AJMAS
https://journal.utripoli.edu.ly/index.php/Alqalam eISSN 2707-7179

Original article

Influence of Dental Fluorosis among Children of Libya

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ARTICLE INFO

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Received: 27-11-2022 ***Accepted***: 15-12-2022 ***Published***: 18-12-2022
Keywords: Dental Fluorosis; Oral Health; Fluoride Levels; Water Fluoridation.

ABSTRACT

Background and aims. *Dental fluorosis may be a condition brought on by societal inequality in access to clean water. The socially disadvantaged rural communities in fluoride-endemic areas lack a regular irrigation system, and their primary source of drinking water is groundwater that naturally contains fluoride, are most affected by this dental public health concern. Children's aesthetic discomfort brought on by the rising prevalence of dental fluorosis globally has the potential to produce psychological and behavioral issues in those who are affected. The aim of this study was to verify the prevalence of dental fluorosis in age between 6-9 year-old children who were school children in the public schools of north west of Libya, and its relationship with different fluoride degrees in the public water supply source.* ***Methods****. The study's participants included 315 children aged between 6 and 9 years (159 males and 156 females) who were schoolchildren in the public schools of North West of Libya. Study subjects were selected by systematic random sampling. The modified Dean's index utilized in the current study enables comparison between several dental fluorosis examinations and assessments of its reproducibility to demonstrate remarkable concordance.* ***Results****. This study found that the percentage of the majority of cases who drink home water desalination (HWD) was 28.9% (n=91) unaffected dental fluorosis, and 57.5% (n=181) have dental fluorosis. While, the cases who drink ground water was 4.8% (n=15) unaffected dental fluorosis, and 8.9% (n=28) have dental fluorosis.* ***Conclusion****. Fluorosis prevalence should be monitored continuously, and sources of fluoride intake in Libya should be further investigated. As a result, the hypothesis of the study showed that there were no statistically significant differences. Furthermore, several kinds of research focusing on various age groups and assessing dental fluorosis in primary teeth and permanent teeth should be conducted.*

Cite this article: *Shebani N, Dokhan T. Influence of Dental Fluorosis among Children of Libya. Alq J Med App Sci. 2022;5(2):596-601.* https://doi.org/10.5281/zenodo.7452399

INTRODUCTION

Fluorine is a natural element that has been observed to exist in many mineral forms. Geographic activity such as weather and volcanoes may cause an increased its quantity within drinkable water [1]. Human bodies require fluorine in order to mineralize teeth, bones, and other hard tissues. Small amounts of fluorine must be taken for normal bone and tooth formation, which can be obtained from drinking water, seafood, cheese, and tea [2,3]. In children between 3 and 6, dental fluorosis is more likely to occur since the permanent dentition develops during this period. Due to the benefits of reduced dental cavities, fluoridating public water sources is widely accepted [4,5].

A sluggish and progressive health problem called fluorosis can be caused by excess fluoride concentrations in water [6]. The World Health Organization (WHO) recommends that fluoride levels in water does not exceed 1.5 mg/l so as not to cause bone and tooth decay. When fluoride is chronically present in the mouth, both the aesthetics and the formation of teeth are affected. There is a disruption of enamel formation and mineralization at both the intracellular and extracellular levels [7,8], and the presence of lesions caused by fluorosis is correlated with substantial consumption of the same during the critical developmental phase (post secretory or early maturation phase), during which the tooth itself is developing. It has been observed that fluorosis causes enamel to become more porous at the microscopic level. Thus, the more fluoride in the enamel, the more porous it is [7,9-10]. The enamel crystals are arranged normal structure, but increasing intercrystalline space lead to increasing porosity [7,11-12]. Many epidemiological studies consider these symptoms essential risk factors for other systemic diseases [9,11,13-20]. It has been shown that fluorosis on the surface of the tooth and its distribution within the mouth present very characteristic characteristics [7,9,18,19,21-22]. There is a risk of developing fluorosis from birth until the age of eight,

and dental aesthetics may become impaired from birth until the age of six. This usually happens to premolars and they get a lot of damage [14,15-23]. The clinical appearance of enamel fluorosis is white opaque lines or spots, or even a white parchment-like layer on the teeth. Occasionally, severe-to-moderate fluorosis can occur, and brown stains can appear from extrinsic stains absorbed from food. The presence of extrinsic stains is also associated with discrete pitting in severe fluorosis. There is an asymmetrical distribution of the fluorosis, but the severity varies [9,13-17].
We have therefore conducted this study in order to verify the prevalence of dental fluorosis in age between 6-9 year-old children who were school children in the public schools of north west of Libya, and its relationship with different fluoride degrees in the public water supply source.

METHODS

Study design

The research is an epidemiological observational and cross-sectional study accomplished by the Dental Technology Research Group (University of Zawia). This study looked at 315 children aged between 6 and 9 years (159 males and 156 females) who were school children in the public schools of North West of Libya. The data conducted it under the direction of the World Health Organization (WHO), the prevalence of dental fluorosis was determined using the oral health assessment form (1986). Several dental fluorosis studies can be compared using the modified Dean's index utilized in this work, and assessments of its reproducibility reveal excellent concordance.
The Modified Dean's Fluorosis Index was used for dental assessment [24]:
i) Unaffected (normal): the enamel had a translucent appearance, and the tooth surface exhibits a glossy, smooth appearance. The color of such a tooth holds a pale or white shade.
(ii) Questionable: the enamel presents some changes from the discussion above. The tooth can present an occasional white fleck or spots. It is applying in cases where "definitive determination of the mildest form of fluorosis is not warranted and a classification of unaffected is not justified."
(iii) Very mild: "small opaque paper-white areas are scattered over the tooth surface but do not involve as much as 25% of the surface."
(iv) Mild: "white opaque areas on the surface are more extensive but do not involve as much as 50% of the surface."
(v) Moderate: 50% of the surface presents white opaque patches.
(vi) Severe: the entirety of the tooth's enamel is impacted; the classification is marked by confluent or discrete pitting.
This study was performed by a trained group. The examination and training processes were standardized and calibrated between the examiners by using the same index. All questions about dental fluorosis and a guide for obtaining an estimate of the extent and nature of the diagnosis. To get good concordance, oral exams were conducted.
The exams were administered in the classrooms under natural light at a standardized time of day, using school chairs and desks and sterilized plane oral retractors. A previously validated, structured questionnaire was presented to the subjects who presented with fluorotic spots, under the supervision of the responsible researcher, in order to obtain their esthetic perception in relation to dental fluorosis.

Statistical Analysis

Data were statistically analyzed by using IBM Statistical Package for Social Science (SPSS), Version 21.0 (SPSS, Chicago, IL, USA). The association between dental fluorosis and drink water supply were calculated by Pearson Chi-Square and one way – ANOVA test were used for multiple comparisons between the groups. A p-value of <0.05 was considered statistically significant.

RESULT

The study included 315 cases, (159 males and 156 females), 33.7 % of cases (n= 106 (41 males, 65 females)) was showed unaffected dental fluorosis, while 66.3% of cases (n= 209 (118 males, 91 females)) was showed that have dental fluorosis with different degree a severity, as shown in Table 1.

Table 1. Dental fluorosis, Gander - Cross tabulation

Dental Fluorosis		Gender		Total
		Male	Female	
No Fluorosis	Count	41	65	106
	% of Total	13.0%	20.6%	33.7%
Fluorosis	Count	118	91	209
	% of Total	37.5%	28.9%	66.3%
Total	Count	159	156	315
	% of Total	50.5%	49.5%	100.0%

The results of this study showed that the percentage of the majority of cases who drink ground water was 4.8% (n=15) unaffected dental fluorosis, and 8.9% (n=28) have dental fluorosis. While, the percentage of the majority of cases who drink 'home water desalination' (HWD) was 28.9% (n=91) unaffected dental fluorosis, and 57.5% (n=181) have dental fluorosis, as shown in Table 2.

Table 2. Dental fluorosis, drink water supply – Cross tabulation

Dental Fluorosis		Drink water supply		Total
		Ground water	HWD	
No Fluorosis	Count	15	91	106
	% of Total	4.8%	28.9%	33.7%
Fluorosis	Count	28	181	209
	% of Total	8.9%	57.5%	66.3%
Total	Count	43	272	315
	% of Total	13.7%	86.3%	100.0%

Otherwise, the result of this study showed that 4.4% (n=14) of drinking ground water cases, and 28.9% (n=91) who drink public water case were unaffected (normal). Also, 1.6% (n=5) of drinking ground water cases, and 6.3% (n=20) who drink public water case were Questionable. Additionally, 4.4% (n=14) of drinking ground water cases, and 28.3% (n=89) who drink public water case were very mild. Furthermore, 1.9% (n=6) of drinking ground water cases, and 17.1% (n=54) who drink public water case were mild. Also, 0.3% (n=1) of drinking ground water cases, and 2.9% (n=9) who drink public water case were moderate. While, 1.0% (n=3) of drinking ground water cases, and 2.9% (n=12) who drink public water case were sever, as shows in Figure 1 and Table 3.

Table 3. Drink water supply, dental fluorosis degree - Cross tabulation

Drink water supply		Dental fluorosis degree						Total
		Normal	Questionable	Very Mild	Mild	Moderate	Severe	
ground water	Count	14	5	14	6	1	3	43
	% of Total	4.4%	1.6%	4.4%	1.9%	0.3%	1.0%	13.7%
HWD	Count	91	20	89	54	9	9	272
	% of Total	28.9%	6.3%	28.3%	17.1%	2.9%	2.9%	86.3%
Total	Count	105	25	103	60	10	12	315
	% of Total	33.3%	7.9%	32.7%	19.0%	3.2%	3.8%	100%

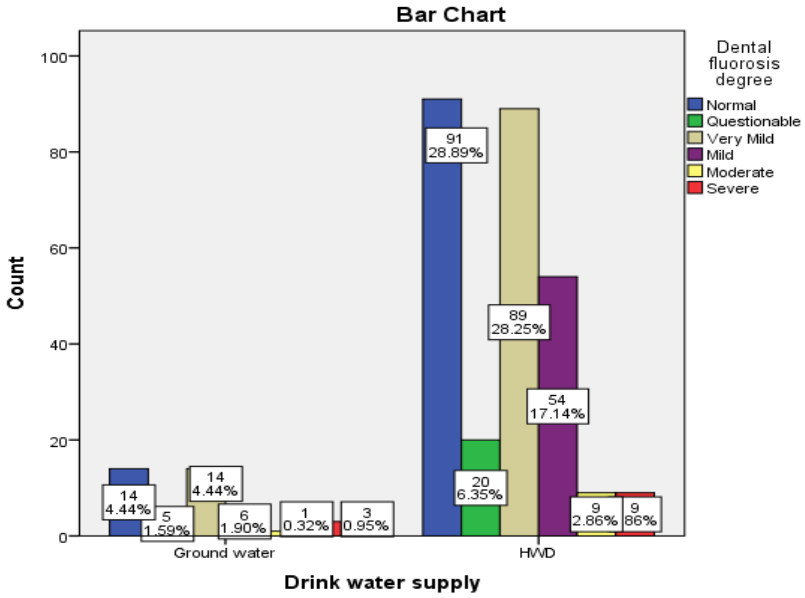

Figure 1. Drink water supply, Dental fluorosis degree distribution

In addition, the result showed that the association between dental fluorosis and drink water supply were calculated by in Pearson Chi-Square and one way – ANOVA test and showed that A *p*-value of > 0.05 in Pearson Chi-Square (p= 0.854) also the analysis showed A p-value of > 0.05 in one way – ANOVA test (p= 0.854) so By collecting samples and comparing them, there were no significant statistically differences as shows in table 4.

Table 4. The association between dental fluorosis and drink water

Pearson Chi-Square	Number of Valid Cases	Value	Sig. (2-tailed)
	315	**0.034**	**0.854**
One way – ANOVA	**315**	**-**	**0.854**

DISCUSSION

Typically, drinkable water consists desalinated or groundwater-desalinated mixtures. In the region, two-thirds of households have access to low-cost energy. Dental caries can be decreased by community water fluoridation by reducing fluoride levels in the water [25]. Moreover, it's a safe and cost-effective way to prevent dental decay [26]. When fluoride levels go up in water, it may be caused teeth fluorosis [27].

Study purposes included evaluation how prevalent fluorosis is within North West Libya, estimating the extent of fluorosis distribution based on gender, drinking water source, and its impact. Water with more fluorosis would be caused a spike in a severity and prevalence. Furthermore, the prevalence in optimal areas was considerably.

Nonetheless, the possibility of that happening in this study was similar to studies in USA and Mexico that indicated fluorosis. Rugg-Gunn et al. [30] found 83% enamel mottling in 14-year-olds in Riyadh in their study. According to Akpata et al. [31] were reported that 90% of the children of school-going age were affected in Hail, Saudi Arabia. Alhobeira et al conducted another study; they examined 253 participants and reported a prevalence of mild to moderate fluorosis of 73.5% [32]. The most recent study by Haridi et al. examined 626 people and discovered that 77.32% of them had dental fluorosis overall. [33], so these findings are very much in line with the result of this study. On the other hand, Vigild et al. examined low-fluoride zones in Kuwait; they found a prevalence of 6% for the 12–15 age group, significantly lower than that discovered in this study [34]. In addition, according to a study done in Al Madinah, Saudi Arabia, reported a 0% prevalence of dental fluorosis among 360 participants. Only this study reported no evidence of the prevalence of dental fluorosis. According to the author, the sampled population's use of bottled water as a source of this may be the cause [35].

CONCLUSION

Fluorosis prevalence should be monitored continuously, and sources of fluoride intake in Libya should be further investigated. As much as drinking water is the major factor contributing to fluoride consumption, we still need to consider that there are multiple factors contributing to fluoride intake such as tooth paste, industrial waste and pollution containing fluorine as well. Furthermore, fluorosis prevention education and community awareness are needed for early intervention to prevent problems with dental and periodontal health. As a result, according to the hypothesis of the study showed that there were no statistically significant differences. Furthermore, several researches focusing on various age groups and assessing dental fluorosis in primary teeth and permanent teeth should be conducted.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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