



Prevalence of Enamel Fluorosis in Libyan Children-A Cross Sectional Study



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Abstract

Aims & Objectives: The aim of this study is to assess the prevalence of enamel fluorosis in Libyan school going children.

Materials & Methods: This study is a part of a cross-sectional investigation of aspects of dental health in 2015 School children aged between 6 -16 years old of both gender from rural and urban areas. The assessment of enamel fluorosis was limited to the labial surface of permanent incisor teeth. If there was fluorosis, the tooth or teeth were diagnosed as having fluorosis and coded according to the method produced by, Al-Alousi (1975).

Results: 2.3% of the children examined had enamel fluorosis. The proportion of boys and girls with fluorosis was 1.9% and 2.7% respectively. Girl had high prevalence of enamel fluorosis than boys. Type 'A' contributed to the majority of 60.8%, followed by Type 'C' 27.0%.

Conclusion: Libyan children show low prevalence of enamel fluorosis. Despite the low level of fluoride in main drinking water, the prevalence of enamel fluorosis may relate to drinking habits and consuming of water from other sources; i.e. wells and rainwater.

Keywords: Fluoride; Libyan; Enamel; Mottling; Fluorosis

Introduction

Fluorosis is caused by hypo mineralization in the enamel due to increased fluoride ingestion during early childhood [1-3]. A considerable amount of evidence has been reported over the years, which has shown that presence of fluoride ions at up to one part per million in public water supply has reduced the prevalence of teeth decay with minimal chance of dental fluorosis. The WHO recognized these facts by its resolution in 1969 [4] and 1975 [5], which stated that water fluoridation, where applicable, should be the cornerstone of any national policy of caries prevention. Optimally fluoridated water has proven to be the most effective preventive measure against dental caries [6]. The optimal concentration is defined as that which gives maximal protection against dental caries, with minimal clinically observable dental fluorosis [7]. This level is determined according to the climate and the resultant drinking habits [6]. Cawson¹ stated that mottling of enamel is the most frequently seen and most reliable sign of excessive quantities of fluoride in the drinking water. Dean [8] concluded that a fluoride level of above 1ppm does not significantly reduce caries beyond the optimal effect of 1ppm. Different

classifications have been introduced to score dental fluorosis [9-12] and the DDE (Developmental defects of Enamel) index by FDI 1982, [13] concluded that fluorosis indices, if used alone, could result in misdiagnosis of dental fluorosis and information about adverse health-related conditions linked to DDEs at specific positions on teeth could help to differentiate between genuine fluorosis and fluorosis-resembling defects. Different investigators have reported various figures for prevalence of enamel fluorosis. 39.2%, for Welsh children¹⁰, 32% for Nigerian children [14]. Using the DDE index of the FDI (1982), defective enamel of 48.9% was found in children from south Wales [10]. In England, the prevalence of fluorosis was 54% in the fluoridated area and 23% in the fluoride-deficient area [15]. In Iran the prevalence of fluorosis was 61% [16]. This study of enamel fluorosis was a part of large cross-sectional study design to investigate the aspects of dental health in Libyan children.

Material and Method

This study is part of a cross-sectional investigation of aspects of dental health in rural and urban Libyan school children. The

research protocol was assessed by Institutional ethical committee and Review board, Faculty of Dentistry, University of Benghazi, Libya and is registered in clinicaltrials.gov as NCT03746990 and follows (CONSORT) consolidated standard of reporting trials guidelines as well as the Helsinki declaration of Human research, as revised in 2013. Total of 2015 Libyan school children aged 7 to 16 years, from urban Tobruk and rural Kufra areas were included in the main study. The children were of almost equal number of both sexes from each age group (Table 1). The total of 1935 children were examined for enamel fluorosis, the remaining, eighty children were excluded because they failed to meet the inclusive criteria. The assessment of enamel fluorosis was limited to the labial surface of permanent incisor teeth. Teeth with class II fracture or crowned were excluded from assessment. If there was fluorosis, the tooth or teeth were diagnosed as having fluorosis and coded according to the method produced by Al- Alousi10, as follows

Table 1: Distribution of the study sample.

Age	Kufra		Tobruk		Total
	Boys	Girls	Boys	Girls	
7	45	46	61	55	207
8	46	42	57	60	205
9	41	43	61	61	206
10	41	36	42	48	167
11	44	43	59	53	199
12	44	43	71	59	217
13	40	43	45	60	188
14	43	42	61	67	213
15	46	44	63	55	108
16	54	39	59	53	205
Range	Total	Total	Total	Total	Total
7-16*	444	421	579	571	2015

*Age Range between 7-16.

- i. White areas less than 2mm in diameter.
- ii. White areas of or greater than 2mm in diameter.
- iii. Colored (brown) areas less than 2mm in diameter, irrespective of there being any white areas.
- iv. Colored (brown) areas of or greater than 2mm in diameter, irrespective of there being any white area.
- v. Horizontal white lines irrespective of there being any white, non-linear areas.
- vi. Colored (brown) or hypo-plastic areas.

Inclusive Criteria

- a) Libyan children born and lived in the same area.
- b) Limited to incisors only.

Exclusive Criteria

- a) Non- Libyan children.
- b) Children who born or lived outside the study areas.
- c) Incisors with class II fracture or crowned

Finding

All data collected from the 1935 children examined in this study were transferred to data files, using data entry program. Data were entered into SPSS the version 20.0, IBM corps, USA for percentages. Enamel fluorosis was assessed on the incisor teeth only. The prevalence of enamel fluorosis by area and sex is given in Table 2. It can be seen that 2.3% of the children examined had enamel fluorosis. The proportion of boys was 1.9% and girls, 2.7%. Comparable figures for Kufra were 2.0%, 1.6% and 2.6 %respectively and for Tobruk the figures were 2.6%, 2.2% and 2.8% respectively. Girl had high prevalence of enamel fluorosis than boys. Table 3 shows the prevalence of different type of enamel fluorosis. It can be seen from this table that type- 'A' contributed the majority, 60.8%, followed by Type C, 27.0%. The remaining a small proportion was shared by Type B and F (9.5% and 2.9%, respectively. Furthermore, Type D and E fluorosis were not found. The proportion of tooth type involved with enamel fluorosis is give in Table 4. It can be seen that most of the enamel fluorosis was found in the upper central incisors followed by lower central incisors and symmetrically distributed between the right and left side, i.e. between paired teeth.

Table 2: Prevalence of enamel fluorosis by area and sex.

Group	Kufra	Tobruk	Total
Boys	1.6	2.2	1.9
Girls	2.6	2.8	2.7
Total	2.0	2.6	2.3

Table 3: Prevalence of different types of fluorosis.

Type of mottling	Proportion
A	60.8%
B	9.3%
C	27.0%
D	0.0%
E	0.0%
F	2.9%

Alousis Classification of fluorosis graded as A-white area<2mm in diameter-white area>2mm, C-colored area<2mm, D-colored area>2mm, E-Horizontal white lines-colored areas.

Table 4: Proportion of incisors with fluorosis.

UR2*	UR1*	UL1*	UL2*	LR2*	LR1*	LL1*	LL2*
7.8	20.6	20.6	7.4	9.3	12.3	12.3	9.8

*UR2-Upper right lateral incisor *UL1-Upper left central incisor

*UR1- Upper right central incisor *UL2-Upper left lateral Incisor

*LR1- Lower right central incisor *LL1- Lower left central incisor

*LR2- lower right lateral incisor *LL2- Lower left lateral incisor

Discussion

Enamel fluorosis is considered to be the most reliable sign of excessive quantities of fluoride in the drinking water [1]. However, others have shown that fluorosis is also common in communities with little or no fluoride in the drinking water [2,10]. In this study the study sample is taken from Kufra and Tobruk. The official estimates of fluoride concentration in the drinking water are 0.75 and 0.2ppm respectively. It should be appreciated, however, that these estimates take account of well water, which are also in use. Enamel fluorosis was assessed using AL-Alousi's classification (1975) [10]. This classification was used because it is simple, and it depends on sound epidemiological principles and not on the basis of a reassumed aetiology as in Dean's classification (1934) [9]. It is also simple, descriptive and not weighted index. The result showed 2.3% of the children examined had enamel fluorosis. Girls have higher prevalence than boys. This finding agrees with the findings of Arpita and Jackson¹⁴ for Nigerian children (the prevalence was 29.8% for boys and 34.3 for girls). Tobruk children had a high enamel fluorosis than Kufra children (2.6% and 2.0% respectively) despite the level of fluoride in the main water supply in Kufra (0.75ppm) being higher than tobruk (0.2ppm). There is no certain explanation, but it could be due to the fact that in both areas people drink water from other sources, such as wells or rainwater, in which the level of fluoride is unknown. The most dominant type was type A (60.8%) followed by type C (27.0%).

The central incisors were found to be the tooth type most affected by fluorosis. This finding is in agreement with the finding of AL-Alousi [10] in English children and with finding of Akpata and Jackson [14] in Nigerian children. The right and left symmetry of enamel mottled incisors was striking, this may be because all incisors that mineralize contemporaneously would be expected to be affected by enamel opacities. Comparing the prevalence of enamel fluorosis of permanent incisors in Libyan children (2.3%) with, the similar study carried by in English children¹⁰ (F=0.9ppm), found that the mouth prevalence of 13 to 16-year-old was 39.2%. and the prevalence of fluorosis was 54% in the fluoridated area and 23% in the fluoride-deficient area [15]. The results of the present study demonstrated that Libyan children had a much lower of fluorosis in permanent incisors than did the English children [10,15] and in comparison with Iran, the prevalence of fluorosis was 61%.¹⁶ This result should be interpreted with prudence, because the generalized DDEs may be of genetic origin [17,18] or caused by malnutrition or diseases that occurred during early childhood [18,19]. Fluorosis and some other generalized DDEs are similar in appearance [20,21]. Therefore, the result provided base line data which should have priority in any further investigation.

Conclusion

The role of fluorosis in bringing out defects in enamel and other associated hard tissues of the teeth cannot be ruled out. To optimize fluoridation in drinking water is a challenge in developing countries. The present findings bring into the light, the role of naturally sourced water such as well water which has shown a decrease in fluorosis among Libyan children. Though it could be attributed to various causes, future studies need to be done to evaluate the levels of fluoride in different drinking sources and to optimize its availability to bring about a decrease in fluoride related defects globally.

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