ORIGINALES

Food Addiction and Nutritional Status in Adolescents of a Public High School in Mexico
Adicción a la comida y estado nutricional en adolescentes de una preparatoria pública en México

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ABSTRACT:
Objective: To know the prevalence of food addiction according to age, sex, and body mass index and to determine the association between food addiction and nutritional status in adolescents from northern México.
Method: Cross-sectional study with a descriptive and correlational design, carried out during August and September 2018; the study population was comprised by 630 adolescents, students, ranging from 15 to 17 years of age, from a public high school in Nuevo Leon, Mexico. Anthropometric measurements were taken and the Yale Food Addiction Scale questionnaire was used.
Results: A sample of 245 adolescents predominantly female (53.1%), with a mean age of 15.83 years; mean body mass index was 23.18 kg/mt2 (S = 3.74) in males and 24.57 kg/mt2 (S = 4.00) in females; 87.8% of adolescents showed positive to the frustrated desire to stop consumption criterion, 36.3% tolerance, and 34.3% consumption despite the consequences; 20.7% of overweight adolescents showed food addiction.
Conclusions: The majority of adolescents showed normal weight, while women showed a body mass index (BMI) higher than men; less than half of the participants had food addiction; positive criteria prevailed in women, and adolescents with overweight and obesity, and older. No association was found between food addiction and nutritional status.

Key words: Food Intake and Eating Disorders; Food Addiction; Adolescent; Addictive Behavior; Nutritional Status; Obesity.

RESUMEN:

Objetivos: Conocer la prevalencia de la adicción a la comida de acuerdo a edad, sexo e índice de masa corporal y determinar la asociación entre la adicción a la comida y el estado nutricional en adolescentes del norte de México.

Método: Estudio descriptivo correlacional de corte transversal, realizado durante agosto y septiembre de 2018, la población se conformó por 630 adolescentes estudiantes de 15 a 17 años de edad de una preparatoria pública en Nuevo León, México, se realizaron mediciones antropométricas y se empleó el cuestionario *Yale Food Addiction Scale.*

Resultados: Una muestra de 245 adolescentes predominando el sexo femenino (53,1%), con una edad media de 15,83 años, la media de índice de masa corporal fue de 23,18 kg/mt2 (S = 3,74) en hombres y 24,57 kg/mt2 (S = 4,00) en mujeres, 87,8% de los adolescentes presentó positivo el criterio deseo frustrado de parar el consumo, 36,3% tolerancia y 34,3% consumo a pesar de las consecuencias; 20,7% de adolescentes con sobrepeso presentan adicción a la comida.

Conclusiones: La mayoría de los adolescentes presentan peso normal, las mujeres presentaron un índice de masa corporal mayor que el de los hombres, menos de la mitad de los participantes presenta adicción a la comida predominando los criterios positivos en mujeres, adolescentes en condición de sobrepeso, obesidad y de mayor edad. No se encontró asociación entre adicción a la comida y estado nutricional.

Palabras clave: Trastornos de Alimentación y de la Ingestión de Alimentos; Adicción a la Comida; Adolescente; Conducta Adictiva; Estado Nutricional; Obesidad.

INTRODUCTION

Overweight and obesity (SP/OB after the names in Spanish) are considered health problems worldwide. In 2017, 3.4 million deaths related to this condition [1] were recorded; one of the most vulnerable groups is that of adolescents, since this population is predisposed to develop this condition [2,3]. This may be due to food desire, access to fast food, and the negative impact caused by alimentary abstinence [4,5]; additionally, SP/OB are risk factors to develop comorbidities such as diabetes mellitus type 2, cardiovascular disease, and some types of cancer [1].

SP/OB occurs in more than 18% of adolescents at world level; in Mexico, this amount duplicates since there is a prevalence of 39.2% in women and 33.5% in men, from 12 to 19 years of age; the states located in the northern part of Mexico are the most affected [6,7]. The increase in prevalence of SP/OB is a risk factor that contributes to reduce the quality of life of the people. In the last years, studies have been carried out in order to understand the factors that influence the development of this condition, such as the access to food with high caloric content, the reading of the nutritional content in the labels, the consumption of large amounts of food, and physical inactivity. However, few studies have addressed food addiction (AC in Spanish) in adolescents[8-10].

Approximately 38% of adolescents with SP/OB show AC; this variable is defined as a chronic problem that is characterized by the addiction to and excessive consumption of highly caloric food, with great amounts of salt, sugar, and grease. Moreover, this condition may take the form of binge eating disorder; AC is related to the increase in the body mass index (BMI) in adolescents [10-12].

Various mental health disorders are related to AC in adolescents, such as low self-esteem, depression, and feeling of loneliness. Additionally, is important to mention that depression and AC are associated to obesity problems in this age group [13,14]. Therefore, it is necessary to carry out studies that address this situation and thus

develop interventions to promote health and to help reduce prevalence of obesity in adolescents, taking into consideration behavioral variables. The nutritional status in adolescents from 10 to 19 years of age is obtained from the BMI, which is the most used indicator based on sex [15].

The objectives of this study were: be aware of AC prevalence according to age, sex, and BMI, and to determine the association between AC and nutritional status in a sample of adolescents of the northern part of Mexico.

MATERIAL AND METHOD

Design and Population

The design used was descriptive correlational and cross-sectional. It was developed in a public high school in Nuevo León, Mexico, during August and September 2018. The participant population was comprised by 630 adolescents and students from 15 to 17 years of age, distributed in 18 groups. A simple random sampling was carried out using Microsoft Excel® and the size of the sample was estimated using nQueryAdvisor® 7.0, resulting a total of 245 adolescents. Students who at the moment of the research were under medical or psychological treatment to loose weight, were excluded.

Instruments and Measurements

A sociodemographic data card was used in order to be familiar with age, sex, and the group in which there were enrolled for their later location. Also, anthropometric measurements were recorded in the card, which were assessed measuring weight and size using standardized protocols [16]; this way, the BMI was obtained using the formula BMI=kg/m2; each student was classified as: a) low weight with an BMI ranging from 15 to 18.5, b) normal weight with an BMI ranging from 18.51 to 24.99, c) overweight with an BMI ranging from 25 to 29.99, d) obesity with an BMI ranging from 30 to 39.99 and e) severe obesity with an BMI higher than 40[17]. Students enrolled in the Bachelor's Degree in Nursing were trained as research assistants to carry out the measurements.

To determine AC, the self-applicable instrument called *Yale Food Addiction Scale* [4] was used, which uses criteria proposed by DSM-5 for substance dependence; the scales was translated and validated on Mexican population[18]. The instrument has 25 items divided in five components with multiple-choice questions, that is, never = 0 points, once a month = 1 point, 2-4 times a month = 2 points, 2-3 times a week = 3 points, and 4 or more times a week/daily = 4 points; questions with dichotomous reply options are included, where yes is equivalent to 1, and no is equivalent to 1 point. The final result indicates there is AC if at least three of the criteria that comprise the scale after obtaining the sum are positive. The first item includes the following criteria: 1) The subject consumes the substance in larger amount and for longer period than intended, 2) Use more time to obtain or use the substance, and 3) Show withdrawal symptoms, and it includes items 1-7, 12, 13, and 20. The second component includes the tolerance criterion, such as continuing with the habits despite knowledge of adverse consequences; it includes items 9, 15, 17, 19, and 21. The third component is comprised by the criterion of persisting desire or incapability to reduce or stop consumption, including items 22 to 25.

The fourth component includes giving up or reducing social, occupational, or recreational activities, including items 8 and 10, and the withdrawal criterion which includes item 14. The fifth component corresponds to the consequences of discomfort and impairment, and giving up or reducing social, occupational, or recreational activities, including items 11, 15, and 18. For the study, a Cronbach alpha of 0.80 was obtained for this sample.

Data Assessment

To process data, the statistical software walled SPSS® version 20,0 for Windows was used. The descriptive analysis was carried out through frequencies, proportions, central tendency measures and measures of dispersion, prior to the inferential analysis, the distribution of the variables were assessed through the Kolmogorov-Smirnov test, with Lilliefors correction; since the variables did not showed a normal distribution the Spearman correlation coefficient was used.

Ethical Considerations

The study adhered to national standards; the approval of the Research Committee and Ethics Committee of the School of Nursing of the Universidad Autónoma de Nuevo León; after that, the objective of the research was submitted to the authorities of the university for its approval. Before data collection, an information meeting was held with the adolescent students and teachers to announce the study and an informed consent was provided in order to collect the signature of the father or guardian; two days after the meeting, 100% of informed consent already signed was obtained. It was explained that the research did not pose any risk, and the right they have to withdraw at any time.

RESULTS

The total sample correspond to 245 adolescents, where women predominate with 53,1%, and an average age of 15,83 years (S= 0,69); BMI was higher in women (table 1).

Table 1: Age and Anthropometric Measurements per Sex in a Sample of Adolescents from a Public High School in Mexico, 2018.

Variables	Men n = 115		Women n = 130	
	$\overline{x}$	S	$\overline{x}$	S
Age (years)	15,83	0,69	15,83	0,70
Weight (Kg)	61,30	11,49	57,20	13,24
Size (cm)	163,00	6,44	153,0	10,66
BMI[f] (Kg[d]/m2)	23,18	3,74	24,57	4,00

Source: Sociodemographic and clinical data card, [a]n = 245

Regarding AC, most of the participants showed 3 positive criteria, which show: a) Frustrated desire to stop consumption (87,8%); b) Tolerance (36,3%); and c) Consumption despite consequences (34,3%) (table 2).

Table 2: Diagnostic Criteria for Food Addiction in a Sample of Adolescents from a Public High School in Mexico, 2018.

Diagnostic Criterion	n= 245	%
1.- Tolerance	89	36,3
2.- Abstinence	27	11,0
3.- Consumption higher than intended	56	22,9
4.- Frustrate desire to stop consumption	215	87,8
5.- Much time used for consumption	38	15,5
6.- Abandonment of important activities	68	27,8
7.- Consumption despite consequences	84	34,3
8.- Important clinic alteration	46	18,8

With regards to sex, women showed a greater AC prevalence (20%). According to the nutritional status, greater AC prevalence in overweight adolescents was noted (20,7%). Regarding the nutritional status and sex, greater AC prevalence is noted in overweight men (33,3%) and in normal-weight women (22,3%) (table 3).

Table 3: Food Addiction per Sex and Nutritional Status in a Sample of Adolescents from a High School in Mexico, 2018.

Nutritional Status (BMI^c [kg^d/m2^e])	Men (n= 115)				Women (n=130)				Total (n=245)	
	With AC		Without AC		With AC		Without AC		With AC	
	22		93		26		104			
	f	%	f	%	f	%	f	%	f	%
Normal (n=178)	14	63,6	76	81,7	20	80,8	65	62,6	36	20,2%
Overweight (n=53)	7	31,8	14	15,1	4	15,4	29	26,9	11	20.7%
Obesity (n=16)	1	4,5	3	3,2	1	3,8	11	10,5	2	12.5%

According to age, the 17 years old participants showed greater AC prevalence AC (25%), predominating in obese adolescents (33,3%) (table 4).

Table 4: Percentage of Addiction to Food per Nutritional Status and Age in a Sample of Adolescents from the Northern Part of Mexico, 2018.

Nutritional Status (BMI = [kg/m2])	AC Diagnostics 15 years of age n= 88		AC Diagnostics 16 years of age n= 117		AC Diagnostics 17 years of age n= 40		AC Diagnostics Total n= 245	
	f	%	f	%	f	%	f	%
Total of the AC Diagnostics per age and BMI	16/88	18.2	20/117	17.2	10/40	25.0	46	18.8
Normal (18.5-24.99)	11/62	17.7	15/84	17.9	7/28	25.0	33	18.8

Overweight (25.0-29.9)	4/21	19.0	5/24	20.8	2/9	22.2	11	20.4
Obesity (≥30.0)	1/5	20.0	0/6	0	1/3	33.3	2	12.5

One of the objectives of the study was to determine the association between AC and the nutritional status in adolescents of the northern part of Mexico; however, no relationship was found between the variables of interest (*p*> 0,05).

DISCUSSION

The purpose of this study was to find out the AC prevalence, according to age, sex, and BMI, and to determine the association between AC and the nutritional status in adolescents of the Northern part of Mexico. A study carried out in Chile in order to determine the association of AC and the nutritional status in a sample of 292 university students with an average age of 21,4 years (S = 2,4), the results showed that most part of the adolescents met the 4 criteria for AC; greater AC prevalence was present in women (14,4% vs. 4,7%) [19]. Similar results to those obtained in this study.

In food addiction differences regarding sex are shown, and multiple biological and behavioral variables may be associated to these results. A study shows that neuronal activity related to anxiety for food is lower in men when some distraction is provided, while in women it is less probable to reduce the anxiety signal to eat despite any distraction. Likewise, hormones and menstrual cycle can have an effect on the anxiety for food, interfering with eating control and weight reduction [20,21]; however, a study carried out in India shows there is no significant differences in food addiction with respect to sex [22].

Regarding age, most part of adolescents that met the AC criteria correspond to the 17 year-old participants (25%); likewise, within this age group, adolescents with obesity and AC predominated (33,3%). In a study carried out with a population ranging from 18 to 65 years of age, the results show a negative correlation between AC and age, where prevalence is greater in the age group that ranges from 18 to 29 years [24].

Currently, adolescents have an easy access to social networks and to the publicity shown in them, such as recipes with low nutritional value and fast food restaurants; moreover, they represent a distractor for selection of healthy food [24]. A study shows that 85% of adolescents who use Instagram share photos of food in their profile, of which most of them (67,7%) refers to highly caloric food [25].

In this study, the group of overweight adolescents who got positive criteria for (20,7%) predominated. A research carried out with university students ($\bar{x}$ = 20,19 years) showed a positive association between BMI and AC[26]. It is important to note that overweight or obese adolescents obtained higher score for AC and addictive food that stands out in consumption prevalence in this group are chocolate, french fries, ice cream, flour and pasta; thus, since childhood AC could have direct influence on obesity during adult age [27].

Significant correlation was not found between AC and the nutritional status in the sample studied (p > .05); findings differ of those reported in another similar research[19]. The latter could be explained due to the characteristics of the sample of this study, since for the most part the sample was comprised by adolescents within the

parameters of normal weight according to BMI, considering that one of the main characteristics in AC is the risk to present SP/OB [28].

Family and school environment exercise an important influence in the adoption of healthy food habits in adolescents; however, the perception of parents and children regarding what is a balanced diet is mainly related to prepare food at home, and the minimum use of artificial colorants and other chemicals, forgetting the actual nutritional make-up of the food, while teachers think that the commitment of education regarding a balanced diet is actually up to the parents, more than to them [29].

It is necessary to carry out studies that take into account the influence of the context in the AC; the sample corresponds to adolescent of Nuevo León (Northern part of Mexico), where SP/OB prevalence in this group was 37% in 2012[30], while that in the states of the Southern part of Mexico, such as Oaxaca (26,7%) and Chiapas (28,9%) is lower [1,2]. It should be mentioned the economic and health inequality between the North and South parts of Mexico, since 20,4% of the population in Nuevo León lives in poverty, while in Chiapas this amount increases to 76,2%[7].

One of the limitations that was encountered in this study was the context, since only one sample of adolescents from Nuevo León, Mexico, was studied. Therefore, it is recommended to carry out future studies including other states in the North and South parts of Mexico to compare the results. Another limitation was that the BMI of the adolescents was that most of them showed a normal weight, thus, a sample of students with SP/OB could give different results.

CONCLUSIONS

According to international recommendations, most of adolescents of both sexes have normal weight; women presented a higher body mass index than men. Most of the adolescents showed more than three positive criteria for food addiction; and lower positive percentage for significant clinical alteration.

Women showed greater addiction to food than men; 17 year-old adolescents presented greater levels of food addiction than younger ones. This condition increases in overweight and obese adolescents. There was no statistically significant association among food addiction and the nutritional status in adolescents.

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