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Original Article

Association Between Nutritional Status and Dental Caries in Brazilian Teenagers with and without Risk for Eating Disorders

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Abstract

Objective: To evaluate the relationship between nutritional status and dental caries in Brazilian female adolescents with and without behavioral risk for eating disorders. **Material and Methods:** Cross-sectional study involving 60 girls, 15 to18 years old, randomly selected from public and private schools. Risk behavior for eating disorder was assessed by the Bulimic Investigatory Test of Edinburgh, anthropometric measurements were taken to calculate the body mass index, dental examinations were performed to verify the caries experience and a questionnaire to collect sociodemographic data was applied. Data were analyzed descriptively and analytically using the Statistical Package for the Social Sciences 18.0 software. The level of statistical significance was set at 5%, with a 95% confidence interval. **Results:** Most of the girls studied in public school (75,0%), had no partner (95,0%) and had a monthly family income above the minimum wage (63,3%). The prevalence of dental caries was high (86.7%). The most used practice for weight loss was the act of purge (18.3%). There was no statistically significant association between dental caries and Body Mass Index (p=0,655), however, it was observed that adolescents with high Body Mass Index had a higher risk for Eating Disorders (p<0,05). **Conclusion:** The nutritional status was not associated with dental caries, however the monitoring of girls with high Body Mass Indexis important due to the increased risk of eating disorders.

Keywords: Body Mass Index; Feeding Behavior; Dental Caries; Adolescent Behavior.

Introduction

Eating disorders are psychiatric conditions associated with different types of behavior, manifested together or separately, have multifactorial etiology and may be presented in different ways, severities and intensities [1,2]. They are classified as the third most common chronic diseases in adolescents, especially in girls, and among this group of individuals, eating disorders have higher morbidity and mortality than any other mental disorder [3]. There are three main diagnoses in which eating disorders are classified according to the Diagnostic and Statistics Manual of Mental Disorders Manual - DSM 5: anorexia nervosa, bulimia nervosa and binge-eating disorder [4]. Among these, the most prevalent are anorexia nervosa (0.5-1.0%) and bulimia nervosa (2.0-3.0%) [5,6].

Although genetic predisposition is an ever-present factor in psychiatric disorders, it is considered that eating disorders cannot be distanced from the social context of the population, since socio-cultural factors such as social pressure to aesthetics associated with thinness and eating habits have great influence on these diseases [7]; therefore, emphasis should be given to feeding behavior, which has repercussions on well-being and health [8].

There are a large number of adolescents with inadequate feeding practices; eating and restricting food has revealed to be harmful strategies to deal with situations of emotional conflicts [9].

The relationship between food and reducing anxiety for some individuals creates a favorable situation for the emergence of problems such as binge eating and obesity [9]. These situations can trigger the search for immediate solutions to reverse the bingeing situation, which added to feelings of grief and frustration are the gateway to eating disorders [9].

Eating behaviors bring many health risks, but oral complications from these conditions must be emphasized because they are the only that cannot be reversed [10]. Obesity and eating disorders share risk factors such as concerns about weight, loss of dietary control and unhealthy weight control behaviors [11].

Due to the multifactorial nature of these disorders, a multidisciplinary approach is needed to conduct the treatment in the best possible way [12]. As the dentist is usually the first professional to identify dental signs that are result of behavioral change from eating disorders, this professional should refer the patient for treatment with a psychologist, physician and nutritionist [12,13].

Thus, this study aimed to assess the relationship between nutritional status and the incidence of dental caries in female adolescents with and without behavioral risk for eating disorders.

Material and Methods

Study Population

This is a cross-sectional study conducted in the city of Campina Grande - PB, northeastern Brazil, with a population of 405,072 inhabitants and Human Development Index (HDI) of 0.720 [14].

The universe was composed of all students aged 15-18 years enrolled in private and public schools of the city, totaling 14,351 individuals. The sample of this research originated from a probabilistic sample by clusters with 850 female subjects of a study previously developed [15]. From the identification of adolescents with behavioral risk of high severity for eating disorders (12 individuals), pairing was held in the proportion of 1: 4 with adolescents without risk, totaling 60 individuals that composed the study sample.

Training and Calibration Process

Prior to data collection, calibration was performed for the diagnosis of dental caries. Calibration was performed in two stages, one theoretical and the other clinic. In the first stage, the gold standard examiner trained the examiner for dental caries discussing codes and criteria for diagnosis according to the DMFT index [16]. In the next step, 20 volunteers from a public school aged 15-18 years were examined. The gold standard and examiner results were compared using the Kappa Cohen coefficient, obtaining inter-rater agreement of 0.97. Adolescents were again examined after a 15-day interval for the calculation of the intra-rater agreement, obtaining the value of 0.98.

The pilot study was conducted with 59 adolescents aged 15-18 years from a previously drawn public school, with the aim of testing methods, research instrument and to prepare and train the examiner. It was observed that there was no need to modify the previously proposed methods.

Dental Examinations and Nonclinical Data Collection

Data were collected using the Bulimic Investigatory Test of Edinburgh (BITE) questionnaire [17], which was validated for use in the Brazilian population [18] and evaluates behavioral risk for eating disorders. This tool presents as final results two scales, one of symptoms and other of severity. The scale of symptoms has three possible outcomes: situation of "no risk" for the development of eating disorders (score <10); "risk situation" (score ≥ 10 and less than 20) for the development of eating disorders, which suggests an unusual eating standard without all the criteria that characterize an eating disorder; "eating disorder situation" (scores from 20 to a maximum of 30), characterized by the presence of binge-eating behavior and a high possibility of presence of bulimia, which is considered the main indicator for the occurrence of eating disorders. The severity scale has three possible outcomes: mild severity (less than 5 points); moderate severity (5 to 9 points); high severity (from 10 points). It is recommended that subjects respond to the questionnaire considering their behavior in the last three months [18]. The variables of interest such the use of drugs to lose weight and self-induced vomiting are included in this tool.

In this study, score ≥ 20 and up to a maximum of 30 on the symptom scale and score ≥ 10 on the severity scale was used to indicate that the adolescent has high behavioral risk for eating disorders [3].

A sociodemographic questionnaire was also used in order to characterize the sample according to type of school, family income in minimum wages (considering the amount of R$ 788,00

or US$ 250.00 equivalent to the minimum wage in Brazil at the time) and use of dental services in the six months preceding the survey.

The DMFT index was dichotomized into DMFT = 0 (no caries experience) and DMFT> 1 (caries experience) and used to verify the experience and presence of dental caries [19], and body mass index (BMI) to determine anthropometric measurements [20]. According to the World Health Organization classification, BMI value less than 18.5 is considered below normal; between 18.5 and 24.9 is considered normal; and greater than 24.9 is considered above normal [20].

Data collection was performed in three stages: the first was the visit to eight schools and classrooms to explain the research and to deliver the Informed Consent Form and Agreement Form for parents / guardians and adolescents, respectively. The next day, after returning the forms properly signed, two questionnaires were applied: sociodemographic and BITE. In the second stage, the questionnaires were evaluated and the cutoff point established to determine that the adolescent had high risk for eating disorders (symptom score ≥ 20 and severity score ≥ 10). Every high-risk adolescent was paired with four others who did not have the risk (1: 4) [3].

All adolescents were submitted to dental examination and had their anthropometric measurements taken. Dental examinations were conducted on school premises with adolescents positioned face-to-face with the examiner who had all personal protective equipment (PPE) and used artificial lighting through a Petzl Zoom lamp attached to the head (Petzl America, Clearfield, UT, USA). Sterilized mouth mirrors (Prisma, São Paulo, SP, Brazil) and sterile gauze swabs were used to clean and dry the teeth in accordance with infection control standards [16]. The examiner [LMTB] remained blind to the risk factor for eating disorder of adolescents at the dental examination.

Data Analysis

Data collected were tabulated (double entry) and analyzed using the Statistical Package for the Social Sciences (SPSS 18.0) software. Descriptive statistics was performed to analyze the frequency and distribution of data, while bivariate analyses were used by Pearson chi-square or Fisher's exact test to verify the association between nutritional status and sociodemographic variables, and between nutritional status and behavioral risk for eating disorders. The level of statistical significance was set at 5%, with 95% confidence interval.

Ethical Aspects

This study is part of research entitled "Eating disorders and their association with dental caries and dental erosion", which was approved by the Ethics Committee for Research with Human Beings of the State University of Paraíba under protocol No. 729654, according to guidelines established by Resolution 466/12 of the National Health Council - Ministry of Health.

Results

Most participants (75.0%) were from public schools, had no partner (95.0%), family income above minimum wage (63.3%) and have not visited the dentist in the past six months (Table 1). There was a high prevalence of dental caries experience (86.7%) and only 20% had high BMI (Table 1).

Table 1. Characterization of adolescents according to sociodemographic and clinical variables.

Variables	N	%
Type of school [60]		
Public	45	75.0
Private	15	25.0
Marital status [60]		
With partner	3	5.0
Without partner	57	95.0
Monthly family income* [30]		
≤ US$ 250,00	11	36.7
> US$ 250,00	19	63.3
Dental visit in the last 6 months [60]		
Yes	30	50.0
No	30	50.0
DMFT [60]		
DMFT = 0	8	13.3
DMFT ≥ 1	52	86.7
Body mass index (BMI) [60]		
Below normal or normal	48	80.0
Above normal	12	20.0
Risk behavior for eating disorder [60]		
Absent	48	80.0
Present	12	20.0

*Minimum wage value at the time of the survey: U$ 250.15 in the year 2015.

As for behavioral methods to lose weight, 16.7% of adolescents reported using some type of drug to lose weight (pills, laxatives or diuretics) and 18.3% reported inducing vomiting (Table 2).

Table 2. Distribution of behavioral methods to lose weight described by adolescents.

Behavioral Methods	N	%
Use of drugs to lose weight [60]		
No	50	83.3
Yes	10	16.7
Vomiting self-induced [60]		
No	49	81.7
Yes	11	18.3

Regarding the relationship between BMI and dental caries experience, the results showed that 83.3% of adolescents with high BMI had caries experience, but this prevalence was also high among controls (87.5%), with no statistically significant association (p> 0.05) (Table 3). Also according to Table 3, there was a statistically significant association between BMI and behavioral risk for eating disorders (p <0.05) and between BMI and the use of drugs to lose weight (pills, laxatives or diuretics) (p <0.05). However, there were no associations between BMI and independent variables such as type of school, marital status, monthly family income and visits to the dentist.

Table 3. Association between Body Mass Index (BMI), dental caries experience, behavioral risk for eating disorders, sociodemographic and behavioral variables.

Variables	BMI**		P-value
	Below normal or normal	Above normal	
DMFT			
DMFT = 0	6 (12.5%)	2 (16.6%)	0.655 *
DMFT ≥ 1	42 (87.5%)	10 (83.3%)	
Total	48 (100.0%)	12 (100.0%)	
Risk behavior for eating disorders			
Present	6(12.5%)	6 (50.0%)	0.009 *
Absent	42 (87.5%)	6 (50.0%)	
Total	48 (100.0%)	12 (100.0%)	
Type of school			
Public	35 (72.9%)	10 (83.3%)	0.712*
Private	13 (27.1%)	2 (16.7%)	
Total	48 (100.0%)	12 (100.0%)	
Marital status			
With partner	2 (4.2%)	1 (8.3%)	0.495*
Without partner	46 (95.8%)	11 (91.7%)	
Total	48 (100.0%)	12 (100.0%)	
Monthly family income*			
≤ US$ 250,00	8 (38.1%)	3 (33.3%)	1.000*
> US$ 250,00	13 (61.9%)	6 (66.7%)	
Total	21 (100.0%)	9 (100.0%)	
Dental visit in the last 6 months			
Yes	27 (56.3%)	3 (25.0%)	0.053
No	21 (43.8%)	9 (75.0%)	
Total	48 (100.0%)	12 (100.0%)	
Vomiting self-induced			
Yes	8 (16.7%)	3 (25.0%)	0.677*
No	40 (83.3%)	9 (75.0%)	
Total	48 (100.0%)	12 (100.0%)	
Use of drugs to lose weight			
Yes	4 (8.3%)	6 (50.0%)	0.003*
No	44 (91.7%)	6 (50.0%)	
Total	48 (100.0%)	12 (100.0%)	

* Fisher's exact test; **BMI = Body mass index; *** Minimum wage value at the time of the survey: U$ 250.15 in the year 2015.

Dental examination showed that all adolescents with behavioral risk for eating disorders had caries experience (DMFT ≥1), as well as 83.3% of controls (p = 0.338), with no statistically significant association (Table 4).

Table 4. Relationship between behavioral risk for eating disorders and caries experience.

DMFT	Risk behavior for Eating Disorder		P-value
	Absent	Present	
DMFT = 0	8 (16.7%)	0 (0.0%)	0.338 *
DMFT ≥ 1	40 (83.3%)	12 (100.0%)	
Total	48 (100.0%)	12 (100.0%)	

Discussion

The search for the perfect body has generated a change in diet and lifestyle standards, affecting especially the female population. Eating disorders appear as physical and psychological response of abnormal behavior, generated by the pursuit of perfection [3,21]. They are associated

with different behaviors expressed alone or together [1], which can lead to severe psychological and social damage and increase morbidity and mortality, particularly among adolescents [2].

This study was conducted only with females, similar to most studies conducted by Brazilian [3,6,9] and foreign researchers [10,22], who discuss eating disorders, as this is a condition more prevalent in women [23,24]. However, a study conducted in Spain with sample composed of both men and women [5] has shown that although females are the most affected by eating disorders, ED have similar effects on males [23].

In this study, adolescents did not have a diagnosis of eating disorder; they were identified and selected by means of an instrument validated [18] and used in literature [3,9], which assesses the risk of suffering from eating disorders (bulimia nervosa) (BITE) [17]. Assess the risk of eating disorder is an important tool, although few studies in literature have used this resource [3,9,18,25]. Often the patient denies his condition, making diagnosis difficult and contributing to an unfavorable prognosis [26]. The identification of risk groups aims at the establishment of preventive measures, bringing benefits to this population group [9,25].

In this research, most adolescents reported monthly family income greater than one minimum wage (63.3%), and there was no association between nutritional status and income (p> 0.05). However, results found in Turkey [27] found that better economic condition is directly related to obesity among children, and a systematic review shows that economic difficulty can lead to increase vulnerability and health problems [28].

Proportionally, this research showed a higher percentage of individuals with high BMI among students from public schools (83.3%), but there was no statistically significant difference between types of school when related to BMI. Previous research developed in Turkey [29] showed that children from public schools had lower average BMI than children from private schools.

Routine visit to the dentist was reported by half of adolescents, corroborating the findings of previous study conducted in Southeastern Brazil [30,31] Patients with eating disorders are more likely to hide and deny their condition, thus avoiding the help of health professionals [26]. After evaluating women aged 18 years or older with diagnosis of bulimia nervosa, US researchers found that the majority (70.8%) reported that they had not talked with oral health professionals about their problem, and the causes related to this barrier between patient and oral health professional were mainly embarrassment (81.1%), shame (77.6%) and fear (54.2%) [22].

Among compensatory methods reported by adolescents, the most common was to induce vomiting (18.3%). This result contrasts with that obtained in another study conducted in Brazil [25], in which diet, physical activity and use of diuretics and laxatives were described as more routine practices. Similarly, other researchers [5] observed that the habit of vomiting as a strategy to control food intake also had a low prevalence (1.92%), with higher proportions found in the group of overweight and obese students. It is noteworthy that the habit of vomiting has harmful implications to health; therefore, even a low prevalence is dangerous and cause for concern and preventive initiatives should be proposed to raise awareness of the population [25]. The high

number of adolescents making use of inadequate dietary practices underscores the attention that this issue requires from the academic community, especially in the field of public health, strengthening its position as an emerging issue in the Brazilian scenario [9].

In this study, caries experience was observed among all individuals with high behavioral risk for ED, corroborating the findings of another Brazilian study [3], which also revealed a high percentage of dental caries among the group of individuals with eating disorders (80%). This observation can be explained by the fact that individuals at high risk for eating disorder usually choose foods high in carbohydrates, which favors the presence of caries [21]. However, although some authors claim that individuals with binge eating for sweet food are at greater risk for dental caries [13], the occurrence of this condition is variable in binge-eating patients [13], showing that the risk for caries is highly individual and dependent on various factors [3,10,32, 33]. According to Brazilian researchers, a key factor in dental caries process are the eating habits [33]. The increase in the occurrence of caries in individuals with already installed eating disorder is due to moments of hyperphagia, characterized as the consumption of cariogenic foods that in addition to reducing salivary pH, may be accompanied by acidification caused by subsequent vomiting [12].

Although the vast majority of adolescents with high BMI in this study have presented caries experience (83.3%), there was no statistically significant association between these variables, unlike other Brazilian study that showed lower DMFT index in a obese children and adolescent group [34]. Another study that examined the relationship between BMI and dental caries also found no association between these variables [29], although its sample included both genders and different age group (10-12 years). However, a study conducted in Saudi Arabia [35] found partial positive correlation between BMI and DMFT analyzing men and women aged 18 years or older. Analyzing women aged 13-32 in Spain [10], the results regarding dental caries were inconclusive, since the etiology of dental caries is multifactorial and influenced by diet, oral hygiene and saliva. Caries in patients with eating disorders is even more complex because EDs are multifactorial and controversial, so further research on this subject should be carried out and should include analyses of diet, saliva, and details on individual behavior regarding self-induced vomiting [32]. In this study, one fifth of adolescents had high BMI, a result similar to another study also conducted in Brazil [25], in which 15.7% were overweight or obese; however, in contrast to results obtained in Spain [5], where only 5.2% of students were obese. Similarly, a previous study conducted in northeastern Brazil using BMI of adolescents found that only 5.3% of the sample was overweight or obese [9].

When analyzing the relationship between BMI and behavioral risk for EDs, it was observed that half of adolescents with high behavioral risk for EDs had high BMI, and the association between high BMI and behavioral risk of high severity was statistically significant (p <0.05). It has been found that high BMI increases the possibility of the individual to develop behavioral risk for EDs [36]. However, there is no consensus on this association. Research conducted in Brazil [6] showed discordant results, in which high BMI was inversely associated to the risk of developing EDs. Thus, further studies assessing risk association for ED and BMI should be carried out. This study also

observed association between high BMI and use of drugs (p <0.05), which is consistent with the results obtained by American researchers [37], who showed association between BMI and use of drugs to control weight gain (laxatives, diuretics and pills), pointing out that this association is higher in patients with bulimia nervosa. BMI seems to be a confounding factor, so further analyses on the subject should be performed [6].

Practices to lose weight are worrying and further studies should be carried out covering these and other risk factors for eating disorders. The follow-up of girls with high BMI is essential because girls have higher risk of developing eating disorders.

The dentist should keep informed about eating disorders and care for this group and seek awareness of their patients on this topic, bearing in mind that a multidisciplinary approach is the best alternative. Public managers should work in public education in relation to eating habits, obesity, oral health and benefits of a healthy lifestyle, seeking to promote health and prevent risks for the development of eating disorders.

Conclusion

A high prevalence of dental caries experience was observed, but there was no association between BMI and this condition in adolescents with and without behavioral risk for eating disorders. However, nutritional status has been associated with behavioral risk for eating disorders.

Acknowledgments

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