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REVIEW ARTICLE

Eating disorder symptoms in Brazilian university students: a systematic review and meta-analysis

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Objective: To synthesize the risk of eating disorder (ED) symptoms in Brazilian university students through a systematic review and meta-analysis. Secondary goals were to analyze whether any specific majors were related to higher ED risk and whether any regions of Brazil had higher proportions of college students at risk of ED.
Methods: The procedures followed the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines, and a search was conducted in three electronic databases (MEDLINE, LILACS, and SciELO).
Results: Thirty-three studies were included in the analysis, of which 14 were included in the meta-analysis. All included studies used self-report questionnaires, the most frequent of which was the Eating Attitudes Test (EAT-26). None of the studies used a structured interview to diagnose ED. A meta-analysis of studies with a cutoff $\geqslant 20$ for the EAT-26 (n=5) found 14.9% (95%CI 12.8-17.2%) positive screenings, while those with a cutoff of $t \geqslant 21$ (n=9) found 13.3% (95%CI 11.3-15.6%) positive screenings. There was a significantly higher proportion of positive screenings among nutrition majors than all other majors combined (26.5 and 20.5%, respectively).
Conclusion: Nutrition students seem to be at higher risk of ED. Further research should investigate whether positive screenings translate to actual ED diagnoses.

Keywords: Eating disorders; epidemiology; nutrition; women; statistics

Introduction

The transition to college life can be a stressful period for young adults, and coping strategies can involve changes in eating behaviors.[1] Some of the challenges faced by college students include the need to adapt to new social roles, loss of family or social support when moving away from home, stress over choosing a career, living with people from different sociocultural backgrounds, financial difficulties, and the need to organize work and study schedules. It has been shown that such stressful life events can impact student mental health,[2] leading to symptoms of depression[3] and eating disorders (ED).[4]

A recent meta-analysis of epidemiological studies on eating disorders in Latin America found a pooled prevalence of 0.1% for anorexia nervosa (AN), 1.16% for bulimia nervosa (BN), and 3.53% for binge eating disorder (BED) in the general population above 10 years old.[5] This review searched for studies published until May 2016 and included a total of 17 articles. Among those, only four studies (from Mexico, Chile, Colombia, and Argentina) diagnosed ED with semi-structured interviews, finding rates that varied from 0 to 0.13% for AN, 1.15 to 6.13% for BN, and 2.55 to 4.21% for BED.[6-9] At this point, only three Brazilian studies with an epidemiological design had reported on the prevalence of ED, and none of them focused on university students. They reported BN rates ranging from 0.9 to 1.9% and BED rates ranging from 1.82 to 9.78%.[10-12] Another recent epidemiological study about BED prevalence among Brazilian workers reported a rate of 6.9%.[13]

The question of whether college students are at risk of ED symptoms or diagnosis is of great interest. A number studies developed in different countries have used self-report ED screening instruments in undergraduate students. The rates of positive ED screenings ranged from 4.5 to 6.2% in China,[14,15] 5.4% in Japan,[16] 8.9% in Poland,[17] 9.6% in Puerto Rico,[18] 11.3% in Croatia,[19] 12.64% in the United States,[20] 20.8% in Spain,[21] 22.7% in Pakistan,[22] 22.8% in Turkey,[23] to 24.6% in the United Arab Emirates.[24]

In a cross-sectional study of a community sample of adults from 12 different countries, Kessler et al.[25] investigated whether BN or BED was correlated with academic attainments or impairments and found that non-college

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students had a lower risk of developing BED. They also determined that women who developed BN or BED during their student years were more likely to have higher impairments at work.

The aims of the present study were to perform a systematic review and meta-analysis of all ED research on Brazilian university students. Our main interest was to investigate whether Brazilian college students are at higher risk of ED symptoms. As secondary goals, we aimed to explore whether there was a higher rate of students at risk of ED in any specific majors. We also addressed whether there is a greater risk of ED among college students in any specific regions of Brazil.

Methods

A systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines. The review protocol can be found in the online-only supplementary material (Appendix 1). Three electronic databases were searched: SciELO, LILACS, and PubMed. We analyzed all articles published through the end of July 2017. In PubMed, the search terms were selected from the Medical Subject Headings: anorexia, anorexia nervosa, bulimia, bulimia nervosa, binge eating disorder, BED – correlated with – university, universities, college, colleges, student, students, undergraduate, undergraduates, academic, scholar. In this database, a filter – adults (19-44 years of age) – was used to exclude children, adolescents, and elderly subjects. The search strategy was then adapted for use in the SciELO and LILACS databases with corresponding terms in Portuguese, according to the Health Sciences Descriptors (Descritores em Ciências da Saúde): anorexia nervosa, bulimia nervosa, transtorno da compulsão alimentar – correlated with – estudantes, universidade.

The inclusion criteria were: studies with samples of Brazilian university students who completed an ED and/or body image assessment using a validated research instrument (such as a self-administered questionnaire and/or a semi-structured interview). Studies were excluded if they used a non-representative sample (e.g., elementary or high school students), a non-validated instrument or an incomplete version of a validated instrument (e.g., applying only some of the items), or were a questionnaire validation study. ED symptoms were defined as positive screenings, which measure either binge eating, inadequate compensatory behaviors to prevent weight gain (purging, over-exercise, fasting), and/or distorted cognitions associated with body image and weight perception.

The search was conducted by two independent authors (APT and BPN) who first analyzed titles and abstracts and then selected full manuscripts. Disagreements about study inclusions were resolved through discussion with the other authors (JCA, PM, JT) until consensus was reached. The reference lists of all included studies were also hand searched to check for other relevant articles. Unpublished studies, presented as posters or dissertations, were requested after contacting the authors, but no data from those sources were included in the final analysis.

The following data were extracted from the selected articles by two authors (APT and BPN) and entered into a form designed for this review: title; first author; year of publication; journal; number of participants (divided by gender, mean age, and body mass index [BMI]); university type (public or private); study design and included instruments; results; covariables analyzed, and conclusions.

The methodological quality of all selected articles was assessed using the Newcastle-Ottawa scale; the results of this process can be seen in the online-only supplementary material (Tables S1 and S2).

All meta-analytic procedures were performed using Comprehensive Meta-analysis software version 3. The meta-analysis was performed using a random effects model. Publication bias was assessed with visual inspection of funnel plots and the Q and I^2 statistics (an I^2 value of 75-100% was considered to represent high heterogeneity). A forest plot was made to compare studies that reported a percentage of students with a positive screening (and the cutoff used). We also assessed whether possible moderator variables (major; percentage of females in the sample; university type; region of Brazil) in a meta-regression model explained effect size variance across studies. The inclusion criterion for the meta-analysis and meta-regression was a minimum of 10 observations.

Results

The search flowchart and selection procedures are shown in Figure 1. All 33 studies included in the final selection are summarized in Table 1.

Data was obtained on 11,487 Brazilian university students (77.5% female) with a mean age of 21.6 years old and a mean BMI of 22 kg/m2. Of note, no study investigated students from the northern or midwestern regions of Brazil exclusively, while 53% of the research was conducted in the southern region and 46% in the southeast. There were no studies focusing exclusively on social science majors, while 75% focused only on health-related majors, especially nutrition. Among the 33 reviewed articles, 13 were led by a professor of nutrition,[12,27-38] by a professor of medicine,[26,54,55] 10 by a professor of sports science,[31,35-37,39,40,44-46,51,52] and one by a professor of psychology.[56] Three of these articles were conducted by multidisciplinary groups.[30,54,55] A variety of self-report instruments were used to screen for possible ED: the Eating Attitudes Test (EAT-26) was used in 19 articles,[26,28,29,31-33,38,41-44,47-50,53,54,56,57] the Bulimic Inventory Test, Edinburgh (BITE) in six studies,[29,30-32,49,50] and the Binge Eating Scale (BES) in two studies.[46,57] Regarding body image disorders, 14 studies used the Body Shape Questionnaire (BSQ),[26,29-32,34,35,39-42,52-54] while eight used the Stunkard Figure Rating Scale (FRS).[25,33,37,41,44,45,51,55] The results from all EAT-26 studies are shown in Table 2, and studies using the BITE and BSQ are shown in the online-only supplementary material (Tables S3-S5).

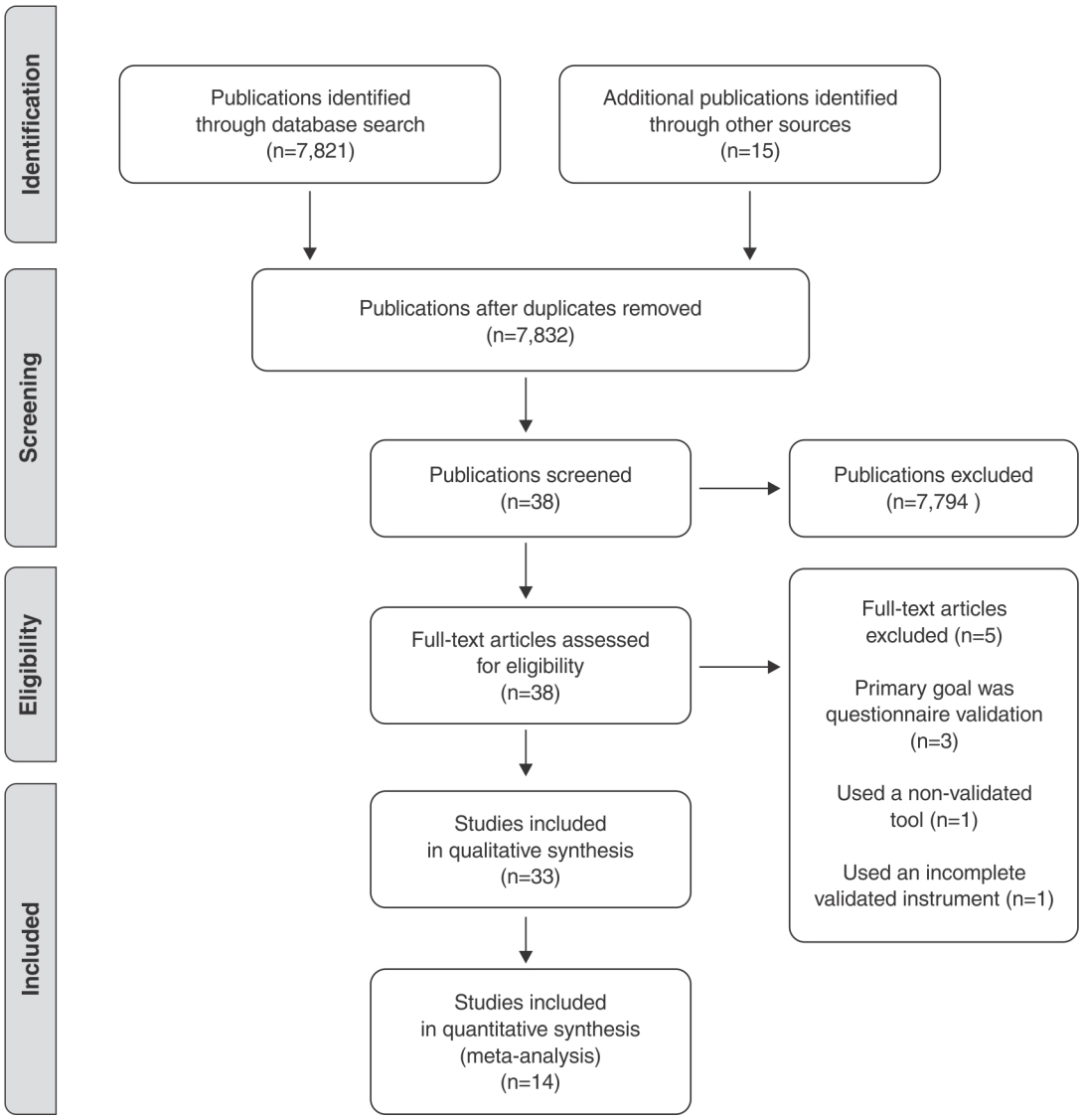

Figure 1 Systematic review flowchart.

Meta-analysis

Studies that used the EAT-26 with a cutoff $\geqslant$ 20 points (n=5) had a pooled positive screening rate of 16.7% (95% confidence interval [95%CI] 11.4-23.7%).[33,41,43,50,55] The rate for sports science students (n= 2) was 15.1% (95%CI 5.9-33.5%),[33,43] the rate for medical students (n= 3) was 14.9% (95%CI 6.1-32.2%),[33,50,55] and that of nutrition students (n= 2) was 28.2% (95%CI 6.3-69.8%).[41,43] Each of the other courses contributed only one observation to the model. Heterogeneity was high and significant (Q-value = 49.08 [degree of freedom (Q) = 9]; $p < 0.001$; $I^2 = 81.66$). Egger's test was not significant (p = 0.36). The forest plot for this analysis is available in the online-only supplementary material (Figure S1).

Studies with a higher EAT-26 cutoff point ($\geqslant$ 21) (n=9) had an overall positive screening rate of 13.3% (95%CI 11.3-15.6%) (Figure 2).[26,29,38,44,48,49,53,54,56] The pooled rate for nursing students (n=2) was 10.8% (95%CI 6.2-18%),[53,56] while that of nutrition students (n=5) was 25.3% (95%CI 19.7-31.9%).[38,48,53,54,56] Psychology, medicine and sports science each contributed only one observation to the model. There was high and significant heterogeneity for the pooled rate (Q-value = 172.48 [degree of freedom = 8]; $p < 0.001$, $I^2 = 93.63$, $T^2 = 0.39$). A non-significant Egger's test indicated no small study effects (p = 0.20). Visual inspection of the funnel plots (online-only supplementary material, Figures S2 and S3) for both EAT-26 cutoffs demonstrated bias. A meta-regression using university course (nutrition set as reference) was possible for both EAT-26 cutoff points, whereas a model including university course, percentage of female subjects, region, and university type (public or private) was only possible with EAT-26 cutoff $\geqslant$ 21 points, since these studies provided all the necessary information.

The first meta-regression model, which used university major as a predictor among studies with a lower EAT-26 cutoff, was not significant (p = 0.93). In contrast,

Table 1 Characteristics of studies included in the systematic review

Article	Year	Region	Mean age	Mean BMI	University	n (% female)	Major	Screening tool
Alberton[26]	2013	South	N/A	N/A	Public	391 (51)	Medicine	EAT-26
Alvarenga[27]	2010	Southeast	23.5	22	N/A	2,402 (100)	Six different majors of health sciences	Stunkard FRS
Alvarenga[28]	2011	All regions	23.0	22	N/A	2,489 (100)	Six different majors of health sciences	EAT-26
Alvarenga[29]	2013	All regions	23.0	22	N/A	2,489 (100)	Six different majors of health sciences	EAT-26
Bosi[30]	2006	Southeast	21.0	21	Public	193 (100)	Nutrition	BSQ
Bosi[31]	2008	Southeast	22.0	21	Public	191 (100)	Sports science	EAT-26; BITE; BSQ
Bosi[32]	2009	Southeast	21.0	21	Public	175 (100)	Psychology	EAT-26; BITE; BSQ
Bosi[33]	2014	Southeast	21.0	21	Public	189 (100)	Medicine	EAT-26; BITE; BSQ
Cenci[34]	2009	South	20.0	21	Public	220 (100)	N/A	BITE; BSQ
Coqueiro[35]	2008	South	23.0	22	Public	256 (50)	Sports science	Stunkard FRS
Costa[36]	2010	South	20.0	21	Public	220 (100)	N/A	BSQ
Ferrari[37]	2012	South	20.0	N/A	Public	832 (42)	N/A	BSQ
Fiates[38]	2001	South	N/A (19.0-25.0)	N/A	Public	221 (100)	Nutrition vs. other unspecified majors	EAT-26
Frank[39]	2016	South	23.0	N/A	Private	299 (42)	Sports science	Stunkard FRS
Garcia[40]	2010	Southeast	21.0	22	Private	194 (100)	Sports science vs. medicine	BSQ
Gonçalves[41]	2008	Southeast	N/A (22.0-24.0)	N/A	Public	227 (N/A)	Nutrition vs. sports science	EAT-26
Kirsten[42]	2009	South	N/A (17.0-41.0)	N/A	Private	186 (100)	Nutrition	EAT-26
Laus[43]	2009	Southeast	N/A (18.0-22.0)	N/A	Private	127 (100)	Nutrition vs. sports science vs. exact sciences	EAT-26; BSQ
Legnani[44]	2012	South	25.0	23	Public	229 (54)	Sports science	BSQ
Martins[45]	2012	South	20.0	N/A	Public	865 (42)	N/A	Stunkard FRS
Miranda[46]	2012	Southeast	21.0	22	Public	535 (56)	Social vs. exact sciences vs. health sciences	BSQ
Nicoli[47]	2011	Southeast	20.0	22	Public	217 (81)	Medicine and nursing	BES
Penz[48]	2008	South	24.0	20	Private	203 (100)	Nutrition	EAT-26
Pereira[49]	2011	South	21.0	21	N/A	188 (100)	Seven different health sciences majors	EAT-26
Pinto[50]	2009	Southeast	N/A	N/A	Private	85 (100)	Medicine	EAT-26; BITE
Quadros[51]	2010	South	20.0 (M); 21.0 (F)	23 (M); 21(F)	N/A	874 (42)	N/A	Stunkard FRS
Rech[52]	2010	South	22.0	22	Public	249 (63)	Sports science	Stunkard FRS
Santos[53]	2008	Southeast	N/A	N/A	Public	142 (100)	Nutrition vs. nursing vs. biological sciences	EAT-26
Silva[54]	2012	Southeast	21.0	N/A	Public	175 (100)	Nutrition	EAT-26
Souza[55]	2002	Northeast	N/A	N/A	Public	199 (100)	Medicine	EAT-26; BITE
Souza[56]	2011	N/A	N/A	N/A	Private	352 (100)	Four different health sciences majors	EAT-26; BSQ
Stipp[57]	2003	Southeast	N/A	N/A	Private	239 (100)	Nutrition vs. psychology	BSQ
Vitolo[58]	2006	South	N/A	N/A	Private	491 (100)	Social vs. exact sciences vs. health sciences	BES

BES = Binge Eating Scale; BITE = Bulimic Investigatory Test; BMI = body mass index; BSQ = Body Shape Questionnaire; EAT-26 = Eating Attitudes Test; F = female; M = male; N/A = not available; Stunkard Figure Rate Scale = Stunkard FRS.

Table 2 The results of studies (positive EAT-26) on Brazilian university students (by major)

Article	Sample size	EAT-26+ (%)*	Cutoff point	University type	Region of Brazil
Nutrition					
Gonçalves[41]	149	14.10	⩾ 20	Public	Southeast
Laus[43]	24	50.00	⩾ 20	Private	Southeast
Fiates[38]	114	25.43	⩾ 21	Public	South
Santos[53]	42	23.80	⩾ 21	Public	Southeast
Penz[48]	203	35.00	⩾ 21	Private	South
Souza[56]	153	20.20	⩾ 21	Private	N/A
Silva[54]	175	21.70	⩾ 21	Public	Southeast
Kirsten[42]	186	24.70	> 21	Private	South
Stipp[57]	104	18.00	> 21	Private	Southeast
Medicine					
Souza[55]	199	5.50	⩾ 20	Public	Northeast
Pinto[50]	39	28.00	⩾ 20	Private	Southeast
Bosi[33]	189	19.10	⩾ 20	Public	Southeast
Alberton[26]	391	10.00	⩾ 21	Public	South
Nursing					
Santos[53]	61	9.80	⩾ 21	Public	Southeast
Souza[56]	51	12.20	⩾ 21	Private	N/A
Sports science					
Gonçalves[41]	78	10.30	⩾ 20	Public	Southeast
Laus[43]	37	24.00	⩾ 20	Private	Southeast
Legnani[44]	229	7.30	⩾ 21	Public	South
Bosi[31]	191	14.10	> 21	Public	Southeast
Psychology					
Souza[56]	133	8.90	⩾ 21	Private	N/A
Stipp[57]	135	13.00	> 21	Private	Southeast
Bosi[32]	175	9.60	> 21	Public	Southeast
Marketing					
Laus[43]	32	13.00	⩾ 20	Private	Southeast
Management					
Laus[43]	34	18.00	⩾ 20	Private	Southeast
N/A					
Alvarenga[28]	2.483	26.10	⩾ 21	N/A	All regions
Pereira[49]	214	48.00	⩾ 21	N/A	South

EAT-26 = Eating Attitudes Test; N/A = not available.
* Percentage of positive results.

a meta-regression using major as predictor with a higher EAT-26 cutoff point was significant ($p < 0.001$) and explained 83% of the pooled effect size variance ($R^2 = 0.83$). The rate of nutrition students with a positive EAT-26 (cutoff ⩾ 21 points) was significantly higher than all other majors. A final meta-regression model adding all three moderators, major, university type, and percentage of females was not significant due to the collinearity between the percentage of females and region. Only two studies investigated both genders.

The results of studies using the BSQ varied widely due to the many different cutoff points ascribed to moderate and high body dissatisfaction. Studies that used the BITE reported findings for each of its subscales (symptoms and severity). One of the two studies that used the BES found a 12.9% positive screening rate among medical and nursing students, with 9.22% classified as moderate BED and 3.69% as severe BED.[47] Vitolo et al.[58] reported a total positive BES rate of 18.1% among 518 college students from different majors (12.6% moderate results and 5.5% severe results). They also reported the total rates for each major: 20.7% in health-related majors vs. 18.7% in mathematics-related majors vs. 16.4% in social sciences majors. Pooled results for the BITE, the BSQ, and a summary of EAT-26 results are shown in Table 3. There were not enough studies that used the BITE, BES and BSQ to perform a meta-regression.

Discussion

To the best of our knowledge, this is the first meta-analysis from a systematic review to report the risk of ED symptoms among Brazilian university students. None of the included studies used a second-stage confirmatory diagnostic interview or focused on a specific Brazilian region; it was thus impossible to determine whether some regions had a higher proportion of students at risk of ED than others. Nutrition students had the highest frequency of positive ED screenings.

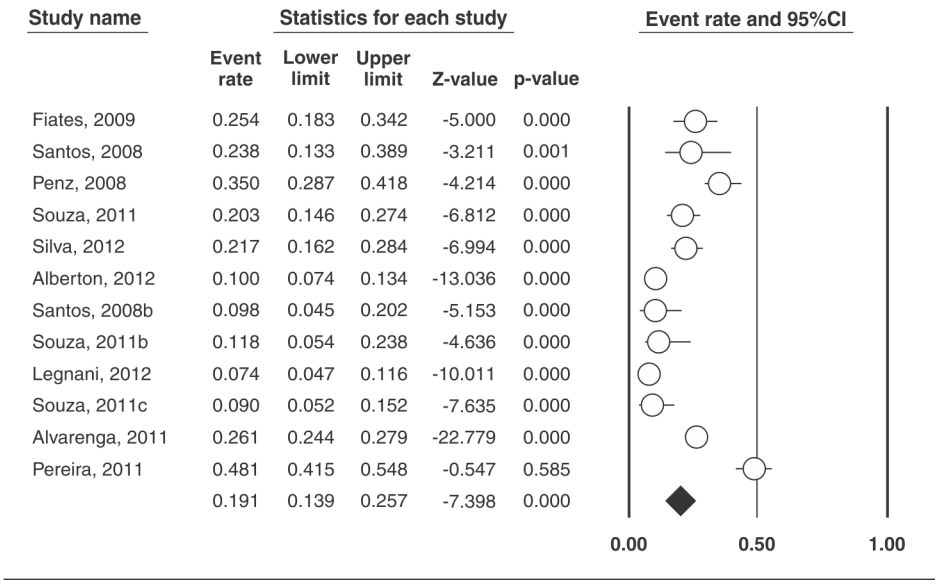

Figure 2 Forest plot of positive screening rates in studies using Eating Attitudes Test (EAT-26) (cutoff point ⩾ 21).95%CI = 95% confidence interval.

Table 3 Pooled screening results

Screening (cutoff)	Percentage of positive results
EAT-26	
EAT-26 (⩾ 20 cutoff)[33,41,43,50,55]	16.7 (11.4-23.7)
EAT-26 (⩾ 21 cutoff)[26,29,38,44,48,49,53,54,56]	13.3 (11.3-15.6)
BITE	
BITE-symptoms subscale (10-19 cutoff = moderate risk)[31-34,50,55]	29.7 (26.5-33.1)
BITE-severity subscale (5-9 cutoff = moderate risk)[31-33,50,55]	6.4 (4.7-8.5)
BITE-symptoms subscale (⩾ 20 cutoff = high risk)[31-34,50,55]	4.8 (3.4-6.7)
BITE-severity subscale (⩾ 10 cutoff = high risk)[31-33,50,55]	3.9 (2.7-5.6)
BSQ	
BSQ (91-110 cutoff)[43]	10.6 (3.9-25.8)
BSQ (111-140 cutoff)[30-33,36,40,44,54,57]	10.6 (8.0-13.8)
BSQ (⩾ 140 cutoff)[30-32,44,56]	15.7 (11.3-21.4)
BSQ (> 140 cutoff)[33,40,54]	17.1 (10.6-26.3)

Data presented as % (95% confidence interval).
BITE = Bulimic Inventory Test, Edinburgh; BSQ = Body Shape Questionnaire; EAT-26 = Eating Attitude Test.

The positive screening rate found in Brazilian students with the EAT-26 is within the range reported in other countries. Previous studies conducted in South Africa (33.3% in nutrition vs. 16.9% in other majors)[59] and Greece (30.2 vs. 11.1% in technology related majors)[60] also found that nutrition students had higher levels of positive screenings (EAT-26 cutoff > 20 points). There have been negative studies from Washington University (19.4% in nutrition vs. 42.9% in sports science)[61] and the University of North Florida-Jacksonville (9.5% in nutrition vs. 10.3% in other health-related majors vs. 10% in non-health related majors).[62] The fact that more nutrition students were recruited in studies using an EAT-26 cutoff ⩾ 21 points than the ⩾ 20 cutoff might explain why only the former yielded positive results in our meta-regression.

Regarding body image perception, despite the different cutoff points applied, Brazilian articles seem to have reported a higher prevalence of positive BSQ than studies from non-western countries[63,64] and values closer to the results of other Latin American studies.[65,66]

Since few studies have involved a diagnostic interview following ED screening procedures, the ED screening instruments have an uncertain predictive power for the risk of actual ED diagnosis in college students. Only 10% of 161 Brazilian women with a positive BITE were actually diagnosed with ED (using semi-structured interviews) in a 4-year follow up, compared to 4.5% of controls with a baseline negative BITE screening.[67] Using the Disordered Eating Symptoms Scale (DESS), Striegel-Moore et al.[68] found that only 11 of 18 college students who had previously screened positive remained so after one year of follow up. Eisenberg et al.[68] found that even though 13.5% of 2,000 female students screened positive on the Sick, Control, One, Fat and Food Questionnaire

(SCOFF), only a modest number of students still remained positive when the test was administered again after a 2-year follow up. Interestingly, during this 2-year period, only 48% of the students with positive screenings felt that they needed professional help, and only 15% had any counseling or mental health therapy, which highlights the possibility that a large proportion of college students with an ED-related pathology are neither identified nor treated.[69] Although positive screenings may not translate into a diagnosed ED, a British prevalence study in the general population reported that individuals with a positive SCOFF had greater psychiatric comorbidities and suicidal ideation than those with negative screenings.[69] Of note, although 31.7% of these positive SCOFF cases recognized the need for professional help, only 27.4% of all positive cases had visited a general practitioner and only 5.5% had consulted with a mental health specialist at the time of the study.[70] This could indicate the potential effectiveness of a broad, preventive approach to ED in college settings that focuses on awareness of ED symptoms and impairments secondary to ED.

This review presents a number of limitations, including the fact that the data were extracted from cross-sectional studies involving screening instruments. The high sensitivity of these instruments could have led to higher positive rates, and the lack of diagnostic studies on Brazilian college students leaves the ED diagnosis conversion rate unknown. Moreover, the use of different cutoff scores for the EAT-26 by different authors impaired comparability between many studies. Another limitation was the high heterogeneity of studies included in the meta-analysis. The use of random-effects models (rather than fixed-effect models) was an attempt to control this problem, since they are more appropriate for dealing with highly heterogeneous studies. Furthermore, the scarcity of studies with good methodological quality could have led to greater bias in the results. Finally, there are no Brazilian community norms for the EAT-26, BITE, BSQ, or BES, so it is impossible to determine whether the rates found among university students are above the expected rate for the general population.

One of the implications of this review is that nutrition students, and possibly those of other health-related areas, could be at higher risk of ED and would be a suitable target population for preventive strategies. Further research should focus on addressing whether these positive screenings translate to actual ED diagnoses to clarify the ''at risk'' concept, as well as to investigate whether the EAT-26 (the self-report questionnaire used in most of the included studies) is the ideal screening tool for ED screening in this population. Longitudinal studies should examine whether this major contributes to the onset or worsening of ED. This systematic review has highlighted a research gap in epidemiological studies about ED in Brazil, especially concerning diagnostic and longitudinal studies and/or studies of high methodological quality.

The present review indicates that Brazilian students are at risk of ED and that further epidemiological studies are needed to establish the needs of students, given the detrimental effects that ED symptoms have on health and academic outcomes. Nutrition students appear to be at higher risk, and the mechanisms involved in this finding could inform prevention strategies.

Disclosure

The authors report no conflicts of interest.

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