DENTAL CARIES IN ADOLESCENTS AND ITS ASSOCIATION WITH THEIR USE OF DENTAL SERVICES

Keity Dayane **Reifur**[1*], Samuel Jorge **Moysés**[1]

[1]Departament of Odontoclinic, School of Dentistry, Universidade Federal do Paraná, Curitiba, PR – Brasil.

Palavras-chave: Adolescente. Cárie Dentária. Índice CPOD. Assistência Odontológica. Serviços de Saúde Bucal.

RESUMO

Objetivo: Avaliar a associação entre cárie dentária em adolescentes e a utilização de serviços odontológicos no Brasil. **Métodos:** Estudo transversal, baseado em dados secundários relativos às duas últimas Pesquisas Nacionais de Saúde Bucal (2003 – 2010), considerando a prevalência estimada de cárie dentária e higidez dental em adolescentes (15 a 19 anos) e a assistência odontológica. **Resultados:** Para o Brasil, o índice de cuidados odontológicos (ICO) registra um aumento, na média, de 41,2 (2003) para 50,8 (2010); o índice de mutilação dental (IMD), uma diminuição, na média, de 11,7 (2003) para 7,4 (2010); quanto à média de dentes permanentes hígidos, um aumento de 4,9% para o período analisado. Em 2010, a região Centro-Oeste do Brasil é a única que sofre redução, em relação ao índice de cuidados odontológicos. **Conclusão:** Há melhorias, ao menos quantitativamente, quando se analisa a questão do cuidado odontológico por meio do componente restaurado, e qualitativamente na redução do componente perdido, na saúde bucal de adolescentes brasileiros.

Keywords: Adolescent. Dental Caries. DMFT Index. Dental Care. Oral Health Services.

ABSTRACT

Objective: To assess the association between dental caries in adolescents and the use of dental care services in Brazil. **Method:** Cross-sectional study based on secondary data obtained in the last two National Oral Health Surveys (2003 - 2010), considering the estimated prevalence of dental caries and dental hygiene in adolescents aged 15 to 19 years and dental care services. **Results:** In Brazil, the dental care index (DCI) has increased on average from 41.2 (2003) to 50.8 (2010). The dental mutilation index (DMI) has decreased on average from 11.7 (2003) to 7.4 (2010). The healthy permanent teeth index (HPTI) showed an increase of 4.9% in the above period. In 2010, the Central West was the only region in the country to show a decrease in the dental care index (DCI). **Conclusion:** There have been quantitative improvements in regard to dental restoration (dental care), and qualitative improvements in what concerns to tooth loss in the oral health of Brazilian adolescents.

Submitted: september 20, 2018
Modification: november 26, 2018
Accepted: november 27, 2018

***Correspondence to:**
Keity Dayane Reifur
Address: Universidade Federal do Paraná, Rua Padre Camargo, 280 - 5º andar, Alto da Glória – Curitiba - Paraná - Brasil - CEP 80060-240.
Telephone number: +55 (41) 36656393; +55 (41) 996607039; +55 (41) 33852112.
E-mail: keityreifur@hotmail.com

INTRODUCTION

Adolescence is a period between childhood and adulthood, characterized by complex changes in the biopsychosocial process. The World Health Organization (WHO) understands adolescence from 10 to 19 years and considers that youth extends from 15 to 24 years. These concepts allow different understandings, identifying young adolescents (15 to 19 years) and young adults (20 to 24 years). In Brazil, according to the WHO, basic oral health surveys work with the concept of young adolescents between the ages of 15 and 19 years.[1]

The Brazilian National Oral Health Survey 2010, which is the latest population-based survey coordinated by the Ministry of

Health, reveals that 13.6% of the adolescents in the study had never been to the dentist, and that at 12 years of age, 34.8% of the patients had already shown some sort of oral problem or discomfort. Among these problems, the most cited are difficulty-eating, discomfort when brushing teeth, irritation or nervousness due to one's oral condition, and embarrassment to smile. The situation was similar for people aged between 15 and 19 years.[2]

The results of the last two population surveys show that the average DMFT index (decayed, missing and filled teeth index) among Brazilian adolescents aged 15 to 19 years is substantially higher when compared to the index of patients aged 12 years. In 2003, the national estimate for the DMFT Index at 12 years old was 2.8, whereas at 15-19 years old it was 6.2. However, in 2010, even with the decrease observed at both age groups in the average index, there was a significant difference between them: the DMFT index was 2.1 for patients aged 12 years, and 4.2 for patients aged 15-19 years.[2,3] Therefore, dental caries and its consequences are a public health problem in Brazil for showing alarming rates in adolescents.

Several researchers have focused on this critical question: what is the cause of the worsening in the national distribution of dental caries average rates between 12-year olds and 15-19-year olds ?[4-7]

Generally, in this life cycle adolescent patients are expected to show favorable health indicators, which would allow them to advance to adulthood with full vitality.[8] However, the data indicate that individuals are susceptible to increased oral health problems during adolescence. What biological, behavioral, social and institutional reasons could explain the epidemiological profile of oral problems in adolescence? One of the factors concerns to the access to care and effective use of health services, since adolescents are no longer benefited by the care and attention traditionally provided to children, nor by assistance programs, such as those provided to adults, pregnant women and elderly people.[9]

The use of proxy variables such as the "dental care index" - DCI (which is also known as the Walsh index); the "dental mutilation index" - DMI; as well as the healthy permanent teeth index - HPTI, allow us to study the ability of dental services to meet, at least partially, the dental care demands associated with dental diseases. These indices reflect the attention and care provided to oral health through preventive/restorative procedures, absence of tooth loss and dental caries, and consequently indirectly expresses the equality / inequality in access to dental care and the effective use of services.[10,11]

Therefore, the focus of the present study will be to evaluate the association between dental caries in adolescents and the use of dental services in Brazil.

MATERIAL AND METHODS

Type of study

The methodology used in this study consists of a quantitative approach in an observational epidemiological study, with a cross-sectional design.

Ethical aspects

Public secondary data were obtained from the following databases:

a) 2003 National Oral Health Survey[3], submitted to the National Committee for Ethics in Research (CONEP) under registration no. 1,356, approved on July 21, 2000, in accordance with report no. 581/2000;

b) 2010 National Oral Health Survey,[2] submitted to CONEP under registration no. 15,498, approved on January 7, 2010, in accordance with report no. 009/2010.

Sample

In the last two National Oral Health Surveys in Brazil, 2003 [3] and 2010,[2] samples were collected by conglomerates. In 2003, 108,921 individuals were analyzed, while in 2010, the number of analyzed individuals was 37,519. The main harms to oral health as well as the factors related to socioeconomic status, access to dental services and oral health perception by age group were collected.

Inclusion and exclusion criteria

The inclusion criterion used in this study was the age of individuals (15 to 19 years). In 2003, the number of individuals analyzed was n=16,833, while in 2010 it was n=5,367. The main dental problem considered in the study was dental caries. The remaining ages and dental problems were excluded.

Variables studied

The following indicative variables were used in order to study the dental care services provided to adolescents aged 15 to 19 years: a) Walsh index, or DCI,[10,11] given by the ratio between filled teeth (F) and the DMFT Index components; b) Dental Mutilation Index (DMI), given by the ratio between missing teeth (M) and the DMFT Index components, which is an expanded adaptation of the original Walsh Index;[10,11] c) Healthy Permanent Teeth Index (HPTI).

Data analysis

All variables were analyzed according to their values presented in both National Oral Health Surveys in Brazil, which were carried out in the years 2003 and 2010. As the database involves a complex sampling plan, considering the weight of each primary and secondary sampling unit, data weighting was performed before each analysis through the weighting variable contained in the database, which allowed the extrapolation for any database variable, including the indices created. As for the dependent variables, analysis of variance was applied to two or three criteria, in a full factorial model, since the objective was to assess whether there was a difference in the mean values of the indices according to the polytomous categorical independent variables (Year, Region and Age Group). Also, the Pearson Linear Correlation Coefficient when the two variables presented a continuous scale, assuming values in the field of real numbers. This test describes the association between two variables and was applied in order to describe the influence of the components (decayed, missing and filled teeth), that is, which one had the highest degree of impact on the DMFT Index,[12] considering a significant correlation at the 0.01 significance level. The coefficient of determination was obtained by the square of the Pearson Linear Correlation Coefficient, considering the significant correlation at the same level described above, whose result shows how much of the variation in the dependent variable is explained by the variations in the independent variable.[12] All statistical analysis was performed using IBM STATISTICS SPSS software version 21.0.

RESULTS

According to the objectives outlined and the methodology employed, the main results of the present research are presented. In Brazil the average DCI increased from 41.2 (2003) to 50.8 (2010). The average DMI decreased from 11.7 (2003) to 7.4 (2010), and the average HPTI increased by 4.9% (23.0 in 2003 to 24.1 in 2010).

The variables "year" and "region" were analyzed, revealing significance <0.05 between years, between regions, and in the interaction between year and region. Therefore, it can be inferred that the behavior of the variable region was not the same from one year to another.

In 2010 the Brazilian Central-West region was the only one to suffer a decrease in the DCI (-2.4%), while the North region showed the highest increase (43.1%), followed by the Northeast (40.7%), South (11.4%) and Southeast (6.9%). There was a decrease in the DMI of 39.6% in the Northeast, 38.5% in the South, 27.5% in the North, and 24.8% in the Central-West region. The Southeast presented a small increase (13.6%) in the DMI, but a substantial increase in the HPTI (6.1%) in that period, followed by the Northeast (5.5%), Central West (3%), South (2%) and North (0.3%) (Table 1).

In the age group 15-19 years, the DMFT Index showed a reduction of 22.7% from 2003 to 2010 in the Brazilian national average and also in the individual analysis of its components: decayed, missing and filled teeth. The variable "decayed permanent teeth" registered a reduction of 32%, while the variable "filled permanent teeth" presented a reduction of 9%, and the variable "missing permanent teeth" had a reduction of 45% (Table 2).

The Pearson Correlation Coefficient and the Coefficient of Determination for the years 2003 and 2010 were used, in order to investigate the degree of association and the impact of each component (decayed, missing and filled teeth) to explain the variations in the index, since the correlation was expected to be positive as the components were part of the index itself. There was a positive and regular correlation between decayed teeth, missing teeth and the DMFT Index, which showed a determination coefficient of 29.3% and 22.9%, respectively, for the year 2003, and 30.6% and 19.1% for the year 2010, respectively. However, the component filled teeth, which presented a positive and regular correlation in 2003 and a coefficient of determination of 35.5% had a positive and strong correlation in 2010 with a coefficient of determination of 44.4%, which demonstrates that in this age group the component that had the most impact on the DMFT Index was filled teeth.

***Table 1**: Variation in Dental Care Index, Dental Mutilation Index and Healthy Permanent Teeth for the age group 15 to 19 years, from 2003 to 2010 for each region, in Brazil.*

Region	DCI (%)	DMI (%)	HPTI (%)
North	+43.1	-27.5	+0.31
Northeast	+40.7	-39.6	+5.47
Southeast	+6.9	-13.6	+6.11
South	+11.4	-38.5	+2.05
Central-West	-2.4	-24.8	+3.02
Total	+23.2	-36.8	+4.94

***Table 2**: Descriptive statistics of the DMFT Index by component for the age group 15 to 19 years in Brazil, by years 2003 and 2010*

DMFT Index component	Year	Average	Standard deviation	N (teeth)	Decrease (2003/2010)
Decayed teeth component	2003 2010	2.2 1.5	2.97 2.53	18690173 9460218	32.00%
Missing teeth component	2003 2010	0.7 0.4	1.61 1.21	18690173 9460218	45.50%
Filled teethcomponent	2003 2010	2.4 2.2	3.37 3.06	18690173 9460218	9%

***Table 3**: Pearson Correlation Coefficient for the age group 15 to 19 years, in Brazil in 2003 and 2010*

Age group 15 to 19 years, 2003		Decayed teeth	Filled teeth	Missing teeth	DMFT*
Decayed teeth	Pearson Correlation p Value N	1 18690073	-0.24** 0.00 18690073	0.18** 0.00 18690073	0.54** 0.00 18690073
Filled teeth	Pearson Correlation p Value N	-0.24** 0.00 18690073	1 18690073	0.00** 0.00 18690073	0.60** 0.00 18690073
Missing teeth	Pearson Correlation p Value N	0.18** 0.00 18690073	0.00** 0.00 18690073	1 18690073	0.48** 0.00 18690073
DMFT*	Pearson Correlation p Value N	0.54** 0.00 18690073	0.60** 0.00 18690073	0.48** 0.00 18690073	1 18690073
Age group 15 to 19 years, 2010		**Decayed teeth**	**Filled teeth**	**Missing teeth**	**DMFT***
Decayed teeth	Pearson Correlation p Value N	1 9460053	-0.13** 0.00 9460053	0.16** 0.00 9460053	0.55** 0.00 9460053
Filled teeth	Pearson Correlation p Value N	-0.13** 0.00 9460053	1 9460053	0.08** 0.00 9460053	0.67** 0.00 9460053
Missing teeth	Pearson Correlation p Value N	0.16** 0.00 9460053	0.08** 0.00 9460053	1 9460053	0.44** 0.00 9460053
DMFT*	Pearson Correlation p Value N	0.55** 0.00 9460053	0.67** 0.00 9460053	0.44** 0.00 9460053	1 9460053

*Note: * Decayed, missed, and filled teeth. ** Statistical significance*

***Table 4**: Coefficient of Determination for the age group 15 to 19 years, Brazil, by years 2003 and 2010*

Coefficient of determination	Year 2003	Year 2010
Decayed Teeth component	29.3%	30.6%
Missing Teeth component	22.9%	19.1%
Filled Teeth component	35.5%	44.4%

DISCUSSION

Nadanovsky and Sheiham[13] point out that the decline of dental caries in the 1970s and 1980s in developed countries among schoolchildren was explained as 65% due to the improvement in socioeconomic conditions, whereas only 3% was attributed to the provision of dental services. Celeste et al.[14] state that 14% is attributable to socioeconomic variables and 11% to the variables of dental services. However, one should take into account the different age groups and methodological differences between the analyzed studies when making comparisons. Data concerning to the last two National Oral Health Surveys (2003-2010)[2,3] were analyzed in terms of the dental care received by the adolescents. The DCI and HPTI registered an increase in their average, while the DMI decreased, demonstrating an improvement in the dental care services provided to this population in the last decade in Brazil.

By analyzing the regions, one may observe that in 2010 the North and Northeast showed the greatest increase in dental care, demonstrated by the DCI, while the Brazilian Central-West region was the only one to suffer a decrease. It must be emphasized that these regions have presented worse health indicators (including oral health) and greater inequalities than other regions over time. Therefore, the largest DCI increase in the North and Northeast region may have occurred because in 2003 these regions presented higher levels of untreated caries than the South and Southeast regions.[2,3]Since then these regions have received substantial contributions of investments and services, based on the principle of equity. That is, a "positive discrimination" to strengthen primary and specialized care, with the implementation of oral health teams and equipment of the *Brasil Sorridente* program (Family Health Strategy, Dentistry Centers, among others).[15-17]

Given the above assumptions, the DCI in these regions may have improved because they already presented greater needs for treatment, with subsequent fulfillment of these needs. The Central-West was the only region to present an increase in the need for more complex treatment of dental caries from 2003 to 2010, including restorations of two or more surfaces, which could explain the drop in the DCI in this region. Is there any influence due to more extensive restorations that demand a longer clinical time of primary care ? [2,3] Is it due to the ineffectiveness of the existing services? Further studies may address such issues.

There was a decrease in the DMI, with greater amplitude in the Northeast and South regions. This decrease might be due to the change in the number of adolescents that had never been to the dentist in the Northeast, which also decreased, suggesting more access to care. To ratify, the DCI showed an increase, demonstrating the growth in the access and use of restorative services. The number of adolescents with no caries also increased, both in the Northeast and in the South. It might represent an improvement in the quantity and also quality of the services, with a focus on health promotion and prevention.[2,3]

The concept of "access" has been widely discussed and authors have used several definitions. By considering public health policies as a social right, an implicit concept is assumed that institutions ensure access to a set of benefits (actions and services) to the largest number of people, according to the needs, priorities and vulnerabilities of social groups.[18] Assuming that the concept of "care" means having access to the necessary treatment imposed by reality, the Northeast stands out. The access to services may result in fewer missing teeth due to the greater possibility of receiving a dental filling procedure. This factor needs special attention in a region that has shown so many social inequities throughout history. Missing teeth could cause fewer work opportunities for the individual, low self-esteem, and also difficulties of personal and professional relations, which makes it more difficult for them to be included in society.[19]

In addition, assuming that the concept of preventive care in oral health is to present a higher average of healthy teeth (with no problems or clinical interventions), the HPTI showed the highest increase in the Southeast and Northeast regions.

These three results add more elements to the debate on the impact of the National Oral Health Policy, since between 2002 and 2008 the number of oral health teams rocketed from 4,261 to 17,349. Oral health teams were present in 4,857 of the 5,564 Brazilian cities and federal expenditures on oral health investments rose from 56.5 million in 2003 to 600 million in 2008. Approximately R$ 2.4 billion were invested in that period.[16] The Northeast received a large improvement with the implementation of the Federal program *Brasil Sorridente*, which included oral health teams acting in the Family Health Strategy; however, there was a controversial influence on epidemiological outcomes.[15-17,20] The Northeast region showed the greatest increase in the population coverage of oral health teams in Brazil (13% to 52%), according to the Department of Basic Care.[21]

Silva and Gottems[22] showed that the degree of coverage of oral health teams in the Family Health Strategy, besides the implementation of primary health care in a structured way and the access to secondary health care are factors that influence the integrality of oral health care. Soares, Chaves and Cangussu[23] also identified that there is a profile of inequality in the use of oral health services, and

those users who belonged to a poor service organization used less secondary attention, indicating that access to use of services is dependent on the organization of care by the local government. This same study verified a trend towards justice in care, corroborating with the advances made by SUS in the offer of services. Otherwise, Ely et. al.[24] suggested that the improvement in access with the presence of oral health in the Family Health Strategy did not culminate with the improvement in the oral health of the users in the studied regions.

According to Celeste et al.[14] and Ekstrand et al.,[25] cities committed to the sustained practice of preventionat individual and collective levels presented improvements in the DMFT Index or decreased chances of untreated caries. Dental services focused on prevention were considered an important factor in the goal of reducing the prevalence of oral diseases, especially dental caries.[14,25-27]

Another point is that cities with instability related to labor, patient coverage or service funding were associated with negative changes in the caries experience, reinforcing the need for sustainable quality dental services, with sufficient and stable workforce, focused on health promotion and prevention in order to provide early diagnosis and minimal intervention.[25,28]

The DMFT Index was analyzed considering its components: decayed, missing and filled teeth. The variables showed a reduction between 2003 and 2010. The data showed a positive and regular correlation between decayed and missing teeth in the DMFT Index. However, the component filled teeth, which had a positive and regular correlation in 2003, presented a positive and strong correlation in 2010, thus being the component that had the most impact on the DMFT Index in this age group. These results demonstrate a quantitative improvement in the component filled teeth and a qualitative improvement in the component missing teeth.

It can be assumed that the drop in the coefficient of determination for missing teeth represents an increase in the quality of dental care, as when fewer teeth are extracted from adolescents they preserve both their functional and aesthetic aspects. According to Davoglio et al.,[29] the increase in the provision of dental services does not necessarily decrease oral health inequities. The authors verified that by improving the access to dental services tooth loss is decreased, as decayed teeth can be treated on a timely basis. Barbato and Peres[30] report that 92.7% of the tooth loss cases in their study were due to untreated dental caries.

In order to properly analyze the results presented in this study, one should take into account the limitation in the use of secondary data, the design of the studies (which may not properly address causality), and the chronological period of the investigations, since updates are required for certain information. In addition, the limitation of statistical models, through quantitative data, to explain the complexity of the attention models of the country and their contextual, qualitative and subjective nuances should also be taken into account. However, it must be emphasized that even with these limitations, the availability of these data and their use as instruments by researchers, managers and decision makers on national and regional oral health policies are of great relevance.

The larger population coverage by oral health teams seems to become more and more relevant, as this coincides with a temporal increase in the DCI. However, the cross-sectional design of this study does not allow inferring cause/effect relationships. Therefore, longitudinal design studies are needed in order to test this hypothesis. Finally, it is important to highlight the relevance of well-collected and robust epidemiological data that meet a rigorous design, with adequate standardization and methodology for its use. Tools that allow researchers to verify trends in the epidemiological profile and contribute to the planning, monitoring and assessment of oral health services are also highly relevant.

The results evidence a reformulation in dental care services provided to adolescents in Brazil, with an increase in the Dental Care Index and Healthy Permanent Teeth Index in most regions and a decrease in the Dental Mutilation Index. This demonstrates an improvement in dental care, at least quantitatively in what concerns to the component filled teeth, and a qualitative improvement in regard to the components missing teeth and healthy permanent teeth.

REFERENCES

1. Biazevic MGH, Frias AC. Levantamentos em saúde bucal – métodos básicos. 5ª ed. Faculdade de Odontologia da Universidade de São Paulo (FOUSP). 2017.
2. Brasil. Ministério da Saúde. Pesquisa Nacional de Saúde Bucal 2010. Brasília, Ministério da Saúde, 2012.
3. Brasil. Ministério da Saúde. Condições de Saúde Bucal da População Brasileira 2002-2003. Brasília, Ministério da Saúde, 2004.
4. Reifur KD, De Oliveira Piorunneck CM, Moyses SJ. Dental Caries and Treatment Needs in Adolescents Aged 15 to 19 Years Old and their Relationship with Dental Services: A Systematic Review. Dent Health Curr Res. 2017 3:2 doi: 10.4172/2470-0886.1000129.
5. Vazquez F de L, Cortellazzi KL, Kaieda AK, Bulgareli JV, Mialhe FL, Ambrosano GM, et. al. Individual and contextual factors related to dental caries in underprivileged Brazilian adolescents. BMC Oral Health. 2015 Jan; 20; 15:6. doi: 10.1186/1472-6831-15-6.
6. Paula JS, JND Cruz, Ramires TG, Ortega EMM, Mialhe FL. Longitudinal impact of clinical and socioenvironmental variables on oral health-related quality of life in adolescents. Braz Oral Res. 2017 Ago; 31:70. doi: 10.1590 / 1807-3107BOR-2017.vol31.0070.
7. Östberg AL, Kjellström AN , Petzold M. The influence of social deprivation on dental caries in Swedish children and adolescents, as measured by an index for primary health care: The Care Need Index.

Comunidade Dent Oral Epidemiol. 2017 Jun; 45 (3): 233-241. doi: 10.1111 / cdoe.12281.

8. Palazzo LS, Bérla JU, Tomasi E. Adolescentes que utilizan servicios de atención primaria: Cómo viven? Por qué buscan ayuda y cómo se expresan? Cad. Saúde Pública. 2003; 19 (6):1.655-1665. doi:http:// dx.doi.org/10. 1590/S0102-311X2003000600010.

9. WHO, World Health Organization. Nutrition in adolescence: issues and challenges for the health sector: issues in adolescent health and development. 2005, Geneva: WHO.

10. Walsh J. International patterns of oral health care—the example of New Zealand. Harv Dent Alumni Bull. 1968; 10 (17).

11. Antunes JLF, Peres MA, Frazão P, Souza MLR. Cárie dentária. In: Antunes JLF, Peres MA (Org.). Epidemiologia da saúde bucal. 2ª ed. São Paulo: Santos; 2013. p. 71-96.

12. Callegari-Jacques SM. Bioestatística: Princípios e aplicações. Porto Alegre: Artmed; 2011.

13. Nadanovsky P, Sheiham A. Relative contribution of dental services to the changes in caries levels of 12-year-old children in 18 industrialized countries in the 1970s and early 1980s. Community Dent Oral Epidemiol. 1995; 23:331–339. doi:https://doi.org/10.1111/j.1600-0528.1995.tb00258.x.

14. Celeste RK, Nadanovsky P, Leon AP de. Associação entre procedimentos preventivos no serviço público de odontologia e a prevalência de cárie dentária. Rev Saude Publica. 2007; 41:830–838. doi: 10.1590/S0034-89102007000500018.

15. Scherer CI, Scherer MDA. Avanços e desafios da saúde bucal após uma década de Programa Brasil Sorridente. Rev Saúde Pública. 2015; 49:1-12. doi: 10.1590/S0034-8910.2015049005961.

16. Antunes JLF, Narvai PC. Políticas de saúde bucal no Brasil e seu impacto sobre as desigualdades em saúde. Rev Saúde Pública. 2010; 44 (2): 360-365. doi: http://dx.doi.org/10.1590/S0034-89102010005000002.

17. Pereira CR dos S, Roncalli AG, Cangussu MCT, Noro LRA, Patrício AAR,Lima KC. Impacto da Estratégia Saúde da Família sobre indicadores de saúde bucal: análise em municípios do Nordeste brasileiro com mais de 100 mil habitantes. Cad Saúde Pública. 2012; 28 (3): 449-462. doi:http://dx.doi.org/10.1590/S0102-311X2012000300005.

18. Fleury S, Ouverney AM. Política de saúde: uma política social. In: Giovanella L, Escorel S, Lobato LV, Noronha JC, Carvalho AI (Org.). Políticas e sistemas de saúde no Brasil. 2ª ed. Rio de Janeiro: Editora Fiocruz; 2008. P.23-64.

19. Moreira TP, Nations MK, Alves SCF. Dentes da desigualdade: marcas bucais da experiência vivida na pobreza pela comunidade do Dendê. Cad Saúde Pública. 2007; 23 (6): 1383-1392. doi: 10.1590/S0102-311X2007000600013.

20. Scarparo A, Zermiani TC, Ditterich RG, Pinto MHB. Impact of the Brazilian Oral Health Policy – Programa Brasil Sorridente – on the provision of public dental services in the State of Rio de Janeiro. Cad. Saúde Colet. 2015; 23 (4): 409-415. doi: 10.1590/1414-462X201500040153.

21. Brasil. Ministério da Saúde. Portal do departamento da atenção básica (DAB). Brasília, Ministério da Saúde, 2016.

22. Silva HEC, Gottems LBD. The interface between primary and secondary care in dentistry in the Unified Health System (SUS): an integrative systematic review. Ciênc. Saúde Coletiva 2017; 22(8):2645-2657. doi: 10.1590/1413-81232017228.22432015.

23. Soares FF, Chaves SCL, Cangussu MCT. Governo local e serviços odontológicos: análise da desigualdade na utilização. Cad. Saúde Pública. 2015 Mar; 31(3):586-596. http://dx.doi.org/10.1590/0102-311X00077214.

24. Ely HC, Abegg C, Celeste RK, Pattussi MP. Impacto das equipes de saúde bucal da Estratégia da Saúde da Família na saúde bucal de adolescentes do sul do Brasil. Ciênc. Saúde Coletiva. 2016; 21(5):1607-1616. doi: 10.1590/1413-81232015215.07822015.

25. Ekstrand KR, Christiansen MEC, Qvist V, Ismail A. Factors associated with inter-municipality differences in dental caries experience among Danish adolescents. An ecological study. Community Dent Oral Epidemiol. 2010; 38:29–42. doi: 10.1111/j.1600-0528.2009.00505.x.

26. Lu H-X, Wong MCM, Lo ECM, McGrath C. Risk indicators of oral health status among young adults aged 18 years analyzed by negative binomial regression. BMC Oral Health. 2013; 13:40. doi: 10.1186/1472-6831-13-40.

27. Moreira KMS. Oral health in the family health strategy: how to proceed? Rev. Bras. Odontol. 2015 jan./jun; 72(1/2):114-7.

28. Mattos GCM, Ferreira EF, Leite ICG, Greco RM. A inclusão da equipe de saúde bucal na Estratégia Saúde da Família: entraves, avanços e desafios. Ciênc. Saúde Coletiva. 2014; 19(2):373-382. doi: 10.1590/1413-81232014192.21652012.

29. Davoglio RS, Aerts DRG de C, Abegg C, Freddo SL, Monteiro L. Fatores associados a hábitos de saúde bucal e utilização de serviços odontológicos entre adolescentes. Cad Saude Publica. 2009; 25:655–667. doi: 10.1590/S0102-311X2009000300020.

30. Barbato PR, Peres MA. Perdas dentárias em adolescentes brasileiros e fatores associados: estudo de base populacional. Rev Saúde Pública. 2009; 43:13–25. doi: 10.1590/S0034-89102009000100003.