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Analysis of impacts of dental fluorosis on the quality of life of students at Senegal

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Abstract

Background: Dental fluorosis, which is an attack on the structure of teeth that changes their appearance, can have a negative impact on the quality of life of children and adolescents.

The objective of this study was to evaluate the impact of dental fluorosis on the quality of life of students living in an endemic fluorosis zone.

Material and Method: A cross-sectional, descriptive and analytical study was carried out. The sample consisted of 125 students aged 13 to 15, enrolled at Khar Ndoffène Diouf College in Fatick. Dental fluorosis was measured clinically using the Dean index. The Child-OIDP questionnaire was used to assess the effect of fluorosis on quality of life. The data were analyzed with the SPSS 20.0 software using Chi², Sperman tests with a significance threshold set at $p < 0.05$.

Results: Dental fluorosis was noted in more than 80% of students. It was more frequent in moderate and severe forms. No significant relationship was found between fluorosis and socio-demographic data. In contrast, dental fluorosis significantly affected performance "performing school activities" ($p = 0.03$).

Conclusion: The prevalence of dental fluorosis was high. However, the latter did not have much impact on the quality of life.

Keywords: oral health related-quality of life, dental fluorosis, adolescents, Senegal

Introduction

The use of fluorides in the prophylaxis of carious diseases is a common practice. However, their ingestion in excessive doses (> 1.5 mg/l according to WHO) poses the problem of their long-term toxicity. Indeed, under these conditions, fluorides can be responsible for many chronic diseases of the teeth or skeleton. Dental fluorosis is a dental dysplasia due to chronic fluoride intoxication that occurred during the mineralization period of the enamel and most often affect permanent teeth [1]. In central Senegal, this type of intoxication is mainly found in the Groundnut Basin area (Diourbel, Kaolack, Fatick, Thies) where fluorides are naturally present in excessive quantities in groundwater (1 to 14 mg / l) [2-5]. Assessing the relationship between quality of life and oral health is a major problem in the health policies of developed countries. In oral health, several specific oral quality of life indicators have been developed. An abbreviated version for children has been validated in English, the Child-OIDP (Child-Oral Impacts on Daily Performances) [6]. The objective of this study was to evaluate the impact of dental fluorosis on the quality of life of students living in the commune of Fatick.

Materials and Methods

This was a descriptive cross-sectional study carried out at the Khar Ndoffène Diouf College in the commune of Fatick. The study included students who were born and raised in Fatick; aged 13 to 15 years, enrolled in 5th grade and with the informed consent of the legal guardian. Not included were all students without dental fluorosis or with any other structural abnormality other than fluorosis and those with significant gaps. An exhaustive selection was made and all students meeting the inclusion criteria were selected for the survey. The survey was conducted in two phases: first, the Child-OIDP questionnaire was completed and then the oral clinical examination to determine the Dean index. The Child-OIDP questionnaire consists of two steps: the first step contains a list of common oral health problems that children have probably

encountered in the past three months, but also an open-ended question regarding any other unexpected problems they may have experienced. They are then asked about the impact of these problems on their daily activities. These 8 daily activities (performances) are: 1) eating, 2) talking, 3) cleaning teeth, 4) relaxing by including sleeping, 5) smiling, laughing and showing teeth without embarrassment, 6) maintaining an emotional state, 7) studying by including going to school and doing homework, 8) contact with others. The oral impact score for each activity is obtained by multiplying the frequency by the severity of the scores of 0.1 2, 3. Therefore, scores can range from 0 to 9 and for each child from a minimum score of 0 when there is no problem to a maximum of 72.

$$\text{Total impact score} = \frac{\Sigma \text{ of the 8 performance scores} \times 100}{72}$$

The Dean index uses 6 degrees of fluorosis, depending on the severity of the symptoms, with an indicative value used as a quantitative expression [7]. A clinical examination of both dental arches was performed to determine the presence or absence of fluorotic lesions. The score is based on the two most affected teeth. If these two teeth do not have the same degree of affection, the score chosen is that of the most affected tooth.

The statistical analysis was performed using IBM SPSS 20.0 software. Qualitative variables were described by their numbers and frequencies and quantitative variables by their means and standard deviations. The relationships between fluorosis and independent variables (age, sex, socio-professional level of parents and performance indices) were studied with the Chi-square test, the Spearman correlation test

and then the Spearman Row and the significance threshold was set at $p < 0.05$.

Results

The study involved 125 students aged 13 to 15 years. The average age was 13.32 +/- 0.903. The sample consisted of 63.2% girls.

Dental fluorosis was noted in 82.4% of students, 59.20% of whom had a moderate or severe form (Figure 1).

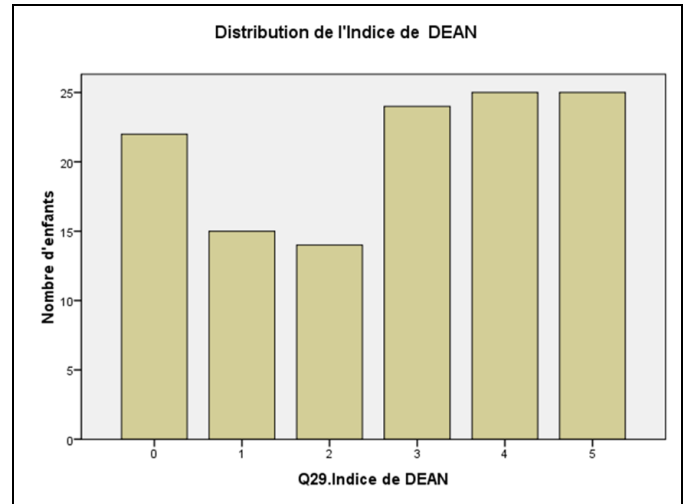


Fig 1: Distribution of students according to Dean's index

Dental stains, sensitive teeth, decayed teeth and toothache were the major oral problems reported by students with 51.2%, 40%, 40% and 36.8% respectively (Table I).

Table I: Perceived oral problems in the last three months

Oral problems encountered in the last three months	Number of children involved	
	Effective No	Percentage
Toothache	46	36,80
Sensitive teeth	50	40,00
Decayed teeth (holes on teeth)	50	40,00
The teeth of milk falling	22	17,60
A space between the teeth due to the non-eruption of a definitive tooth	28	22,40
Fractured definitive tooth	12	9,60
Teeth staining	64	51,20
The size or shape of your teeth?	21	16,80
The position of your teeth (twisted, projected teeth, spacing)	13	10,40
Bleeding at the gum level?	18	14,40
Swollen gums (which has swollen or swollen)	11	8,80
Pie at your teeth	4	3,20
Oral ulcerations	17	13,60
Bad breath?	1	0,80
Deformation of the mouth or face (cleft lip or palate)	8	6,40
Definitive teeth eruption?	2	1,60
No permanent teeth	1	0,80
Other	46	36,80

The overall prevalence of oral impacts for the 8 daily activities was 20.32% and the total impact score was 84.4%. The most affected daily performance was "Eating a meal or ice cream" found in 63.2% of students with an impact score of

52.9%. Difficulties in smiling, laughing and showing teeth without feeling embarrassed" were noted in 14.4% with an impact score of 10% (Table II).

Table II: Distribution of students by performance

Performance	Number of students (%)
Eating (lunch, ice)	63,20%
Talk Clearly (distinctly)?	2,90%
Clean your mouth (rinse your mouth, brush your teeth)	6,90%

Relax (including sleep)?	5,70%
Maintain your normal emotional condition without feeling irritable	1,70%
Smile, laugh and show your teeth without feeling embarrassed	14,20%
Make your school spots (i.e. go to school, learn in class, do your homework)	1,70%
Contact with people (i.e. go out with friends, go visit a friend at home)	3,40%

Problems with "eating a meal or ice cream" had little effect and occurred once or twice a month. On the other hand, problems with "smiling, laughing and showing teeth without

feeling embarrassed" and "performing school activities" had a moderate effect and occurred more than 3 times in the month or once or twice a week (Tables III and IV).

Table III: Distribution of students by severity of impact

Performance (Activities)	Little effect %	Moderate effect %	Severe effect %
Eating (lunch, ice)	75,5	19,1	5,4
Speak clearly (distinctly)?	20	40	40
Clean your mouth (rinse your mouth, brush your teeth)	66,7	16,7	16,6
Relax (including sleep)?	30	30	40
Maintain your normal emotional condition without feeling irritable	66,7	33,3	0
Smile, laugh and show your teeth without feeling embarrassed	32	68	0
Make your school spots (i.e. go to school, learn in class, do your homework)	0	100	0
Contact with people (i.e. go out with friends, go visit a friend at home)	16,7	66,7	16,6

Table IV: Distribution of students by frequency of impacts Dental fluorosis had an impact only on the correct performance of school tasks (p= 0.03) (Table V).

Performance	Once or 2 times per month %	Not more than three times a month, once or twice a week	Three or more times in the week %
Eating (lunch, ice)	86,4	5,5	8,1
Talk Clearly (distinctly)?	20	20	60
Clean your mouth (rinse your mouth, brush your teeth)	50	33,3	16,7
Relax (including sleep)?	60	30	10
Maintain your normal emotional condition without feeling irritable	100	0	0
Smile, laugh and show your teeth without feeling embarrassed	32	64	4
Make your school spots (i.e. go to school, learn in class, do your homework)	33,3	33,3	33,4
Contact with people (i.e. go out with friends, go visit a friend at home)	50	33,3	16,7

Table V: Relationship between dental fluorosis and daily performance

Daily activities	Category	With fluorosis	Without fluorosis	OR [CI 95%]	p
Eating (lunch, ice)	With impact	0,667	0,523	0,198	0,614
	Without impact	-0,667	-0,523	-0,198	-0,614
Speak clearly	With impact	20,53	3	28,41	0,790
	Without impact	0,53	0,3	11,4	0,12
Clean your mouth (rinse your mouth, brush your teeth)	With impact	1,481	0,752	0,681	0,116
	Without impact	-1,481	-0,752	-0,681	1
Relax (including sleep)?	With impact	3	1,014	1,22	1,15
	Without impact	2,6	1,014	0,946	0,582
Maintain your normal emotional condition without feeling irritable	With impact	-8,71	16,171	1	0,667
	Without impact	6,71	3,71	1	0,7
Smile, laugh and show your teeth without feeling embarrassed	With impact	1,48	0,753	0,598	0,537
	Without impact	3,41	1,03	0,55	0,35
Make your school spots (i.e. go to school, learn in class, do your homework)	With impact	2,32	1,22	0,33	0,03
	Without impact	7,32	1,62	0,43	1,33
Contact with people (i.e. go out with friends, go visit a friend at home)	With impact	2,69	1,014	1,08	0,749
	Without impact	-1,19	4,6	2,1	0,749

Discussion

The aim of this study was to assess the impact of dental fluorosis on students' quality of life. The choice of the study framework was based on the largest in the commune of Fatick. One of the limitations of this study was the lack of coordination between school supervisors, which significantly reduced the sample size.

The age group of 13 to 15 years was chosen at the suggestion of the academic authorities during the validation of the questionnaire in Senegalese children, to allow a better understanding.

The Child-OIDP questionnaire developed by Gherunpong *et al.* [6] was used to assess the impact of oral problems on

quality of life. Its psychometric properties have been proven in validation studies in several countries [8-10]. The prevalence of dental fluorosis was with a predominance of moderate and severe forms. The high fluoride content of the city's drinking water explains this fluorosis. Indeed, an epidemiological survey [11] carried out in the departments of Mbour and Fatick revealed that 70% of the 900 respondents are in contact with fluoride levels above 1.5mg/L (WHO guide values); 83.6% of the respondents are affected by dental fluorosis (Dean index greater than 1). Common sensitivities and dental pains may be related to enamel defects that have a high prevalence in the study population. Indeed, dental fluorosis can lead to enamel fractures, especially in its severe forms, exposing the dentin

and resulting in sensitivity. The latter will also play on the diet with the difficulties mentioned when eating a meal or an ice cream.

The overall prevalence of impacts was low and the most impacted activity was "eating a meal or ice cream". These results are similar to those of the studies by Michel-Crosata *et al.* [12] where oral hygiene and food consumption were the most affected activities. The activity "smile, laugh and show your teeth without embarrassment" was the second activity affected but with a low score. This could be explained by the fact that these populations consider dental fluorosis as a normal alteration since it is found in almost everyone around them. However, almost 2/3 of the sample are girls who are more sensitive to aesthetic problems; in addition, the age of girls who are in adolescence promotes interest in smiling and therefore justifies their concern about colored teeth. Problems with "eating a meal or ice cream", "smiling, laughing and showing your teeth without feeling embarrassed" and "doing school activities" had little effect and were not considered severe on the correct performance of students' daily activities. No statistically significant relationship was found between fluorosis and age, between fluorosis and sex, between fluorosis and the socio-professional level of the parents. These results are similar to those of the studies by Edgard Michel-Crosato *et al.* [12] and Onoriobe *et al.* [13]. Of the eight activities studied, only the performance "performing school activities" was associated with dental fluorosis. This still poses the aesthetic problem of dental fluorosis. The various studies on the association between fluorosis, dental caries and quality of life in children show rather contrasting results. Peres *et al.* [14] showed that dental fluorosis had no impact on children's self-perception of appearance. Studies by Crosata *et al.* [12] have shown that there is no statistically significant relationship between dental fluorosis and the eight daily activities. Onoriobe *et al.* [14] also showed that the impacts of enamel fluorosis on the one hand, and dental caries on the other, on the quality of life related to oral health differ. There was no statistically significant association between fluorosis and impaired quality of life. Conversely, cavities had an impact on the quality of life of older children. For Aimée *et al.* [15], the increased impact of oral problems on quality of life was related to the severity of dentine damage in cavities, but fluorosis resulting from combined exposure to fluoride at an early age was not a concern for adolescents.

Opposing results showing that dental fluorosis had a negative impact on the quality of life related to children's oral health have been found in other studies [16-18].

Dental fluorosis directly or indirectly affects function and aesthetics. Indeed, Singh *et al.* [19] showed that there was a significant positive correlation between dental fluorosis and functional limitation and leisure activity on the one hand; and a significant negative correlation between dental fluorosis and oral symptoms on the other hand. Studies by Nilchian *et al.* [20] have shown that the increase in fluorosis severity was associated with increased dissatisfaction and decreased quality of life.

Conclusion

Although this study assessed the oral health-related quality of life in children with dental fluorosis in endemic fluorosis, it is necessary to continue the epidemiological study with a wide range of study participants.

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