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RESEARCH ARTICLE

Risky eating behaviors and body satisfaction in Mexican university students

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KEYWORDS

Eating Behavior;
Body Dissatisfaction;
Nutritional Status;
Obesity.

ABSTRACT

Introduction: Risky eating behaviors have been reported in emerging adults (such as incoming students). Also, body dissatisfaction and nutritional status have been documented as a risk factor in the development of risky eating behaviors. Therefore, the aim of this study is to present the correlations among the presence of risky eating behaviors, body dissatisfaction and nutritional status, to identify possible predictors for risky eating behaviors.

Methodology: We design a cross-sectional observational protocol to analyzed the data obtained with the Brief Questionnaire on Risky Eating Behaviors and the Image Satisfaction-Dissatisfaction Scale, that were applied to 1,399 newly admitted university students (age range: 18-29 years). Their nutritional status was determined by measurements of weight, size, body mass index, and percentage of body fat. Data were compared by Kruskal-Wallis test. An adjusted Poisson model was used to obtaining predictive variables of risky eating behaviors.

Results: 7.2% of the women and 5.0% of the men presented risky eating behaviors. Higher scores on risky eating behaviors and body mass index, body fat, and waist circumference showed a significant correlation. Poisson adjusted model showed that body mass index, waist circumference, and satisfaction with the abdomen, waist, and legs are the best predictors of risky eating behaviors.

Conclusions: Risky eating behaviors are present in new universitary students, so the observation and attention to some indicators such as body mass index and body satisfaction, particularly with the abdomen, waist and legs, could help to prevent the development of risky eating behaviors.

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PALABRAS CLAVE

Conducta Alimentaria;

Insatisfacción Corporal;

Estado Nutricional;

Obesidad.

Conductas alimentarias de riesgo y satisfacción corporal en estudiantes universitarios mexicanos

RESUMEN

Introducción: Se ha reportado la presencia de conductas alimentarias de riesgo en adultos emergentes (como estudiantes universitarios de recién ingreso). Asimismo, la insatisfacción y el estado nutricio se han documentado como factor de riesgo en el desarrollo de conductas alimentarias de riesgo. Por tanto, el objetivo de este estudio es mostrar las correlaciones entre la presencia de conductas alimentarias de riesgo, insatisfacción corporal y estado nutricio, para identificar posibles predictores de conductas alimentarias de riesgo.

Metodología: Diseñamos un protocolo observacional transversal para analizar los datos obtenidos con el Cuestionario Breve sobre Conductas Alimentarias de Riesgo y la Escala de Satisfacción-Insatisfacción con la Imagen, que se aplicaron a 1.399 estudiantes universitarios de reciente ingreso (rango de edad: 18-29 años). Su estado nutricional se determinó mediante medidas de peso, tamaño, índice de masa corporal y porcentaje de grasa corporal. Los datos se compararon mediante Kruskal-Wallis. Las variables predictivas para conductas alimentarias de riesgo se obtuvieron mediante un modelo Poisson reducido.

Resultados: 7,2% de las mujeres y 5,0% de los hombres presentaron conductas alimentarias de riesgo. Las puntuaciones más altas en conductas alimentarias de riesgo e índice de masa corporal, grasa corporal y circunferencia de la cintura mostraron una correlación significativa. El modelo Poisson ajustado mostró que el índice de masa corporal, la circunferencia de la cintura y la satisfacción con el abdomen, la cintura y las piernas son los mejores predictores de conductas alimentarias de riesgo.

Conclusiones: Las conductas alimentarias de riesgo están presentes en los nuevos estudiantes universitarios, por lo que la observación y atención a algunos indicadores como el índice de masa corporal y la satisfacción corporal, particularmente con el abdomen, la cintura y las piernas, podría ayudar a prevenir el desarrollo de conductas alimentarias de riesgo.

KEY MESSAGES

1. Prevalence of risky eating behaviors has been identified in emerging adults from a university in southeastern Mexico.
2. There is a correlation between high scores for risky eating behaviors and high body mass index, body fat, and waist circumference.
3. Body mass index, waist circumference, and satisfaction with the abdomen, waist, and legs are the best predictors of the appearance of risky eating behaviors in emerging adults.

CITATION

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INTRODUCTION

Risky eating behaviors (REB) are partial or subclinical manifestations of eating disorders, which occur with less intensity and frequency, and whose presence may be prior to the onset of the last one[1]. In Mexico, eating disorders have increased 300% in the last 20 years, with higher prevalence in adolescents and women, mainly between the ages of 14 and 19 of age[1,2]. On other hand, the most frequent REB are worry over getting fat, eating too much and, losing control over what is ingested[2].

Formerly research on eating disorders and REB was mainly conducted in women and adolescents[3]. However, it presence has been reported in men[3] and university students[4,5]. Regarding the presence of REB in young adults, several studies have been conducted in the center of the country[1,6]. Likewise, some authors have theorized that eating disorders and REB might be present in those who begin their university career given the stress derived from making key decisions for their future[4,6].

The state of Veracruz ranks 5th nationally in the number of people with obesity[7]. This nutrition disorder has been widely related to REB[1]; however there are scarcely reports on the prevalence of REB for this state. Likewise, it has been described that increased body mass index is directly related to body dissatisfaction. Also, people with obesity or overweight reported higher body dissatisfaction scores[1,8].

Body dissatisfaction is characterized by value judgments about one's own body, which often do not conform to reality. It is influenced by social and cultural factors, among which body aesthetic models are the most important[9]. Body dissatisfaction is considered a risk factor for the development of risky eating behaviors and an important factor in the origin and maintenance of eating disorders.

Several authors recognized adolescence as the most critical period of life for body dissatisfaction, since the stresses of pubertal development plus the aesthetic ideal of their own social context could trigger eating disorders, at this or subsequent life stages. However, recent studies showed emerging adulthood can also be a risky stage due to the psychological and social instability of this phase[6].

Based on the foregoing, we conducted this study to determine the correlations among the presence of REB, nutritional status and body dissatisfaction for incoming university students.

METHODOLOGY

A cross-sectional study was carried out new university students, who voluntarily agreed to participate and were in the age range of 18 to 29 years. The study was carried out in the Area of Nutrition of the Center for Studies and Health Services (CESS), under the criteria indicated by the Research Committee and the Ethics Committee of the CESS. The protocol was registered in the University Linking System and in the Research Registration and Evaluation System following the administrative procedures of the University.

Procedure

The subjects were selected by non-probabilistic convenience sampling. Inclusion criteria were: age range 18 to 29 years, students recently enrolled in the university (first time students in their first semester at university). Those who did not meet these criteria were not admitted to the study. The records of students who did not answer or left the two questionnaires incomplete were excluded. A total of 1,399 of 2,500 students who attended the CESS and who voluntarily decided to participate in the study, signing the informed consent, answered two questionnaires: one of them to assess risky eating behaviors and another questionnaire about body satisfaction. The nutritional assessment of the participants was determined by the following measures: weight, height, body mass index, and percentage of body fat. All participants signed an Informed Consent which explained the purposes of the research, and were notified that the activity would not have negative consequences on their physical and psychological integrity, and that their participation was anonymous and voluntary. Subsequently, a database without personal references was created for further data analysis.

Measurement tools

Brief Questionnaire on Risky Eating Behaviors (BQREB):

The risk for the development of risky eating behaviors was assessed through "Brief questionnaire on risky eating behaviors" (BQREB), which was constructed under the criteria for the diagnosis of eating disorders of the "Diagnostic and Statistical Manual of Mental Disorders"[10]. The questionnaire included items about the concern of gaining weight; two on the practice of binge eating with a feeling of lack of control; four on restrictive type behaviors (e.g., diet, exercise, fasting or diet pills), and three on

purgative type behaviors (e.g., self-induced vomiting, laxatives or diuretics). It is rated with four response options: 0 = never or almost never, 1 = sometimes, 2 = frequently (twice a week) and 3 = very frequently (more than twice a week). To identify people at risk or possible cases of eating disorders, a cut-off point greater than 10 which was determined by the specificity and sensitivity values of the scale. This questionnaire has a Cronbach's Alpha = 0.83[1,11]. Likewise, to analyze the relationships of the independent variables in the risky eating behavior continuum, an additional cut-off point was established to the one raised in the BQREB, called "moderate risk" and defined with a value greater than or equal to the average plus a standard deviation (SD) of the qualification obtained in the BQREB for the population studied (> average + 1SD). In this way, there was a classification in three levels: 1) no risk (0 to 6 points), 2) moderate risk (7 to 10 points) and 3) high risk (> 10 points)[1,11].

***Image Satisfaction-Dissatisfaction Scale*:**

For the analysis of body dissatisfaction, we evaluate body part estimation and global body estimation. Body part estimation was evaluated using a different image for men and women. Each participant assigned a value between 0 and 10 to different parts of his or her body (0 = totally dissatisfied; 10 = totally satisfied) and marked with an X the area that represented an aesthetic problem. The overall body estimate was obtained from the sum of the values assigned to the different parts of the body[12].

***Nutrition Status Assessment*:**

Weight. Indicator of body volume expressed in kilograms. The measurement was carried out with a platform scale with a maximum capacity of 210 kg. Participants were asked to stand with their feet parallel to the center of the platform, back to the examiner, with the least amount of clothing possible and without shoes.

Size. Body length indicator measured in centimeters (cm). A stadiometer was used for the measurement. The participant took off shoes, caps or any other head ornament and left their loose hair.

Body Mass Index (BMI). It is the result of the relationship between weight and height. It is frequently used to identify overweight and obese adults[13]. It was calculated by dividing the subject's weight in kilograms by the square of their height in meters (kg/m^2).

Body fat percentage. Body fat percentage indicates the amount of fat mass present in the total body. It was measured with a Fat Loss Monitor[14], which sends an extremely low electrical current of 50 kHz and 500 µA through the body to determine the amount of fat tissue. Two hours of fasting was required before measuring, which was performed at the same time throughout the protocol. Immediately prior to the procedure, each participant removed all metallic items on their bodies or clothes. Both hands were placed on the monitor while holding the electrodes of the handle, placing the middle finger around the groove of the handle.

Statistical analysis

Measures of central tendency and dispersion were calculated. The comparison of the frequency of dissatisfaction/body satisfaction, according to the level of risky eating behavior, was carried out using the xi^2 test. The scores of the total values of risky eating behaviors and body satisfaction were analyzed according to the nutritional status of the participants, with the Kruskal-Wallis test, since the data did not meet the assumption of normality. The correlation between variables of nutritional status and variables of body satisfaction was estimated using the Spearman coefficient.

Due to the variable of risky eating behaviors has a Poisson distribution, the Poisson model[15] was used to determine the effect of the anthropometric variables and of body satisfaction on the variable of risky eating behaviors. The Akaike Information Criterion was used to identify the most parsimonious model, and given the presence of overdiption in the reduced model, the Quasi-Poisson model was used to identify the best predictive variables. The R-project[16] software was used to perform the statistical analyzes.

RESULTS

A total of 1,399 students participated, of whom 1,378 completely answered the questionnaires on risky eating behavior and body satisfaction/dissatisfaction, and 21 of the participants did not have complete data, and were not considered in the statistical analysis. Thus, the final sample consisted of 1,378 subjects of which 49.5% are male and 50.5% female. Women had a frequency of 7.2% of high-risk eating behaviors and men of 5.0%, without statistical differences. The scores of the main variables analyzed are shown in Table 1. We also found that the percentage of overweight/obese men was much higher (45.75%) than women (36.27%), without statistically significant differences.

Statistically significant differences among the percentages of body dissatisfaction were found when compared

Table 1. Mean values variables of nutritional status, body satisfaction and risk eating behavior, by gender.

Variables	Male (n=682)		Female (n=696)	
	Mean	SD	Mean	SD
Weight (kg)	74.21	17.23	61.57	14.23
Height (m)	1.71	0.07	1.58	0.06
Waist circunference (cm)	84.21	13.45	77.05	11.34
Fat percentage (%)	19.75	7.87	27.62	6.60
BMI	25.29	5.22	24.48	5.12
Underweight	17.38	0.86	17.41	0.99
Normal	22.15	1.74	22.06	1.78
Overweight	27.11	1.33	27.25	1.50
Obesity	34.00	3.98	34.31	3.97
Global Body Satisfaction	146.64	27.54	143.35	28.80
Eating behavior risk	4.28	3.17	4.58	3.52
No risk	2.97	1.81	3.06	1.84
Moderate risk	8.00	0.97	8.10	1.02
High risk	12.38	2.86	13.28	2.54

BMI: Body mass index; **SD:** Standard deviation.

according to the risk of developing risky eating behaviors (No risk, Moderate risk, High risk). The latter group showed the highest percentages of body dissatisfaction, and the most problematic areas were: abdomen (71.4%), waist (61.9%), arms and face skin (47.6%) and hips (45.2%). (Supplementary Table 1).

People with obesity had a higher mean in REB and lower score on global body satisfaction, satisfaction with arms, abdomen and waist, compared to those with a different nutritional status (Table 2).

Risky eating behaviors, body mass index, body fat percentage and waist circumference showed positive significant correlations of medium magnitude. On the other hand, major scores on global body satisfaction and body satisfaction of different body parts were inversely associated with lower risk on REB; these correlations were stronger in the case of waist and abdomen (Table 3).

Poisson model revealed that body mass index, body fat percentage, satisfaction with hands, abdomen, waist and legs are the best predictors of risky eating behaviors (Supplementary Table 2).

DISCUSSION

Research on eating disorders and risky eating behaviors (REB) have increased over time, due to their prevalence and health consequences, mainly in the young population[1,17]. According to the National Health and Nutrition Survey concerns about gaining weight, losing control over eating and overeating were the most frequent REB in the Mexican adolescent population. Particularly the latter was reported with higher frequency by both genders. Meanwhile, in the Mexican university population, a prevalence of REB of 7.9-18.9% has been reported for women, and 4.2-13.0% for men[5,6,18]. However, these studies are limited to the center of the country. Thus, greater recognition and exploration of REB prevalence is required, as well as the identification of possible predictive factors.

In an effort to expand data on the prevalence of REB and possible predictive parameters for them, we conducted a study on university students (n=1399; aged 18 to 29) of the southeast of Mexico. The results revealed a prevalence of high-risk eating behaviors (7.2% for women and 5.0% for men) similar to other studies[19]. For a long time, the belief that women were the most susceptible population to develop REB or eating disorders, dominated the literature. However, current national and international reports show the male population is not exempt from developing them, but it is necessary to document the facts, and even modify the measurement scales for men[4,5,20].

Going deeper into the results, we found participants with high-risk EB showed greater body dissatisfaction (BD), focusing on the waist and abdomen (Supplementary material). These two body areas are central points in the predominant aesthetic ideal: a slender, proportionate and harmonious body, with a small waist (for women) and a flat abdomen (for men and women) and an imposed eternal youth appearance, as a synonym of beauty[12,21]. This physical model permeates mainly in young people (such as those in our sample), driving obsession to rectify those "imperfections" not attached to the model. These obsessions can manifest through behavioral disorders such as bigorexia, orthorexia or REB[12,22,23].

Analyzing data of participants categorized as obese, a high prevalence of REB and low body satisfaction, with the lowest satisfaction score for the waist and abdomen was found.

Table 2. Mean values of risky eating behavior and body satisfaction, according to the nutritional status.

Variables	Underweight (n=109)		Normal weight (n=713)		Overweight (n=358)		Obesity (n=198)		p value
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	
REB	1.5	1.5	3.6	2.9	5.7	3.0	6.7	3.8	0.000
GBS	149.9	24.5	147.2	27.7	144.0	29.1	136.0	28.6	0.000
Hair	8.3	2.3	8.2	2.2	8.1	2.3	8.6	1.9	0.392
Face skin	7.6	2.5	7.4	2.5	7.4	2.5	7.3	2.3	0.560
Eyes	8.8	1.6	8.8	1.8	8.7	1.8	8.5	2.0	0.127
Nose	7.3	2.9	7.3	2.7	7.5	2.6	7.7	2.3	0.596
Mouth	8.4	2.0	8.4	2.1	8.5	2.0	8.5	1.9	0.803
Lips	8.8	1.7	8.8	1.8	8.7	1.9	8.7	1.7	0.852
Neck	9.0	1.3	8.7	1.9	8.4	1.9	7.7	2.3	0.000
Chest	8.2	2.0	8.2	2.2	7.8	2.4	7.1	2.7	0.000
Arms	8.0	2.3	8.1	2.2	7.7	2.5	6.9	2.7	0.000
Hands	8.8	1.7	8.7	2.0	8.6	2.0	8.3	2.1	0.085
Abdomen	8.6	2.0	7.4	2.6	6.2	2.9	5.2	3.1	0.000
Waist	8.7	1.8	7.8	2.4	6.9	2.9	5.8	3.0	0.000
Genitals	9.2	1.1	8.9	1.9	8.7	2.1	8.4	2.3	0.006
Buttocks	7.4	2.6	7.8	2.5	8.1	2.4	7.5	2.7	0.009
Hips	8.4	2.0	8.2	2.2	7.9	2.5	7.0	2.7	0.000
Thighs	7.9	2.5	8.3	2.1	8.3	2.1	7.4	2.7	0.000
Legs	7.7	2.7	8.2	2.2	8.5	2.0	7.7	2.6	0.001
Feet	8.8	1.6	8.2	2.3	8.0	2.4	7.9	2.4	0.003

p values were obtained through Kruskal-Wallis test.

REB: Risky eating behavior; **GBS:** Global body satisfaction.

Since REB are actions carried out mostly in an attempt to control body weight, it is expected that individuals far from the "ideal" weight will perform them, and at the same time find themselves dealing with the acceptance of their own bodies[24]. Likewise, it has been described obesity can be a predictor of dissatisfaction with the body image (in adolescents)[1]. This dissatisfaction is linked to the mental representation of their physical appearance, which is distorted because of the imbalance in the perceptual, cognitive-affective, and behavioral components of the self-image, plus social criticism. This imbalance can lead to the execution of behaviors such as REB[21,22].

On the other hand, in our sample, there is a direct correlation among high scores of REB, higher body mass index, and greater amount of body fat. In this regard, several articles have reported more frequently the relationship between body mass index and REB[1,5,6]. Instead, this is the first report that mentions the correlation of a higher percentage of body fat and greater waist circumference with REB. In the literature, the increase in body mass index over time has been associated with the development of REB[1]. Therefore, if we use this indicator, plus the other two mentioned above, we could have more reliable data for early interventions with people who show other signs of REB.

Table 3. Correlations among risky eating behavior, anthropometry and satisfaction with the body, total sample.

Variables	BMI	Body fat percentage	WC	REB
REB	**0.556****	**0.441****	**0.469****	1.000
GBS	-0.127**	-0.200**	-0.145**	-0.276**
Hair	0.023	0.007	0.013	-0.111**
Face skin	-0.010	-0.077	-0.016	-0.141**
Eyes	-0.030	-0.001	-0.064	-0.108**
Nose	0.032	-0.015	0.012	-0.125**
Mouth	0.041	0.022	0.008	-0.069*
Lips	0.000	-0.010	-0.041	-0.093*
Neck	-0.171**	-0.170**	-0.176**	-0.193**
Chest	-0.111**	-0.129**	-0.158**	-0.174**
Arms	-0.143**	-0.226**	-0.155**	-0.226**
Hands	-0.044	-0.049	-0.060*	-0.132**
Abdomen	-0.364**	-0.389**	-0.342**	-0.414**
Waist	-0.309**	-0.356**	-0.307**	-0.378**
Genitals	-0.074*	-0.105**	-0.080*	-0.154**
Buttocks	0.065*	-0.053*	0.016	-0.088*
Hips	-0.148**	-0.191**	-0.176**	-0.229**
Thighs	-0.041	-0.124**	-0.067*	-0.125**
Legs	0.050	-0.049	0.006	-0.066*
Feet	-0.084*	-0.097**	-0.089*	-0.171**

REB: Risky eating behavior; **GBS:** Global body satisfaction; **WC:** Waist circumference.

Significative variables: *p<0.05; **p<0.01.

This last result was corroborated by performing the multivariate analysis of our data since we found that body mass index, body fat percentage, satisfaction with hands, abdomen, waist, and legs are the best predictors of REB development. The body mass index had already been previously reported as a predictor, but not the other variables[5,8]. Furthermore, a previous study showed that body dissatisfaction with the abdomen is present in both genders[12]. It noteworthy that the body areas identified in our study as REB predictors: abdomen, waist and legs, are focal points of the ideal aesthetic image that prevails in the advertising media and in society. Particularly, a slender figure, with a delineated waist, shapely legs and a body that is not excessively muscular, is appreciated by women[19]. The internalization of these parameters can generate dissatisfaction. It has been widely discussed in the literature that individuals who are dissatisfied with their body image do not see the real image when they view their own body[8]. Instead, they see an image that is influenced and "modified" by personal perceptions of the perfect body. This distortion of body image plus body image dissatisfaction has been linked to eating disorders[9]. Although REB, are at a midpoint between "normal" eating behaviors and eating disorders, their presence reveals psychological features of the individual that presents them, because it is associated with problems of self-perceived image distortion, leading to low rates of body satisfaction and low self-esteem, which favors the execution of REB[1,25]. Likewise, REBs are a health risk for those who practice them, since they have been associated with the appearance of chronic degenerative diseases[20] and the permanent risk of developing eating disorders and their consequences (weakness and loss of muscle mass, osteoporosis, electrolyte deficiency, renal failure, heart failure, etc.).

Some authors agree that the clearest manifestations of REB occur in adolescence[1]. If we consider that the analyzed population ranged between 18-29 years, we could assume that the factors associated (for example, low self-esteem, low body satisfaction, etc.) with REB were present, and their influence was accentuated by the new challenges of this age segment (emerging adults), who are under the demands of adequate performance at university, new residence, starting a family (for some), etc. In addition to the prior sentences, in our country and the state of Veracruz, the prevalence of overweight and obesity, also present in the emerging adults surveyed, affects the risk of developing REB.

This study is the first of its kind in the southeast of the country, and was conducted at the largest university in this area, which made it possible to work with data from 1,378 students who were entering university for the first time. With these data we were able to identify predictor variables REB in the sample. As a limitation of our study, since we could not guarantee the participation of all the newly admitted students who belonged to the study region, approximately 40% were surveyed; 21 of these cases did not have complete answers, thus this data were eliminated for statistical analysis. Likewise, an age range (18-29 years) was established as a requirement to be surveyed, so that new students outside the range could have been discarded.

Another no less important complication was that we did not find any report on the validation of the Body Satisfaction-Dissatisfaction Scale. However, when carrying out a preliminary analysis with the 1378 available cases, we found that there is a Cronbach's Alpha of 0.93, for the satisfaction measurement (in which values from 0 to 10 are assigned). A similar scale obtained a Cronbach's Alpha of 0.87 when it was applied to 452 students between 15 and 19 years of age[26]. We also carry out an analysis of the reliability of the scale where the problematic body parts are indicated, obtaining 0.85 reliability with the Kuder-Richardson formula 21 (KR -21)[27]. Therefore, we consider it as a next step to validate the scale, to avoid the instrument's reliability bias.

CONCLUSIONS

This study shows the correlation between risky eating behaviors, nutritional status and body satisfaction in a sample of incoming university students from the largest university in southeastern Mexico. These behaviors are linked to body dissatisfaction in specific areas, so their observation and attention could help in the prevention of REB or the possible installation of eating disorders. Research in this field should also continue in different regions of the country and by population segments (e.g., rural vs. urban population) to reinforce conclusions.

AUTHORS' CONTRIBUTIONS

All the authors contribute equally on the drafting and revision of the article.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

COMPETING INTERESTS

The authors state that there are no conflicts of interest in preparing the manuscript.

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