

## Prevalence and Severity of Dental Fluorosis in Hail, Saudi Arabia

Hazza A Alhobeira<sup>1</sup>, Ammar Ahmed Siddiqui<sup>2</sup>, Rashid Iqbal Mian<sup>3</sup>

### Contributors:

<sup>1</sup>Assistant Professor, Department of Restorative Dentistry, College of Dentistry, University of Hail, Hail, Saudi Arabia; <sup>2</sup>Lecturer and Course Director, Department of Dental Public Health, College of Dentistry, University of Hail, Hail, Saudi Arabia; <sup>3</sup>Lecturer, Department of Restorative Dentistry, College of Dentistry, University of Hail, Hail, Saudi Arabia.

### Correspondence:

Dr. Siddiqui AA. Dental Public Health College of Dentistry, University of Hail, Hail City, Saudi Arabia. Phone: 00966-553226295. Email: ammarqta2002@hotmail.com

### How to cite the article:

Alhobeira HA, Siddiqui AA, Mian RI. Prevalence and severity of dental fluorosis in Hail, Saudi Arabia. J Int Oral Health 2015;7(12):1-4.

### Abstract:

**Background:** This study aimed to identify prevalence and severity of dental fluorosis and also its association with various sources of drinking water among respondents of Hail province, Saudi Arabia.

**Materials and Methods:** Descriptive study with cross-sectional design having a sample size of 253 obtained from Raosoft sample size calculator. The margin of error was kept at 5%. The confidence level for the study selected at 95%, and the response rate was set at 80%. Dean index was used as a study tool. Responses were collected and descriptive statistics, the Chi-square tests performed.

**Results:** Prevalence of dental fluorosis was found to be 73.5%. In term of overall prevalence among gender, results were not significant with male 70% and female 77.6% affected by dental fluorosis. A significant association was found in between severity of dental fluorosis and different sources of drinking water  $P < 0.001$  on the Pearson Chi-square test using SPSS version 20.

**Conclusion:** Prevalence of dental fluorosis was found to be very high in general and also if compared to limited studies available in Kingdom. The study was first of its kind which provided baseline data on the concerned issue and recommended further research on contributing factor corresponding to dental fluorosis in Hail and other cities of Saudi Arabia.

**Key Words:** Dental, fluorosis, prevalence, severity

### Introduction

There exists a relationship of fluoride on health in term of its effect. As per-oral health is concerned appropriate evidence accept the significant role of fluoride in the reduction of costly non-communicable disease that is dental caries. However, evidence also supports the consequences related to excessive intake of fluoride on oral health in term of dental fluorosis.<sup>1</sup> Dental fluorosis clinically manifest as

white spots, opaque lines, pits in enamel surface, and dark brown to black discoloration depending on the severity of chronic exposure to high fluoride.<sup>2</sup> The affects have a direct relation to the consumption, timing and duration of fluoride exposure, although no identifiable minimal threshold dose is recognized where affects will not be evident clinically. The importance of fluoride in the reduction of caries is considered a main preventive element. As a result community water fluoridation was developed to limit dental decay.<sup>3</sup> During the 1980s among United States (US), population severity of dental fluorosis was reported to be increased, probably because of the intervention of many other available sources of fluoride such as tooth paste, and relevant fluoride containing supplements. The range of very mild, mild, moderate, and severe fluorosis were reported higher in adolescents aged 12-15 in 1999-2004 then in 1986-87.<sup>4</sup> Dental fluorosis is a dental public health concern in countries or areas enriched with a high amount of natural existing fluoride.<sup>5</sup> In this regard Hail province of Saudi Arabia is no exemption, in a study by Ng and Manton (2007), reported no clinical association between the increased levels of fluorosed enamel and caries reduction, thus an association between increased enamel fluoride and community water fluoridation is not a reasonable argument for pre-eruptive beneficial effects of fluoride.<sup>6</sup> In Kingdom of Saudi Arabia to the best of our knowledge, an attempt was made by Al-Shammery *et al.* in 1996-97 to determine the prevalence and severity of fluorosis among 10 regions.<sup>7</sup> However, the data reproduced was representative of sample from all regions of Saudi Arabia and was not categorized region wise which can be misleading for various reasons in term of prevalence of dental fluorosis in Hail. Further, no association among severity of fluorosis in relation to the source of drinking water was described in any study. Nevertheless, a study by Akpata *et al.* 1997 in Hail region of Kingdom of Saudi Arabia investigated the optimum level of fluoride present in well water in contrast with the severity of dental fluorosis and reported a significant association between fluoride level in well drinking water and severity of dental fluorosis among 11-15 years of age.<sup>8</sup> This study aimed to provide the prevalence and severity of dental fluorosis and also its association with various sources of drinking water among Hail population on various age groups.

### Materials and Methods

It was a descriptive study having a cross-sectional design. The study tool for the study was Dean Index, which was introduced by Dean in 1934.<sup>9</sup> It's the first ever index for measurement

of prevalence and severity of dental fluorosis and is widely recognized and accepted until date. The sample for the study includes patients and their attendant who came for a routine dental checkup from October 2014 until December 2014 among various dental clinics in Hail, Saudi Arabia. Sample size calculation was performed using Raosoft sample size calculator. Suggested sample size was 246 for this study. The margin of error was kept at 5%. The confidence level for the study selected at 95%, and the response rate was set at 80%. However, 300 respondents were approached and 253 agreed to participate. Descriptive statistic was calculated on SPSS version 20. Data displayed in the form of number and percentage. For the association between dental fluorosis and various age groups, Chi-square test was used.  $P < 0.05$  was considered significant. Oral examination using dean index was carried out by two licensed and experienced dentists after formal training. For reliability and reproducibility examiner calibration was done by examining 10 respondents twice separated by 1 week time. Intra-examiner consistency was up to 93% and Kappa statistical value was 0.88, thus exemplifying suitable level of concordance.<sup>10</sup> For identification of source of drinking water a self-administered validated questionnaire was used after pre testing it on 10 respondent separated by 1 week using cronbach's alpha test giving a statistical value (0.88) for internal consistency. Verbal consent was taken before examination. Ethical approval was granted from Ethical Committee University of Hail Saudi Arabia.

## Results

This descriptive study obtained samples from 253 subjects at a response rate of 85%. Almost 50% each from males and females. The participants were classified into four age groups, categorized as 10-20 years, 20-30 years, 30-40 years, and 40 years or above (Table 1). Prevalence between genders of mentioned age groups was presented in (Table 2). Severity of dental fluorosis among affected respondents is mentioned in (Table 3). Prevalence of fluorosis was 73.5%. Statistically no significant difference was identified among genders in all the reported age groups except age grouped of 30-40 years. However, prevalence of dental fluorosis in female was 7.6% higher than male (Table 2).

Table 3 indicated the severity of dental fluorosis among respondents based on their source of drinking water. Most of them were affected by mild to moderate extent (Table 3). Eight individuals reported to have severe dental fluorosis. On Chi-square test significant associations was identified among various sources of drinking water and extent of dental fluorosis  $P < 0.001$ .

## Discussion

The presented study aimed at providing data on prevalence and severity of dental fluorosis in Hail region of Saudi Arabia. Based on our best knowledge, there are few studies on concerned topic in Saudi Arabia and none includes specifically samples

Table 1: Characteristic of participants.

Age group (years)	n (%)		
	Male	Female	Total
10-20	68 (53.1)	44 (35.2)	112 (44.2)
20-30	33 (25.7)	31 (24.8)	64 (25.3)
30-40	19 (14.9)	39 (31.2)	58 (23)
40 and above	8 (6.3)	11 (8.8)	19 (7.5)
Total	128 (50.5)	125 (49.5)	253 (100)

Table 2: Prevalence of dental fluorosis and its association among gender and age groups.

Variables	Dental fluorosis (%)		$\chi^2$	P value
	Present	Absent		
10-20 years			0.38	0.538
Male	49 (72)	19 (28)		
Female	34 (77.2)	10 (22.8)		
Sub total	83 (74)	29 (26)		
20-30 years			0.18	0.664
Male	24 (72.7)	9 (27.3)		
Female	24 (77.4)	7 (22.6)		
Sub total	48 (75)	16 (25)		
30-40 years			3.88	0.048*
Male	11 (57.9)	8 (42.1)		
Female	32 (82)	7 (18)		
Sub total	43 (74.1)	15 (25.9)		
40 years and above			0.37	0.255
Male	5 (62.5)	3 (37.5)		
Female	7 (63.6)	4 (25.4)		
Sub total	12 (63.1)	7 (26.9)		
Prevalence of fluorosis			2.11	0.14
Male	89 (70)	39 (30)		
Female	97 (77.6)	28 (22.4)		
Grand total	186 (73.5)	67 (26.5)		

\*: Significant at  $p < 0.05$

from Hail region. A study by Al-Shammary *et al.* in 1997 includes samples from the eastern region of Kingdom that also includes, Hail, along with other populated cities. Data were presented in overall thus cannot be generalized to our studied region; however, prevalence was found to be nearly 27% that differ greatly with the findings of this study that showed 73.5% respondent with dental fluorosis. Only study by Akpata *et al.* in 1997 carried in Hail was the basis of this current study that reported a prevalence of more than 90% among respondent aged 12-15 years that is somehow constant with our findings of 74% (Table 2). Around 16% low prevalence in present study compared to 1999 could be due to availability of various sources of drinking water (Table 3) that showed a significant difference  $P < 0.001$  by the Chi-square test (Table 3). Whereas, previously the main source of drinking water in Hail was from common well, that may be the probable cause of high level of dental fluorosis.<sup>8</sup> The present study leads the work of Akpata *et al.* and described in detailed the prevalence and severity of dental fluorosis among genders of various age groups, and also its association with various sources of drinking water (Tables 2 and 3). A significant difference was observed among gender from respondent aged between 30 and 40 years. In term of overall 26% in age group 30-40 years were without fluorosis

Table 3: Association of dental fluorosis with various sources of drinking water.

Variable	Severity of dental fluorosis						Total
	None	Questionable	Very mild	Mild	Moderate	Severe	
Mineral water	25	10	50	51	23	5	164
Tap water	2	0	2	18	2	0	24
Community water tank	22	4	3	8	2	1	40
Common well	18	0	0	0	5	2	25
Total	67	14	55	77	32	8	253

P&lt;0.001\*\*\*

in contrast to related study that showed 68% of respondent without the same (Table 2).<sup>7</sup> A prevalence of around 30-45% were reported by Almas *et al.* during 1999 among samples from Al-Qaseem Saudi Arabia that varied with the finding of present study. Mild fluorosis was the most persistent finding presented by 18% that is not in line with the observed result of this study reported 42% with the same (Tables 2 and 3).<sup>11</sup> A study of German school children in 2007, and in Indian population 2012 showed fluorosis to be 11.3% and 4%, respectively, that differ considerably with the findings of present study 75% (Table 2).<sup>12,13</sup> A study in (US) 2004 reported a prevalence of 41% among adolescent that unlikely matched with present study finding which indicated 74% affected by fluorosis in similar age group (Table 2). This largely in constant finding from various studies can be because of high level of fluoride in drinking water and/or consumption of diet enriched with fluoride. On the basis of current findings further researches are recommended to relate the high prevalence of fluorosis in this region with relevant corresponding factors as Wondwossen *et al.* 2004 and Grobler *et al.* 2001 have mentioned that increased severity of fluorosis contribute to post-eruptive breakdown and exposure of subsurface hypo mineralized enamel, thus increases the risk of developing dental caries.<sup>14,15</sup>

#### Limitation of the study

Smaller sample size among various groups considered to be a limitation of this present study.

#### Conclusion

Prevalence of dental fluoride was found to be very high. The study provided evidence to a limited data available on dental fluorosis in Saudi Arabia, specifically Hail region. Based on the results of this observational study, it is recommended to have further research on dental fluorosis at national level to have baseline data for various regions, which can set future direction of research in kingdom on concerned issue. It is also recommended to have studies on other contributing factors such as dietary factors, for instance consumption of local tea called (Gahwa) and intake of fluoride containing oral cleansing agent.

#### Acknowledgment

The authors like to acknowledge the efforts of Dr. Aziza Eldarrat (college of dentistry, University of Sharjah) for her valuable time in designing of the questionnaire.

#### References

- McDonagh MS, Whiting PF, Wilson PM, Sutton AJ, Chestnutt I, Cooper J, *et al.* Systematic review of water fluoridation. *BMJ* 2000;321(7265):855-9.
- Rozier R. Epidemiologic indices for measuring the clinical manifestations of dental: Overview. and critique. *Adv Dent Res* 1994;8(1):39-55.
- Indermitte E. Exposure to fluorides in drinking water and dental fluorosis risk among the population of Estonia. [Dissertation]. Estonia: University of Tartu;2010. Available from <http://dspace.ut.ee/handle/10062/15127>.
- Health UD, Services H. Proposed HHS recommendation for fluoride concentration in drinking water for prevention of dental caries. *Fed Regist* 2011;76(9):2383-8.
- Petersen PE. The World Oral Health Report 2003: Continuous improvement of oral health in the 21<sup>st</sup> Century: The approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 2003;31(s1):3-24.
- Ng F, Manton D. Aesthetic management of severely fluorosed incisors in an adolescent female. *Aust Dent J* 2007;52(3):243-8.
- Al-Shammery AR, Guile EE, El Backly M. The prevalence of dental fluorosis in Saudi Arabia. *Saudi Dent J* 1997;9(2):58-61.
- Akpata E, Fakiha Z, Khan N. Dental fluorosis in 12–15-year-old rural children exposed to fluorides from well drinking water in the Hail region of Saudi Arabia. *Community Dent Oral Epidemiol* 1997;25(4):324-7.
- Dean HT. Classification of mottled enamel diagnosis. *J Am Dent Assoc* (1922). 1934;21(8):1421-6.
- World Health Organization. Strategies for the Prevention of Blindness in National Programmes: A Primary Health Care Approach. Geneva: World Health Organization; 1997.
- Almas K, Shakir Z, Afzal M. Prevalence and severity of dental fluorosis in Al-Qaseem province Kingdom of Saudi Arabia. *Trop Dent J* 1999;22(85):44-7.
- Momeni A, Neuhäuser A, Renner N, Heinzl-Gutenbrunner M, Abou-Fidah J, Rasch K, *et al.* Prevalence of dental fluorosis in German schoolchildren in areas with different preventive programmes. *Caries Res* 2007;41(6):437-44.
- Chauhan D, Chauhan T, Sachdev V, Kirtaniya BC. A study of prevalence and severity of dental fluorosis among school children in a Northern hilly state of India. *SRM J Res Dent Sci* 2012;3(3):170.
- Wondwossen F, Åström AN, Bjorvatn K, Bårdsen A. The

relationship between dental caries and dental fluorosis in areas with moderate-and high-fluoride drinking water in Ethiopia. *Community Dent Oral Epidemiol* 2004;32(5):337-44.

15. Grobler S, Louw A, Kotze VW. Dental fluorosis and caries experience in relation 15. three different drinking water fluoride levels in South Africa. *Int J Paediatr Dent* 2001;11(5):372-9.