Research Article
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Contribution of water fluoridated to facial aesthetics in a context of low prevalence of caries

Abstract

Background: Fluoridated water adds a preventive benefit against caries, even in epidemiological scenarios with a low prevalence of the disease. It is not known whether in such contexts this public health technology has an impact on facial aesthetics, as the preventive effect of fluoridated water on anterior, aesthetically relevant, and posterior teeth groups is different. In this article this possible effect is evaluated.

Methods: Two ssimultaneous, epidemiological census population surveys, were carried out in two Brazilian cities with low prevalence of caries: Silveiras (fluoridated), and São José do Barreiro (not fluoridated). The values of the Decayed, Missing and Filling Teeth - DMFT index were organized according to their distribution by two teeth groups, called "anterior" and "posterior". In order to make comparisons and evaluate the meaning of the values found in the census, the proportions of the participation of anterior teeth groups at the age of 12 years were calculated in databases of epidemiological population surveys of caries made available by the Collaborating Center of the Ministry of Health of São Paulo University, carried out in Santos-1995 (fluoridated), in Suzano-2012 (fluoridated), as well as the research São Paulo State- SB-SP-2015 (fluoridated and not).

Results: The mean DMFT index was 1.7 (sd=1.9) in Silveiras, and 2.6 (sd=3.4) in São José do Barreiro. The average DMFT was: 1.73 (1.57-1.89) in Santos, 1.21 (1.02-1.39) in Suzano, 1.89 São Paulo state (exposed fluoridation) and 2.38 (not exposed). The percentage share of anterior teeth groups in the composition of the DMFT values, at 12 years of age, was: Silveiras 4.33, São José do Barreiro 14.11, Santos 4.08, Suzano 4.44, and in São Paulo state 4.54 (exposed) and 7.54 (not exposed).

Conclusion: Water fluoridation produces epidemiological effects on anterior teeth groups, even in contexts of low disease prevalence. This effect is relevant in permanent teeth, helping to prevent losses and preserve dental occlusion, thereby improving facial esthetics.

Keywords: public health, oral health, facial aesthetics, teeth, dental cavity, DMFT index, fluoridation

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Introduction

Since ancient times people have subjectively attributed cognitions and emotions to their own face and to that of those who coexist. Facial beauty has always had an influential power on populations and is related to universally accepted attributes. In this context, teeth, especially the maxillary anteriors, play an important aesthetic role, contributing to facial harmony. This characteristic is widely recognized and valued as, among other authors, SOARES et al (2006) point out, for whom "a pleasant smile is mainly related to the upper anterior teeth"[1,2] and also CONCEIÇÃO (2007) who, recognizing that the anterior teeth they have "special importance in facial aesthetics and are extremely valued by patients", emphasizes the "psychological and self-esteem effect that a better aesthetic appearance represents in a highly competitive society, associated with better social and professional opportunities".[3]

DETOGNI evaluated the dental conditions of the Enawene-Nawe indigenous people in Mato Grosso state, Brazil, concluding that they "value the smile a lot and compare the appearance of people with missing anterior teeth (very common even among teenagers due to the high incidence and severity of caries lesions in these teeth), especially in the upper arch), with the appearance of monkeys".[4]

Thus, caries prevention strategies, whether directed to individuals in the clinic or oriented to populations, should not underestimate the relevant aesthetic role of anterior teeth, that is, canines and incisors, lateral and central. It is known, however, that the dental groups present, in general, different vulnerabilities to caries, due to their anatomical characteristics. The susceptibility is greater in posterior, lower and upper teeth, especially molars, due to the presence of pits, grooves and fissures, according to abundant documentation in the scientific literature.[5] In anterior, lower and upper teeth, smooth surfaces largely predominate and, for this reason, this group has less susceptibility to the disease. However, contextual variables can change these general characteristics, increasing or decreasing the vulnerability of anterior teeth to the disease. Hence the importance of knowing the impact of these variables, such as exposure to fluoridated water, on the susceptibility to caries of anterior teeth, since the role of this dental group in facial harmony is recognized.

McDonald et al.,[6] analyzed the occurrence of caries according to the characteristics of the teeth surface, in young people aged 13 to 15 years, concluding that when caries levels are low, most lesions occur in the occlusal region or in of grooves and fissures of posterior teeth. A similar conclusion was obtained in a study with approximately 20.000 American schoolchildren, aged between 5 and 16 years, from ten locations, in which hierarchy was demonstrated regarding the type of teeth and sites of primary development of the caries lesion. The group of posterior teeth was the most susceptible to the disease.[5]

Fluoridation of public water supplies is a collective health technology recommended by international dental entities, such as the American Dental Association (ADA) and the World Health Organization (WHO), whose effectiveness and safety in preventing caries are recognized worldwide,[7] which is why this measure is widely used in public health strategies for disease prevention, in Brazil and worldwide.[8,9] Since the pioneering studies on this technology,

developed in the mid-20th century, it has been accepted that its preventive effectiveness can also contribute, indirectly, by reducing the number of teeth extracted as a result of caries, to obtain a better-quality dental occlusion. There is a proven association between teeth loss and the occurrence of occlusal anomalies, notably misalignment and crowding, since the prevalence of dentofacial deformities decreases as the length of the dental arch is conserved.[1,10]

Despite the relevance of analyzing possible contributions of the water fluoridation process to dental and facial aesthetics, no specific articles related to the topic were found.[11] This article analyzed the impact of exposure to fluoridated water on the distribution of caries in anterior and posterior dental groups, in a scenario of low prevalence of this disease, in view of the different susceptibility in these two dental groups, evaluating the impact of this characteristic epidemiology of caries on facial esthetics.

Methods

Study Location and Setting

Santos and Suzano are municipalities in the State of São Paulo, Brazil, located respectively on the coast and in the metropolitan region of São Paulo, with populations of more than 300.000 inhabitants, each municipality, and which had a low prevalence of caries at the index age of 12 years, when surveys were carried out (1995 and 2012). Both had fluoridated public water supply covering more than 85% of the population: Santos since 1975 and Suzano since 1984.[12]

The "SB-SP-2015" survey was a large, multicenter, population-based epidemiological survey carried out by the São Paulo State Health Department (SES-SP) and carried out under the technical-scientific coordination of the Piracicaba Dental School (FOP) from the State- University of Campinas (Unicamp). From the database provided by SES-SP and FOP/Unicamp, the proportions of anterior teeth in the composition of the DMFT index of 12-year-old schoolchildren (n=27.077), exposed (n=26.230) and unexposed (n=847) to fluoridated water in the state of São Paulo.[12]

Study design

Two simultaneous epidemiological population surveys, census type, were carried out in populations with universal access to fluoride toothpaste. Primary data were obtained in populations exposed or not exposed to fluoridated public water supply for at least five years. A total of 312 epidemiological examinations were carried out in adolescents aged between 11 and 12 years old, exposed (N=184) and not exposed (N=128) to the preventive measure, at least 5 years. In order to measure the magnitude of the occurrence of caries in permanent teeth, using the DMFT index, as recommended by the World Health Organization (WHO).[13] The results obtained in Silveiras and São José do Barreiro were analyzed in an article on the effectiveness of fluoridation in permanent teeth.[14] Other methodological aspects of the investigation of which this study is part are described in that article.

Study populations and data collection

Concurrent censuses were carried out in the municipalities of Silveiras (with fluoridation) and São José do Barreiro (without fluoridation). Both are located in the administrative region of Guaratinguetá, in the Paraíba Valley, São Paulo State, Brazil, as they met the requirement methodological approach of constituting a "social space" subject to epidemiological investigation in cross-sectional studies, as recommended by Barata and Werneck.[15] Exposure to fluoridated water was proven, the pairing of populations was done, *a priori*, due to the similarity of the social spaces that characterize both municipalities. The research project was approved by the Brazilian National Ethics Committee with CAAE process number 34299614 .7.00005421.064944/2014, recognized by the CEP/CONEP system, respecting the requirements to this type of investigation.[16] Data collection was carried out in 2014, by four trained and calibrated teams [inter-examiner agreement corresponded to (K=0.97-0.98) and intra-examiner agreement (K=0.98-1.00)], as described in the article by Cruz and Narvai.[14]

Data processing and analysis of primary data

The values of the DMFT index were organized according to their distribution by two teeth groups, called "anterior" and "posterior". The teeth included in the "anterior" group were the central and lateral incisors and the upper and lower canines. The teeth included in the "posterior" group were the first and second premolars and first and second molars, upper and lower. In this way, the magnitude of caries was obtained for the group of anterior teeth and for the group of posterior teeth, for both populations. With the objective of measuring the magnitude of the participation of the anterior teeth group in the composition of the DMFT index, the proportions of this grouping in the composition of the value of this index were calculated, in situations of exposure and non-exposure to the measure. For the analysis, the assumption was accepted that it is undesirable, for a favorable facial esthetics, for the proportion of DMF teeth to be greater in anterior teeth than in posterior teeth. Data processing was performed using the Epi-Info software.[17]

Epidemiological surveys in oral health, brazil: setting parameters and comparisons

Additionally, in order to make comparisons and evaluate the significance of the values found for the situations observed in Silveiras and São José do Barreiro, the proportions of the participation of anterior teeth groups at the age of 12 years were calculated in survey databases. Epidemiological data on caries made available by the Collaborating Center of the Ministry of Health of the University of São Paulo (CECOL/USP), carried out in 1995 in Santos ("Santos-1995"), and in 2012 in Suzano ("Suzano-2012"), as well as as in the survey "SB-SP-2015"[12].

Results and discussion

The mean DMFT was 1.7 (sd=1.9) for the population exposed to fluoridated water (Silveiras), and 2.6 (sd=3.4) for those not exposed (São José do Barreiro). In Santos-1995 (n=734) the estimate of the average DMFT was 1.73 (1.57-1.89), and in Suzano-2012 (n=372) it registered 1.21 (1.02-1.39). At this same age, the estimate for the state of São Paulo, in 2015, was 1.89 for those exposed to fluoridated water and 2.38 for those not exposed.

Table 1 shows the percentage participation of anterior teeth groups in the composition of the DMFT index values, at 12 years of age, in the surveys used in this study.

The participation of anterior teeth in the composition of the DMFT index among those exposed to fluoridated water (Silveiras) follows the pattern observed in similar situations, as seen in Table 1 for Santos-1995, Suzano-2012, and fluoridated municipalities participating in the SB-SP- 2015. The percentage of this share is approximately twice as high in the absence of fluoridated water. In Silveiras, however, this difference was even greater, being more than three times.

Blinkhorn et al.[18] when comparing the prevalence of caries in children aged 9 and 10 years old in two Scottish cities, with and

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without fluoridation, in incisors and canines, the inhabitants of the fluoridated city had 81% less caries when compared to those who were not exposed to fluoridation.[18]

Cypriano et al.[19] analyzed the participation of anterior teeth in the composition of the DMFT index in thirteen municipalities in the region of Campinas, São Paulo, Brazil, from 1998 to 2001, classified as having low caries prevalence. A total of 1.141 epidemiological exams were performed. The share of anterior teeth was 5.2%. [19]

Environmental variables can change the pattern with which anterior teeth participate in the DMFT composition. Detogni[4] reports that the Enawene-Nawe indigenous people, whose diet basically consists of cassava of different varieties, corn, fish and some collection products such as fungi, fruits, insects and honey, produce a drink called oloyti, which is a fermented porridge prepared from roasted cassava dough and consumed daily. To prepare it, women of all ages, including children from 9-10 years of age, chew the manioc mass until it becomes a paste moistened with saliva, which is then boiled. To produce oloyti, women keep cassava in contact with their teeth (the mass is placed between the upper front teeth and the upper lip) for prolonged periods, every day. This custom is associated with other eating habits that include corn cake and the use of honey. According to DETOGNI[4], at 18 and 19 years of age, 75% of those examined in 1999, had significant dental loss of maxillary anterior teeth, causing significant esthetic impairment, requiring the placement of dental prostheses for "recovery of esthetics and smile, because without teeth In previous years, women and men feel a lot of shame when talking and smiling socially".

It is observed in Table 1 that the percentages of anterior teeth grouping in the composition of the DMFT index, in a situation of exposure to fluoridated water, suggests consistency in terms of obtaining substantially lower values when compared to the percentages obtained for non-exposed patients, indicating that the load of the disease is significantly lower in these groups.

Table 1 Percentage of anterior teeth in the composition of the DMFT index in situations of exposure and non-exposure to fluoridated water, in Silveiras (Fluoridation) and São José do Barreiro (Not Fluoridation) in 2014, in Santos-1995 (Fluoridation), in Suzano-2012 (Fluoridation), and in the state of São Paulo-SB-SP-2015 (Fluoridation and not)

Survey	% of Anterior teeth in DMFT
São José do Barreiro	14.11
Silveiras	4.33
Santos-1995	4.08
Suzano-2012	4.44
SB SP-2015 - Fluoridation	4.54
SB SP-2015– Not Fluoridation	7.54

The lower participation of anterior teeth in the composition of the DMFT index obtained for those exposed to water fluoridation corroborate the differential protective potential of this measure for facial aesthetics. This characteristic is relevant, since facial harmony contributes to the subjective dimension inherent to oral health, as it refers to psychological aspects that are decisive for a positive self-perception of one's own health, as emphasized by Sheiham et al.[20], Watt[21] and Peres et al.[22]

Facial beauty and the smile have always had influence on populations.[1,2] Emmerich et al refer to what they call the "Hollywood smile" to emphasize the appreciation, which they consider too much, of aesthetic aspects related to teeth in the facial set, with varied stimuli launched daily to meet the aesthetic desires of consumers who have access to informative journalistic materials, seductive and attractive with effective expressions such as "successful smile", "perfect smile", "plastic dentistry", "cosmetic dentistry", "Hollywood smile restoration" and "metal free", "high tech dentistry", "whitening laser", "German ceramic prosthesis", "all-on-four surgical technique". According to these authors, this generates an "exaggerated cult of the myth of happiness, seduction and aesthetics as a path to success". Dental piercing is emblematic in this context, characterized as "vanity dentistry", since it reissues "a cultural practice of the Mayan people" who in the 9th century carried out "jade and turquoise inlays, with the purpose of adornment, and mutilation of the teeth for religious purposes". Unlike the Mayan people, "vanity dentistry loses its limits in the act of placing a dental piercing" since it "banalizes the understanding of the health-disease process, having as a social product the veneration of beauty and vanity".[23]

Notwithstanding the critical perspective that Emmerich et al.[23] proposes for the approach of different aspects related to facial aesthetics, including the potential for commodification of this subjective aspect of oral health, characteristic of the distortions introduced by market dentistry in dental practice, and predominant in the days current, it is relevant to consider that the anterior, lower and upper teeth should be the object of attention in public health strategies.[24–26]

In the analysis carried out in the present study, it appears that the fluoridation of public water supplies has a relevant effect on preserving the integrity of anterior teeth, which are important for facial harmony, thus impacting the subjectivity involved in the self-perception of oral health and affecting positive self-esteem.

According to Conceição[3] good aesthetic appearance, to which facial harmony contributes with the notable contribution of anterior teeth, is equivalent, in highly competitive societies such as contemporary ones, to better social and professional opportunities[3]. It follows that the technology of fluoridation of public water supply should not be given up, even in contexts of low prevalence of caries and practically universal use of fluoride toothpaste, also in view of this purpose, which is to benefit the aesthetic-facial aspect represented by less pathological involvement and eventual teeth loss, not with individual aesthetic assistance, but through the implementation of a typical preventive measure of public health. The primary data analyzed in this study, corroborated by secondary data from different epidemiological population surveys, indicate that fluoridation of public water supply is a measure that has positive potential and that should both be maintained wherever it is being carried out and adopted in locations where it is being used that this does not happen.

Conclusion

In addition to adding a preventive benefit against caries, to that obtained by the universal use of fluoride toothpaste, water fluoridation produces epidemiological effects on anterior teeth groups, even in contexts of low prevalence of the disease. This effect is relevant in permanent teeth, helping to prevent losses and preserve dental occlusion, thereby improving facial esthetics.

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None

Conflicts of interest

The authors declare that there is no conflict of interest.

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