

SALIVARY PARAMETERS, ORAL HEALTH HABITS, AND SOCIOECONOMIC ASPECTS AS RISK FACTORS FOR DENTAL CARIES IN 12-YEAR-OLD CHILDREN FROM A PRIVATE SCHOOL OF THE CITY OF CURITIBA, BRAZIL

Parâmetros salivares, hábitos de saúde bucal e aspectos socioeconômicos como fatores de riscos para cárie dental em crianças de 12 anos de idade em uma escola particular na cidade de Curitiba, Brasil.

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Abstract

OBJECTIVES: The aim of this study was to compare socioeconomic aspects, oral health habits and salivary parameters between 12-year-old students with and without caries experience. **MATERIAL AND METHODS:** A sample of 113 non-related 12-year-old subjects was selected in a private school of Curitiba-PR, Brazil, for a case-control study. They were divided into groups with and without caries experience through the DMFT index. The frequency of tooth brushing, use of dental floss, diet, frequency of dentist visit, fluoride use, dental plaque index, socioeconomic aspects and salivary parameters were evaluated. Data were analyzed by qui-square and Mann-Whitney. **RESULTS:** Results showed no statistical difference between the groups in relation to oral hygiene habits and socioeconomic status. It was observed an association between dental plaque presence and caries experience, although not significant ($p = 0.08$). A reduced salivary flow was highly associated with decay experience ($p = 0.00$). **CONCLUSION:** It was concluded that the salivary flow was an important factor to determine dental caries experience in a homogeneous group of children from a private school of Curitiba-PR. Studies on host response aspects may be desirable in this kind of populations.

Keywords: Dental caries; Risk factors; Salivary flow.

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Resumo

OBJETIVOS: O objetivo deste trabalho foi comparar aspectos socioeconômicos, hábitos de saúde bucal e parâmetros salivares entre estudantes de 12 anos de idade, com ou sem experiência de cárie. **MATERIAL E MÉTODO:** Uma amostra de 113 indivíduos de 12 anos de idade, não parentes, foi selecionada numa escola particular de Curitiba-PR, Brasil, para um estudo de controle de casos. Foram divididos em grupos com e sem experiência de cárie pelo índice DMF-T. A frequência de escovação dentária, uso de fio dental, dieta, frequência de visitas a dentistas, uso de flúor, índice de placa dental, condição socioeconômica e parâmetros salivares foram avaliados. Os dados foram analisados estatisticamente por qui-quadrado e Mann-Whitney. **RESULTADOS:** Não houve diferença estatisticamente significativa entre os grupos em relação a hábitos de higiene bucal e condição socioeconômica. Observou-se uma associação entre presença de placa dental e experiência de cárie ($P=0.000$). **CONCLUSÃO:** Concluiu-se que o fluxo salivar foi fator importante na determinação da experiência de cárie num grupo homogêneo de crianças de uma escola privada de Curitiba-PR. Estudos sobre aspectos de resposta do hospedeiro podem ser necessários neste tipo de população. **Palavras chave:** Cárie dental; Fatores de risco; Fluxo salivar.

Introduction

Studies have been showing a significant reduction in the prevalence and severity of dental caries in developed countries in the last decades (1-3). This reduction has been also observed in Brazil. Epidemiological surveys conducted by the National Government in 1986, 1996, and 2003 confirmed this tendency on caries reduction, especially in children's populations (4-6). This trend has even been more expressive in the South and Southeast regions of Brazil. In cities like Santos SP (7), in 1995, and Blumenau SC (8), in 1998, 45.4% and 47.3%, respectively, of the 12-year-old children were caries free.

A discussion has been conducted exploring the factors associated to caries decline, including socioeconomic and behavioral aspects. Scientific evidence demonstrates that either in developed or in development societies, the lower is the material status, the worse is the health condition of the population, independently of the indicator used. This has been clearly demonstrated in relation to general health in individual level (8-10). Associations between socioeconomic level and oral health behaviors have been shown (11,12), allowing to suggest that a high socioeconomic level could improve the conditions against dental caries (oral hygiene habits, diet, access to dental care). Dental caries is an infectious disease resulting from an unbalance between the mineralization and demineralization processes of the enamel. It

begins with the presence of a cariogenic biofilm, associated with inadequate diet and deficient oral hygiene, leading to irreversible loss of dental tissues (13). Although Fejerskov (14) considered dental caries as a reflex of localized bacterial activity, it does not mean that it is a single process, but a succession of events during certain time.

There are several factors associated with dental caries, being special importance given to saliva and microorganism colonization/metabolism (15). Saliva composition, together with its flow, seems to be a relevant factor in the etiopathology and progression of the decay (16). A constant flow of saliva efficiently eliminates food remains and pathogenic microorganisms, and a reduced flow leads to a proliferation of bacteria, followed by inflammation of the gum and rapid damage to the teeth (17). The salivary flow represents the amount of saliva secreted in a certain time. The more saliva is produced, the more protection against tooth decays (18-20). Saliva contains innate or acquired defense factors, able to inhibit the growth and/or the bacterial metabolism through different mechanisms (18), such as the inhibition of bacterial adherence and acid production by oral streptococci. Saliva is able to modify the pH of the oral cavity, from acid to neutral. If the mouth stays acid for long periods of time, enamel demineralization occurs, increasing the cariogenic activity (21). The value of the pH is a reasonably constant parameter. An individual with high oral pH presents repeated readings of high values.

Together with other risk indicators to decay, the salivary flow, pH and buffer capacity become useful to diagnose the potential cariogenic activity and to predict the risk to caries for an individual (22). Knowledge of risk factors to dental caries in different populations can allow health care adjustments, respecting equity and social justice (23).

The aim of this study was to compare oral health habits, socioeconomic aspects and salivary parameters between 12-year-old students with and without dental caries experience from a private school of Curitiba-PR, Brazil.

Material and Methods

Sample selection

113 non-related 12 year-old children, both sexes, were selected from a private school of Curitiba-PR. An informed consent was obtained from the children's responsible, in agreement with the norms of the Research Ethics Committee of the Biological Sciences and Health Center of the Pontifical Catholic University of Paraná (PUCPR), according to the Resolution 196/96 of the National Health Council, approved under registration number 104.

Children in good general health were excluded when smokers, orthodontic appliance users, and users of chronic anti-inflammatory drugs and antibiotics for the last six months.

First, the children's caries experience was defined using the DMF-T index (24). Individuals were divided into two groups:

Group 1: Fifty-one (51) children without dental caries experience (DMF-T = 0).

Group 2: Sixty-two (62) individuals with dental caries experience (DMF-T = 1).

Teeth with cavities and white stain lesions were considered decayed. The parameter used to define the DMF-T cut-off point of groups was based on the mean DMF-T for that age on the region where the school was located. According to the last epidemiological data conducted in the city, this value was 1.31 (25). The school was located in a region of reasonable socioeconomic status supplied with fluoridated water. Thus, the study area was considered to have low challenge to caries.

Only one examiner performed the clinical evaluation. The clinical exams were accomplished at school, using natural light, wood spatula, gauze and gloves. X-rays were not taken.

Oral health habits

A questionnaire was used to collect data about the frequency of tooth brushing, use of dental floss, fluoride use, frequency of ingestion of sugar between meals, frequency of dentist visits.

Socioeconomic aspects

The socioeconomic status was determined by means of a request from the Brazilian National Association of Research Companies (26).

Dental plaque index

The dental plaque presence was registered by the modified Visible Plaque Index (VPI), after drying the buccal surface of superior incisors (27).

Salivary parameters

Salivary Flow

For the collection of stimulated saliva, the children chewed during five minutes a rubber piece of 1 cm² (28). The saliva was collected in a collector flask that had been previously weighted. After the collection, the flasks were closed tightly and weighted once again. The weight difference before and after the collection provided the volume in milliliters of expelled saliva. Each 1.0 g of saliva weight corresponded to 1.0 ml saliva (29).

pH measurement

The salivary pH was measured by the comparative method of the pH ribbon (Merck). The ribbon was maintained in the flask containing saliva for five minutes. After this period, the ribbon was removed and its color was compared with the table of colors, each one corresponding to a pH value.

Salivary Buffer Capacity

Salivary buffer capacity was determined by titration measuring the volume of 0.1 N lactic acid necessary to decrease the salivary pH to the value of

3.9 (22). Depending on the volume of lactic acid used, it is possible to classify the individuals into three groups:

1. Volume of lactic acid > 1 mL = individuals resistant to caries.

2. Volume of lactic acid = 1 mL = individuals susceptible to caries.

3. Volume of lactic acid < 1 mL = individuals very susceptible to caries.

Statistical analysis

Statistical significant differences between the analyzed groups were accessed by qui-square test

(c2) at the level of probability $p \leq 0.05$. When expected frequencies were smaller than 5, in 2X2 tables, the Fisher test was also used. The U of Mann-Whitney test was used to observe the differences between the mean values for the variables pH, buffer capacity and salivary flow, once the variables did not present normal distribution in relation to the two groups.

Results

The studied population was shown homogeneous in relation to socioeconomic and behavioral aspects. There were no statistically significant differences between the groups with and without dental caries experience in relation to frequency of toothbrushing, use of dental floss, fluoride use, frequency of sugar between meals, frequency of dentist visits, and socioeconomic aspects. The mean DMF-T index of the study population ($n = 113$) was 1.7 (Fig. 1), and 3.1 for the group with caries experience ($n = 62$) (Fig. 2).

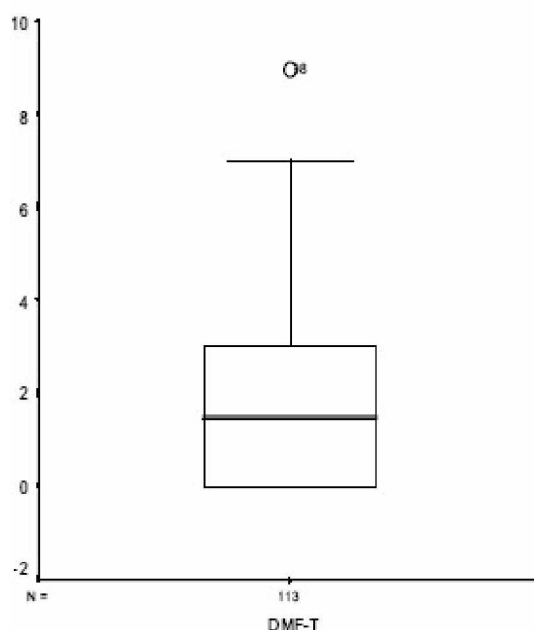


Fig. 1 Box-Plot of DMF-T index in the study population, $n = 113$.

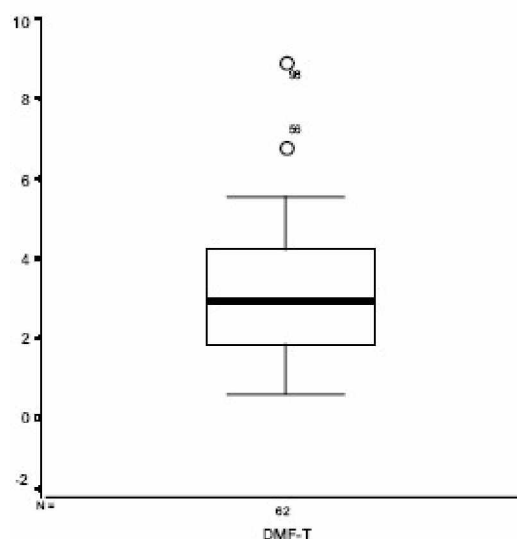


Fig. 2 Box-Plot of DMF-T index in group 2, $n = 62$.

Most individuals for the two groups brushed their teeth one to three times a day (87.6 %) and more than a half did not use dental floss (57.5 %). A relationship was observed in the group with caries experience between toothbrushing frequency and use of dental floss ($p = 0.04$). Fifty-two percent (62 %) of the whole children did not make use of fluoride, besides dentifrice. Ingestion of snacks

between meals was accomplished up to three times a day by 68 % of the individuals.

The frequency of visits to the dentist was reported as at least once a year by 95.5% of the whole children. Most of the children (55.7%) belonged to the middle class, 24 % to the upper class, 18.6 % to the middle-low class, and 1.76 % to the low class. Presence of dental plaque, estimated by the VPI, showed a tendency of association with the group with caries experience, although not statistically significant ($p = 0.08$).

Regarding salivary aspects, only the salivary flow parameter showed statistically significant difference between the groups ($p = 0.00$) (Fig. 3).

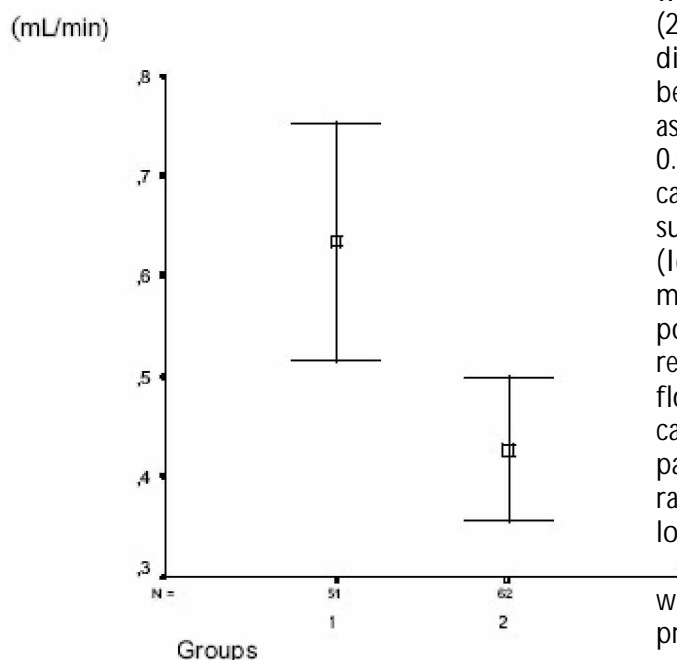


Fig. 3 Salivary flow in groups with low and high caries experience.

Discussion

An epidemiological study, conducted by the Ministry of Health in Brazil, in 1986, demonstrated a higher than 90 % prevalence of dental caries experience, with a DMF-T index of 6.7 for the age of 12 (4). This situation was very distant from the goal proposed by the World Health Organization for 2000 (DMF-T \leq 3.0 for 12 year-old children) (30). A more recent national study, conducted in 2002/2003, showed a significant decrease in the prevalence of dental caries for 12-year-old children, with a

mean DMF-T of 2.78 (6). In Curitiba, since 1958, when it was initiated the water fluoridation, dental caries experience was followed through epidemiological surveys. The mean DMFT for the 12-year-old children at that time was 8.2. From 1997 to 1998, for a sample of 380 12-yearold students, both sexes, from public and private schools, the mean DMF-T was 1.81: DMF-T = 1.95 for public schools, and 1.54 for private schools (31). Finally, the last epidemiological study, conducted in 2002/2003, showed a mean DMF-T for this age of 1.27 (25).

In the present study, the 12-year-old children mean DMF-T index was 1.7, a little higher than what was found for the region in which the school was located: DMF-T = 1.31 (25). It was observed statistically significant difference in the parameter salivary flow between the groups. Reduced salivary flow was associated with high caries experience ($p = 0.00$), reflecting the decrease of oral clearance capacity and protective salivary components, such as lactoferrin and immunoglobulin A (IgA) (20), which reinforces the importance of mechanical removal of food residues and potentially cariogenic bacteria, in case of reduced salivary flow. In fact, a reduced salivary flow is strongly associated to the high cariogenic activity, as observed in diabetic patients (32) and people submitted to the radiotherapy (33), condition that results from lower salivary production.

In spite of the great number of factors, which influences dental caries initiation and progression, some of them took into consideration in this study, the salivary flow undoubtedly was shown to be an important aspect accounting for the susceptibility to this disease in the studied population.

Individuals with reduced salivary flow should be advised to maintain acceptable patterns of oral hygiene and to reduce the frequency of sugar ingestion. Additionally, they should be accompanied by a dental professional, who should determine the frequency of professional plaque removal.

The results suggest that the susceptibility to dental caries in homogeneous groups, in terms of socioeconomic and behavioral features, may be related to biological individual host factors. Although it is evident the reduction of caries experience in Brazil,

especialmente em populações economicamente favorecidas e com acesso à água fluorada, ainda é alto o número de indivíduos apresentando a doença (6).

Programas escolares focados na suscetibilidade à cárie dentária devem ser implementados para identificar os grupos de alto risco, para os quais uma assistência individual mais próxima é desejável.

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