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Prevalence of dental caries in obese and normal-weight Brazilian adolescents attending state and private schools.

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Objective: To measure the association between dental caries and obesity in adolescents aged 12 to 15 years attending state and private schools. ***Basic research design:*** Cross-sectional study. ***Research setting:*** State and private schools in the state of Paraíba, Brazil. ***Participants:*** 1,665 obese and 1,665 normal-weight adolescents. ***Main outcome measures:*** These were chosen by means of an anthropometric study using height/age and weight/height indices, adopting as baseline the National Center for Health Statistics indices. The diagnostic criteria for caries were those of the World Health Organization (1997). ***Results:*** The average DMFT for obese adolescents from state schools was 4.27 and for those of normal weight it was 4.25 (p = 0.7802). In private schools, the corresponding figures were 1.90 and 1.91, respectively (p = 0.1151). In state schools, the caries prevalence amongst the obese group was 50.9% and amongst those of normal weight, 52.4% {p = 0.5393). In private schools, it was 9.0% amongst the obese group and 9.6% amongst those of normal weight {p = 0.6790). ***Conclusions:*** There was no statistically significant association between dental caries and obesity. Caries levels were higher amongst adolescents attending state schools.

Key words: dental caries, obesity, prevalence

Introduction

Obesity amongst adolescents is a public health problem of increasing importance in the developed world and in populations undergoing cultural transition (Schonfeld-Warden and Warden, 1997). The precise cause of pediatric obesity has not yet been elucidated, although it is suspected that there is a complex interaction of genetic, environmental and behavioural factors. Overweight in adolescence is a predictor of adult obesity, which is associated with several chronic diseases, including type 2 diabetes mellitus, coronary heart disease and hypertension (Hanley *et al*., 2000). To date the adolescent Brazilian population has not been evaluated in relation to obesity trends. However, adolescence is a critical period for aggravation of preexisting obesity, due to the physiological increase in adipose tissue, increased consumption of high caloric fast food and frequent emotional instabilities (Nguyen *et al*., 1996). Diet is a deeply ingrained element of a person's life. It is a cultural trait that reflects factors such as: ethnic background, life-style, values, habits and beliefs. In addition, food is eaten not only for nourishment, but also as a source of pleasure (Katz, 1981).

A number of studies have shown a close relationship between a cariogenic diet and the occurrence of dental caries (Duggal *et al*., 2001; Rodrigues and Sheiham, 2000;). In accordance with the Committee on Medical Aspects of Food Policy, caries experience is positively related to the amount of non-milk extrinsic sugars in the diet and their consumption frequency. Diets with a high sugar intake may contribute to the general excess of food energy consumption responsible for the development of obesity (COMA, 1990). The WHO TRS 916 report (2003) states that nutrition should be placed at the forefront of public health policies and programmes because foods containing high sugar energy contribute to obesity and dental diseases.

Therefore, the aim of this study was to measure the association between dental caries and obesity in 12 to 15 years-old adolescents attending state and private schools in the state of Paraíba, Brazil.

Method

Subjects

The population studied comprised adolescents aged from 12 to 15 years of age. A pilot study was carried out to obtain an estimate of dental caries prevalence in obese and normal-weight individuals, and to determine the size of the sample required. A total of 3,330 adolescents, of whom 1,665 were normal weight and 1,665 obese, were selected.

The study was carried out in seven state schools and six private schools, selected by a random sampling technique. The selection of students was carried out in two stages. Initially, all the adolescents between 12 and 15 years of age registered at each school were weighed and measured. A total of 4,676 pupils were from state schools and 3,817 from private schools. The prevalence of normal-weight adolescents in state schools was 44%; in private schools, it was 40%. The prevalence of obese pupils was 17.8% in state schools and 21.7% in private schools The second stage comprised the dental examina-

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tion. Only the adolescents whose parents had signed an informed consent form took part in this study. Adolescents who were overweight or underweight according to the anthropometric evaluation, as well as those with diabetes mellitus or other systemic illness which modified saliva flow, leading to xerostomia, were excluded from the sample. Those using appetite-regulating drugs or antidepressive drugs were also excluded.

Anthropometric Evaluation

Height and weight measurements were recorded. The students, wearing school uniforms, were weighed and had their height measured in bare feet, on a standard balance beam scale. The measurements were compared with growth standards established by the National Center for Health Statistics (NCHS, 1976) for age and gender. For each student, the percentage of ideal body weight for height at the 50th percentile was calculated, and four weight categories were defined: (1) underweight - < 90% of ideal for weight/height, (2) normal-weight - 90% to 110% of ideal for weight/height, (3) overweight - 110% to 120% of ideal weight for height, and (4) obesity - > 120% of ideal for weight/height (Moses *et al*., 1989).

Dental Examination

The WHO (1997) dental caries diagnostic criteria were used for the classification of caries. A single examiner using a probe to remove tooth debris conducted the dental examinations in natural light. A trained assistant recorded the findings on data collection forms. Teeth missing for orthodontic reasons, extraction or trauma were not included in the DMFT scores. Caries in primary teeth was not recorded. Radiographs were not taken. The intraexaminer reliability for clinical caries diagnosis was assessed by reexamining 10% of the sample, four days after the first examination. Cohen´s Kappa index was 0.92.

Ethical approval for the study was obtained from the Ethics Committee of the University of Pernambuco.

In the bivariate analyses, the Mann-Whitney and the Kruskal-Wallis tests were used and also the chi-squared test to compare the association between the variables.

Results

The mean DMFT for obese adolescents from private schools was 1.90 and for those of normal weight it was 1.91 ($p = 0.1151$). The mean DMFT for obese adolescents from state schools was 4.27 and for those of normal weight it was 4.25 ($p = 0.7802$) (Table 1). The values for caries prevalence in the obese groups were 9.0% and 50.9% in private and state schools, respectively. The caries prevalence in the normal-weight group was 9.6% in private schools and 52.4% in state schools. In the total group, irrespective of the type of school, the caries prevalence was 30.0% in obese and 31.0% in normal-weight adolescents ($p = 0.5222$).

In both school types filled teeth (F) contributed the greatest proportion of the DMFT with the missing component (M) contributing the least (Table 1). The mean DMFT were higher in pupils attending state schools (DMFT = 4.27 for obese and 4.25 for normal-weight) than those attending private schools (DMFT = 1.90 for obese and 1.91 for normal-weight) ($p < 0.0001$). The mean DMFT values increased gradually with age in both types of school. At state schools, for the 12-year-olds group, the mean DMFT was 3.35 and 5.23 for the 15-year-olds ($p < 0.0001$) in obese group and it was 3.39 and 6.09 for the respective ages in normal-weight group ($p < 0.0001$). In private schools, for the 12-year-olds, the DMFT average was 1.36 and for the 15-year-olds it was 3.39 ($p < 0.0001$) in obese group and it was 1.33 and 2.44 for the respective ages in the normal-weight.

In relation to gender, the average DMFT values were higher amongst female adolescents in both private and state schools.

Discussion

In the sample studied caries levels and the prevalence of caries were similar in obese and normal-weight children in both private and state schools. These findings do not agree with those of Larsson *et al*. (1995) and Larsson *et al*. (1997), who showed that adolescents with higher DMFT values tended to be obese.

Chen *et al*. (1998) investigated whether three-year-old obese children were prone to develop dental caries and found that there were no significant differences in the dft scores between groups with different nutritional status. Although the ages of the children studied in the latter study were different from those reported in this paper, it is noteworthy that Chen *et al*. (1998) also observed no association between dental caries and obesity. Ludwig *et al*. (2001), in a longitudinal study, found that the increasing prevalence of obesity in children is linked to the consumption of sugar-sweetened drinks. The logistic regression analysis model adjusted for potentially confounding variables showed that the consumption of sugar-sweetened drinks is associated with obesity.

In this study, we should take account of the limitations of a cross sectional design from which a cause-effect relationship over a limited period of time cannot be established. Some of the adolescents might have been obese in childhood and had limited their sugar intake by the time this study was conducted. Ideally one would conduct a study to see whether there is a relationship between caries increment over time and changes in body weight whilst also making an assessment of the amount and frequency of intake of free sugars. However, this would be a more difficult and expensive study to undertake.

Fillings contributed the greatest proportion of the total DMFT recorded (72.8%), with the decayed component (D) at 24.3% contributing most of the remainder.This could be a result of an improvement in the treatment services provided for Brazilian adolescents. Brazilian adolescents who attend state schools are from poor families and present higher levels of dental caries and a greater need for treatment. These findings show a clear polarization of the disease, probably due to the lack of oral health policies targeting a poor population. Oral health inequalities will only be reduced by implementing effective and appropriate health promotion policies.

These results show a relationship between socioeconomic status and dental caries, where tooth decay is

Table 1. The percentage with caries (prevalence), the mean DMFT (standard deviation) and the mean D, M and F among obese and normal weight adolescents aged 12,13,14,15 years by type of school.

Private Schools												
	Obese						*Normal Weight*					
Age	*n*	*% with caries*	*DMFT (SD)*	*D*	*M*	*F*	*n*	*% with caries*	*DMFT (SD)*	*D*	*M*	*F*
12	249	7.23	1.36 (1.81)	0.12	0.00	1.24	242	8.26	1.33 (1.80)	0.13	0.01	1.19
13	271	8.86	1.55 (2.42)	0.10	0.00	1.45	259	10.04	1.69 (2.20)	0.12	0.00	1.57
14	219	9.59	2.33 (3.06)	0.14	0.01	2.18	223	9.42	2.52 (2.54)	0.20	0.01	2.32
15	93	12.90	3.39 (3.64)	0.29	0.03	3.06	109	11.93	2.44 (2.81)	0.19	0.00	2.25
Total group	832	9.0	1.90 (2.69)	0.14	0.01	1.76	833	9.6	1.91 (2.33)	0.15	0.01	1.75
State Schools												
12	262	49.24	3.35 (3.03)	1.14	0.15	2.06	204	46.08	3.39 (3.19)	1.23	0.13	2.03
13	222	49.55	4.23 (3.28)	1.29	0.12	2.82	246	50.81	3.82 (3.14)	1.22	0.09	2.52
14	207	54.59	4.81 (3.63)	1.64	0.22	2.95	245	54.29	4.38 (3.45)	1.50	0.14	2.73
15	142	50.70	5.23 (3.55)	1.40	0.28	3.55	137	61.31	6.09 (3.78)	1.62	0.28	4.19
Total group	833	50.9	4.27 (3.41)	1.35	0.18	2.74	832	52.4	4.25 (3.47)	1.37	0.15	2.74

strongly associated with social deprivation as reported by Diehnelt and Kiyak (2001). It is concluded that there was no difference in the caries experience of obese and normal weight adolescents in private and state schools. Caries levels were considerably higher in state schools.

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