Obesity And Its Related Factors Among University Medical Students In Syria: A Cross- Sectional Study

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Abstract

Background: Obesity is a world-wide pandemic that has many contributing factors. Healthcare personnel has a crucial role in health promotion and is considered the role models for the general population. We aim to evaluate the BMI and physical activity (PA) of medical students their association with multiple variables, including psychological.

Methods: This is a cross-sectional study that was conducted in Damascus University. Paper-based questionnaires were distributed that included International PA Questionnaire short version (IPAQ-S7S) and the Depression, Anxiety and Stress Scale (DASS 21).

Results: The mean BMI was 23.5. Males had significantly higher BMI than females by 2.5 kg/m². Shisha smoking, alcohol, family history, daily number of meals, high-fat meals, eating after midnight, physical activity, and having either moderate to severe depression, anxiety, and/or stress were all significantly associated with higher BMI ($p < 0.05$). However, economic status, mean grades, marital status, living conditions, eating vegetables regularly, and number of snacks consumed did not significantly affect BMI. Low PA was found in 23.2% and was only associated with male gender.

Conclusion: Our study found an association between obesity and the psychological factors among medical students. Smoking, fatty food and eating rates were also associated with obesity, while economic status was not. Low PA was prevalent among medical students and was associated with worse mental health which might reflect BMI being indirectly affected by war. This high BMI and low PA in medical students are particularly concerning and require rapid intervention.

1. Introduction:

Obesity is a world-wide pandemic that has an increasing pattern in the world. In 2005, it was estimated that there were more than 1,200 million who were either overweight and obese adults worldwide and these numbers will exceed 3,000 million by 2030 which is more than half of the adult population (1). Many factors might be involved such as diet, physical activities, genetic predispositions, and physiological and behavioural factors (2). Many studies showed a wide range of risk factors associated with obesity. Bad dietary behaviour like high number of meals and high calories food were associated with low PA, smoking and alcohol consumption which subsequently led to obesity(3–5). Unfortunately, although health personnel have a crucial role in health promotion and are considered role models of having a healthy lifestyle, many studies suggest that obesity is a common issue among them (6–10). Moreover, medical students beliefs towards obesity greatly affect their ability to council patients and affect their bias towards patients with obesity (11). Obesity was a major issue in Syria before the war as the mean population had a body-mass index that corresponded with obesity (12).

Many factors might affect obesity. Smoking cigarettes and shisha, for instance, can affect weight loss or gain (12, 13).

This study aims to evaluate the BMI among university medical students and the patterns that might affect their BMI.

2. Methods:

This is a cross-sectional study was carried out by paper-based questionnaires, which were used and distributed after lectures to medical students who are studying medicine to become doctors at Damascus University, which is the largest university in all Syria and has over 1000 medical graduates every year.

2.1 Sample:

Medical students from second to sixth year were recruited to fill a printed questionnaire from October 2019 to December 2019. Questionnaires were distributed at the end of mandatory lectures on several occasions during the previous period.

In total, 540 agreed to participate amongst the medical students at Damascus university, 501 questionnaires were included for data analysis, while the other 39 questionnaires were excluded due to having diarrhea in the last two days, chronic diseases, diabetes mellitus $\leq$ or $\geq$, endocrine and metabolic disorders that might affect body weight in addition to uncompleted questionnaires.

The average time to complete the questionnaire was 15 – 20 minutes and the response rate was 92.8%.

This study was approved by the University Review Board of Damascus University, faculty of medicine. All methods were performed in accordance with the relevant guidelines and regulations. Written consent was taken from participants before filling in the questionnaire for using and publishing the data.

2.2 Measures:

The questionnaire contained information on demographic data such as name, age, gender, academic year, marital and living status, college score and socioeconomic status which was assessed by family income as good (having a luxurious life), average (having basic needs and some luxury), fair (provide only basic needs), and poor (did not have basic needs).

The university average was asked according to university rankings and was divided into four categories excellent (if the student was one of the top ten students in college), good (if the student was in the top 25% in college), average (if the student was of a level over 50% of students) or not any of the mentioned and grades ($>90\%$, $>80\%$, $>70\%$, $>60\%$ and $>50\%$). We could not use a valid tool to determine the socioeconomic status (SES) of participants as there was not a valid tool that could be used in the Syrian community because of the economical differences between Syria and other countries, where the majority of tools were developed and because it is socially inappropriate to ask about the income (14).

Body weight and standing height were measured by the researchers and were rounded to the nearest kg and cm, respectively. Body Mass Index (BMI) was measured by dividing weight in kg by height in meters

square. BMI was used to decide students body status and was divided into 4 categories: underweight (<18.5), normal ($18.5 - 24.9$), over-weight ($25 - 29.9$) and obesity (≥ 30).

We asked whether the participant regularly smoked or not, how many daily cigarettes, weekly shisha smoking and about drinking alcohol (yes, no or occasionally) in addition to living status (with family, alone or other).

We also asked about having a history of familial obesity (father, mother, brothers and sisters).

Diet was assessed by assessing the average quantity of meals every day and the average quantity of meat, vegetables and fatty food weekly and they were categorized into little (a day weekly or never), moderate (2 or 3 days), much (4 days or more) and the average quantity of junk food (never, 1, 2, 3, more), in addition to the time of the main meal (morning, noon, evening).

Lifestyle questions included the daily number of hours spent on study (less than an hour, from 2 to 3 h, from 3 to 6 h, from 6 to 8 h and more than 8 hours), the common study posture (walking, sitting, lying), eating during studying, time of study (morning, evening, no specific time), mean daily sleeping hours and nap hours and a question about sleeping late.

PA was assessed by using the official Arabic version of International PA Questionnaire (IPAQ) short version for the last 7 days (IPAQ-S7S 2014). We categorized the PA into low, moderate and high following the instructions provided by the IPAQ scoring protocol (15). According to IPAQ scoring system, 152 out of 501 students were removed from analysis (15).

The Arabic short version of the Depression, Anxiety and Stress Scale (DASS 21)(16) as used to assess the psychological health of the students to know its effect on the body weight. Each one of depression, anxiety and stress were labelled into five severities (normal, mild, moderate, severe and extremely severe). Then, we combined mild with moderate category into moderate and severe with extremely severe into severe. Therefore, DASS-21 was categorized into three categories in our study normal, moderate and severe.

Data analysis

Data were processed by using IBM SPSS software version 26 for Windows (SPSS Inc, IL, USA). Chi-square and one-way analysis of variance (ANOVA) were used to determine statistical significance. Bonferroni correction was used to reduce type 1 error and is calculated using the equation $p = \alpha / m$ given that α is 0.05 and m is the number of hypotheses. Therefore, p value was set to 0.0045 to be considered statistically significant.

3. Results:

Of 540 students from Damascus university who completed the questionnaire, 39 were excluded from analysis due to exclusion criteria. In the sample, 271 were females and 230 were males. The mean height of females was 162.28 ± 6.15 cm, mean weight was 58.86 ± 10.24 kg and mean BMI was 22.32 ± 3.53

kg/m², while the mean height of males was 176.26 ± 6.43 cm, mean weight was 77.30 ± 15.26 kg and mean BMI was 24.83 ± 4.45 kg/m². Furthermore, 304 (60.68%) had normal BMI (BMI= 18.5-24.99), 40 students (7.98%) were considered underweight (BMI ≤ 18.5), 120 students (23.95%) were considered overweight (BMI= 25-29.99) and 37 students (7.39%) were considered obese (Table 1). The mean BMI in our sample was 23.5 ± 4.2 kg/m² and mean age was 21.3 ± 1.6 years. Using DASS-21, 208 (41.5%) scored normal for depression, 201 (40.1%) had moderate depression, and 92 (18.4%) had severe depression, 250 (49.9%) scored normal for anxiety, 166 (33.1%) had moderate anxiety, and 85 (17.0%) had severe anxiety, 260 (51.9%) scores normal for stress, 166 (33.1%) had moderate stress, and 75 (15.0%) had severe stress. Furthermore, according to IPAQ, 116 (23.2%) had low PA level, 177 (35.3%) had moderate PA, and 56 (11.2%) had high PA.

In the sample according to participants opinions, 91 (18.2%) had low number of daily meals, 346 (69.1%) had moderate meals and 64 (12.8) had high daily meals, 44 (8.8%) had low daily vegetable intake, 254 (50.7%) had moderate vegetable intake, 203 (40.5%) had high vegetable intake, 232 (46.3%) declared that they had low fatty meals intake, 222 (44.3%) had moderate fatty meals intake, and 47 (9.4%) had high fatty meals intake. According to participants, around 20% had low number of daily meals, 10% had low vegetable intake, and 46% had low daily high-fat intake. Finally, 47.9% had one or less fast meals every week and 64% had two snacks or less every week.

When using linear forward regression to regress gender, economy status, marital status, smoking shisha, smoking cigarettes, drinking alcohol, living methods and family history of obesity on BMI score, we found that family history of obesity was significant with $p < 0.001$ and $R^2 = 9.3\%$, gender was significant for $p < 0.001$ and $R^2 = 16.6\%$, shisha smoking was significant ($p = 0.008$ and $R^2 = 17.8\%$), and cigarette smoking was significant for $p = 0.048$ and $R^2 = 18.4\%$. Eating patterns including the nap after it, studying, sports, and DASS-21 results in our sample categorized by their BMI are demonstrated in (Table 2). Obesity was significantly associated with daily number of meals ($p = 0.001$), weekly number of high fatty meals ($p < 0.001$), weekly number of fast food ($p < 0.001$), Staying up after midnight ($p < 0.001$), PA ($p = 0.003$), depression ($p < 0.001$), anxiety ($p < 0.001$) and stress ($p = 0.003$).

The mean age, university year, cigarette and shisha quantity, number of daily meals were categorized according to their BMI are demonstrated in (Table 3).

The results regarding to the PA of individuals in comparison with the DASS scale are shown in (Table 4). Anxiety score decreases as the PA of individuals increases. In the low-physical group, the anxiety score was 5.12 ± 4.27, compared with the group that practiced high PA, the anxiety score decreased to 3.82 ± 3.866 ($p = 0.026$). While no statistical association between the IPAQ score and each of the age, university year, Number of daily cigarettes, number of weekly shisha heads, daily meals, stress and depression scale was detected using the ANOVA test.

About three-quarters of the high PA group were males 41 (73.2%), which was significantly higher than the males who did low PA 44 (37.9%) ($P < 0.001$) as shown in (table 5). Moderate and severe depression scales were found significantly difference between students with low PA 53 (45.7%), 23 (19.8%)

respectively in compare with student with high PA 14 (25.0%), 9 (16.1%) respectively ($P=0.040$). While there were no statistically significant results between the PA and the economic status, mean grades, marital status, smoking, alcohol consumption, living status, heredity within the family, daily mean hours of study, or the scale of anxiety and stress.

4. Discussion:

Overall, males had higher BMI than females and shisha smoking, alcohol, family history, daily number of meals, weekly number of high-fat meals, weekly number of fast food, eating after midnight, not exercising and having either moderate to severe depression, anxiety and/or stress were all significantly associated with higher BMI. Furthermore, when regressing on BMI score with gender, economy status, university average, marital status and smoking, we figured that gender, shisha and cigarette smoking were significant, but gender had an $R^2 = 16.6\%$ which signifies that gender is one of the major factors to affect BMI. However, economic status, mean grades, marital status, living conditions, eating vegetables regularly, number of daily snacks consumed, daily hours of studying, posture or eating while studying, time of studying, having naps after eating and the number of cigarettes and/or shisha consumed were not associated with different BMI. The mean BMI in our sample was $23.5 \pm 4.2 \text{ kg/m}^2$.

Anxiety and depression scores increased with the increased BMI while stress score was not significantly associated with BMI.

High PA was significantly associated with male gender, while it was not significantly associated with economic status, economic status, mean grades, marital status, smoking shisha or cigarettes, alcohol, living circumstances, family history of obesity, studying, depression, anxiety, or stress. Our study showed that around 60% of participants had moderate to severe depression, 50% had moderate to severe anxiety and 50% had moderate to severe stress. Furthermore, 33% did low PA, around 50% did moderate PA, while only 16% did high PA. Finally, 240 (47.9%) had one or less fast meals every week and 321 (64%) had two snacks or less every week.

Low PA is considered one of the established risk factors for many medical condition such as cardiovascular disease, cancer and diabetes (17). Furthermore, it is associated with worse mental health and quality of life. One large study that included 358 population-based surveys found the prevalence of insufficient PA to be around 27.5% with age-standardising (18). Another systemic study that included studies from 20 countries declared that low PA varied from 9–43% and was slightly higher in males (17). Finally, levels of inadequate PA was twice as much in high income countries (31.6%) when compared to low income countries (16.2%) (18). With these numbers we find that 23.2% who had low PA is considered moderate when compared to other countries. This can be particularly significant at this time as low PA is associated with a higher risk for having severe coronavirus disease 19 (COVID-19) and meeting PA guidelines strongly decrease the risk of severe COVID-19 (19).

Generally speaking, obesity and income association is not constant as the curve line the represents obesity rates increase with income at the beginning. However, it then flattens and decreases in high-income countries. Furthermore, obesity is more prevalent among the rich in low-income countries, but among the poor in high-income countries. Women in low- and middle-income countries also suffer more from obesity, whereas the gap diminishes in high-income countries. Finally, urban areas comprise more obesity in low-income countries compared to the rural areas in high-income countries, which has more obesity (20). We had higher prevalence of obesity among males and could not find an association with the income or living circumferences which contradicted the previous study. Syria is considered among the low-income countries where at least 80% of the population are under poverty line (14). Moreover, a study from Pakistan found that among medical students, females suffered from obesity more than males (21). However, in our study, males had higher BMI and we could not use a validated SES tool. One study that combined data from 2004 and 2006 that included 2536 participants from Syria found that the mean BMI was $30.2 \pm 6.3 \text{ kg/m}^2$, but the mean age was 40.8 ± 10.5 years. Moreover, shisha smoking was associated with nearly a threefold-increase in the odds of being obese. Finally, they found the women had higher BMI (12). The BMI in our study is lower, but the mean age is lower as well. Shisha was also associated with increased BMI. Another study from Karachi from Pakistan found that the mean BMI among medical students was $21.72 \pm 4.33 \text{ kg/m}^2$ (21) which is closer to our study.

Shisha was found by other studies that is associated with higher BMI and increased waist circumference (22, 23). In contrast, cigarette smoking is associated with lower BMI (13). These are particularly concerning for Syria as one study found that among under graduate students, 51.4% smoked tobacco, 23.8% smoked cigarettes and 18.0% smoked water pipe in 2019, but this study was conducted in a private university setting (24). Another study found that smoking prevalent in Syria was 20.75% (25) while another one which was conducted in 2019 and used similar online methods to this study found that 37.9% were smokers (26). Finally, shisha link to obesity was found in our study. However, it was not clear for cigarettes.

A published study shows that marital status affects weight, being divorced or never married is related with lower BMI(27), another study from Syria before war found that BMI is associated with marital status(12). However, we did not find an association in our study, maybe due to our sample which is taken from university students and they are mostly not married. Furthermore, alcohol consumption and certain foods, such as food that was fatty or contained oil, were linked with obesity in our study and the previous study as well (12). However, we did not find an association with snakes and vegetables. Seong Ah Ha et al.(4) reported that overweight school students eat snacks less frequently than normal weight which is somewhat similar to our findings

Depression was associated with increased BMI in the previous study in Syria (12), which is also true in our study. In a Pakistani study, 56.9% of the medical students, who declared that they tended to binge eat when stressed, were obese (21).

It was noted that among obese and pre-obese Pakistani medical students that 55% of them rarely had breakfast, 47.9% took four meals or more daily, 39.3% had fast-food meals for at least three times a week

and 58.1% drank soft-drinks or juices almost every day. Moreover, obesity was associated with a decreased consumption of red meat (21).

Results of PA show that normal weight people who do moderate and severe differed significantly from overweight/ obese people ($p < 0.001$). This indicates the importance of sport in preventing obesity. thus, this variable was similar regarding to males' PA results While the same reported study did not find a relationship between obesity and PA among females(28).

A published study among university students in Mexico City(29) showed that waist circumference was associated with parents' obesity, which is consistent with our study. The family history of obesity is necessary because it may be correlated with genetic propensity(30, 31).

Living with parents was also associated with higher nutritional status (21), which is different from our study.

5. Limitation:

This is a cross-sectional study that used paper-based questionnaire in the major university in Damascus. However, this required students to be at the university at the time of data collection and agree to participate. The nature of this study made it difficult to determine the response rate. We could not also determine whether the person was from rural or urban area as people had to relocate to study in Damascus and due to war that might have caused displacement, which made it hard. No valid SES tool could have been used. Recall bias might have affected some of the questions. We could not use a validated questionnaire to estimate daily meals or fruits intake.

Conclusion:

BMI among medical students of Damascus University is probably lower than the general population in Syria. However, it is still an issue that needs to be addressed. The mean BMI in our sample was 23.5 ± 4.2 kg/m². Males had significantly higher BMI than females by 2.5. Shisha smoking, alcohol, family history, daily number of meals, high-fat food, staying up after midnight, PA, and having either moderate to severe depression, anxiety, and/or stress were all significantly associated with higher BMI, while the economic status, university average, mean grades, marital status, living conditions, eating vegetables regularly, number of snacks consumed, daily hours of studying, posture or eating while studying, time of studying having naps after eating and the number of cigarettes and/or shisha consumed were not associated with different BMI. More studies are required, as medical practitioners are responsible of being role model of the community and their image will be reflected on the society.

Abbreviations:

ANOVA	Analysis of variance
BMI	Body mass index
COVID	Coronavirus disease
DASS	Depression, Anxiety and Stress Scale
IPAQ	International Physical Activity Questionnaire
PA	Physical Activity
SES	Socioeconomic Status
SPSS	Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate:

Written informed consent was taken before proceeding with the survey for participating in the research, and for using and publishing the data. We assured to maintain confidentiality and asked no questions that might reveal the person's identity. All subjects aged 18 or older.

Our study protocol and ethical aspects were reviewed and approved by Damascus University deanship, Damascus, Syria. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication:

Written consent for using and publishing the data were taken before participating in the research.

Availability of data and materials:

The data can be made available upon reasonable request.

Competing interests:

We have no conflict of interest to declare.

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We received no funding in any form.

Authors' contributions:

AN: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Writing - review & editing; original draft.

YAJ: Conceptualization; Writing - review & editing; Original draft; Investigation; Data curation; Resources; Validation; Methodology.

AK: Formal analysis; Investigation; Methodology; Writing - review & editing; Supervision; Resources; original draft; Validation.

AG: Writing - review & editing; Formal analysis; investigation; original draft; Resources.

BAS: Supervision; Project administration; Validation; original draft.

All authors have read and approved the manuscript.

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References

1. Kelly, T., Yang, W., Chen, C. S., Reynolds, K. & He, J. Global burden of obesity in 2005 and projections to 2030. *International Journal of Obesity*, **32** (9), 1431–1437 (2008).
2. Wilborn, C. *et al.* Obesity: Prevalence, Theories, Medical Consequences, Management, and Research Directions. *Journal of the International Society of Sports Nutrition*. 2005;2(2).
3. Ekpanyaskul, C., Sithisarankul, P. & Wattanasirichaigoon, S. Overweight/obesity and related factors among Thai medical students. *Asia Pacific Journal of Public Health*, **25** (2), 170–180 (2013).
4. Ha, S. A. *et al.* Eating habits, physical activity, nutrition knowledge, and self-efficacy by obesity status in upper-grade elementary school students. *Nutrition research and practice*, **10** (6), 597 (2016).
5. Dare, S., Mackay, D. F. & Pell, J. P. Relationship between smoking and obesity: a cross-sectional study of 499,504 middle-aged adults in the UK general population. *PloS one*, **10** (4), e0123579 (2015).
6. Abbate, C. *et al.* Evaluation of obesity in healthcare workers. *Med Lav*, **97** (1), 13–19 (2006).
7. Assir, M. K., Khan, Z., Shafiq, M. & Chaudhary, A. High prevalence of preobesity and obesity among medical students of Lahore and its relation with dietary habits and physical activity. *Indian Journal of Endocrinology and Metabolism*. 2016;20(2).
8. Bertias, G., Mammas, I., Linardakis, M. & Kafatos, A. Overweight and obesity in relation to cardiovascular disease risk factors among medical students in Crete, Greece. *BMC Public Health*, **3**, 3 (2003).
9. Kumar, A. & Ramiah, S. Anthropometric studies on students of the Nepal Medical College: elbow breadth. *Kathmandu Univ Med J (KUMJ)*, **3** (4), 345–348 (2005).
10. Rampal, L. *et al.* A national study on the prevalence of obesity among 16,127 Malaysians. *Asia Pac J Clin Nutr*, **16** (3), 561–566 (2007).

11. Fang, V., Gillespie, C., Crowe, R., Popeo, D. & Jay, M. Associations between medical students' beliefs about obesity and clinical counseling proficiency. *BMC Obesity*. 2019;6(1).
12. Ward, K. D. *et al.* The Relationship Between Waterpipe Smoking and Body Weight: Population-Based Findings From Syria. *Nicotine Tob. Res*, **17** (1), 34–40 (2014).
13. Matsuo, K., Dare, S., Mackay, D. F. & Pell, J. P. Relationship between Smoking and Obesity: A Cross-Sectional Study of 499,504 Middle-Aged Adults in the UK General Population. *Plos One*. 2015;10(4).
14. Kakaje, A. *et al.* Mental disorder and PTSD in Syria during wartime: a nationwide crisis. *BMC Psychiatry*. 2021;21(1).
15. Kakaje, A. & Awad, R. Behcet's disease presenting with primary hypothyroidism, adrenal insufficiency, and celiac disease: A case report. *Clinical Case Reports*. 2020.
16. Moussa, M. T., Lovibond, P., Laube, R. & Megahead, H. A. Psychometric properties of an arabic version of the depression anxiety stress scales (DASS). *Research on Social Work Practice*, **27** (3), 375–386 (2017).
17. Bauman, A. *et al.* The International Prevalence Study on Physical Activity: results from 20 countries. *International Journal of Behavioral Nutrition and Physical Activity*. 2009;6(1).
18. Guthold, R., Stevens, G. A., Riley, L. M. & Bull, F. C. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants. *The Lancet Global Health*, **6** (10), e1077–e86 (2018).
19. Sallis, R. *et al.* Physical inactivity is associated with a higher risk for severe COVID-19 outcomes: a study in 48 440 adult patients. *British Journal of Sports Medicine*. 2021.
20. Ameye, H. & Swinnen, J. Obesity, income and gender: The changing global relationship. *Global Food Security*, **23**, 267–281 (2019).
21. Asghar, A., Masood Shah, A., Ali Hussain, A., Tahir, A. & Asghar, H. Frequency of Pre-obesity and Obesity in Medical Students of Karachi and the Predisposing Lifestyle Habits. *Cureus*. 2019.
22. Clarke, R. *et al.* Water-Pipe Smoking and Metabolic Syndrome: A Population-Based Study. *PLoS ONE*. 2012;7(7).
23. Baalbaki, R. *et al.* Association Between Smoking Hookahs (Shishas) and Higher Risk of Obesity: A Systematic Review of Population-Based Studies. *Journal of Cardiovascular Development and Disease*. 2019;6(2).
24. Alolabi, H. *et al.* Prevalence and behavior regarding cigarette and water pipe smoking among Syrian undergraduates. *Heliyon*. 2020;6(11).
25. Kurdy, S., Halawany, G., Al-Nuaimy, H., Abdullah, N. N. & Al-Kubaisy, W. Factors Associated with Smoking Behaviour among University Students in Syria. *Journal of ASIAN Behavioural Studies*. 2017;2(3).
26. Kakaje, A. *et al.* Smoking Habits and the Influence of War on Cigarette and Shisha Smoking in Syria. 2020.

27. Teachman, J. Body weight, marital status, and changes in marital status. *Journal of family issues*, **37** (1), 74–96 (2016).
28. Peltzer, K. *et al.* Prevalence of overweight/obesity and its associated factors among university students from 22 countries. *International journal of environmental research and public health*, **11** (7), 7425–7441 (2014).
29. Lazarevich, I. & del Irigoyen-Camacho, M. E. Consuelo Velázquez-Alva M. Obesity, eating behaviour and mental health among university students in Mexico City. *Nutricion hospitalaria*, **28** (6), 1892–1899 (2013).
30. Willer, C. J. *et al.* Six new loci associated with body mass index highlight a neuronal influence on body weight regulation. *Nature genetics*, **41** (1), 25 (2009).
31. Papas, M. A. *et al.* The built environment and obesity. *Epidemiologic reviews*, **29** (1), 129–143 (2007).

Tables

TABLE 1 demonstrates the characteristics of the sample according to each BMI category.					
Characteristic	18.5> BMI	18.5-24.9	25-29.9	30<BMI	p value
Gender					<0.001
Male	11 (27.5%)	112 (36.8%)	79 (65.8%)	28 (75.7%)	
Female	29 (72.5%)	192 (63.2%)	41 (34.2%)	9 (24.3%)	
Economic status					0.450 ^{NS}
Poor	0 (0.0%)	5 (1.6%)	1 (0.8%)	0 (0.0%)	
Fair	8 (20.0%)	65 (21.4%)	27 (22.5%)	12 (32.4%)	
average	28 (70.0%)	214 (70.4%)	78 (65.0%)	20 (54.1%)	
Good	4 (10.0%)	20 (6.6%)	14 (11.7%)	5 (13.5%)	
Mean grades					0.815 ^{NS}
90+	7 (17.5%)	43 (14.1%)	16 (13.3%)	7 (18.9%)	
80-89.9	12 (30.0%)	143 (47.0%)	55 (45.8%)	13 (35.1%)	
70-79.9	19 (47.5%)	102 (33.6%)	44 (36.7%)	15 (40.5%)	
60-69.9	2 (5.0%)	14 (4.6%)	5 (4.2%)	2 (5.4%)	
50-59.9	0 (0.0%)	2 (0.7%)	0 (0.0%)	0 (0.0%)	
Marital status					0.033 ^{NS}
Single	40 (100.0%)	299 (98.4%)	119 (99.2%)	34 (91.9%)	
Married	0 (0.0%)	4 (1.3%)	0 (0.0%)	3 (8.1%)	
Divorced	0 (0.0%)	0 (0.0%)	1 (0.8%)	0 (0.0%)	
Widowed	0 (0.0%)	1 (0.3%)	0 (0.0%)	0 (0.0%)	
Smoking					<0.001
Regularly	2 (5.0%)	28 (9.2%)	34 (28.3%)	5 (13.5%)	
No	38 (95.0%)	246 (80.9%)	77 (64.2%)	24 (64.9%)	
Not regularly	0 (0.0%)	30 (9.9%)			

			9 (7.5%)	8 (21.6%)	
Smoking Shisha					<0.001
Regularly	0 (0.0%)	20 (6.6%)	27 (22.5%)	5 (13.5%)	
No/ Not regularly	40 (100.0%)	284 (93.4%)	93 (77.5%)	32 (86.5%)	
Smoking Cigarettes					
Regularly	2 (5.0%)	20 (6.6%)	16 (13.3%)	2 (5.4%)	0.097 ^{NS}
No/ Not regularly	38 (95.0%)	284 (93.4%)	104 (86.7%)	35 (94.6%)	
Alcohol					0.001
Regularly	1 (2.5%)	9 (3.0%)	12 (10.0%)	5 (13.5%)	
No	35 (87.5%)	259 (85.2%)	88 (73.3%)	22 (59.5%)	
Not regularly	4 (10.0%)	36 (11.8%)	20 (16.7%)	10 (27.0%)	
Living					0.809 ^{NS}
With family	28 (70.0%)	203 (66.8%)	75 (62.5%)	26 (70.3%)	
Alone	12 (30.0%)	96 (31.6%)	44 (36.7%)	10 (27.0%)	
Other	0 (0.0%)	5 (1.6%)	1 (0.8%)	1 (2.7%)	
If living alone, where?					0.509 ^{NS}
A uni dorm	6 (46.2%)	58 (56.9%)	27 (57.4%)	5 (41.7%)	
Rental	7 (53.8%)	36 (35.3%)	16 (34.0%)	7 (58.3%)	
Other	0 (0.0%)	8 (7.8%)	4 (8.5%)	0 (0.0%)	
Family history obesity					<0.001
Yes	7 (17.5%)	79 (26.0%)	46 (38.3%)	27 (73.0%)	
No	33 (82.5%)	225 (74.0%)	74 (61.7%)	10 (27.0%)	
Which family member had the obesity?					0.243 ^{NS}

Mother	3 (42.9%)	25 (31.6%)	22 (47.8%)	11 (40.7%)
Father	4 (57.1%)	34 (43.0%)	11 (23.9%)	6 (22.2%)
Brother	0 (0.0%)	8 (10.1%)	7 (15.2%)	3 (11.1%)
Sister	0 (0.0%)	3 (3.8%)	1 (2.2%)	0 (0.0%)
More than one		9 (11.4%)	5 (10.9%)	7 (25.9%)
NS: Not significant. Chi-square was used. p value was considered significant when it was $p \leq 0.0045$				

TABLE 2 demonstrates eating patterns, studying methods, physical activity, and DASS 21 results in our sample categorized by their BMI

Characteristic	18.5>BMI	18.5-24.9	25-29.9	30<BMI	P value
How many meals?					0.001
Little	10 (25.0%)	57 (18.8%)	18 (15.0%)	6 (16.2%)	
Moderate	29 (72.5%)	218 (71.7%)	80 (66.7%)	19 (51.4%)	
Much	1 (2.5%)	29 (9.5%)	22 (18.3%)	12 (32.4%)	
Eating vegetables?					0.313 ^{NS}
Little	5 (12.5%)	24 (7.9%)	12 (10.0%)	3 (8.1%)	
Moderate	25 (62.5%)	147 (48.4%)	65 (54.2%)	17 (45.9%)	
Much	10 (25.0%)	133 (43.8%)	43 (35.8%)	17 (45.9%)	
High fatty meals?					<0.001
Little	15 (37.5%)	173 (56.9%)	39 (32.5%)	5 (13.5%)	
Moderate	25 (62.5%)	116 (38.2%)	61 (50.8%)	20 (54.1%)	
Much	0 (0.0%)	15 (4.9%)	20 (16.7%)	12 (32.4%)	
Number of Fast-food in a day in the last week?					<0.001
Less than that	3 (7.5%)	44 (14.5%)	9 (7.5%)	0 (0.0%)	
1	16 (40.0%)	125 (41.1%)	38 (31.7%)	5 (13.5%)	
2	14 (35.0%)	79 (26.0%)	25 (20.8%)	11 (29.7%)	
3	4 (10.0%)	37 (12.2%)	28 (23.3%)	7 (18.9%)	
More than that	3 (7.5%)	19 (6.3%)	20 (16.7%)	14 (37.8%)	
Mean number of Snacks every day in the last week?					0.007 ^{NS}

1	17 (42.5%)	105 (34.5%)	36 (30.0%)	7 (18.9%)	
2					
3	13 (32.5%)	97 (31.9%)	35 (29.2%)	11 (29.7%)	
More than that	5 (12.5%)	41 (13.5%)	31 (25.8%)	14 (37.8%)	
	5 (12.5%)	61 (20.1%)	18 (15.0%)	5 (13.5%)	
Daily mean hours of study?					0.559 ^{NS}
Less than an hour	4 (10.0%)	31 (10.2%)	10 (8.3%)	3 (8.1%)	
From 1 to 3 hours	21 (52.5%)	114 (37.5%)	43 (35.8%)	16 (43.2%)	
From 3 to 6 hours	12 (30.0%)	109 (35.9%)	47 (39.2%)	8 (21.6%)	
From 6 to 8 hours	2 (5.0%)	42 (13.8%)	17 (14.2%)	8 (21.6%)	
More than 8 hours	1 (2.5%)	8 (2.6%)	3 (2.5%)	2 (5.4%)	
Main study posture					0.225 ^{NS}
Walking	9 (22.5%)	56 (18.4%)	14 (11.7%)	2 (5.4%)	
Sitting	28 (70.0%)	205 (67.4%)	93 (77.5%)	28 (75.7%)	
Lying down	3 (7.5%)	40 (13.2%)	13 (10.8%)	7 (18.9%)	
Other	0 (0.0%)	3 (1.0%)	0 (0.0%)	0 (0.0%)	
Eating during studying					0.408 ^{NS}
Rarely	16 (40.0%)	107 (35.2%)	42 (35.0%)	6 (16.2%)	
Sometimes snakes	19 (47.5%)	156 (51.3%)	62 (51.7%)	25 (67.6%)	
Regularly	5 (12.5%)	41 (13.5%)	16 (13.3%)	6 (16.2%)	
Times of studying					0.621 ^{NS}
During the night	7 (17.5%)	77 (25.3%)	29 (24.2%)	13 (10.3%)	
During the day	13 (32.5%)				

No specific time	20 (50.0%)	93 (30.6%)	41 (34.2%)	8 (21.6%)	
		134 (44.1%)	50 (41.7%)	16 (43.2%)	
Nap after meals					0.286 ^{NS}
Yes	12 (30.0%)	94 (30.9%)	42 (35.0%)	17 (45.9%)	
No	28 (70.0%)	210 (69.1%)	78 (65.0%)	20 (54.1%)	
Staying up after midnight					<0.001
Yes	19 (47.5%)	155 (51.0%)	76 (63.3%)	31 (83.8%)	
No	21 (52.5%)	149 (49.0%)	44 (36.7%)	6 (16.2%)	
Physical activity level					<0.001
Low	8 (38.1%)	53 (24.9%)	40 (46.5%)	15 (51.7%)	
Moderate	9 (42.9%)	125 (58.7%)	34 (39.5%)	9 (31.0%)	
High	4 (19.0%)	35 (16.4%)	12 (14.0%)	5 (17.2%)	
Depression					<0.001
Normal	17 (42.5%)	150 (49.3%)	33 (27.5%)	8 (21.6%)	
Moderate	16 (40.0%)	110 (36.2%)	57 (47.5%)	18 (48.6%)	
Sever	7 (17.5%)	44 (14.5%)	30 (25.0%)	11 (29.7%)	
Anxiety					<0.001
Normal	24 (60.0%)	165 (54.3%)	45 (37.5%)	16 (43.2%)	
Moderate	8 (20.0%)	103 (33.9%)	47 (39.2%)	8 (21.6%)	
Sever	8 (20.0%)	36 (11.8%)	28 (23.3%)	13 (35.1%)	
Stress					0.003
Normal	24 (60.0%)	172 (56.6%)	45 (37.5%)	19 (51.4%)	
Moderate					

Sever	9 (22.5%)	85 (28.0%)	57 (47.5%)	15 (40.5%)
	7 (17.5%)	47 (15.5%)	18 (15.0%)	3 (8.1%)

NS: Not significant. Chi-square was used in this table.

p value was considered significant when it was $p \leq 0.0045$

TABLE 3 demonstrates mean age, university year, cigarette and shisha quantity, number of daily meals categorized according to their BMI.

Characteristic	18.5>	18.5-24.9	25-29.9	30<	P value
Age (in years)	21.23 (1.593)	21.14 (1.550)	21.38 (1.636)	22.22 (1.618)	0.001
Current university year	4.10 (1.429)	3.94 (1.395)	3.99 (1.393)	4.46 (1.304)	0.194 ^{NS}
Daily cigarettes	16.00 (5.657)	14.05 (9.561)	13.53 (7.899)	15.00 (7.071)	0.980 ^{NS}
Weekly shisha	-	4.17 (3.446)	3.10 (1.655)	3.67 (1.506)	0.321 ^{NS}
Daily meals	2.40 (0.632)	2.67 (0.880)	2.93 (0.881)	2.78 (0.750)	0.004
Stress score	7.45 (4.512)	7.53 (4.664)	8.66 (4.080)	7.70 (4.678)	0.129 ^{NS}
Anxiety score	4.05 (3.909)	3.96 (3.620)	5.31 (4.002)	5.78 (4.956)	0.001
Depression score	6.25 (4.448)	5.60 (4.294)	7.40 (4.094)	7.76 (4.573)	<0.001

NS: Not significant. One-way ANOVA was used.

TABLE 4 demonstrates stress score, anxiety score, depression score, age, academic year, smoking cigarettes, smoking shisha and number of daily meals categorized according to each IPAQ category.				
Characteristic	Low	Moderate	High	P value
Age	21.01 (1.839)	21.23 (1.522)	21.36 (1.656)	0.358 ^{NS}
Current university year	3.72 (1.569)	3.98 (1.424)	4.02 (1.342)	0.272 ^{NS}
Daily cigarettes	14.10 (6.641)	12.42 (10.587)	14.86 (7.755)	0.821 ^{NS}
Weekly shisha	2.67 (1.303)	4.15 (3.392)	3.50 (3.000)	0.367 ^{NS}
Daily meals	2.61 (0.743)	2.80 (0.905)	2.86 (1.017)	0.115 ^{NS}
Stress score	8.27 (4.556)	7.76 (4.343)	7.48 (5.543)	0.512 ^{NS}
Anxiety score	5.12 (4.270)	4.03 (3.277)	3.82 (3.866)	0.026
Depression score	6.80 (4.316)	6.31 (4.367)	5.14 (4.622)	0.069 ^{NS}
NS: Not significant. One-way ANOVA was used.				

TABLE 5 demonstrates the characteristics of the sample and exercise level according to IPAQ.				
Characteristic	Low	Moderate	High	P value
Gender				<0.001
Male	44 (37.9%)	79 (44.6%)	41 (73.2%)	
Female	72 (62.1%)	98 (55.4%)	15 (26.8%)	
Economic status				0.173 ^{NS}
Poor	1 (0.9%)	2 (1.1%)	3 (5.4%)	
Fair	28 (24.1%)	40 (22.6%)	14 (25.0%)	
average	75 (64.7%)	118 (66.7%)	38 (67.9%)	
Good	12 (10.3%)	17 (9.6%)	1 (1.8%)	
Mean grades				0.591 ^{NS}
90+	26 (22.4%)	25 (14.1%)	8 (14.3%)	
80-89.9	46 (39.7%)	83 (46.9%)	27 (48.2%)	
70-79.9	35 (30.2%)	61 (34.5%)	19 (33.9%)	
60-69.9	8 (6.9%)	7 (4.0%)	2 (3.6%)	
50-59.9	1 (0.9%)	1 (0.6%)	0 (0.0%)	
Marital status				0.005 ^{NS}
Single	112 (96.6%)	177 (100.0%)	54 (96.4%)	
Married	4 (3.4%)	0 (0.0%)	0 (0.0%)	
Divorced	0 (0.0%)	0 (0.0%)	1 (1.8%)	
Widowed	0 (0.0%)	0 (0.0%)	1 (1.8%)	
Smoking Shisha				0.847 ^{NS}
Regularly	10 (8.6%)	17 (9.6%)	4 (7.1%)	
No/ Not regularly	106 (91.4%)	160 (90.4%)	52 (92.9%)	
Smoking Cigarettes				0.307 ^{NS}
Regularly	10 (8.6%)	11 (6.2%)	7 (12.5%)	
No/ Not regularly	106 (91.4%)	166 (93.8%)	49 (87.5%)	
Alcohol				0.447 ^{NS}
Regularly	7 (6.0%)	7 (4.0%)	5 (8.9%)	
No	90 (77.6%)	143 (80.8%)	46 (82.1%)	

Not regularly	19 (16.4%)	27 (15.3%)	5 (8.9%)	
Living				0.769 ^{NS}
With family	78 (67.2%)	116 (65.5%)	38 (67.9%)	
Alone	35 (30.2%)	58 (32.8%)	18 (32.1%)	
Other	3 (2.6%)	3 (1.7%)	0 (0.0%)	
If living alone, where?				0.369 ^{NS}
A uni dorm	23 (57.5%)	36 (58.1%)	10 (55.6%)	
Rental	16 (40.0%)	22 (35.5%)	5 (27.8%)	
Other	1 (2.5%)	4 (6.5%)	3 (16.7%)	
Family history obesity				0.669 ^{NS}
Yes	39 (33.6%)	51 (28.8%)	18 (32.1%)	
No	77 (66.4%)	126 (71.2%)	38 (67.9%)	
Which family member had the obesity?				0.773 ^{NS}
Mother	15 (38.5%)	20 (39.2%)	10 (55.6%)	
Father	15 (38.5%)	17 (33.3%)	4 (22.2%)	
Brother	4 (10.3%)	6 (11.8%)	2 (11.1%)	
Sister	0 (0.0%)	1 (2.0%)	1 (5.6%)	
More than one	5 (12.8%)	7 (13.7%)	1 (5.6%)	
Daily mean hours of study?				0.242 ^{NS}
Less than an hour	12 (10.3%)	14 (7.9%)	6 (10.7%)	
From 1 to 3 hours	40 (34.5%)	73 (41.2%)	20 (35.7%)	
From 3 to 6 hours	38 (32.8%)	63 (35.6%)	24 (42.9%)	
From 6 to 8 hours	20 (17.2%)	25 (14.1%)	6 (10.7%)	
More than 8 hours	6 (5.2%)	2 (1.1%)	0 (0.0%)	
Depression				0.040 ^{NS}
Normal	40 (34.5%)	75 (42.4%)	33 (58.9%)	
Moderate	53 (45.7%)	66 (37.3%)	14 (25.0%)	
Sever	23 (19.8%)	36 (20.3%)	9 (16.1%)	
Anxiety				0.170 ^{NS}
Normal	51 (44.0%)	87 (49.2%)	34 (60.7%)	

Moderate	42 (36.2%)	66 (37.3%)	13 (23.2%)	
Sever	23 (19.8%)	24 (13.6%)	9 (16.1%)	
Stress				0.818 ^{NS}
Normal	54 (46.6%)	90 (50.8%)	30 (53.6%)	
Moderate	43 (37.1%)	61 (34.5%)	16 (28.6%)	
Sever	19 (16.4%)	26 (14.7%)	10 (17.9%)	
NS: Not significant. Chi-square was used. Chi-square was used in this table.				
p value was considered significant when it was $p \leq 0.0045$				