% do not live with a family member. (26.7% stated to live alone, 55.6% live with friends and 13.4% stated to live with a family member.

Table 1. Presents distribution of participants by gender

Gender	Number of Students	%
Female	80	42.8
Male	107	57.2
Total	187	100

Table 2. Presents students' distribution by year of studies

Student Classification	Number of Students	%
Freshmen	128	68.5
Sophomores	29	15.5
Juniors	8	4.3
Seniors	22	11.7
Total	187	100

Table 3. Presents living arrangement of the students

Cohabit	Number of Students	%
Alone	50	26.7
Family	25	13.4
Friends	104	55.6
Other	8	4.3
Total	187	100

Among life style behavior; 77% of the students stated not to smoke, 85% stated not to drink any alcohol beverages. More than 67% of the participants stated to exercise. 50.2% declared to exercise less than two hours a week, 28.3% exercise between two and four hours a week, 15% exercise

between four and six hours a week and 6.5% exercise more than six hours a week. Detailed description of smoking, alcohol intake and physical activity is presented in Tables 4 and 5.

Table 4. Presents smoking, alcohol and physical activity tendency among students

	Smoke		Alcohol		Physical activity	
	Number of students	%	Number of students	%	Number of students	%
Yes	43	23	28	15	126	67.4
No	144	77	159	85	61	32.6
Total	187	100	187	100	187	100

Table 5. Presents number of hours per week each participant exercises

Exercise hours per week	Number of Students	%
Less than 2	94	50.2
2 to 4	53	28.3
4 to 6	28	15
6 to 8	4	2.2
More than 8	8	4.3
Total	187	100

Regarding sleeping behavior, 1.6% of the students stated to sleep an average of less than 3 hours per day, 39.6% sleep between three to six hours per day, 51.9% sleep between six to nine hours and 6.9% state to sleep more than 9 hours per day. Detailed description of sleeping behavior is shown in Table 6.

Table 6. Presents the hours of sleep that each student gets daily

Sleep hours per day	Number of Students	%
0-3	3	1.6
3-6	74	39.6
6-9	97	51.9
More than 9	13	6.9
Total	187	100

As shown on the table 7, we asked the students how stress they feel on a regular bases. 23.5% of the students said to feel stress most of the time, 58.8% sometimes, 11.3% rarely and 6.4% stated not to feel any type of stress.

Table 7. Presents self appraisal of stress levels by each student

Stress	Number	%
Most of the time	44	23.5
Sometimes	110	58.8
Rarely	21	11.3
Never	12	6.4
Total	187	100

Among eating behavior, the majority of the students (52%) reported eating just two meals per day, 12.3% eat one meal per day, 27.8% eat three meals per day, 5.8% eat four meals per day and just 2.1% eat five meals per day. The majority of the students, 40.1%, eat two snacks per day, 13.9% eat one snack per day, 25.1% eat three snacks per day, 4.3% eat four snacks per day and just 1.6% eat five snacks per day. 15.5% of the participants reported the intake of sodas daily, 18.2% drink sodas two to four times a week, 26.2% drink sodas once a week, 5.9% drink sodas less than once a week, 12.3% drink sodas once in a month and 21.9% states not to drink any type of sodas. 9.6% of the sample stated to eat fast food daily, 38% eat fast food two to four times a week, 30% eat fast food once a week, 5.9% eat fast food less than once a week, 11.7% eat fast food once in a month and just 4.8% states not to eat any type of fast food.

32.2% reported to eat one fruit per day, 28.3% eat two fruits per day, 7.5% eat three fruits per day, 4.8% eat four fruits per day, 1% states to eat five fruits per day, and 26.2% states not to eat any fruit during the day. 33.7% states to eat one vegetable per day, 29.4% eat two vegetables per day, 11.2% eat three vegetables per day, 8.6% eat four vegetables per day, 5.9% eat five vegetables per day and 11.2% states not to eat any vegetable during the day. 20.3% of the sample stated to have breakfast everyday, 51.9% have breakfast sometimes, 18.7% have breakfast rarely and 9.1% states to never have breakfast. From the population surveyed 17.1% reported to drink one to two glasses of water per day, 36.4% three to four glasses of water per day, 25.1% five to six glasses of water per day, 16.6% seven to 8 glasses of water per day and just 4.8% reported to drink more than 9 glasses of water per day.

Detailed description of eating behavior is presented in Tables 8, 9, 10, 11, 12.

Table 8. Presents frequency of meals and snacks eaten per day by each student.

Frequency Per day	Meals		Snacks	
	Number of students	%	Number of students	%
0	0	0	26	13.9
1	23	12.3	75	40.1
2	97	52	47	25.1
3	52	27.8	28	15
4	11	5.8	8	4.3
5	4	2.1	3	1.6
Total	187	100	187	100

Table 9. Presents frequency of sodas and fast food intake by each student

Frequency Per month	Sodas		Fast Food	
	Number of students	%	Number of students	%
Daily	29	15.5	18	9.6
2 to 4 times a week	34	18.2	71	38
Once a week	49	26.2	56	30
Less than once a week	11	5.9	11	5.9
Once in a month	23	12.3	22	11.7
Never	41	21.9	9	4.8
Total	187	100	187	100

Table 10. Presents servings of fruits and vegetables per day of each student

Servings Per day	Fruits		Vegetables	
	Number of students	%	Number of students	%
0	49	26.2	21	11.2
1	62	32.2	63	33.7
2	51	28.3	55	29.4
3	14	7.5	21	11.2
4	9	4.8	16	8.6
5	2	1	11	5.9
Total	187	100	187	100

Table 11. Presents how often students eat breakfast

Breakfast	Number of Students	%
Everyday	38	20.3
Sometimes	97	51.9
Rarely	35	18.7
Never	17	9.1
Total	187	100

Table 12. Presents amount of glasses of water intake per day by each student

Glass water/day	Number	%
1 to 2	32	17.1
3 to 4	68	36.4
5 to 6	47	25.1
7 to 8	31	16.6
More than 9	9	4.8
Total	187	100

As shown in the Table 13, among men the prevalence of underweight was 3.7%, normal weight 23.5%, overweight 27.7% and obesity 2.7%, while among women the prevalence of underweight was 4.8%, normal weight 25.7%, overweight 10.7% and obesity 1.6%. Overall, 42.3% were overweight or obese; men (30%) were significantly more overweight or obese than women (12.3%).

As part of our questionnaire we asked the students their weight before coming to Georgia and we compared it with their actual weight. This gave us the information that they either increased or decreased their weight during their stay in Georgia. As shown in the Table 14, 27.3% of the female students increased their weight while 13.4% lost weight. As for the males; 28.9% increased in weight and 24% decreased in weight.

Table 13. Presents the number of male and female university students by country and their BMI classified as underweight, normal weight, overweight and obese

Country	Underweight < 18.5		Normal [18.5-24.9]		Overweight [25-29.9]		Obese ≥30	
	F	M	F	M	F	M	F	M
Afghanistan						1		
Azerbaijan					1			
Cameroun					1			
Chile					1			
Egypt			2	2		3		
Fiji				1	1	1		
India	4	2	12	9	6	15	1	1
Iran	2	1	15	3	3	6		2
Iraq	2		4	9		11		
Israel			1	3		3		
Jordan			1	1	1	1		1
Lebanon				2		2		
Mauritania			1					
Myanmar		1						
Nigeria		1	7	1	1		1	1
Palestine				3		1		
Russia			1					
Somalia	1							
Sri-Lanka						2		
Sudan		1	2	1	1			
Syria			1	7	2	3		
Tunisia		1			1			
UAE			1					
USA					1		1	
Yemen				1				
Zimbabwe				1				
N/A						2		
Total	9	7	48	44	20	51	3	5
Total %	4.8	3.7	25.7	23.5	10.7	27.3	1.6	2.7

Table 14. Presents the amount of students that either increased or decreased weight during their stay in Georgia

Weight	Number		%	
	Female	Male	Female	Male
Increased Weight	51	54	27.3	28.9
Decreased Weight	25	45	13.4	24
N/A	4	8	2.1	4.3
Total	80	107	42.8	57.2

### Discussion:

We studied the reason for weight gain among 187 students from 26 different countries. More than 86% of student sample do not live with their family or under supervision of a guardian which in turn affected their eating habits, causing them to engage in unhealthy eating habits. 82.3% of students are reported to be stressed most of the time or sometimes. Findings also reveal that 41.2% of the students sleep less than six hours a day, while according to the sleep foundation, young adults (18-25 years old) should get the appropriate seven to nine hours of sleep daily [25]. 77% of students reported not to smoke and 85% do not drink any alcohol. With regards to the effect of tobacco and alcohol use on weight gain, we didn't find any correlation. From our results, we cannot say that smoking and alcohol intake does affect weight gain. Only 23% of the sample population reported smoking while just 15% reported alcohol use which is contrary to finding from previous studies that shows that tobacco and alcohol use were associated with overweight and obesity [14, 15, 16, 17].

On physical activity, 67% of the students stated that they engaged in some kind of physical activity, but more than 50% were not engaging in 150 minutes of moderate-intensity aerobic physical activity throughout the week or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week recommended by WHO [27].

In regards to their eating habits, only 20% of the students have breakfast every day, and 64.3% said they ate only two to one meal a day which is not in line with the three to five times day recommended [24]. 53.5% of participants stated to drink less than one liter of water per day; when the recommended amount of water per day is at least 2 to 2.5 liters a day according to Mayo Clinic [23]. Fruit intake and vegetables was not really a trend among students as their intake of both averaged one to three servings per day, but according to the American heart organization it should be four to five servings of each per day [26]. There is correlation between our study and previous findings [18], where students consumed low amounts of fruits and vegetables.

Factors contributing to weight gain included; daily or two to four times a week intake of fast food (48%), over snack-

ing; 46% reported to eat more than 2 snacks per day and 34% of student from sample reported to drink sodas either daily or two to four times per week.

Our meta-analysis allowed us to identify the students with the greatest risk. There were 107 males and 80 females in which overall 8.5% were underweight, 49.2% were normal, and 38% were overweight and 4.3% were obese, which agrees with findings from previous studies [13, 18, 19, 21].

The group that presented the majority cases of overweight and obesity by country were Indian males (55.9%) and Iraqi males (55%).

On the contrary, we encountered unexpected findings that some students lost weight (37.4%) and most of them attributed this weight loss to being formerly overweight and their desire to lose weight. 56% of students that completed the questionnaire have gained weight during their study period in Georgia.

The strength of our study is that we were able to gather information from students from different geographical regions that share at least one thing in common which is to be currently living in Georgia.

### Study limitation:

This study encountered a systematic bias as students from Iraq, Iran, Sudan, Jordan and some students from India were fasting due to Ramadan, which may have affected their response regarding their eating habits and their current weight.

Some questionnaires were excluded from this study because of inappropriate or missing data. In addition, considering that this study was self-reported, some responses could have been under or over reported.

### Conclusion:

The result of this research reveals the increased prevalence of overweight over obesity among students. Overweight and obesity was more common among male students than females. As for normal weight was less than 50% of the total sample of participants.

Although this study had some limitations and was subject of bias, its findings are consistent with the general trends of an increasing prevalence of overweight, as results of decrease physical activity and exercise, the emergence of numerous resultant health risks and the great cost obesity necessitating heightened efforts towards controlling and reducing this trend. Therefore, there is a need to establish effective public health prevention and health promotion campaigns among students in order to curtail the future implications of overweight and obesity on their health.

Several specific health risk practices were identified that can be utilized in health promotion programs. Universities need to address their obesogenic environment and the need for the university administration to promote healthy life styles as proposed by the WHO Global Strategy on Diet,

Physical Activity and Health. Students themselves should be engage in this process since they are also part of the medical community.

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