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Prevalence and severity of dental fluorosis among primary school children in AlRass, Saudi Arabia

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Abstract

Background: Dental fluorosis is considered one of the dental public health problems in many countries especially those with high level of fluoride in drinking water.

Objective: The present study was carried out to assess prevalence and severity of dental fluorosis among an urban and rural population of Al-Rass and two rural suburbs primary schools. MATERIALS AND METHODS: Samples were surveyed from Urban and rural primary schools, at Al Rass city and two of its suburbs. A total of 1292 children participated in the study with mean age 8.54 ± 1.75 years old. The examiners used Dean's index criteria to note the distribution pattern of any defects..

Results: It was found that almost half of Rass children aged 6-12 years old have sort of fluorosis and in Dulaimia, the fluorosis in 61.2%. The highest percentage in fluorosis was found in Delaa' Rasheed with more than three quarter of children have fluorosis (75.4%).

Conclusions: The urban regions seem to be the least affected whilst rural regions seem to be the most affected in term of overall prevalence, and severity degrees range from mild to moderate grades of fluorosis were reported to be very dominant among their which could be as a consequence of shortage of dental care providers and the insufficiency of the healthier sources of drinking water.

Keywords: dental fluorosis, enamel hypo mineralization, rural areas

Introduction

Fluorides occur naturally in soil, water, plants, animals and humans in trace quantities. The natural concentration of fluoride in water depends on several contributing factors such as pH, total dissolved solids, alkalinity, the porosity and acidity of the soil and rocks, the temperature, the depth of wells, etc. [1, 2, 3].

Dental fluorosis is a developmental disturbance of dental enamel, caused by chronic and excessive ingestion of high concentrations of fluoride during tooth development, leading to enamel with lower mineral content and greater porosity [4].

Excessive fluoride ingestion can cause dental fluorosis and skeletal fluorosis. The World Health Organization (WHO) in 2006 listed 28 countries for which there is epidemiological evidence of dental fluorosis and reported that approximately 70 million people may be affected worldwide [5].

The mechanism of fluorosis involves an inadequate substitution of the organic enamel matrix by inorganic material, which results in the hypomineralization of the fluorotic enamel. (Wei *et al*., 2013) [7]. Dental fluorosis at low levels exhibits discrete changes in tooth color and is associated with a lower risk of dental caries. In contrast, severe forms of dental fluorosis result in the staining and pitting of the enamel, and in very severe cases, the deterioration of tooth structure may occur [6, 7].

According to the human data of dental fluorosis, the children younger than 6–7 years' old who have lived in fluoride contamination area for a long time are susceptible to dental fluorosis, as fluoride easily target enamel in the developing and mineralizing process (Dhar and Bhatnagar, 2009). The prevalence and severity of dental fluorosis in primary teeth are different from permanent teeth [8, 9, 10].

The exposure to fluoride and the degree of accumulation in mineralized tissues will vary with lifespan, foraging range, feeding strategy, acidity within the digestive system, and the presence of complexing agents in the diet [11, 12].

Saudi Arabian population also suffers from the menace of fluorosis as an abundance of the well water is still consumed in remote parts of the country [13, 14].

To the best of our knowledge in Saudi Arabia there are some studies that determine dental fluorosis prevalence, severity and some also measure the concentration of fluoride present in well water, that earlier was the primary source of drinking water but these studies are insufficient to come to reach any conclusion and none includes the measurement of topical use of fluoride, in addition none indicated the consumption of fluoride-containing diet [15, 16].

The data on prevalence and severity of fluorosis are scanty in the rural and urban areas of Al Qassim. The present study was carried out with the objective of assessing the prevalence and severity of dental fluorosis among the urban and rural population in Al Rass Primary schools.

Material & Methods

Design

World Health Organization (WHO) oral health form was used to survey the population.

Setting

Subjects were surveyed from Urban and rural primary schools, at Al Rass city and two of its suburbs.

Subjects

A total of 1292 children participated in the study with mean age 8.54 ± 1.75 years old. 668 children from Rass city (51.9 % males and 48.1% females), 366 children in Delaa' Rasheed (53% males and 47% females) and from Dulaimia only 258 children (58.9% males and 41.1% females).

Criteria

Inclusion Criteria

1. Male or female volunteers 6-12 years of age
2. Good general health
3. Must sign informed consent form
4. No history of allergy to personal care consumer products, or their ingredients, relevant to any ingredient in the test products as determined by the dental/medical professional monitoring the study.

Exclusion Criteria

1. Subjects unable or unwilling to sign the informed consent form.
2. Medical condition which requires pre-medication prior to dental visits/procedures
3. Moderate or advanced periodontal disease or heavy dental tartar (calculus).

Calibration

For reliability and consistency examinations were performed by 4 examiners from college of dentistry, Qassim University. Calibration was carried out before the main study by examining a preselected 25 children twice by time interval 2 days. The Kappa score was above 0.82. The examiners thoroughly reviewed and understood the "Criteria for Dental Fluorosis Examinations in the permanent Dentition" document prior to beginning the examination of the subjects.

The elements of the training program included:

1. Review of criteria and protocol
2. Review of slides (PowerPoint) depicting the criteria (available on the UCSF Confluence Wiki: http://wiki.ucsf.edu)
3. Evaluation of trainees' knowledge of the criteria
4. Demonstration Examinations
5. Practice Examinations

Equipment and Supplies

The equipment and supplies needed for the clinical examination were as follows:

- Two chairs of equal height.
- Portable dental chair or similar.
- Chairs for examiner, recorder and parent(s) of subject children
- Tables or countertops for instruments and computer
- Disinfecting wipes • Hand sanitizers
- Gloves, masks, protective eyewear • Surgitel® 1-watt head lamp
- Defend Mirrorlite® mirror system
- New or charged batteries • 2 x 2 gauze
- Patient napkin • Waste baskets/trash bags

Clinical Examination

Enamel Fluorosis

The examiner should note the distribution pattern of any defects, using Dean's index criteria [17], and make a decision as to whether they are typical of fluorosis. Defects falling into the "questionable" to "mild" categories – the conditions most likely to be encountered – may consist of fine white lines or patches and tend to fade into the surrounding enamel.

Coding was done on the basis of the two most severely affected teeth. If the two teeth were not equally severely affected, the score was based on the appearance of the less affected tooth. When the teeth were scored, the examiner should start at the higher end of the index, "severe", and eliminate each score until he or she arrived at the condition present. If there is any doubt, the lower score should be given.

The codes and criteria were as follows:

0 = Normal. Enamel surface is smooth, glossy and usually a pale creamy white color (see Figure 29)

1 = Questionable. The enamel shows slight aberrations in the translucent normal enamel and which may range from a few white flecks to occasional spots (see Figure 30–33)

2 = Very mild. Small, opaque, paper-white areas scattered irregularly over the tooth but involving less than 25% of the labial tooth surface (see Figure 34 and 35)

3 = Mild. White opacities of the enamel involving more than 25% (see Code 2) but less than 50% of the tooth surface (see Figure 36 and 37)

4 = Moderate. The enamel surfaces show marked wear, and brown staining is frequently a disfiguring feature (see Figure 38 and 39)

5 = Severe. The enamel surfaces are severely affected and the hypoplasia is so marked that the general form of the tooth may be affected. There are pitted or worn areas and brown stains are widespread; the teeth often have a corroded appearance (see Figure 40 and 41)

8 = Excluded (e.g. a crowned tooth)

9 = Not recorded

Fig 1

Fig 2

Statistical Analysis

Data were analyzed and tabulated using Scientific Package for Social Sciences (SPSS by IBM) version 20 for window. Descriptive data were displayed in the form of frequency and percentages. Kappa test was used for inter-examiner agreement. Comparison between different areas was carried out using Chi-Square test at significance level $p<0.01$.

Results

The Study obtained from total sample 1292 children with mean age 8.54 ± 1.75 years old. 668 children from Rass city (51.9 % males and 48.1% females), 366 children in Delaa' Rasheed (53% males and 47% females) and from Dulaimia only 258 children (58.9% males and 41.1% females (table 1).

Table 1: Descriptive statistics for sample population

	Gender					
	Males		Females		Total	
	No	%	No	%	No	%
Rass	347	51.9%	321	48.1%	668	100.0%
Rasheed	194	53.0%	172	47.0%	366	100.0%
Dulaimia	152	58.9%	106	41.1%	258	100.0%

By considering Normal and Questionable degrees as absence of fluorosis and all other stages as fluorosis present cases (Figure 3), it was found that almost half of Rass children aged 6-12 years old have sort of fluorosis and in Dulaimia, the fluorosis in 61.2%. The highest percentage in fluorosis was found in Delaa' Rasheed with more than three quarter of children have fluorosis (75.4%).

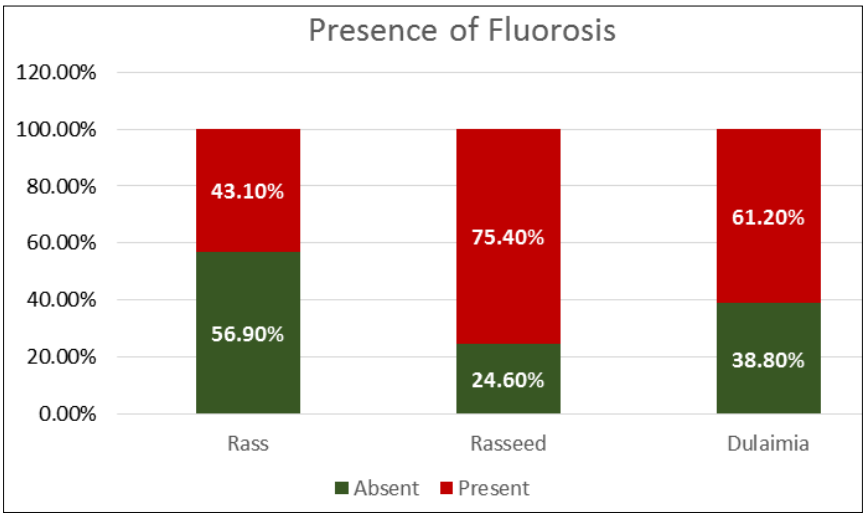

Fig 1: Percentage of Fluorosis presence in different areas

According to Dean's index for dental fluorosis, the more moderate and severe cases were found in Dulaima (16.3% and 14.7% respectively). In Rass City more than half of children were normal (51.8%) while in Delaa' Rasheed the mild cases were the most common (31.1%) with highly statistically significant difference between the 3 groups (p<0.001) (Table 2)

Table 2: Fluorosis according to Dean's index in the study groups

	Area								X^2 (p)
	Rass		Rasheed		Dulaimia		Total		
	No	%	No	%	No	%	No	%	
Normal	346	51.8%	52	14.2%	62	24.0%	460	35.6%	201.728 (p<0.001)*
Questionable	34	5.1%	38	10.4%	38	14.7%	110	8.5%	
Very Mild	58	8.7%	66	18.0%	34	13.2%	158	12.2%	
Mild	76	11.4%	114	31.1%	44	17.1%	234	18.1%	
Moderate	78	11.7%	52	14.2%	42	16.3%	172	13.3%	
Severe	76	11.4%	44	12.0%	38	14.7%	158	12.2%	
Total	668	100.0%	366	100.0%	258	100.0%	1292	100.0%	

X^2: chi square test.
*: significant at p<0.01

Discussion

Dental fluorosis is considered one of the dental public health problems in many countries especially those with high level of fluoride in drinking water. The peak prevalence is in hilly areas where fluoride is naturally exists. In this regard, Saudi Arabia is not an exemption.

To the best of our knowledge in Saudi Arabia, there are few studies that determine dental fluorosis prevalence, severity in different regions. One study was made by Al-Shammary *et al*. in 1997 to determine the prevalence and severity of fluorosis among 10 regions [18].

However, the data reproduced was obtained of the sample from all regions of Saudi Arabia and was not specified region wise which can be misleading for various reasons in term of the prevalence of dental fluorosis in each region. A single study was found aimed at examining the prevalence of dental fluorosis in Qassem region by Kh Almas *et al*. at 1999 [19].

The current study aimed to identify the prevalence and severity of dental fluorosis in AlRass city and two rural suburbs in Qassem Province, Saudi Arabia. The sample size formed of 1292 children with mean age 8.54 ± 1.75 years old.

Dean's index had been used in categorization of different grades of dental fluorosis. Normal and Questionable degrees were considered as absent of fluorosis for exclusion of any doubt in the definite diagnosis for presence or absence of dental fluorosis. and all other stages as fluorosis present cases [17].

The results revealed that, 43.1% of Al Rass children aged 6-12 years old have a degree of dental fluorosis and in Dulaimia, the percentage of fluorosis was found to be 61.2%. The highest percentage in fluorosis was found in Delaa' Rasheed with more than three quarter of children have fluorosis (75.4%).

These results come in accordance with the results of Alhobeira *et al*, who revealed a percentage of 75% had fluorosis in Hail region and these agreements might be due to both populations have the same sources of fluoride in foods and drinking water [13].

In contrary, in Al shammary *et al*. [18], study the prevalence of dental fluorosis varied greatly based on various age groups. A low prevalence of around 8 % was reported among 5 -6 years of age to a high of around 38 % amongst 20-29 years of age[19]. The difference might be due to different inclusion criteria especially the selected age range in the two studies.

The current study also reported significant difference in dental fluorosis among people living in urban area represented in

AlRass population and rural areas represented in the other two suburbs. These come in agreement with the results showed in Dosari *et al*, during 2010 [16].

The resemblance in the two studies could be as a result of the more awareness of the urban population about the hazards of excess fluoride in drinking water and the availability of the dental health care services there than the more rural areas and, probably because of use of bottled water in the big cities.

According to the results shown in this study, the more moderate and severe cases were found in Dulaima (16.3% and 14.7% respectively). While in Rass City more than half of children were normal (51.8%) while in Delaa' Rasheed the mild cases were the most common (31.1%) with a highly statistically significant difference between the 3 groups. These results may be probably because of use of bottled water, and the availability of the dental health education and health promotion programs This was very similar to the results revealed by Al-Shammery *et al*. [18].

Conclusion.

The present study revealed negligence in the dental treatment of children from rural areas resulting in the high prevalence of dental fluorosis in primary schools. Urban regions seem to be the least affected, Whilst rural regions seem to be the most affected in term of overall prevalence, and severity degrees range from mild to moderate grades of fluorosis were reported to be very dominant among their which could be as a consequence of shortage of dental care providers and the insufficiency of the healthier sources of drinking water.

Recommendation

Based on the results of the current study following is recommended;

1. More dental health education and promotion programs should be available to the rural areas.
2. Measuring the fluoride levels and determining the optimum level in drinking water separately for rural and urban population.
3. De-fluoridation of water in areas with high level of fluoride.
4. Limiting unnecessary supplements of topical fluoride in young children
5. Promotion of balanced diet and measurement of dietary intake of fluoride- enriched food.

References

1. Harrison PTC. Fluoride in water: A UK perspective. Journal of Fluorine Chemistry. 2005; 126:1448-56.
2. Msonda KWM, Masamba WRL, Fabiano E. A study of fluoride groundwater occurrence in Nathenje, Lilongwe, Malawi. Phys Chem Earth. 2007; 32(15/18):1178-84.
3. Viswanathan G, Jaswanth A, Gopalakrishnan S, Sivailango S. Mapping of fluoride endemic areas and assessment of fluoride exposure. Sci Total Environ. 2009; 407(5):1579-87.
4. Fejerskov O, Manji F, Baelum V. The nature and mechanisms of dental fluorosis in man. J Dent Res. 1990; 69:692-700;
5. Fawell J, Bailey K, Chilton J, Dahi E, Fewtrell L, Magara Y. Fluoride in Drinking-water. World Health Organization. 2006; 208:693-13.
6. Fejerskov O, Larsen MJ, Richards A, Baelum V. Dental Tissue Effects of Fluoride. Adv Dent Res. 1994; 8(1):15-31.
7. Wei W, Gao Y, Wang C, Zhao L, Sun D. Excessive fluoride induces endoplasmic reticulum stress and interferes enamel proteinases secretion. Environ Toxicol. 2013; 28(6):332-41.
8. Dhar V, Bhatnagar M. Physiology and toxicity of fluoride. Indian J Dent Res. 2009; 20(3):350.
9. Ruan JP, Wang ZL, Yang ZQ, Bardsen A, Astrom An, Bjorvatn K. Dental fluorosis in primary teeth: a study in rural schoolchildren in Shaanxi Province, China. Int J Paediatr Dent. 2005; 15(6):412-9.
10. Warren JJ, Levy SM, Kanellis MJ. Prevalence of dental fluorosis in the primary dentition. J Public Health Dent. 2001; 61(2):87-91.
11. Kierdorf U, Bahelková P, Sedláček F, Kierdorf H. Pronounced reduction of fluoride exposure in free-ranging deer in North Bohemia (Czech Republic) as indicated by the biomarkers skeletal fluoride content and dental fluorosis. Sci Total Environ. 2012; 414:686-95.
12. Rao N. Fluoride and environment - a review. Proc Third Int Conf Environ Heal, 2003, 386-99.
13. Alhobeira HA, Siddiqui AA, Mian RI, Siddiqui A. Dental fluorosis in Hail: A prevalence study… Alhobeira HA, *et al*. Prevalence and Severity of Dental Fluorosis in Hail, Saudi Arabia. J Int Oral Heal. 2015; 7(12):1-4.
14. Khan N. Dental caries, hygiene, fluorosis and oral health knowledge of primary school teachers of Riyadh, Saudi Arabia. Saudi Dent J. 2001; 13(3):128-32.
15. Akpata ES, Fakiha Z, Khan N. Dental fluorosis in 12–15-yearold rural children exposed to fluorides from well drinking water in Hail region of Saudi Arabia. Community Dent Oral Epidemiol. 1997; 25(4):324-327.
16. Aldosari AM, Akpata ES, Khan N. Associations among dental caries experience, fluorosis, and fluoride exposure from drinking water sources in Saudi Arabia. J Public Health Dent. 2010; 70(3):220-6.
17. Dean HT. Classification of Mottled Enamel Diagnosis. J Am Dent Assoc. 1934; 21(8):1421-6.
18. Alshammery AR, Guile EE, Elbackly M. The prevalence of dental fluorosis in Saudi Arabia. Saudi Dent J. 1997; 9(2):58-61.
19. Almas K, Shakir ZF, Afzal M. Prevalence and severity of dental fluorosis in Al-Qaseem province--Kingdom of Saudi Arabia. Odontostomatol Trop. 1999; 22(85):44-7.