

Assessing the Association between Dental Caries and Nutritional Status in Children from the Brazilian State of Amazonas

Katia Vasconcelos¹, Silvane Evangelista², Raquel AB Silva³, Sara Oliveira⁴, Andre Dutra⁵, Adriana Santos⁶, Ananda Noronha⁷, Leandro Belem⁸, Lea Silva⁹, Paulo Nelson-Filho¹⁰, Erika C Kuchler¹¹

ABSTRACT

Aim: To evaluate the association between dental caries and nutritional status in a group of Brazilian schoolchildren, from Manaus. The studied population consisted of 197 students (10–12-year-olds) from public schools at Manaus, Amazonas, Brazil.

Materials and methods: A clinical examination was carried out and the decay-missing-filled-teeth index for primary and permanent teeth (dmft and DMFT) was used to evaluate dental caries. Body mass index Z-score was calculated using variables such as individual height, weight, age, and gender. The nutritional status was classified as underweight, eutrophic, overweight, and obese. One-way ANOVA and Tukey's posttests were used for means' comparison between groups. The established alpha was 5%.

Results: Eighty-one (41.1%) children were caries-free. Five (2.5%) children were underweight; 127 (64.5%) were eutrophic; 49 (24.9%) were overweight; and 16 (8.1%) were obese. The mean dmft/DMFT index was 1.67 (2.05). Obese children had more caries experience than eutrophic and overweight children ($p < 0.05$).

Conclusion: Our study demonstrated that dental caries is associated with obesity in school children from Manaus.

Keywords: Children, Dental caries, Obesity.

International Journal of Clinical Pediatric Dentistry (2019): 10.5005/jp-journals-10005-1638

INTRODUCTION

Dental caries is a multifactorial disease that affects a significant number of children worldwide. Dental caries is one of the most common chronic childhood disease.¹ It is a major oral health problem in most industrialized countries, affecting many schoolchildren.² Data from the Brazilian surveys have been demonstrating a decline in dental caries, especially in children and teenagers.^{3,4}

Body mass index (BMI) is used to measure children's nutritional status. Obesity, overweight, and malnutrition (underweight) are also multifactorial conditions that affect many children worldwide.^{5,6} Like dental caries, the global prevalence of underweight has declined to an average annual rate of reduction of 2.2% per year. On the other hand, childhood obesity/overweight have increased markedly since 1990.⁵

Obesity/overweight and underweight and dental caries are multi-faceted conditions. These conditions are influenced by a diversity of factors such as diet, behavioral, psychosocial, educational level, social class, and genetics aspects.⁷⁻⁹ The literature is rich in studies investigating the association between these conditions in many populations; however, the results are controversial.¹⁰

In fact, a recent systematic review investigated the existing evidence of the association between nutritional status and dental caries. This systematic review included 17 studies from different populations and their results were conflicting and remained inconclusive.¹¹ Therefore, studies evaluating the association between dental caries are still necessary. Hence, the present study aimed to evaluate the association between dental caries and nutritional status in a group of Brazilian schoolchildren, from Manaus (Amazonas).

^{1,2}Department of Pediatric Dentistry, University of São Paulo/IAES, Ribeirão Preto/Manaus, São Paulo/Amazoas, Brazil

^{3,9-11}Department of Pediatric Dentistry, University of São Paulo, Ribeirão Preto, São Paulo, Brazil

⁴⁻⁸Department of Pediatric Dentistry, Universidade do Estado do Amazonas, Manaus, Amazoas, Brazil

Corresponding Author: Erika C Kuchler, Department of Pediatric Dentistry, University of São Paulo, Ribeirão Preto, São Paulo, Brazil, Phone: +55 16 3315-4057, e-mail: erikacalvano@gmail.com

How to cite this article: Vasconcelos K, Evangelista S, et al. Assessing the Association between Dental Caries and Nutritional Status in Children from the Brazilian State of Amazonas. *Int J Clin Pediatr Dent* 2019;12(4):293–296.

Source of support: São Paulo Research Foundation FAPESP–2015/06866-5 (ECK)

Conflict of interest: None

MATERIALS AND METHODS

Participants

The study was approved by The Human Ethics Committee of Amazon State University (No. 923.569). Informed written consent was obtained from the parents and age-appropriate assent document were used for all children.

The studied population consisted of students (10- to 12-year-olds), from public schools at Manaus, Amazonas, Brazil. Manaus is the capital city of the state of Amazonas, a state that is located in the north region of Brazil. Manaus is located in the middle of the Amazon rainforest and the total population comprises 2,094,391

inhabitants. The ancestry of the inhabitants of Manaus is composed mainly by European and native American.¹²

Questionnaire Application

All parents or caregivers answered a questionnaire about sociodemographic information (age and gender); oral hygiene habits (tooth brushing, use of dental floss daily, and brushing teeth before sleep); and dietary information (child’s frequency of ingesting cakes, cookies, and sweets between meals).

Caries Measurement

Trained specialists in pediatric dentistry executed the dental caries examination. The examination was performed outside the schoolyard, with sunlight as a direct light source. After brushing their teeth, the students were placed in a supine position. Dental caries was diagnosed using a modified World Health Organization protocol recommended for oral health surveys.¹³ A caries diagnosis was performed in primary and permanent teeth by visual inspection and was registered if there was visual evidence with a breach in the enamel and extension into dentine. The index (decayed, missing teeth due to caries, filled teeth) for primary (dmft) and permanent (DMFT) teeth was used.

Anthropometric Measurements

The children’s heights were determined in meters. The children’s weight (in kilograms) was determined with a weighing machine.¹⁴ The body mass index (BMI) z-score was calculated by the pediatric Z-score calculator of The Children’s Hospital of Philadelphia (<http://zscore.research.chop.edu/index.php>) using individual height, weight, age, and gender as variables. The nutritional status was classified according to the parameters¹⁵ defined in Table 1.

Statistical Analyses

Data were analyzed using Epi Info 7 and Graph Pad Prism 5.0 (Graph Pad Software Inc., San Diego, CA, USA). The Shapiro–Wilk’s test was used to verify the normality of the data. A one-way ANOVA and Tukey’s post test were used for a comparison of means between “eutrophic”, “underweight”, “overweight,” and “obesity” groups. The established alpha was 5%.

RESULTS

Among the 197 included children, 75 (38.1%) were in permanent dentition and 122 (61.9%) were in mixed dentition. Eighty one (41.1%) children were caries free. The mean age was 10.27 (0.90). The BMI Z-score ranged from –3.77 to 2.56, and the percentile from <1 to >99. The sample characteristics are presented in Table 2.

The oral hygiene habits and dietary information of the studied sample are presented in Table 3. These aspects were not different among BMI categories ($p > 0.05$).

Five (2.5%) children were underweight; 127 (64.5%) were eutrophic; 49 (24.9%) were overweight; and 16 (8.1%) were obese.

Figure 1 demonstrated the caries index distribution according to the nutritional status. In the underweight children, the mean

Table 1: Nutritional status classification

Nutritional status	BMI Z-score	Percentile
Underweight	<–2	<3
Eutrophic	≥–2 and ≤+1	≥3 and ≤85
Overweight	>+1 and ≤+2	>85 and ≤97
Obese	+2	>97

Table 2: Characteristics of the studied sample

Gender <i>n</i> (%)	
Male	96 (48.7%)
Female	101 (51.3%)
Age	
Mean (SD)	10.27 (0.90)
Range	9–12
Caries index	
Mean (SD)	1.67 (2.05)
Range	0–11

Note: SD means standard deviation

Table 3: Oral hygiene habits and dietary information of the studied sample

Brush the teeth before sleep <i>n</i> (%)	
No	18 (9.2%)
Yes	175 (89.7%)
Sometimes	2 (1%)
Consume sweets	
No	137 (69.9%)
Yes	59 (30.1%)
Brush teeth per day	
1×	4 (2.1%)
2×	60 (30.8%)
3 or more	131 (67.2%)
Use mouthwash	
No	135 (68.9%)
Yes	61 (31.1%)
Use dental floss	
No	75 (38.3%)
Sometimes	103 (52.6%)
Everyday	18 (9.2%)

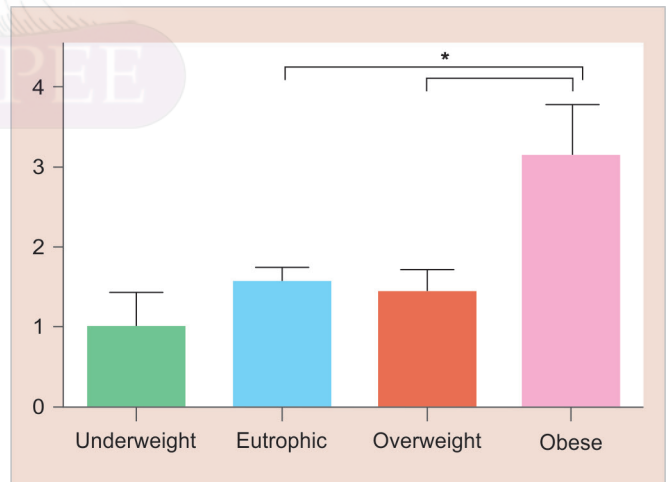


Fig. 1: Dental caries distribution according to the nutritional status. *Statistical significant difference

caries was 1.00 (SD 1.00); in eutrophic children, the mean caries was 1.57 (SD 2.00), in overweight, the mean was 1.44 (SD 1.86); and in obese, it was 3.12 (SD 2.63). Obese children had more caries experience than eutrophic and overweight children ($p < 0.05$).



DISCUSSION

Recently, alterations in lifestyle and diet have been accelerated by industrialization, urbanization, economic development, and market globalization, in many regions, including in Manaus. This study was conducted at the capital of the Amazonas state, Brazil, it is important to emphasize that Manaus is the largest city in northern of Brazil and is the sixth largest economy of the country. These socio-economic aspects of Manaus probably reflect the caries prevalence observed in the present study, in which almost half of the children were caries free and the mean dmft/DMFT were 1.67. Similar results were observed in the last Brazilian national survey in 2010,⁴ which showed that 44% of the Brazilian children were caries free at 12 years old, and at this age the dmft/DMFT was 2.34 in children from Manaus.

In the past decades, these changes in lifestyle and diet have been impacting on nutrition and oral health, notably through higher carbohydrate intake and lower physical activity levels, particularly among the younger members of the population. As a result, the prevalence of child obesity has shot up throughout the world and has become a serious public health problem with grave consequences.¹⁶ In Brazil, about 15% of the children are obese.¹⁷ Also, some authors reported an association between dental caries and obesity in children.^{11,18} We also observed an association between dental caries and obesity.

It is well known that obesity and dental caries have some common risk factors, such as high-calorie and cariogenic diets.¹⁹ However, we were not able to find an association between consumption of sweets, caries, and obesity. This might be related to the fact that this information was evaluated through the parents' information. The reproducibility of the information on dietary habits could be under reported by the parents. Other confounding factors were also not associated with obesity and dental caries. These results were also observed by other studies that although they found an association between nutritional status and dental caries, they were not able to find dietary factors as a risk factor for both conditions.^{11,20}

Other recent studies did not find an association between dental caries and obesity when evaluated early childhood caries^{18,21} and dental caries in school children and teenagers.^{10,21–27}

The association between malnourished (underweight) and dental caries has also been reported. Underweight Brazilian²⁸ and Indian¹⁸ children had higher early childhood caries. In 12-year-old Saudi boys, dental caries risk was two times higher in the underweight group.²⁰ Similar results were also observed in tribal children,²⁹ in which dental caries severity increase with the severity of malnourishment. In our sample, only 2.5% of the children were underweight, which does not allow us to draw any conclusion.

According to the Center for Disease Control and Prevention (CDC), childhood obesity has both immediate and long-term effects on the overall health² and oral health. Obese children from Manaus have a greater likelihood of suffering dental caries than those with lower weight, which shows the need to implement strategies to improve delivery of health care, including nutritional and oral care to school children.

CONCLUSION

Our study demonstrated that dental caries is associated with obesity, but not with overweight and underweight, in school children from Manaus.

ACKNOWLEDGMENT

This project was supported by the São Paulo Research Foundation FAPESP—2015/06866-5 (ECK).

REFERENCES

1. Mohammadi TM, Hossienian Z, et al. The association of body mass index with dental caries in an Iranian sample of children. *J Oral Health Oral Epidemiol* 2012;1:29–35.
2. Petersen PE. Challenges to improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. *Int Dent J* 2004;54(6):329–343. DOI: 10.1111/j.1875-595X.2004.tb00009.x.
3. Brasil. Ministério da Saúde (MS). Projeto SB Brasil 2003: condições de saúde bucal da população brasileira 2002–2003. Resultados principais. Brasília: MS; 2004.
4. Brasil. Ministério da Saúde (MS). Projeto SB Brasil 2010: resultados principais. Brasília: MS; 2011.
5. Onis M, Blössner M, et al. Global prevalence and trends of overweight and obesity among preschool children. *Am J Clin Nutr* 2010;92(5):1257–1264. DOI: 10.3945/ajcn.2010.29786.
6. UNICEF: http://www.who.int/nutgrowthdb/jme_unicef_who_wb.pdf. Assessed: 2017.
7. Alves LS, Susin C, et al. Overweight and obesity are not associated with dental caries among 12-year-old South Brazilian schoolchildren. *Community Dent Oral Epidemiol* 2013;41:224–231. DOI: 10.1111/cdoe.12010.
8. Moreira PV, Rosenblatt A, et al. Prevalence of dental caries in obese and normal-weight Brazilian adolescents attending state and private schools. *Community Dent Health* 2006;23:251–253.
9. Sakeenabi B, Swamy HS, et al. Association between obesity, dental caries and socioeconomic status in 6- and 13-year-old school children. *Oral Health Prev Dent* 2012;10:231–241.
10. Farsi DJ, Elkhodary HM. The prevalence of overweight/obesity in high school adolescents in Jeddah and the association of obesity association with dental caries. *Ann Saudi Med* 2017;37(2):114–121. DOI: 10.5144/0256-4947.2017.114.
11. González Muñoz M, Adobes Martín M, et al. Systematic review about dental caries in children and adolescents with obesity and/or overweight. *Nutr Hosp* 2013;28(5):1372–1383. DOI: 10.3305/nh.2013.28.5.6674.
12. Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Brasileiro de 2010. Rio de Janeiro: IBGE; 2012.
13. WHO (World Health Organization). Oral Health Surveys. Basic Methods##5th ed.##Geneva: WHO; 2013.
14. Silva RA, Barreiros D, et al. Association Between Body Mass Index and Caries Experience in Brazilian Children and Adolescents. *J Dent Child* 2016;83(3):146–151.
15. WHO. Multicentre Growth Reference Study Group. WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development. Geneva: World Health Organization; 2006.
16. Cole TJ, Bellizzi MC, et al. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000;320:1240–1243. DOI: 10.1136/bmj.320.7244.1240.
17. FIOCRUZ - Fundação Oswaldo Cruz. Disponível em: www.fiocruz.br/biosseguranca/Bis/infantil/obesidade-infantil.htm. Assessed: 2017.
18. Aluckal E, Anzil K, et al. Association between Body Mass Index and Dental Caries among Anganwadi Children of Belgaum City, India. *J Contemp Dent Pract* 2016;17(10):844–848. DOI: 10.5005/jp-journals-10024-1941.
19. de Silva-Sanigorski AM, Waters E, et al. Splash!: a prospective birth cohort study of the impact of environmental, social and family-level influences on child oral health and obesity related risk factors and outcomes. *BMC Public Health* 2011;11:505. DOI: 10.1186/1471-2458-11-505.
20. Bhayat A, Ahmad MS, et al. Association between body mass index, diet and dental caries in Grade 6 boys in Medina, Saudi Arabia. *East Mediterr Health J* 2016;22(9):687–693. DOI: 10.26719/2016.22.9.687.
21. Krishna HV, Manaswini E, et al. Association between nutritional status and early childhood caries in Indian children. *J Int Soc Prevent Communit Dent* 2017;7:131–135. DOI: 10.4103/jispcd.JISPCD_25_17.

22. Quadri MF, Hakami BM, et al. Relation between Dental Caries and Body Mass Index-for-age among Schoolchildren of Jazan City, Kingdom of Saudi Arabia. *J Contemp Dent Pract* 2017;18(4):277–282. DOI: 10.5005/jp-journals-10024-2031.
23. Guizar JM, Muñoz N, et al. Association of Alimentary Factors and Nutritional Status with Caries in Children of Leon, Mexico. *Oral Health Prev Dent* 2016;14(6):563–569.
24. Almerich-Torres T, Montiel-Company JM, et al. Relationship between caries, body mass index and social class in Spanish children. *Gac Sanit* 2016;31(6):499–504. DOI: 10.1016/j.gaceta.2016.09.005.
25. Kumar S, Kroon J, et al. Relationship between body mass index and dental caries in children, and the influence of socio-economic status. *Int Dent J* 2017;67(2):91–97. DOI: 10.1111/idj.12259.
26. Farsi DJ, Heba Elkhodary M, et al. Prevalence of obesity in elementary school children and its association with dental caries. *Saudi Med J* 2016;37(12):1387–1394. DOI: 10.15537/smj.2016.12.15904.
27. Liang JJ, Zhang ZQ, et al. Dental caries is negatively correlated with body mass index among 7–9 years old children in Guangzhou, China. *BMC Public Health* 2016 26;16:638. DOI: 10.1186/s12889-016-3295-3.
28. Soares ME, Ramos-Jorge ML, et al. Influence of masticatory function, dental caries and socioeconomic status on the body mass index of preschool children. *Arch Oral Biol* 2017;81:69–73. DOI: 10.1016/j.archoralbio.2017.04.032.
29. Chauhan A, Nagarajappa S, et al. Association of body mass index with dental caries among malnourished tribal children of Indore division. *Clujul Med* 2016;89(4):542–547. DOI: 10.15386/cjmed-651.

