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Depression and food consumption in Mexican college students

Depresión y consumo de alimentos en estudiantes universitarios mexicanos

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ABSTRACT

Introduction: depression is frequently accompanied by overeating and a preference for certain foods that may consequently lead to weight gain.

Objectives: a) to determine the prevalence of depression and the consumption of unhealthy food in first-year college students; and b) to analyze the association between depression score and food consumption frequency.

Methods: a cross-sectional study was carried out in 1,104 freshman students, 40.3% men and 59.7% women, at a public university in Mexico City. The 20-item depression scale (CES-D) and Food Frequency Questionnaire were applied to measure depressive symptoms and food consumption. Logistic regression analysis was carried out for food consumption frequency and CES-D depression score grouped in quartiles.

Results: the prevalence of depression symptoms was 18.2% in men and 27.5% in women ($p < 0.001$). A considerable proportion of the students reported poor eating habits: consumption of fried food (30.3%), sweetened drinks (49.0%) and sugary food (51.8%) 2-7 times/week; and less than half the students practiced vigorous physical activity (39.7%). In women, a higher depression score was associated with a higher frequency of consumption of fast food (OR = 2.08, $p = 0.018$), fried food (OR = 1.92, $p = 0.01$) and sugary food (OR = 2.16, $p = 0.001$), and a lower frequency of physical exercise (< 75 min/week; OR = 1.80, $p = 0.017$). In men, no association was observed between depression score and food consumption variables. An association was observed between depression and low exercise frequency (OR = 2.22, $p = 0.006$).

Conclusions: women vulnerable to depression may use food to cope with negative mood states. Therefore, institutional health promotion and nutritional education programs should include adequate emotion and stress management.

Key words: Depression. Food intake. College students.

RESUMEN

Introducción: la depresión se asocia frecuentemente con comer en exceso y con una preferencia por ciertos alimentos, lo cual puede llevar, consecuentemente, al aumento de peso.

Objetivos: a) determinar la prevalencia de depresión y de consumo de alimentos no saludables en estudiantes universitarios de nuevo ingreso; y b) analizar la asociación entre depresión y consumo de alimentos.

Métodos: se llevó a cabo un estudio trasversal con 1.104 estudiantes de nuevo ingreso, 40,3% hombres y 59,7% mujeres, en una universidad pública de la Ciudad de México. Se aplicaron la escala de depresión de 20 ítems (CES-D) y el Cuestionario de Frecuencia de Consumo de Alimentos para identificar síntomas depresivos y el consumo de alimentos. Se llevó a cabo un análisis de regresión logística para estudiar la asociación entre la

frecuencia de consumo de alimentos y el puntaje de depresión CES-D agrupado en cuartiles.

Resultados: la prevalencia de depresión fue del 18,2% en hombres y el 27,5% en mujeres ($p < 0,001$). Una proporción considerable de estudiantes presentó malos hábitos alimentarios: consumo de frituras (30,3%), bebidas azucaradas (49,0%) y alimentos azucarados (51,8%) 2-7 veces/semana; menos de la mitad de los estudiantes realizó ejercicio vigoroso (39,7%). En las mujeres, la depresión se asoció con una mayor frecuencia de consumo de comida rápida (OR = 2,08, $p = 0,018$), frituras (OR = 1,92, $p = 0,01$), alimentos con alto contenido de azúcar (OR = 2,16, $p = 0,001$) y baja frecuencia de ejercicio (< 75 min/semana; OR = 1,80, $p = 0,017$). En hombres, no se observó asociación entre depresión y las variables de consumo de alimentos; se detectó asociación entre depresión y baja frecuencia de ejercicio (OR = 2,22, $p = 0,006$).

Conclusiones: mujeres vulnerables a la depresión pueden usar los alimentos para mejorar los estados del ánimo negativos. Por lo tanto, los programas institucionales de promoción de la salud y de educación nutricional deben incluir un manejo adecuado de las emociones y el estrés.

Palabras clave: Depresión. Consumo de alimentos. Estudiantes universitarios.

INTRODUCTION

In recent years, a number of behavioral studies have tried to explain the relationship between nutrition and depressive disorders, taking into consideration overeating, frequency of eating, and preferences for certain foods (1-3). Depression is frequently accompanied by appetite changes, which may take the form of either decreased appetite (melancholic depression) or increased appetite (depression with atypical features) (3,4).

According to affective theories, people with depression may use food not only for nourishment, but also to cope with negative emotions; therefore, food intake can be considered as an inadequate coping mechanism in response to stress and tension that can be part of the causal link for developing overweight or obesity (5,6). Other theoretical

frameworks have focused on neurobiological data such as brain-environment interaction referred to as midbrain dopamine system (3). Food represents a potent natural reward and gratification related to dopamine production that influences nutrition choice regarding higher fat and sugary foods (“comfort foods”) (7). As part of a broader framework, reduced affective self-control (impulsive food choices), particularly for “comfort foods”, and a desire to achieve immediate reward may be a shared cognitive mechanism contributing to the high prevalence of co-morbid mood disorders and weight gain (8). Additionally, increasingly greater food availability over recent decades may be another factor that contributes to the relationship between nutrition and depressive symptoms (3).

Studies on food cravings have mostly focused on carbohydrates consumption and, especially, mildly dysphoric mood. It is commonly assumed that carbohydrate craving is related to serotonin deficit (9); therefore, some people tend to overeat sugary food (carbohydrate beverages, pastries, sweets and chocolate, cakes and biscuits) to improve negative mood states (10,11).

Consistent with this theory, recent data suggests that there is an association between a preference for sweet taste and a higher depression score in patients with severe obesity (12). Other studies have shown that intake of “comfort foods”, sweet foods, and a Western-type diet had an effect on physiological and psychological wellbeing and was associated with a higher depression score and obesity in the general population, especially in women (13-21).

Regarding college students and their eating habits, in studies performed in Germany (22), the USA (23) and the United Arab Emirates (24), it has been reported that young adults tend to overeat and consume unhealthy food in response to stressful situations. In the USA, Moore et al. (2) have shown that in non-treatment-seeking youths, aged 8-17 years, depressive symptoms were associated with significantly greater consumption of total energy and energy from sweet snack foods, which could lead to weight gain over time.

However, there are contradictory findings with respect to negative mood and food intake. In spite of the fact that in scientific literature food choice was considered as a deliberate strategy to modify temperament and mood, some researchers have found no consistent differences in dietary composition in comparing the periods of high and low life stress or depression. In addition, to this day it remains unclear whether the food consumption improves negative moods or whether the intake of certain foods can have an effect on human behavior (25).

In the study by Mikolajczyk et al. (26), conducted in three countries (Germany, Poland and Bulgaria) among first-year college students, a positive association has been found between food consumption (i.e., fast-food, cakes, snacks, sweets) and stress, but not between food consumption and depressive symptoms among female students; however, these patterns were not found among male students.

Additionally, Fulkerson and Nancy (27), in the study on depressive symptoms and eating behavior in adolescents, have shown that total caloric intake and snacking frequency were not significantly associated with depressed mood.

In Latin America, depression represents a growing problem among young adults. A high prevalence of depressive symptomatology has been reported among college students, from 11.8% to 30%, which can rise to 50% during stressful situations (28,29). Additionally, in Mexico overweight and obesity have a high and increasing prevalence, 36.3% in adolescents from 12 to 19 years old and 72.5% in individuals over 20 years old (30). Therefore, it is important to study eating habits and their relationship to mood disorders in young population groups. When students experience the transition to university life they are frequently exposed to stress, fatigue, and time restraints. Poor eating habits acquired at this age generally continue into adulthood and may lead to weight gain. An understanding of the influence of negative emotions on eating behavior, along with nutritional education, may be essential in preventing overweight/obesity in adulthood.

The aim of the present study was to investigate a possible association between perceived depression and unhealthy food consumption in college students in Mexico City, and to test the hypothesis that college students with a higher level of depression would have

higher consumption of carbohydrate-rich and/or energy-rich food. Therefore, the objectives of this study were: a) to determine the prevalence of depression and unhealthy food consumption in first-year students, both men and women; and b) to analyze the possible association between depression score and unhealthy food consumption.

MATERIAL AND METHODS

Sample

A cross-sectional study was performed at the Autonomous Metropolitan University in Mexico City with first-year students ($n = 1,131$), who participated in an on-line survey from a total population of 1,364 freshman students enrolled at the university in the autumn of 2016. The response rate was 82.9%.

The questionnaire section of this study was part of the online health survey for freshman students applied during the first week of classes in computer rooms.

Ethics

The questionnaire was completed anonymously, and the participants were assured of data confidentiality. The students participated on a voluntary basis, and they acknowledged informed consent on-line. The University Review Board approved the project, where ethical aspects were considered.

Instruments

A Spanish-language version of the 20-item depression scale created by the Center for Epidemiologic Studies (CES-D) was used to identify depressive symptoms.

This instrument has been validated and utilized in various studies with non-clinical Mexican populations (31). Twenty Likert-type items assessed the frequency of depressive symptomatology in the previous week, including depressed mood, feelings of guilt and worthlessness, psychomotor retardation, and sleep difficulties. This scale had shown a good internal consistency in Mexico's student population, with Cronbach's alpha 0.87. The maximum score of the instrument is 60, indicating severe depression, and the minimum

score is 0, indicating absence of depressive symptoms. In this study, a cut-off point of 16 was used to recognize the presence of depressive symptomatology.

The assessment of food intake was performed using the Food Frequency Questionnaire, which consists of 69 items and encompasses all groups of foods (32). The carbohydrate-rich and/or energy-rich foods (unhealthy foods) were selected from this list and categorized into five groups: cereals (white bread was selected from white wheat cereals), fried food (such as potato chips, corn chips and tortilla chips, French fries, greaves and fried bananas), sweet food (cakes, cookies, pastries, sweets, chocolate, cakes, biscuits, sweet bread), and sweetened beverages (sugary soft drinks, natural and industrial juices). The fast food group (such as hamburgers, fried chicken, pizza, or sausages) was added to the questionnaire. Food intake frequency was measured as the consumption of respective food choices over a number of days of the week with the corresponding answers: almost never, once a week, two or three times per week, four or more times per week. A frequency of consumption of 2-3 times or more per week was considered as unhealthy behavior (33). Physical activity was assessed with the question "How many times per week do you exercise for at least one hour?" Less than 75 minutes of vigorous physical activity per week was considered as unhealthy behavior in line with the World Health Organization criteria and the recommendations of the American College Health Association (34,35).

Self-reported weight and height were recorded and BMI was calculated. According to the World Health Organization (WHO) criteria (36), the cutoff point for being overweight was $\text{BMI} \geq 25 \text{ kg/m}^2$; for being obese, $\geq 30 \text{ kg/m}^2$; and for being underweight, $< 18.5 \text{ kg/m}^2$.

Data analysis

The main characteristics of the study group are presented as means and standard deviations for continuous variables and percentage for categorical variables. To study the associations between food consumption frequency and depression, 78 students with low BMI ($\text{BMI} < 18.5$) were excluded from this analysis. A logistic regression analysis was carried out for food consumption frequency and CES-D depression score was divided by

quartiles. The observations in the 1st quartile (non or few depression symptoms) were used as the reference group. The models were constructed by sex and adjusted for age and BMI. Odds ratios and 95% confidence intervals (CI) were obtained. Statistical significance was set at p-value < 0.05. The statistical package STATA V12 (College Station TX. StataCorp LLC) was used for data analysis.

RESULTS

A total of 1,104 students were evaluated; 445 (40.3%) of them were men and 659 (59.7%) were women. The mean age of participants was 19.6 \pm 2.4. Descriptive characteristics of the participants are presented in table I.

About 19% of the students revealed that they had prior psychological treatment (16.2% men and 21.1% women, p = 0.041). Additionally, 268 students (23.8%) presented depressive symptoms (cutoff point of 16), more women (27.5%) than men (18.2%), p < 0.001.

Considering BMI, 228 participants (20.6%) were overweight and 57 (5.2%) were obese. Mean BMI was higher in men than in women (23.6 \pm 3.6 and 23.0 \pm 3.4, p = 0.006). Students with higher depression score demonstrated a higher BMI (β = 0.04, p = 0.002).

In terms of eating habits, college students frequently do not make healthy food choices and their diet was high in fried food (in 30.3% of the participants), soft drinks (in 49.0% of the participants) and, especially, sugary food (in 51.8%); less than a half of the students (39.7%) practice vigorous physical activity. Men consumed more fast food (p = 0.007), sweetened soft drinks (p < 0.001) and white bread (p < 0.001) than women; however, women exercised less than men (p < 0.001). Frequency of unhealthy eating habits and physical exercise is shown in table II.

Bivariate and multivariate logistic regression models to analyze the relationship of depressive symptoms with food consumption and physical exercise are shown in table III.

In women, according to bivariate analysis, the frequent consumption of fast food (OR = 2.07, 95% CI 1.13-3.78, p = 0.018), fried food (OR = 1.85, 95% CI 1.13-3.03, p = 0.014) and sugary food (OR = 2.17, 95% CI 1.37-3.42, p < 0.001), as well as exercising less than 75

min/week (OR = 1.80, 95% CI 1.11-2.91, $p = 0.016$) were associated with higher depression score. No association was observed between depression score and food variables in men. However, an association was found between the 4th quartile of depression score and low physical activity compared with the 1st quartile of depression score in men (OR = 2.22, 95% CI 1.26-3.91, $p = 0.006$).

In women, according to the multivariate logistic analysis, significant associations were observed between the 4th quartile of depression score and the frequent consumption of fast food (OR = 2.08, 95% CI 1.14 -3.82, $p = 0.018$), fried food (OR = 1.92, 95% CI 1.17-3.15, $p = 0.010$), sugary food (OR = 2.16, 95% CI 1.37-3.43, $p < 0.001$) and low frequency of exercise (OR = 1.80, 95% CI 1.11-2.91, $p = 0.017$) (Table III).

DISCUSSION

The present study examined the association of depression symptoms with unhealthy food consumption and exercise in first-year college students. Our findings support the hypothesis that higher depression score is related to unhealthy behavior (poor eating habits and low exercise frequency). According to the results, the prevalence of depression was high among participants, especially in women (27.5%), similar to other studies performed in student populations that have shown an onset of depression from a young age, its elevated prevalence among young adults, and a higher prevalence in females than in males (28,29).

A considerable number of the participants reported the consumption of unhealthy food more than two times per week, i.e., fast food (20.8%), fried food (30.3%), sugary drinks (49.0%), sweet foods (51.8%) and white bread (38.6%). Approximately one third of women (32.5%) and half of men (50.5%) performed rigorous physical activity at least 75 minutes per week. These data are consistent with previous findings that have shown low levels of physical activity and unhealthy habits such as the frequent consumption of sugary foods and a high intake of fast food in Mexican student groups (37,38). Regarding differences by sex, we found that some unhealthy eating (sweetened beverages and white bread) was

significantly more frequent in men than in women, whereas women had less frequency of exercise than men had.

In women in the present study, depression symptoms were significantly associated with consumption of fast food, fried food, and sweet foods, as well as with lower exercise frequency. It is important to note that these unhealthy behaviors acquired at a young age can consequently lead to weight gain. In a systematic review and meta-analysis, it has been reported that considerable weight and adiposity gains occur throughout college life, with a mean change in weight of 1.55 kg and 1.17% in body fat mainly due to decreased physical activity and food consumption away from home (39). Obesity, unhealthy dietary practices, and physical inactivity are risk factors for the development of metabolic syndrome from early adulthood (40). In the follow-up study, performed in the USA among young adults, it has been reported that the risk of metabolic syndrome increases on average 23% per 4.5 kg of weight gained, whereas regular physical activity over time *versus* low activity was considered to be a protective factor (41).

Our data were similar to the results of previous studies performed in the USA, UK, Australia, and China that have shown an association between a higher depression score and intake of a Western-type diet such as processed food, fried foods, refined grains, and sugary products in the general population (13-16), as well as with obesity (17), particularly in women (18-21). According to Dubé et al. (13), intake of “comfort foods” was associated with physiological and psychological wellbeing in women: high-calorie foods (high sugar and fat content) were more efficient in alleviating negative affects whereas low-calorie foods were more efficient in increasing positive emotions. In the study by Kampov-Polevoy et al. (14), it has been shown that hedonic response to sweet taste is associated with elevated sensitivity to mood altering effects and impaired control of eating sweet foods. Consistent with our data, Jeffery et al. (15) have found that in middle-aged U.S. women, depressive symptoms were positively associated with the consumption of sweet foods and negatively associated with the consumption of non-sweet foods.

In the present study, a significant association was found between depressive symptoms and BMI. This finding corroborates the hypothesis that people with higher depression

score frequently use “comfort foods” to make them feel better. It is worth mentioning that a growing number of studies have shown a reciprocal relationship between depression and higher BMI (42); therefore, it is important to take into consideration the influence of negative mood on eating behavior in overweight prevention and treatment strategies. “Comfort foods” have become increasingly available in an “obesogenic” environment over the last half-century, and individuals with depression symptoms can seek out “comfort food” in order to improve their psychological wellbeing (3). A rational coping style (i.e., planning to solve a problem or thinking of an alternative way to solve it), is generally more effective than an emotional eating style, and these skills must be learned from an early age. The transition to university life is a stressful experience for many students; therefore, time management, stress and problem coping skills should be taught for those susceptible to depression.

However, we did not find any association between sweetened drink consumption and depression score, nor has an association between unhealthy eating behavior and depression score been found in men. The above suggests that these eating behaviors are more typical for women, and men may have other ways of managing their negative emotions and stressful situations (13-21).

Additionally, non-consistent results reported in this domain may be explained by the fact that depressive symptoms or emotional stress can lead to either increased or decreased appetite. Effects of emotions on eating have been studied extensively. Surveys have shown that most people experience changes of appetite and eating behaviors in response to emotional stress: 11% to 55% eat more, while 32% to 70% eat less (43). Therefore, due to individual variability it remains difficult to predict how negative emotions may affects eating habits in a given person.

However, due to the high and increasing prevalence of overweight/obesity worldwide and the fact that individuals with elevated depressive symptoms may be prone to overeating and exhibit a preference for high-energy foods, an integral approach aimed at stress and emotion management and nutrition education may contribute to the development of healthy eating behavior (44).

Most countries have experienced nutrition transition, which is characterized by marked socio-economic transformation over recent decades. Such a transition has led to profound changes in food consumption and lifestyle patterns (45). The intake of fast food and sugar-sweetened beverages has increased drastically and the intake of milk, fruit, vegetables, and high fiber foods has decreased. Additionally, the level of physical activity has decreased and sedentary behavior has risen. This may contribute to the incidence of obesity and associated chronic diseases (46,47).

Finally, it is important to underline that information on the dietary and lifestyle patterns of young people is needed to prevent weight gain and to promote healthy food habits among the young population.

Among the limitations of the study, it should be noted that it was carried out with a specific non-clinical population (freshman students with a mean age of 19 years) and it is difficult to extrapolate the results to other population groups.

The self-reported questionnaire applied in the study for assessing depression only identifies symptoms or vulnerability to depression and does not diagnose a clinical condition. Additionally, a self-reported questionnaire may overestimate or underestimate food consumption frequency; weight and height were also self-reported. Despite this limitation, the study was carried out on a large sample of the student population, and associations were found between depression score and variables of food consumption in women, as well as between depression score and BMI. Further research with more precise techniques is required to assess the consistency of this data. Finally, longitudinal studies are needed to evaluate the long-term effect of depression on food consumption and body weight.

CONCLUSIONS

Freshman students presented a high prevalence of depression symptoms, and their diet was high in fried food, sweetened drinks and sugary food. Consumption of fast food, fried food and sweet food, as well as low exercise frequency were associated with higher depression score.

Individuals vulnerable to depression may use food for psychological comfort; therefore, an integral approach should be included in nutrition education. The efficiency of institutional programs, promotion of physical activities, and thematic workshops aimed at stress and emotion management may contribute to the development of healthy eating behaviors.

REFERENCES

1. Konttinen H, Mannisto S, Sarlio-Lahteenkorva S, Silventoinen K, Haukkala A. Emotional eating, depressive symptoms and self-reported food consumption. A population-based study. *Appetite* 2010;54(3):473-9.
2. Mooreville M, Shoemaker LB, Reina SA, Hannallah LM, Cohen LA, Courville AB, et al. Depressive symptoms and observed eating in youth. *Appetite* 2014;75:141-9.
3. Privitera GJ, Misenheimer ML, Doraiswamy PM. From weight loss to weight gain: appetite changes in major depressive disorder as a mirror into brain-environment interactions. *Front Psychol* 2013;4:873.
4. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: American Psychiatric Pub; 2013.
5. Canetti L, Bachar E, Berry EM. Food and emotion. *Behav Processes* 2002;60:157-64.
6. Privitera GJ, King-Shepard QK, Cuifolo KN, Doraiswamy PM. Differential food intake and food choice by depression and body mass index levels following a mood manipulation in a buffet-style setting. *J Health Psychol* 2016;1-10. DOI: 10.1177/1359105316650508.
7. Singh M. Mood, food and obesity. *Front Psychol* 2014;5:925.
8. Privitera GJ, McGrath HK, Windus BA, Doraiswamy PM. Eat now or later: Self-control as an overlapping cognitive mechanism of depression and obesity. *PLoS One* 2015;10:123-36.
9. Berg KA, Clarke WP, Cunningham KA, Spampinato U. Fine tuning serotonin 2c receptor function in the brain: molecular and functional implications. *Neuropharmacology* 2008;55(6):969-76.
10. Corsica JA, Spring BJ. Carbohydrate craving: a double-blind, placebo-controlled test of the self-medication hypothesis. *Eat Behav* 2008;9(4):447-54.

11. Christensen L, Pettijohn L. Mood and carbohydrate cravings. *Appetite* 2001;36:137-45.
12. Aguayo GA, Wallant MT, Arendt C, Bachim S, Pull CB. Taste preference and psychopathology. *Bull Soc Sci Med Grand Duche Luxemb* 2012;2:7-14.
13. Dube LJ, LeBel L, Lu J. Affect asymmetry and comfort food consumption. *Physiol Behav* 2005;86:559-67.
14. Kampov-Polevoy A, Alterman A, Khalitov E, Garbutt J. Sweet preference predicts mood altering effect of and impaired control over eating sweet foods. *Eat Behav* 2006;7(3):181-7.
15. Jeffery RW, Linde JA, Simon GE, Ludman EJ, Rohde P, Ichikawa LE, et al. Reported food choices in older women in relation to body mass index and depressive symptoms. *Appetite* 2009;52:238-40.
16. Akbaraly TN, Brunner EJ, Ferrie JE, Marmot MG, Kivimaki M, Singh-Manoux A. Dietary pattern and depressive symptoms in middle age. *The Brit J Psychiat* 2009;195(5):408-13.
17. Jacka FN, Pasco JA, Mykletun A, Williams LJ, Hodge AM, O'Reilly SL, et al. Association of Western and traditional diets with depression and anxiety in women. *Am J Psychiat* 2010;167(3):305-11.
18. Jacka FN, Mykletun A, Berk M, Bjelland I, Tell GS. The association between habitual diet quality and the common mental disorders in community dwelling adults: the Hordaland health study. *Psychosom Med* 2011;73(6):483-90.
19. Liu C, Xie B, Chou CP, Koprowski C, Zhou D, Palmer P, et al. Perceived stress, depression and food consumption frequency in the college students of China Seven Cities. *Physiol Behav* 2007;92:748-54.
20. Crawford GB, Khedkar A, Flaws JA, Sorkin JD, Gallicchio L. Depressive symptoms and self-reported fast-food intake in midlife women. *Prev Med* 2011;52(3-4):254-57.
21. Fowles ER, Timmerman GM, Bryant M, Kim S. Eating at fast-food restaurants and dietary quality in low-income pregnant women. *West J Nurs Res* 2011;33(5):630-51.

22. Macht M, Haupt C, Ellgring H. The perceived function of eating is changed during examination stress: a field study. *Eat Behav* 2005;6:109-12.
23. Adams T, Rini A. Predicting 1-year change in body mass index among college students. *J Am Coll Health* 2007;55:361-5.
24. Carter AO, Elzubeir M, Abdulrazzaq YM, Revel AD, Townsend A. Health and lifestyle needs assessment of medical students in the United Arab Emirates. *Med Teach* 2003;25:492-6.
25. Quirk SE, Williams LJ, O'Neil AO, Pasco JA, Jacka FN, Housden S, et al. The association between diet quality, dietary patterns and depression in adults: a systematic review. *BMC Psychiatry* 2013;13:175-87.
26. Mikolajczyk RT, El Ansari W, Maxwell AE. Food consumption frequency and perceived stress and depressive symptoms among students in three European countries. *Nutr J* 2009;8:31.
27. Fulkerson JA, Nancy E. Depressive symptoms and adolescent eating and health behaviors: a multifaceted view in a population-based sample. *Preventive Med* 2004;38:865-75.
28. González-Ramírez MT, Landero-Hernández R, García-Camayo J. Relación entre la depresión, la ansiedad y los síntomas psicosomáticos en una muestra de estudiantes universitarios del norte de México. *Rev Panam Salud Pública* 2009;25(2):141-5.
29. Agudelo DM, Casariego CP, Sánchez DL. Características de ansiedad y depresión en estudiantes universitarios. *Int J Psychol Res* 2008;1(1):34-9.
30. Shamah Levy T, Cuevas Nasu L, Rivera Dommarco J, Hernández Ávila M. Encuesta Nacional de Salud y Nutrición de Medio Camino 2016. México: Secretaría de Salud/Instituto Nacional de Salud Pública; 2016.
31. González-Forteza C, Solís TC, Jiménez TA, Hernández FI, González-González A, Juárez GF, et al. Confiabilidad y validez de la escala de depresión CES-D en un censo de estudiantes de nivel medio superior y superior en la Ciudad de México. *Salud Ment* 2011;34(1):53-9.

32. Ramírez Silva CI, Mundo Rosas V, Rodríguez Ramírez SC, Vizuet Vega NI, Hernández Carapia N, Jiménez Aguilar A. Encuestas dietéticas: recordatorio de 24 horas y frecuencia de consumo de alimentos. Centro de Investigación en Nutrición y Salud Instituto Nacional de Salud Pública. México: Instituto Nacional de Salud Pública; 2006.
33. Reséndiz AB, Hernández SA, Sierra MM, Torres MT. Hábitos de alimentación de pacientes con obesidad severa. *Nutr Hosp* 2015;31(2):672-81.
34. Organización Mundial de la Salud. Recomendaciones mundiales sobre actividad física para la salud. Ginebra: OMS; 2010.
35. American College Health Association. National College Health Assessment II: Reference Group Executive Summary Spring 2013. Hanover, MD: American College Health Association; 2013.
36. World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO Consultation. WHO Technical Report Series 894. Geneva: WHO; 2000.
37. Rivera MB. Hábitos alimentarios en estudiantes de la Universidad Juárez Autónoma de Tabasco. *Rev Cubana Salud Pública* 2006;32(3):1-7.
38. Lorenzini R, Betancur-Ancona DA, Chel-Guerrero LA, Segura-Campos MR, Castellanos-Ruelas AF. Estado nutricional en relación con el estilo de vida de estudiantes universitarios mexicanos. *Nutr Hosp* 2015;32(1):94-100.
39. Fedewa MV, Das BM, Evans EM, Dishman RK. Change in weight and adiposity in college students: a systematic review and meta-analysis. *Am J Prev Med* 2014;47(5):641-52.
40. Huang TT, Shimel A, Lee RE, Delancey W, Strother ML. Metabolic risks among college students: Prevalence and gender differences. *Metab Syndr Relat Disord* 2007;5(4):365-72.
41. Carnethon MR, Loria CM, Hill JO, Sidney S, Savage PJ, Liu K. Risk factors for the metabolic syndrome: The Coronary Artery Risk Development in Young Adults (CARDIA) study, 1985-2001. *Diabetes Care* 2004;27(11):2707-15.

42. Luppino FS, De Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BW, et al. Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Arch Gen Psychiatry* 2010;67(3):220-9.
43. Macht M. How emotions affect eating: a five-way model. *Appetite* 2008;50(1):1-11.
44. Lazarevich I, Irigoyen Camacho ME, Velázquez-Alva MD, Zepeda Zepeda M. Relationship among obesity, depression, and emotional eating in young adults. *Appetite* 2016;107:639-44.
45. Amuna P, Zotor FB. Epidemiological and nutrition transition in developing countries: impact on health and development. *Proc Nutr Soc* 2008;67:82-90.
46. Musaiger AO, Al-Khalifa F, Al-Mannai M. Obesity, unhealthy dietary habits and sedentary behaviors among university students in Sudan: growing risks for chronic diseases in a poor country. *Environ Health Prev Med* 2016;21(4):224-30.
47. Martínez-Álvarez JR, García-Alcon R, Villarino-Marín A, Marrodan-Serrano MD, Serrano-Morago L. Eating habits and preferences among student population of the Complutense University of Madrid. *Public Health Nutr* 2015;18:2654-9.

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Table I. Descriptive characteristics of the study group (n = 1,104)

<i>Characteristics</i>	<i>Total</i>	<i>Men</i>	<i>Women</i>	<i>p-value</i>
	1,104 (100%)	445 (40.3%)	659 (59.7%)	
Age (mean \pm SD)	19.6 (\pm 2.4)	20.0 (\pm 2.6)	19 (\pm 2.3)	< 0.001
Students who study and work				
Yes	314 (28.4%)	154 (34.6%)	160 (24.3%)	0.002
No	790 (71.6%)	291 (65.4%)	499 (75.7%)	
Prior psychological treatment				
Yes	211 (19.1%)	72 (16.2%)	139 (21.1%)	0.041
No	893 (80.9%)	373 (83.8%)	520 (78.9%)	
Depressive symptoms				
CES-D < 16	842 (76.2%)	364 (81.8%)	478 (72.5%)	0.001
CES-D 16-23	163 (14.8%)	55 (12.4%)	108 (16.4%)	
CES-D \geq 24	99 (9.0%)	26 (5.8%)	73 (11.1%)	
Body mass index (mean \pm SD)	23.2 (\pm 3.5)	23.6 (\pm 3.6)	23.0 (\pm 3.4)	0.006
Body mass index (BMI kg/m ²)				
BMI < 18.5	77 (7.0%)	33 (7.4%)	44 (6.7%)	0.002
BMI 18.5-24.9	742 (67.2%)	272 (61.1%)	470 (71.3%)	
BMI 25-29.9	228 (20.6%)	116 (26.1%)	112 (17.0%)	
BMI \geq 30	57 (5.2%)	24 (5.4%)	33 (5.0%)	

Table II. Eating habits and physical exercise in Mexican college students

<i>Variables</i>	<i>Total*</i>	<i>Men</i>	<i>Women</i>	<i>p-value</i>
	1,027 (100%)	412 (40.1%)	615 (59.9%)	
<i>Fast food</i> (≥ 2 times/week)	214 (20.8%)	103 (25.0%)	111 (18.0%)	0.007
<i>Fried food</i> (≥ 2 times/week)	311 (30.3%)	123 (29.8%)	188 (30.6%)	0.807
<i>Sweetened drinks</i> (≥ 2 times/week)	503 (49.0%)	228 (55.3%)	275 (44.7%)	< 0.001
<i>Sugary food</i> (≥ 2 times/week)	532 (51.8%)	219 (53.2%)	313 (50.9%)	0.478
<i>White bread</i> (≥ 2 times/week)	396 (38.6%)	197 (47.8%)	199 (32.4%)	< 0.001
<i>Physical exercise</i> (≥ 75 min/week)	408 (39.7%)	208 (50.5%)	200 (32.5%)	< 0.001

*Students with BMI < 18.5 were excluded from this table.

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Table III. Odd ratios from the logistic regression models for food consumption variables and depression score in female college students (n = 615)

<i>Variable</i>	<i>Crude OR 95% CI</i>	<i>p-value</i>	<i>Adjusted OR*</i>	<i>p-value</i>
<i>Fast food (≥ 2 times a week)</i>				
Depression score				
2 nd quartile	1.41 (0.77-2.58)	0.273	1.42 (0.77-2.61)	0.260
3 rd quartile	1.65 (0.87-3.13)	0.126	1.69 (0.89-3.21)	0.112
4 th quartile	2.07 (1.13-3.78)	0.018	2.08 (1.14-3.82)	0.018
<i>Fried food (≥ 2 times/week)</i>				
Depression score				
2 nd quartile	1.36 (0.84-2.20)	0.218	1.34 (0.82-2.17)	0.240
3 rd quartile	1.36 (0.81-2.30)	0.250	1.38 (0.81-2.34)	0.232
4 th quartile	1.85 (1.13-3.03)	0.014	1.92 (1.17-3.15)	0.010
<i>Sweetened drinks (≥ 2 times/week)</i>				
Depression score				
2 nd quartile	0.71 (0.46-1.09)	0.117	0.71 (0.46-1.09)	0.117
3 rd quartile	1.02 (0.64-1.63)	0.941	1.03 (0.64-1.65)	0.907
4 th quartile	1.44 (0.92-2.26)	0.111	1.46 (0.93-2.29)	0.103
<i>White bread (≥ 2 times/week)</i>				
Depression score				
2 nd quartile	1.11 (0.70-1.74)	0.669	1.11 (0.70-1.74)	0.667
3 rd quartile	0.80 (0.48-1.33)	0.389	0.81 (0.48-1.35)	0.411
4 th quartile	1.13 (0.70-1.81)	0.628	1.13 (0.70-1.83)	0.606
<i>Sugary food (≥ 2 times/week)</i>				
Depression score				
2 nd quartile	1.13 (0.73-1.73)	0.592	1.12 (0.73-1.72)	0.616
3 rd quartile	1.60 (1.00-2.57)	0.049	1.58 (0.98-2.53)	0.059
4 th quartile	2.17 (1.37-3.42)	0.001	2.16 (1.37-3.43)	0.001

<i>Physical exercise (less than 75 min/week)</i>				
Depression score				
2 nd quartile	1.37 (0.88-2.13)	0.169	1.37 (0.88-2.14)	0.168
3 rd quartile	1.73 (1.05-2.86)	0.032	1.73 (1.05-2.87)	0.032
4 th quartile	1.80 (1.11-2.91)	0.016	1.80 (1.11-2.91)	0.017

Reference depression score 1st quartile. *OR adjusted for age and BMI.

