ORAL HEALTH AND RISK FACTORS FOR DENTAL CARIES OF LOW-INCOME SCHOLARS ENROLLED IN A FULL-TIME EDUCATIONAL PROGRAM

Patricia Nivoloni **Tannure**[1], Denise Noya de **Oliveira**[2], Andrea Graciene Lopez Ramos **Valente**[1], Marcia Rejane Thomas Canabarro **Andrade**[3], Tatiana Kelly da Silva **Fidalgo**[4*], Andréa Fonseca-**Gonçalves**[5]

[1] Professor, Veiga de Almeida University (UVA), Rio de Janeiro, RJ, Brazil
[2] Undergraduate student, Veiga de Almeida University (UVA), Rio de Janeiro, RJ, Brazil
[3] Professor, Federal Fluminense University (UFF), Nova Friburgo, RJ, Brazil
[4] Professor, State University of Rio de Janeiro (UERJ), Rio de Janeiro, RJ, Brazil
[5] Professor, Federal University of Rio de Janeiro, (UFRJ), Rio de Janeiro, RJ, Brazil

Palavras-chave: Cárie Dentária. Criança. Saúde Bucal.

RESUMO

Introdução: Muitos fatores estão associados ao desenvolvimento da cárie em crianças, incluindo o ambiente que estão inseridos. Poucos estudos avaliam a condição bucal em um ambiente educacional de tempo integral. **Objetivo**: identificar as condições de saúde bucal e os fatores de risco para cárie em crianças matriculadas em um programa educacional de tempo integral. **Métodos**: Os dados os pais e seus filhos de 3 a 12 anos que estavam matriculados no programa educacional de tempo integral no Rio de Janeiro, Brasil, foram coletados. Os pais responderam a um questionário com informações sociodemográficas, sobre higiene bucal, hábitos e dieta. As crianças foram submetidas a exames clínicos. Foram realizadas análises sobre possíveis associações entre cárie infantil e escolaridade dos pais; status socioeconômico; biofilme dentário; hipoplasia, sangramento gengival e maloclusão (teste do qui-quadrado ou exato de Fisher; p <0,05). **Resultados**: Trinta e oito pais participaram da entrevista. Os cuidadores predominantes foram mães, em sua maioria com ensino médio completo e pertencentes à família de baixa renda. A amostra foi constituída por 350 crianças, 38 (7,27 ± 2,22 anos) que foram examinadas durante nove meses. A maioria das crianças era do sexo feminino (63,2%) na dentição mista (69%) e sem cárie (61,9%). De acordo com o índice de cárie (dentes cariados, ausentes e preenchidos), a maior média foi encontrada na dentição decídua (dmf-t = 1,20 ± 2,12) enquanto na permanente a média do CPOD foi de 0,35 ± 0,86. **Conclusão**: Biofilme, hipoplasia, sangramento gengival e má oclusão não foram associados à cárie (p> 0,05). Os determinantes socioeconômicos e os demais fatores de risco não foram considerados fatores predisponentes para a cárie, sugerindo que os programas educacionais de tempo integral exercem influência positiva na saúde bucal das crianças.

Keywords: Dental Caries. Child. Oral Health.

ABSTRACT

Introduction: Many factors are associated with caries development in children, including the daily environment. Thinking that few studies evaluate oral condition in a full-time educational environment. **Objective**: identify the oral health conditions and risk factors for caries in children enrolled in a full-time educational program. **Methods**: Data were collected from parents and their children aged 3-12 years that were enrolled in the full-time educational program in Rio de Janeiro, Brazil. The parents answered a questionnaire with socio-demographic, oral hygiene, habits and diet information. The children underwent clinical examinations. The association between children's caries and: parents education level; socioeconomic status; dental biofilm; hypoplasia, gingival bleeding and malocclusion was performed (Chi-square or Fisher's exact tests; p<0.05). **Results**: Thirty-eight parents attended the interview. The predominant caregivers were mothers with a high school complete degree and belonging to low income family. From a sample of 350 children, 38 (7.27±2.22 years) were examined during nine months. Most of these children were girls (63.2%) in the mixed dentition (69%) and without caries (61.9%). According to the caries index (decayed, missing and filled teeth), the highest average was found in the primary dentition (dmf-t = 1.20±2.12) while in the permanent one the mean DMFT was 0.35±0.86. **Conclusion**: Biofilm, hypoplasia, gingival bleeding and malocclusion were not associated with caries (p>0.05). The socioeconomics determinants and the risk factors were not considered predisposing factors for caries, which suggest that educational programs of full-time study exert a positive influence on children's oral health.

Submitted: December 27, 2017
Modification: February 19, 2018
Accepted: March 05, 2018

*** Correspondence to:**

Tatiana Kelly da Silva Fidalgo
tatianaksfidalgo@gmail.com
Universidade do Estado do
Rio de Janeiro (UERJ)
Boulevard Vinte e Oito de Setembro,
157 - CEP: 20551-030
Vila Isabel, Rio de Janeiro, RJ, Brazil -
Phone: (21) 2868-8286

INTRODUCTION

Caries remains the most prevalent non-contagious disease in most industrialized countries, affecting 60–90% of schoolchildren and the vast majority of adults.[1] The last Brazilian epidemiological survey showed that five-year-old Brazilians children have a mean of more than two caries lesions and among these children, 80% of cavitated tooth surfaces remained untreated (Brazilian Oral Health Survey - SB Brazil Project 2010).[2] Especially about southeast region, the decayed, missing and filled teeth index (dmf-t) observed was 2.10 in this age group. The consequences of dental caries are usually pain and esthetic alterations, which affect the children's and caregivers' quality of life.[3] This has led to a greater search for aesthetic treatment and healthy smile, in both general and pediatric dental visits in recent years.[4] In addition to caries and its consequences, oral problems, including malocclusion, also have a negative impact on the quality of life of adolescents.[5,6]

Risk assessment is essential in decision-making for targeted caries prevention and management. Family caries experience, transmission-related behaviors especially good habits, dietary factors, health beliefs, and lower income were identified as risk factors for caries progression toward cavitation in very young children in a recent study.[7,8] Many factors are associated with caries development in children, including the daily environment that modulates the oral hygiene's habits of children. Despite of that there are few studies related to caries risk in children who stay in a full-time educational ambient, especially in public schools in metropolis of Brazil such as industrialized area such as Rio de Janeiro. Thus, the purpose of this study was to identify the oral health conditions and risk factors for the development of caries in children enrolled in a full-time public educational program in Rio de Janeiro, Brazil.

MATERIALS AND METHODS

The Human Ethics Committee of the Veiga de Almeida University (protocol number 149.814) approved this study. Informed consent was obtained from all participating individuals or parents/legal guardians.

Eligible children from 3 to 12 years of age (range of children enrolled in the full-time educational program called *Abrigo Tereza de Jesus* – ATJ) were included in the study using a cross-sectional design during the period of June 2013 to March 2014. ATJ is a non-economic association, located in Tijuca, Rio de Janeiro, Brazil, with religious character. Tijuca is a middle-class neighborhood surrounded by low-income communities. The children enrolled in ATJ were from public schools and received daily, scholar lessons and educational activities: library, informatics, reading, manual working, recreation and cultural visiting. Besides, they have medical and nutritional assistance. Although the dentist is important in the multi-professional team, the dental assistance was not provided due to its expensive cost for maintenance; however, the children received oral hygiene instructions by the nurses.

Parents or caregivers were contacted twice by a letter and they answered a questionnaire conducted about socioeconomic characteristics and children oral habits in distinct life moments. Breastfeeding practices, use of pacifiers, suck digital, biting objects and onychophagia data were collected. Oral hygiene information and preventive measures from caries, such as, toothbrush frequency, use of fluoride and dental floss were obtained through questionnaires. The socio-economic background of the studied sample was summarized in terms of family income, using the minimum wage as a unit (equivalent to USD 300-900). Families that receive more than 900 were classified as high family income and those who received < USD 900, were classified as low family income.

The clinical examination of the children was undertaken by trained post-graduate students with the professor's supervision. We evaluated the presence or absence of malocclusions such as overjet, overbite, open bite and abnormal midline. We also considered the presence or absence, providing the score "0" for absence and "1" for the presence of the following variables: visible dental plaque, gingival bleeding (using dental floss), hypoplasia and malocclusion as risk factors for dental caries. In addition, we evaluated the presence or absence of fluorosis in children with permanent teeth (mixed dentition).

Patients were seated in a dental chair, and the examiner performed the professional cleaning using a prophylactic paste and Robinson brush. Probe and dental mirror were used according to the criteria recommended by the World Health Organization.[9] Caries lesions were diagnosed in primary and permanent teeth by visual examination and registered if there was definite visual evidence with a breach in the enamel and extension into dentine. Dental caries was assessed using the DMFT and/or dmf-t indexes.[9]

The children were classified according to the caries experience level. We considered the mean number of dmf-t/DMFT in individuals with caries. The criteria were determined as follows: caries-free subjects had a complete absence of carious lesions in both dentitions; low caries experience subjects had 1 or 2 teeth decayed, filled, or missing due to caries lesions; and high caries experience subjects had 3 or more teeth decayed, filled, or missing due to caries lesions.

Data were analyzed using SPSS 19.0 software (IBM SPSS

Statistics for Windows, Version 19.0. Armonk, NY, USA: IBM Corp). The level of statistical significance was set at *p*d"0.05. Chi-square or Fisher's exact tests were used to determine if caries experience were associated with risk factors.

RESULTS

Of 350 children and adolescents enrolled in ATJ for one year, 150 informed consents were obtained from parents and legal guardians. However, only eighty four children were clinically examined (n = 84) and thirty-eight (n=38) parents/caregivers accepted our invitation and attended to interview. The mean age of the children was 7.27 (±2.22) and 63.2% were girls. The characteristics of this population were summarized in Table 1. The monthly family income of the majority of the children varied from less than 1 to 3 times the Brazilian minimum wage, equivalent to USD 300–900. The parent/caregiver education level and family's socioeconomic status were not associated with caries experience (p > 0.349), since 84.2% presented low family income and 59.4% from this universe were caries free. As well as, 50.0% of children with high caries experience presented high family income.

***Table 1**: Demographic data of the parents/caregivers (N=38)*

Parents/Caregivers	**N (%)**
mother	32 (84.2)
father	2 (5.2)
grandmother	3 (7.8)
others	1 (2.6)
Age, years	**(%)**
15 - 30	10 (27.6)
31 - 50	27 (70.2)
> 50	1 (2.1)
Educational level	**N (%)**
Incomplete primary school	10 (27.7)
Complete primary education	2 (4.3)
Incomplete high school	5 (12.8)
Complete high school	17 (44.7)
Incomplete higher education	3 (8.5)
Complete higher education	1 (2.1)
Monthly income	**N (%)**
0 - 1 minimum wages	16 (46.6)
1 - 3 minimum wages	22 (57.4)

***Table 2**: Preventive measurements and oral habits data reported from parents/caregivers (N=38)*

Tooth-brushing	**N (%)**
1-2 times	19(50)
3 times or more	19 (50)
Tooth-brushing before sleep	38 (100)
Use of dental floss daily	
yes	11 (28.9)
no	27 (71.1)
Use of fluoride toothpaste	38 (100)
Responsible for Tooth-brushing	
child	23 (60.5)
caregiver	11 (28.9)
both	4 (10.6)
Breastfeeding	
yes	37 (97.4)
no	1 (2.6)
Digit-sucking habits	
previous	3 (7.9)
yes	1(2.6)
no	34 (89.5)
Pacifier	
yes	14(36.8)
no	24 (63.2)
previous	5 (13.2)
no	22(57.9)
yes	11(28.9)
Onychophagia	
previous	1 (2.6)
no	30 (78.9)
yes	7(18.4)

Table 2 presented the preventive measurements and oral habits data reported from parents/caregivers. Thirty eight children underwent a clinical oral examination for the assessment of caries, malocclusions and risk factors for caries

progression toward cavitation, such as, dental plaque visible, gingival bleeding and hypoplasia as show in Table 3.

***Table 3**: Characteristics of children dentition (N=84)*

Dental age	**N (%)**
Primary dentition	23 (27.4)
Mixed dentition	58 (69.0)
Permanent dentition	3 (3.6)
Malocclusion	
yes	39 (46.4)
no	45 (53.6)
Crossbite	
anterior	2 (2.5)
posterior	12 (14.2)
no	70 (83.3)
Open-bite	
yes	11 (13.1)
no	73 (86.9)
Overbite	
normal	75 (89.3)
alteration	11 (13.1)
Overjet	
normal	73 (86.9)
alteration	11 (13.1)
Abnormal Midline	
yes	14 (16.7)
no	70 (83.3)
Dental caries	
yes	32 (38.1)
no	52 (61.9)
Visible plaque	
yes	76 (90.5)
no	8 (9.5)
Gingival bleeding	
yes	40 (47.6)
no	44 (52.4)
Fluorosis	
yes	19 (22.6)
no	65 (74.4)
Hypoplasia	
yes	10 (11.9)
no	74 (81.1)

The mean dmf-t was 1.20 (±2.12) and DMFT was 0.35 (±0.86). In deciduous teeth we obtained a mean of 2.86 (±2.01) for the decayed component of the index, 0.12 (±0.43) for the missing component and 0.38 (±0.80) for the filled component. In permanent teeth we obtained a mean of 1.58 (±1.24) for the decayed component of the index, 0.00 for the missing component and 0.20 ± (0.63) for the filled component.

The mean dmf-t in children diagnosed with early childhood caries (ECC) (n=16) was 1.56 (±2.22). The percentage of caries-free children was 61.9%, 25.0% had high caries experience and 13.1% had low caries experience. The presence of biofilm (*P*=1.00), hypoplasia (*P*=0.73), gingival bleeding (*P*=0.26) and malocclusion (*P*=0.07) were not associated with dental caries.

DISCUSSION

Rio de Janeiro is a big city localized in southeast Brazil and is one densely populated and industrialized region of the country. Only 19.5% of the children and adolescents are attending at municipal public school in full-time period. We studied this population since we aimed to understand the oral hygiene and health of children from a full-time educational program.

In our study, it was possible to observe a lower prevalence of dental caries when compared to the data from the last survey carried out in the country. Analyzing the dmf-t and DMFT components, we found a higher number of decayed teeth in comparison with the filled and missing component. It is well known that untreated caries and its clinical consequences exerted a negative impact on the quality of life of the Brazilian schoolchildren.[10,11] It is suggested that these families have difficulties in accessing public services. In addition to that, lack of knowledge about oral hygiene and cariogenic diets could be a reason for this pattern observed in families with lower parents' educational level. In the present study, 61.9 % of children presented no caries lesions; a percentage value higher than the last national epidemiologic sense called SB Brazil that was 46.6 %.[12] Nova et al.[13] found a similar percentage (72 %) of caries-free child in a population from São Paulo.[13]

Our findings revealed a different situation compared to a recent study in Satão, Portugal,[14] since they obtained a moderate level of prevalence of dental caries in adolescents, with a higher number of filled teeth considering the DMF-T index applied. This condition indicates the differences of the two countries, since in the Brazil most of the adolescents do not have, during their lives, dental appointments for dental caries treatments and lower access to dental appointments. It is important to emphasize that relevant consequences of cavitated dentine lesions such as pain and chewing difficulties

can affect the child's learning and growth processes and are related to the need for children's hospitalization.[15]

It is important to analyze oral health behavior and risk factors, such as, enamel defects during clinical oral examination. There is evidence for a genetic component in caries susceptibility, and studies in humans have suggested that variation in enamel formation genes may contribute to caries.[16] Moreover, the susceptibility to caries results from gene-environment interactions.[17] A recent study with Brazilian children observed that caries experience was more common among children who had enamel hypoplasia in their posterior teeth than among those with none. The authors concluded that enamel hypoplasia appears to be an important risk factor for dental caries.[18] In our study, the prevalence of enamel hypoplasia was 11.9% and, contradicting the previous findings we not observed association between this alteration and caries, maybe this fact can be explained by the limited sample size. This can be justified by the fact that the majority of our sample consisted by children with mixed dentition and without caries experience. Besides it, the full-time study program can influence oral health status of these children.

Regarding dental fluorosis, the majority of children with permanent teeth did not present this alteration. All patients used fluoride toothpaste, and 39.5 % of them were supervised and/or had tooth brushing supervision by their parents. This fact can contribute for the reduced number of children with dental fluorosis compared with others studies in Brazilian population.[19,20] It is important to point out that many studies have been demonstrating that the use of fluoride in tooth paste supervised by an adult is crucial for caries control.[21] Thus, the caregivers from our study were advised about the importance of fluoride in reducing dental caries. We suggest that the caries experience was low in this population because the children spent the major day in the full-time educational program that presented a food and oral hygiene control.

Extensive dental decay probably results in unplanned extractions in the primary and mixed dentitions and, in many cases, could cause malocclusions. However, in the current study, it was not found association among dental caries and malocclusion, we suggest that it can be explained by the limited sample size. A rotated tooth may be difficult to clean and can cause increased plaque retention. A traumatic occlusion may result in direct damage to the periodontal support. Overbites may predispose to damage of the gingiva palatal to the upper incisor teeth. Similarly, severely retroclined upper incisor teeth may damage the labial gingiva of the lower teeth. In addition, malocclusion teeth lead psychosocial problems related to impaired dentofacial aesthetics and also disturbances of oral functions.[22] Considering the relevant conditions exposed above, we verified the occlusion in our population, and, we observed a moderate prevalence of malocclusions when compared with the epidemiological survey in Brazil in 2010.[2] According to Welbury all children from the age of 8 years should be screened for malocclusion.[23]

It is important to emphasize the relevance of the ATJ in these children´s development and health. Moreover, few studies assessing the oral health condition of children enrolled in a full-time educational program has been reported. Considering low income family in Brazil, full-time educational programs present a fundamental hole in general and oral health condition of children and adolescents, presenting a direct impact on school success, rescuing self-esteem and enabling him to effectively achieve learning and an adequate quality of life. Moreover, regarding oral health, ATJ presented a restrict diet and oral hygiene education that contributes to improve oral condition.

It is known that family caries experience, transmission-related behaviors, dietary factors, health beliefs, and lower income were identified as risk factors for caries progression toward cavitation in very young children.[8] The risk factors analyzed were not associated with dental caries and we observed a low prevalence of cavitation and malocclusions when compared with the most recent epidemiological survey in Brazil. We believe that the measures of oral hygiene and caries status in these children confirmed the adherence to preventive oral health orientations that probably had been reinforced during the ATJ period.

AKNOWLEDGEMENTS

The authors thank to FAPERJ and CNPq for the financial support and Abrigo Tereza de Jesus (ATJ).

REFERENCES

1. Vieira, A.R., A. Modesto, and M.L. Marazita, Caries: review of human genetics research. Caries Res, 2014. 48:491-506.-

2. Roncalli, A.G., [Thee SB Brazil 2010 Project: a key strategy for developing an oral health surveillance model]. Cad Saude Publica 2010 26: 429. 2010.

3. Martins-Junior, P.A., et al., Impact of early childhood caries on the oral health-related quality of life of preschool children and their parents. Caries Res, 2013. 47:211-218.

4. Bonecker, M., et al., Impact of dental caries on preschool children's quality of life: an update. Braz Oral Res, 2012. 26 Suppl 1:103-107.

5. Mashoto, K.O., et al., Dental pain, oral impacts and perceived need for dental treatment in Tanzanian school students: a cross-sectional study. Health Qual Life Outcomes, 2009. 7: 73.

6. Piovesan, C., et al., Impact of socioeconomic and clinical factors on child oral health-related quality of life (COHRQoL). Qual Life Res, 2010. 19:1359-1366.

7. ADA, Caries Risk Assessment Form (Age >6). American Dental Association, 2011.

8. Fontana, M., et al., Identification of caries risk factors in toddlers. J Dent Res, 2011. 90:209-214.
9. World Health Organization (WHO). Oral health survey: basic methods/ Geneva-1997
10. Leal, S.C., et al., Untreated cavitated dentine lesions: impact on children's quality of life. Caries Res, 2012. 46:102-106.
11. Mota-Veloso, I., et al., Impact of untreated dental caries and its clinical consequences on the oral health-related quality of life of schoolchildren aged 8-10 years. Qual Life Res, 2016. 25: p. 193-199.
12. Brasil. Projeto SB Brasil 2010. Pesquisa Nacional de Saúde Bucal, 2010.
13. V., N.F.A. and A.G.M. B., Tempo de permanência em unidade pré-escolar e as condições de saúde bucal aos 5 anos no município de Tatuí - SP. Odontol. Clín.-Cient, 2013. 12:31-34.
14. Veiga, N.J., et al., Prevalence of dental caries and fissure sealants in a Portuguese sample of adolescents. PLoS One, 2015. 10: p. e0121299.
15. Wadhawan, S., et al., Early childhood caries-related visits to hospitals for ambulatory surgery in New York State. J Public Health Dent, 2003. 63:47-51.
16. Shimizu, T., et al., Enamel formation genes influence enamel microhardness before and after cariogenic challenge. PLoS One, 2012. 7: e45022.
17. Tannure, P.N., et al., Genetic variation in MMP20 contributes to higher caries experience. J Dent, 2012. 40: 381-386.
18. Vargas-Ferreira, F., et al., Association between developmental defects of enamel and dental caries in schoolchildren. J Dent, 2014. 42: 540-546.
19. Carvalho, T.S., H.M. Kehrle, and F.C. Sampaio, Prevalence and severity of dental fluorosis among students from Joao Pessoa, PB, Brazil. Braz Oral Res, 2007. 21:198-203.
20. Pereira, A.C., et al., Dental caries and fluorosis prevalence study in a nonfluoridated Brazilian community: trend analysis and toothpaste association. ASDC J Dent Child, 2000. 67:132-135, 183.
21. Marinho, V.C., et al., Systematic review of controlled trials on the effectiveness of fluoride gels for the prevention of dental caries in children. J Dent Educ, 2003. 67:448-458.
22. Proffit, W.R. and H.W. Fields, *Contemporary orthodontics, Mosby.* 2000.
23. Welbury, R.R., M.S. Duggal, and M.T. Hosey, *Paediatric Dentistry Third. OXFORD & U. PRESS, eds., Oxford University Press Inc., New York.* 2005.