DOI: 10.1111/j.1365-263X.2006.00821.x

Perception of dental fluorosis and other oral health disorders by 12-year-old Brazilian children

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International Journal of Paediatric Dentistry 2007; 17: 205–210

Aim. The aim of this study was to verify the perception of dental fluorosis as an oral health problem by 12-year-old Brazilian children and to evaluate if they were able to detect other oral disorders.

Methodology. The sample consisted of 401 schoolchildren. Firstly, clinical examinations were performed using a visual method under natural light. After that, children answered a questionnaire with the purpose of assessing the self-perception of their oral health problems. Next, the volunteers were shown a photo album containing 24 photographs, and had to match each photo with a severity scale.

Results. The prevalence of fluorosis was 18.2%; 81.8% of this total in fluorosis scale T-F 1. Of the 401 children, 48.9% ($n = 196$) answered oral health problems related to concerns, such as aesthetic appearance or pain. Among them, only two children, both with fluorosis T-F 2, correlated their problems with the presence of stained teeth. As regards the photo album analysis, the children considered photos showing fluorosis T-F 7–9 as the most severe, whereas the photo of an orally healthy patient was considered the least severe.

Conclusion. Children did not show negative perception of dental fluorosis, except for dental fluorosis at severe levels (T-F 7–9), and were mainly able to detect aesthetic or pain-related problems.

Introduction

The published work has shown that the incidence of dental fluorosis has increased during the last few decades, not only in areas with fluoridated water supplies, but also in nonfluoridated areas[1–6]. One of the determinants of increased dental fluorosis prevalence is the inadequate use of fluoride-containing products, mainly fluoride dentifrices, because 2–3-year-old-children swallow up to 55% of the dentifrice[7,8].

Therefore, epidemiologists and other dental health professionals have discussed the question of whether or not dental fluorosis is a public health problem. They have, however, concluded that it is not a matter of great concern, as the most prevalent condition in most populations is dental fluorosis at mild levels, which does not have any adverse effects on the oral health of the individuals/populations[5,9]. However, educational approaches to the rational use of fluoridated products and a better control of fluoride in the water supply are strategies that deserve attention, in order to maintain adequate fluoride levels in children's mouths, and consequently preventing dental fluorosis in their teeth, especially at the more severe levels that compromise the aesthetic appearance and function of teeth[5,7].

Criteria for good oral health are usually established by the dentists through objective evaluations based on their scientific knowledge, as well as their subjective view of what they consider to be healthy, functional, and aesthetical. In the majority of cases, patients do not participate in the diagnostic process of their own oral condition, and their perception of what constitutes an oral health problem, or even self-perception of their own problem, is therefore not assessed. Dental fluorosis self-perception studies have shown that dental fluorosis, in general, does not have any impact on patients' satisfaction with their appearance. Only a low

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percentage of individuals relate dissatisfaction that is related to teeth with severe fluorosis[9–12]. It is, however, important to emphasize that different cultural factors among individuals/groups can influence the perception of an oral health problem.

The aim of this study was to verify the perception of dental fluorosis as an oral health problem by 12-year-old Brazilian children and to evaluate if they were able to detect other oral disorders.

Materials and methods

Ethical aspects

This study was approved by the Research Ethics Committee of the School of Dentistry of Piracicaba, State University of Campinas, Piracicaba, Brazil. Written authorization was obtained from head professors to perform the survey and also from schoolchildren's parents to participate in the study.

Sample

The sample comprised of 12-year-old schoolchildren, both genders, enrolled in public and private schools in Ponta Grossa, Parana, Brazil, which has had a fluoridated water supply since 1984 (0.9 ppmF). Fluoridated dentifrices (1000–1500 ppmF) have been in market in the country since 1989 and schoolchildren from this study did not participate in any preventive program based on fluoride therapy.

The sampling process was conducted in two stages: first by selecting the schools and then by selecting the children. The schools were randomly selected from official records supplied by the Education Department, with an endeavour to contemplate private and public schools proportionally. In order to determine the sample size, a pilot study was conducted with 45 12-year-old children who analysed a photo album containing 24 photos of different clinical situations of oral health. As 90% of the children detected dental fluorosis at T-F 7–9 levels (photo no. 7) as the worst oral health problem in the pilot study, the sample size was defined as 401 12-year-old children with a sampling error of 3% and a confidence level of 95%. The sample of this study corresponded to 5% of the total number of children in the city in 2004 (Table 1). All individuals, with parental consent for participation in the study, who did not wear fixed orthodontic appliances, or had no severe dental hypoplasia, were included in this study.

Table 1. Sample distribution of the 12-year-old schoolchildren in Ponta Grossa, Parana, Brazil, 2004.

School	Boys	Girls	Total
Public school 1	62	69	131
Public school 2	32	41	73
Private school 3	57	52	109
Private school 4	43	45	88
Total	194	207	401

Self-perception evaluation questionnaire

The children's self-perception of the presence of an oral health problem was evaluated by means of a questionnaire containing three questions. The purpose of these questions was that each child reported: (i) the description of any oral health problem, displeasure or discomfort in his (her) mouth; (ii) where it was located; and (iii) the expectation of having his (her) problem solved. The questionnaire was used for the first time and was therefore not validated.

Evaluation of the perception of the oral health problem and its severity through the photo album

A photo album containing 24 randomly numbered size 10 × 15 cm photos was organized to include different oral conditions such as: general oral health, malocclusion, dental caries, oral cancer, periodontitis, and different degrees of dental fluorosis measured by the Thylstrup–Fejerskov (T-F) Index[13], among others. Five dentists had previously evaluated the photo album in order to select the most suitable photos to include in it, and their sequence was subsequently randomly organized by one examiner. After that, the dentists only checked to confirm that the sequence was suitable for use in the study.

Each volunteer analysed the photos in the album, before being clinically examined by the dentist. The children were instructed to mark the oral problems on a specific sheet in a

decreasing order of severity and, if possible, name the problem shown. In order to facilitate the data analysis, photos received specific codes (A–Y), so that each child used the 'A' to show the worst and the 'Y' to show the best condition. In addition, the answers were grouped into four classes: very severe, severe, moderate, and mild [Classes: 1 (from A to F), 2 (from G to L), 3 (from M to R), and 4 (from S to Y)]. Data analysis in this study was focused on each nominated class.

Calibration and pilot phases

Before the survey, the examiner was trained by a 'benchmark' examiner with experience in dental fluorosis in order to calibrate the trainee examiner and obtain an acceptable level of reproducibility. The Kappa value for the calibration process was 0.91[14]. The examiner had also already been calibrated for the other oral health conditions in previous oral health surveys. Forty-five 12-year-old children were examined in the pilot stage to analyse the presence of dental fluorosis and the acceptance of the questionnaire and the album by this age group. As previously explained, the pilot study also contributed to defining the sample size.

Epidemiological examinations

Thylstrup–Fejerskov Index[13] was used for recording dental fluorosis, considering the highest level of fluorosis found in each child. The previously calibrated examiner, helped by a note taker, carried out all examinations.

Before the examination, each child received a toothbrush with fluoridated dentifrice and brushed their teeth, supervised by a dental hygienist. After that, the examiner examined all the schoolchildren under natural light in an outdoor setting, using buccal mirror and gazes to dry and remove debris and biofilm from the teeth.

All vestibular surfaces of all permanent teeth were evaluated to measure dental fluorosis. Teeth with less than two-thirds of their crowns in eruption and teeth with fillings and extensive cavitations were excluded from the examinations.

During the survey, 10% of the sample was randomly examined within an interval of 1 week in order to verify the intraexaminer error. Kappa value for this phase was 0.93[14].

The differential diagnosis between dental fluorosis at mild levels and nonfluorotic opacities was carried out by using Russell's criteria[15], considering distribution, localization, configuration, visibility, delimitation, and colour.

Data analysis

A statistical descriptive analysis was made considering both the distribution of the answers obtained from the children's self-perception questionnaire, and the distribution of the answers obtained from the photo album about the children's perception of the severity of an oral health problem, in accordance with nominated classes (1, 2, 3, and 4).

Results

Of the 401 schoolchildren, 18.2% ($n = 73$) presented dental fluorosis, 12% ($n = 48$) T-F-1, and 6.2% ($n = 25$) T-F 2 levels.

Among all schoolchildren, 48.9% ($n = 196$) had self-perception of having an oral health problem. These answers were confirmed by the results obtained from the epidemiological examinations in 100% of the cases. In addition, there was complete agreement between the clinical evaluations and the answers concerning the location of the child's oral health problem. Most of them related aesthetic ($n = 110$) or pain ($n = 64$) problems. Among children with dental fluorosis at T-F 2 level, only two referred to stained teeth as a problem. With regard to the children's expectations of having their problems solved, 59.2% ($n = 116$) believed the solution would be to wear orthodontic appliances, 33.2% ($n = 65$) by restorative procedures, 1.0% ($n = 2$) by dental extractions, and 4.1% ($n = 8$) by professional dental cleaning (Table 2).

To determine the children's ability to perceive dental fluorosis, the answers of children (18.2%) who presented dental fluorosis were correlated with the answers from the questionnaire. Among those with dental fluorosis at T-F 1 level ($n = 48$), most (60.4%) reported some discomfort in their mouths, due to 'the position of teeth' (65.5%). No schoolchildren referred to their stained teeth

Table 2. Number (*n*) and percentage (%) of 12-year-old children who were dissatisfied with their dentition and reasons for the dissatisfaction. Ponta Grossa, Parana, Brazil, 2004.

Dissatisfaction	*n*	%
Dissatisfaction with their dentition	196	48.9
Dissatisfaction due to fluorosis – T-F 1	0	0.0
Dissatisfaction due to fluorosis – T-F 2	2	0.50
Dissatisfaction due to pain	64	32.7
Dissatisfaction due to aesthetics	110	56.1
Dissatisfaction due to dental caries	5	2.6
Dissatisfaction due to other problems	15	8.1

as an oral health problem. In relation to the children with dental fluorosis T-F 2 level ($n = 25$), 52.0% ($n = 13$) answered that had oral health problems causing some discomfort. Among them 38.5% ($n = 5$) correlated their problems to malocclusion in anterior teeth, or, in other words, concern about their aesthetic appearance, and believed it could be solved by using orthodontic appliances. Another 38.5% ($n = 5$) related tooth ache due to dental caries. Only 7.7% ($n = 1$) presented pain and gingival bleeding caused by periodontal disease, which was not recognized by the child. A total of 15.4% ($n = 2$) reported their oral health problem to be stained teeth, in spite of not being able to correlate it to dental fluorosis. They believed the solution to their problem would be to wear orthodontic appliances. On the other hand, the children with dental fluorosis at T-F 2 level ($n = 12$) affirmed that they had no oral problem or discomfort.

In relation to the evaluation of perception of oral health problems through the photo album, Fig. 1 shows the distribution of answers for each photo according to its severity, classified by nominated classes: very severe, severe, moderate, and mild (classes 1, 2, 3, and 4). The oral health problems were classified in decreasing order of severity by the children as follows: dental fluorosis level T-F 7–9, advanced periodontitis, oral cancer, and cervical and occlusal dental caries. Most of the children recognized the photo showing a case of oral health as being a condition of light severity. Dental fluorosis levels T-F 1–3 were also considered conditions of light severity by most of them.

Discussion

Several studies have identified and reported on dental fluorosis, resulting from a specific disturbance during tooth mineralization, due to chronic and excessive ingestion of fluoride[16–20], as the first sign of the toxic effect of fluoride[19]. Consequently, the increasing prevalence of dental fluorosis observed among populations[3,5], is possibly due to inappropriate use of fluoride.

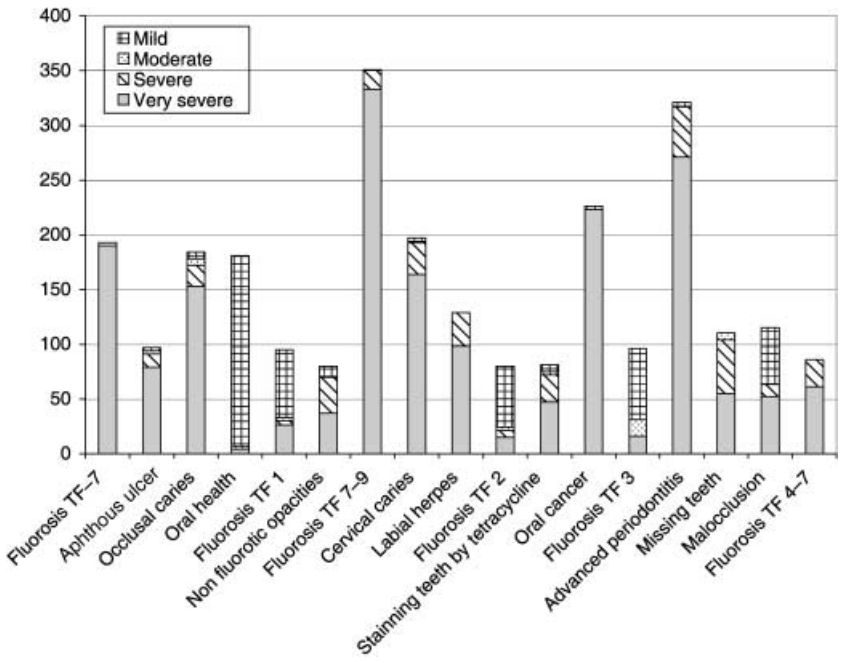

Fig. 1. Distribution of answers from the photos according to the severity levels attributed by the 12-year-old children. Ponta Grossa, Parana, Brazil, 2004.

From evaluating the questionnaire, it could be observed that the children had self-perception about oral health and were able to locate their problems. Most of the oral problems the children noted either affected anterior teeth or involved pain caused by decayed teeth. According to them, the solutions would be to have dental restorations or extractions. Another concern expressed by 12-year-old children was related to aesthetic problems caused mainly by malocclusion, which most children believed could be solved by wearing orthodontic appliances.

As one of the aims of this study was to evaluate dental fluorosis self-perception ability, special attention was paid to the answers given by the 73 children with dental fluorosis. None of the volunteers with dental fluorosis level T-F 1 noted stains on their teeth. This result is in agreement with others[21,22], who demonstrated that mild fluorosis levels are acceptable and hardly perceptible. Only two children with dental fluorosis level T-F 2 related that they had stained teeth. They did not, however, identify this as being dental fluorosis. Moreover, they suggested that their dental problem could be solved by wearing an orthodontic appliance, as they had some malocclusion in their dental arches. In other words, the adequate position of teeth in dental arches is more important to them than the presence of stains on their teeth.

As previously mentioned, the purpose of the photo album including a large number of photos showing fluorotic teeth, among several other problems, was to verify the volunteers' perception of oral health problems. Photos of dental fluorosis levels T-F 7–9 were considered to be related to extreme severity and a photo showing a healthy mouth was considered of light severity (Fig. 1).

It is interesting to observe that in general, the children correlated the photos showing dental destruction with extreme severity which, according to them, was caused only by dental caries, indicating that the disease is well recognized by the population. Another important finding is that none of the children recognized photos showing fluorotic teeth as dental fluorosis, corroborating the findings of Silva *et al.*[11].

This study showed that most volunteers identified dental fluorosis levels T-F 1 and T-F 2 as being acceptable, in agreement with Marthaler[23], who related that society generally accepts mild to moderate levels of dental fluorosis, if the prevalence of caries is moderate to high, and with Clark *et al.*[24], who affirmed that dental fluorosis is taken into consideration only when it becomes an aesthetic problem for individuals[22].

The patient has his (her) own concepts of what is healthy or not, good or bad for him (her). A person's ability to perceive an oral problem is one of the main reasons for him (her) to visit a dentist. Therefore, not only the professional evaluation but also the patient's opinion should be focused on, in order to attend the patient's needs, restore his (her) oral health and consequently, influence his (her) well-being.

Conclusion

This study showed that 12-year-old schoolchildren did not present a negative perception of dental fluorosis. When evaluating the photos, however, they recognized dental fluorosis at severe levels (T-F 7–9) as an oral health problem. Moreover, they were able to detect mainly aesthetic or pain-related problems.

Acknowledgements

The authors wish to thank the director and the students of schools located in the city of Ponta Grossa, Parana, Brazil, for their valuable participation in this study.

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