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BRIEF REPORT

Sensitivity, specificity, and cut-off points in the Brief Questionnaire for Measuring Disordered Eating Behaviors in Mexican Women

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Abstract

Background Evidence suggests that disordered eating behaviors can result in eating disorders, which is already a reality for the Mexican population, representing an increasingly complex public health problem. Early detection is therefore essential.
Aim of the study To obtain the sensitivity, specificity, and cut-off points of the Brief Questionnaire for Measuring Disordered Eating Behaviors to identify eating disorders in Mexican women.
Methods The Eating Disorders Examination-Questionnaire and the Brief Questionnaire for Disordered Eating Behaviors were applied to patients diagnosed with eating disorders at two public health institutions and university students. ROC analysis was performed to determine sensitivity, specificity, predictive values, and cut-off points.
Results Three cut-off points were obtained: first: eight points (Sensitivity = 60.7%, Specificity = 92.2%), showing low risk; second: 11 points (sensitivity = 24.1%; specificity = 98.9%), detecting moderate risk; and, finally, 15 points and over (sensitivity = 4.46%; specificity = 100%), indicating high risk.
Conclusions The instrument adequately identifies those individuals who are not at risk for eating disorders, making it possible to channel prevention efforts towards those who do have DEB, thus optimizing resources.
Level of evidence Level III: case–control analytic study.

Keywords Specificity · Sensitivity · Cut-off points · Disordered eating behaviors · Eating disorders · Brief Questionnaire for Disordered Eating Behaviors

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Introduction

Disordered eating behaviors (DEB) include manifestations of eating disorders (ED)—such as restrictive, purgative, and binge-eating behaviors, but with less intensity and frequency [1]. Early detection of DEB is essential as evidence suggests that DEB can result in ED, which is already a reality for the Mexican population, representing an increasingly complex public health problem [2].

According to the National Health and Nutrition Survey 2012 (ENSANUT, 2012), 1.9% of women and 0.8% of men between the ages of 10 and 19 were at risk of eating disorders [3]. According to the Survey on the Prevalence of Drug and Alcohol Use in the Federal District Student Population, between 1997 and 2012, the frequencies of DEB in adolescent students fluctuated between 3.4% in girls and 1.3% in boys [4], and 8.8% and 4.3%, respectively (data not published).

Due to the high morbidity, mortality, and disability caused by eating disorders, it is important to have reliable, valid ad hoc measurement instruments in Spanish to detect the risk of eating disorders in Mexican populations, to be able to offer prevention and timely treatment.

The aim of this paper is therefore to estimate the sensitivity, specificity, and cut-off points of the Brief Questionnaire for Disordered Eating Behaviors (BQDEB) [5], and thereby contribute to the detection of the risk of ED in Mexican women. On this occasion, the authors used as a reference the scores obtained by subjects diagnosed with an eating disorder using the Eating Disorders Examination-Questionnaire (EDE-Q) [6], one of the most widely used measurements in international clinical research for the detection of eating disorders, recently validated in Mexico [7].

Since the BQDEB has been used in various national population surveys [2–4], it is essential to have detailed cut-off point data from this instrument that will allow comparisons between Mexican populations from different sociocultural contexts and thereby contribute to knowledge on the distribution of DEB and ED in Mexico.

Materials and methods

Sample

We conducted a convenience sampling of female patients with an eating disorder diagnosis; according to criteria from DSM-5, it was obtained through a clinical interview conducted by experts between August and December of 2014. The patients were drawn from the Eating Disorders Clinic of the Ramón de la Fuente Muñiz National Institute of Psychiatry and the Eating Disorders and Obesity Clinic of the Salvador Zubirán National Institute of Medical Sciences and Nutrition.

A comparison group was also formed by a convenience sampling of female freshmen at the Universidad Autónoma Metropolitana, Xochimilco Campus, recruited during the same period (August–December of 2014).

Informed consent was requested from both patients and students. In the case of minors, informed consent was requested from the child's parents or guardian. Ethical approval for the protocol was obtained from the Ramón de la Fuente National Institute of Psychiatry Ethical Committee, the Salvador Zubirán National Institute of Medical Sciences and Nutrition, and the Academic Committee of the Biological and Health Sciences of the Universidad Autónoma Metropolitana-Xochimilco.

Instruments

BQDEB questionnaire was self-applied, from which sensitivity, specificity, and cut-off points were estimated to identify the risk of eating disorders, as well as the Eating Disorders Examination-Questionnaire (EDE-Q), used as a reference for case identification.

The BQDEB was prepared for the Survey on the Prevalence of Drug and Alcohol Use in the Federal District Student Population 1997 [4], based on the diagnostic criteria of DSM-IV. It consists of 10 questions on concern over gaining weight, binge eating, feeling a lack of control when eating, as well as restrictive (diets, fasting, exercise, and use of weight loss pills) and purgative eating behaviors (self-induced vomiting, use of laxatives, and diuretics), in the 3 months prior to the application of the questionnaire. There are four response options: "0" never or hardly ever, "1" sometimes, "2" often (twice a week), or "3" very frequently (more than twice a week). A higher score on the questionnaire corresponds to a greater number of disordered eating behaviors. The scale has a total Cronbach's alpha reliability value of 0.83 and is divided into three factors that explain 64.7% of the total variance, and internal consistency values for the three factors are: (1) "binge-purge" ($\alpha = 0.74$), (2) "compensatory behaviors" ($\alpha = 0.72$), and (3) "restriction" ($\alpha = 0.76$). A cut-off point of 10 was defined for the selection of at-risk cases, with a sensitivity of 0.81 and a specificity of 0.78, a positive predictive value of 0.38, and a negative predictive value of 0.96. Thus, a score ≥ 11 indicates risk, with 30 being the highest possible score [5].

The EDE-Q has 28 questions [6] related to behaviors and attitudes regarding food in the past 28 days. It is divided into four subscales: restriction, concern over food, body shape, and weight, scored on a scale from 0 to 6, where a higher score suggests greater pathology. It focuses on the main behavioral symptoms of ED.

In this paper, the Spanish version of the EDE-Q was used, validated in a sample of Mexican students and ED patients [7]. The confirmatory analysis showed that the model best suited for the data was the seven-question version, divided into three subscales proposed by Grilo, Reas, Hopwood, and Crosby [8]. The Cronbach's alpha value for the total scale was 0.9, whereas for the subscales, it fluctuated between 0.8 and 0.9.

Statistical analysis

Descriptive analyses of means or proportions were performed according to the type of variable, for sociodemographic characteristics. Both *t* and Chi-square tests were

applied to determine differences between the characteristics, using a significance level of 0.05.

Determination of BQDEB cut-off points

The mean and standard deviation for the EDE-Q score (SD-EDE-Q) were obtained from the total patient sample. Students were classified as: "1", at risk for eating disorders (eating disorders = 1), if they had values ≥—1 SD-EDE-Q and, "0", not at risk for eating disorders if they had values <—1 SD-EDE-Q. Based on this classification, a non-parametric ROC curve was constructed to determine the sensitivity and specificity values, as well as the predictive values and optimal cut-off points, defined by Zweig and Campbell, [9] for the BQDEB questionnaire. These analyses were carried out using the "dtroc" module of STATA statistical software, version 14.

Results

We obtained information of 610 individuals that willingly agreed to participate, and we excluded 20 individuals, because they did not have complete information, meaning that the final sample consisted of 590 women, 108 of whom were patients in treatment and 482 students. Table 1 shows data on the age and body mass index (BMI) of the study population.

The mean and standard deviation of the EDE-Q score in the patient sample was 25.5 and 11.4, respectively. To obtain the classification for the students, the mean − 1SD was used, yielding 14 points. All students with less than 14 points in the EDE-Q were classified using the value "0" (not at risk for ED), while those who obtained a score of 14 or more points in the EDE-Q were classified with the "1" value (at risk for eating disorders).

The value for the area under the curve (AUC) of the BQDEB of the student sample was: AUC = 0.87817 (CI 95%: 0.84559–0.90602). We obtained three cut-off points to classify possible ED cases according to two criteria:

1. the optimal values yielded by the analysis, of the sensitivity and specificity;
2. the False-Negative/False-Positive ratio (FP/FN = 1).

The first cut-off point is: eight points and over in the BQDEB (sensitivity = 60.9%; specificity = 92.1%), reflecting a low risk for ED. The next cut-off point is located at 11 points and over in the BQDEB (sensitivity = 24.3%; specificity = 98.9%), and detects individuals with a moderate risk of eating disorders. Finally, a score of 15 points and over

Table 2 Sensitivity and specificity values

Cut-off point	Se[a] (%)	Sp[b] (%)	FP/FN[c] effectiveness (%)
0	100	0	0
1	100	7.89	7.89
2	99.1	23.9	23.1
3	97.4	38.4	35.8
4	93	56.6	49.6
5	87.8	71.3	59.1
6	80	80.3	60.3
7	71.3	87.4	58.7
8	60.9	92.1	53
9	47.8	95.8	43.6
10	34.8	97.4	32.2
11	24.3	98.9	23.3
12	14.8	99.7	14.5
13	11.3	99.7	11
14	6.96	99.7	6.69
15	5.22	100	5.22
16	4.35	100	4.35
19	3.48	100	3.48
21	2.61	100	2.61
22	1.74	100	1.74

Possible cut-off points for BQDEB

[a]Sensitivity

[b]Specificity

[c]False positives/false negatives

Table 1 Age and body mass index indicators of study population

	Total	Patients	Students
n (%)	590 (100%)	108 (18.3%)	482 (81.7%)
Age, years (SD)	19.9 (4.02)	22.6 (7.23)	19.3 (2.49)*
BMI, kg/m^2 (SD)	23.1 (4.13)	23.2 (5.60)	23.1 (3.73)
BMI classification *p* (IC95%)			
Low weight	6.9 (5.15–9.31)	14.8 (9.23–22.88)	5.2 (3.52–7.57)*
Normal	68.9 (65.12–72.59)	59.3 (49.71–68.16)	71.2 (66.94–75.04)
Overweight	17.9 (15.06–21.28)	15.7 (9.98–23.93)	18.5 (15.24–22.19)
Obesity	6.1 (4.43–8.35)	10.2 (5.71–17.52)	5.2 (3.52–7.57)

*$p < 0.05$ between patients and students

(sensitivity = 5.22%; specificity = 100%) detects individuals with a high risk for eating disorders (Table 2). A recommendation is to look for immediate intervention with specialized treatment when a respondent scores 15 points or over on the BQDEB.

Resuming, the BQDEB correctly identifies: (1) 92.0% of individuals not at risk for eating disorders, with less than eight points, (2) 60.0% of individuals at low risk, with scores ranging from 8 to 10 points, (3) 99.7% of individuals without moderate risk and 24.1% with moderate risk, with a range of 9–14 points, and (4) 100.0% of individuals without high risk and 5.2% with high risk, which implies 15 points or more.

Discussion

The BQDEB is widely used in research on eating disorders in the Mexican population. It has become a benchmark for reporting DEB in adolescents, mainly in the National Health and Nutrition Surveys [2, 3], as well as the Survey on the Prevalence of Drug and Alcohol Use in the Mexico City Student Population [4]. It is therefore important to periodically review the accuracy of its cut-off points.

Evidence for Mexico suggests that the prevalence of DEB in adolescents doubled between 2006 and 2012 [2, 3]. It is also noteworthy that, in university student samples, prevalence fluctuates between 8.8% and 25.0% [10], depending of the year of study and type of institution. These data point to the need for increasingly accurate, sensitive instruments that will facilitate the early detection of possible cases and thereby contribute to the identification of appropriate treatments.

Although the ability of the BQDEB to determine the risk of eating disorders decreases as the score (or the intensity of the risk) increases, this analysis ensures the correct classification of those who are not at risk. In other words, false positives increase, but false negatives decrease. The instrument adequately identifies those who are not at risk for eating disorders, making it possible to channel prevention efforts towards those who do have DEB, thus optimizing resources.

This new analysis proposal for the BQDEB consolidates the previously obtained cut-off points and provides an additional one, whereby extremely severe cases can be detected. It also makes it possible to expedite the identification of treatment options, thereby at least temporarily postponing the need for a diagnostic interview, which requires specialized personnel who is not always available at educational or health institutions.

The BQDEB validation presented here contributes to the methodological soundness of clinical and epidemiological research specifically related to the risk of ED in young Mexican women, with access to specialized health services. Nevertheless, it is necessary to continue testing it in female populations with different age compositions and sociocultural contexts. Limitations of the study include the use of a small sample collected by convenience, not letting to generalize the results to all ED patients in the country; the bias related to self-administered questionnaires, the lack of a sufficiently big male sample to validate and offer cut-off points for this assessment instrument, and not reporting the validation data of the questionnaire for this sample. Besides this, we consider that a replication of this study should be carried out with a probabilistic sample to be able to generalize the results.

What is already known in this subject?

The eating disorder field counts with several questionnaires for the screening of disordered eating behaviors, and many of them count with a cut-off point that allows identifying cases at risk for developing an eating disorder.

What does this study add?

This study adds to the eating disorder field a screening instrument that allows the identification of low-, moderate-, and high-risk individuals, on one hand directing prevention efforts to those individuals who strictly need it and on the other hand, channel those with high risk to treatment in an expeditious way.

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Compliance with ethical standards

Conflict of interest The authors have no competing interests to declare.

Ethical approval Ethical approval for the protocol was obtained from the Ramón de la Fuente National Institute of Psychiatry Ethical Committee, the Salvador Zubirán National Institute of Medical Sciences and Nutrition, and the Academic Committee of the Biological and Health Sciences of the Universidad Autónoma Metropolitana-Xochimilco.

Informed consent Informed consent was requested from both patients and students. In the case of minors, informed consent was requested from the child's parents or guardian.

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