

Dental Fluorosis in Saudi Arabia: A review of current literature

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ABSTRACT

Dental fluorosis is a dental public health concern in many regions of Saudi Arabia. The aim of this review is to report all studies undertaken till now on concerned issue. Google scholar was searched for last 25 years based on key words provided below. Out of 15 articles, 8 were selected based on inclusive criteria. The only inclusive criteria was studies that reported either prevalence or severity of dental fluorosis, studies that only reported well water concentration of fluoride were excluded. This review concludes that dental fluorosis varies greatly region wise, whilst Hail region had more fluorosis in Saudi Arabia. Regarding severity of dental fluorosis mild to very mild fluorosis was widely reported. It is therefore recommended further research on dental fluorosis in each region of Saudi Arabia, so that further recommendation can be made and implemented such as measurement of topical use of fluoride, as well as measurement of diet enriched with fluoride such as sea food and tea.

Keywords: Dental fluorosis, Prevalence of fluorosis.

INTRODUCTION

It is well documented that dental fluorosis is one of the dental public health apprehension in many global populations especially those with high levels of fluoride in drinking water. Mostly it is prevalent in Hilly areas where natural existence of fluoride is dominant.^[1] Prevalence of dental fluorosis seems to be rising in fluoridated as well as non-fluoridated communities.^[2] In United State of America (USA) water fluoridation was developed with the goal of reducing caries. Though the goal was achieved but it was reported that severity of dental fluorosis increased.^[3] Saudi Arabian population also suffers from menace of fluorosis as abundance of well water is still consumed in remote parts of the country.^[4, 5] The increased risk of dental fluorosis is possibly because of exposure to fluoride above optimum level, and further use of fluoride containing anti cariogenic agents that include, tooth paste, mouth wash, fluoride containing chewing gum, and diet enriched with fluoride such as consumption of fish as well as frequency of tea intake. These can be seriously considered as primary determinants that may be a risk factor for dental fluorosis.^[6] 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.^[7 8]

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Though anticariogenic efficacy of fluoride is universally accepted but only if administered carefully at recommended dosage both as in general through water fluoridation and specifically to children with greater risk of having dental caries locally. In few studies prevalence of dental fluorosis is reported over all but not region/city wise. The primary aim of this review is to summarize all published studies done in Saudi Arabia on dental fluorosis prevalence, and severity. The objective includes highlighting the role of other means of fluoride uses, and encouraging further research to measure its implication in future studies. The present review may also serve as an attempt of providing baseline data for dental fluorosis on what has been published till now in Saudi Arabia.

MATERIAL & METHODS

Google scholar database was searched for last 25 years with 3 keywords, "Dental, Fluorosis and Saudi Arabia". The only inclusive criteria were studies that reported either prevalence or severity of dental fluorosis among various regions of Saudi Arabia. Total 15 studies were identified and findings from 8 studies were included in the current review based on inclusive criteria. Out of selected

studies 2 includes data exclusively from Hail province, 2 were from Riyadh area, and 1 each from Al qaseem and Al madinah province. Two studies includes sample from all region of Saudi Arabia for instances, Northern, eastern, southern, and western regions as well central region except Riyadh. In term of overall among total 8 studies 4 includes data from Hail, 2 from Al qaseem, 3 from Almadinah and 2 from Riyadh.

Author s	Ye ar	Location	Sam ple Size N	Age Gro up Year s	Sex	Standardi zed Method	Sampli ng Metho d	Prevale nce	Severity	Calibrat ion	Conclusio n
Akpata ES, Et Al ^[7]	1997	Hail Region	2355	12-15	Male & FEMA LE	TFI	Two-Stage Stratified Cluster Sampling Technique	12 Years : 31.4% "Majority " 15 Years : 20.3% "Lowest Frequency "		Yes Through Cohen's Kappa Statistic Of At Least 0.75.	Use Of Well Water Was Document ed To Be Associated With High Prevalence Of Dental Fluorosis
Al Shammery, Et Al ^[9]	1997	Eastern Province, Al Qassim, Hail, Tabouk, Najran, Al Baha, Gizan, Makkah-Al-Mukarramah, Al Madinah-Al-Munawarah And Asir	7,377	6 – 7 12-13 15-19 20-29 3-44 65-74	Male & Female	Dean's Index	Stratified Random Cluster Sample Technique	Prevalence Of Dental Fluorosis Was Reported To Be Around 25%	Questionable: (13.17% 20-29years Very Mild : 11.11% 35-44 Years Mild : (8.56%) 35-44 Years Moderate: (4.90%) 20-29 Years Severe : (2.13%) 65-74 Years	Yes By Kappa Statistic. Kappa Averaged 0.907 For Inter-Examiner Reliability.	Study Indicated That Prevalence Of Dental Fluorosis For Saudi Population Is 25 %, The Study Further Reported That Mild To Very Mild Fluorosis Was Dominant And There Exist A Significant Association Between People Living In Urban And Rural Areas.
Kh. ALMAS Et Al ^[10]	1999	AL-Qaseem Province	800	12,15 , 35-44, >65	Male	Dean's Index	Cluster Sampling	24-67 Percent Of 12, 15, 34-44 And >65 Years Subjects Were With Dental Fluorosis Both In Urban And Rural Areas. 12.5 %	67 Percent Of The Age Group Of 35-44 Years Subjects Were With Severe Fluorosis	Examiner Calibration Was Through And Intra-Examiner Constancy Was Up To 90 Percent Of The Total Sample Size.	1. Fluorosis Was Prevalent In Rural Subjects 2. There Is A Need Of Defluoridation Of Water Supplies In The Areas With High Fluoride Level

								Of The Population Examined Were With Moderate To Severe Dental Fluorosis. Eight Percent Of The Urban And 16.3 % Of Rural Population Were With Moderate To Severe Dental Fluorosis.			
Nazeer Khan Et Al ^[5]	2000-2001	Riyadh	297	< 30 31-35 36-40 ≥ 41	Male	Dean's Index	Stratified Cluster Sampling Method	Prevalence Of Dental Fluorosis Was 75 %	Normal (24.6%) Questionable (15.2%) Very Mild (32.3%) Mild (21.5%) Moderate (6.4%)	Yes And Agreement Between The Examiner Was Found To Be 90% By Kappa Statistics	The Study Sample Of Riyadh Population In Present Study Was Reported Higher Than Other Relevant Study On Same Topic
R.A .Albanyan Et Al ^[11]	2000	Riyadh	272	5-12 Years	Male And Female	Dean Index	Non Probability Sampling	14 % Children With Mild Fluorosis		Yes Through Kappa Statistics	Mild Fluorosis Was Reported To Be 14 %
Abdullah M. Aldosari , Et Al ^[8]	2010	(Alhodoud alshamali ah) aljouf , tabuk , alsharqiah , hail, almadinah , mecca , jazan , najran asier , albaha	12,200	6-7 12-13 15-18	Male & Female	TFI	Stratified Sampling	The Prevalence Was 30 -40% Higher On Maxillary Incisors, Whilst Higher In Permanent Than Primary Dentition.		Yes Through Kappa Statistics	A) Fluoride Levels In Drinking Water Sources Correlate With Dental Fluorosis. B) Study Document Fluoride Concentration For Drinking Water In Saudi Arabia, And Indicated 0.6ppm To Be Adequate.
A.Bhayat Et Al ^[12]	2013	Al Madinah-Al-Munawar	360	12	Male	Dean's Index	Two Stage Probability	No Fluorosis		Yes And Was In Agreement Using	Dental Fluorosis Was Not Reported,

		ah					Samplin g For School And School Childre n's			Kappa Statistics.	Probably Because Of Use Of Bottled Water Instead Well Water.
Hazza Et Al [4]	201 5	Hail	253	10- 20- 20- 30- 30- 40 >40	Male & Female	Dean's Index	Probabi lity Samplin g	Prevalen ce Was Reported To Be Around 74%	Very Mild To Mild Fluorosis Was Most Reported To Be More Frequent	Yes Through Kappa Statistics And Was In Agreeme nt	Prevalence Of Fluorosis Was Very High. Study Recommen ded Further Research On Tropical Use Of Fluoride, As Well As Consumpti on Of Diet Enriched With Fluoride.

DISCUSSION

Data from selected studies was summarized in the above table.

Dental Fluorosis in Riyadh

The two studies were identified which were carried out during year 2000-01 by Khan et al, and R. A. Albanyan et al, with sample from below 30, 31-35, 36-40 above 40 years of age, and among 5-12 years of children respectively.^[5,11] Khan et al reported that prevalence of dental caries was 75 % overall and noted that very mild to mild fluorosis was more prevalent among the study population, On the contrary, R.A. Albanyan did not report overall prevalence among 5 -12 years of age children however, mild fluorosis was reported to be the most significant finding affecting 14% of studied population. This drastic difference among 2 studies in similar population suggest that further studies with well-designed sample size may help in giving true picture for overall prevalence of dental fluorosis in Riyadh.

Dental Fluorosis in Hail

Two studies were found exclusively on the stated issue. A study By Akpatta E et al in 1997 on 12 and 15 years of age children reported dental fluorosis to be 31.4 % in 12 years of age whilst 20.3% in 15 years of age.^[7] A most recent study by Hazza et al during 2015 amongst resident of Hail region showed dental fluorosis was present amongst 73.5 % and most severe type observed was mild to very mild fluorosis.^[4] That is in line with the finding of study done in Riyadh by Khan et al.^[5] Again there exist a disparity in results of 2 studies carried out in Hail. As in general the probable reason for high

prevalent in Hail might be because people still drink water from well, that may put them at higher chance of getting dental fluorosis elsewhere in Saudi Arabia.

Dental Fluorosis in Al Qaseem, and Al madinah region

Single study was found in both region independently by Kh Almas et all and A Bhayat et all during 1999, and 2013 respectively.^[10,12] Kh Almas et all reported that dental fluorosis was present in 24-67 % belonging to age group 12-15, 34-45 and above 65 years of age. Sixty seven (67%) of respondent between 34-45 years had severe dental fluorosis. These finding are somehow similar with Akpata E et al study done in Hail.^[7] Interestingly dental fluorosis was not reported in any respondent of 12 years of age in Madinah.^[12] This is alone study which have not reported any prevalence of dental fluorosis amongst any population of Saudi Arabia, according to the author it might be because sample of the said study were consuming bottled water, however study from Hail region do reported mild to moderate dental fluorosis amongst people who were consuming bottled water as the primary choice of drinking. Based on that difference in occurrence of dental fluorosis, factor such as prescription of formula milk to infant by pediatrician must be account for as reported by S J Foman et al and OO Osujp et al that fluoride present in formula milk contribute as one of the risk factor of dental caries, and there exist no study in Saudi Arabia to reports its association with dental fluorosis.^[13,14]

Studies on dental fluorosis in whole Saudi Population

Two studies conducted amongst all region of Saudi Arabian population were found that include samples from each region of Saudi Arabia. One study was done by Al shammery et al, during the year 1997 and one by A.M. Dosari et al, during 2010.^[9,8] In both the studies sample size was more than 7000 subjects and the data on dental fluorosis were gathered from larger cities of all region which include Al jouf, Hail, Madinah, Makkah, Dammam, Tabuk, Abha, Gizan. Dental fluorosis in these studies was reported as overall for whole country but not region or city wise which increases the chance of respondent bias. In Al shammery et al, 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. In general the authors concluded dental fluorosis was around 25 % in Saudi Arabia, which might not be true for some region such as Hail where prevalence was found to be 75 %.^[4] However, the study documented dental fluorosis to be high and emphasized the needs of measuring level of fluoride in drinking water. The study also reported significant difference in dental fluorosis among people living in urban and rural area. The study by A. M Dosari et al, did not report prevalence of dental fluorosis overall but it was recognized that dental fluorosis is around 40 % more prevalent in maxillary incisors and also in permanent dentition. This may account for aesthetic concern among people with dental fluorosis; further studies can describe people aesthetic perceptions because of fluorosis, as it is documented that people with poor esthetic may be at risk of having or developing low self-esteem.^[15]

CONCLUSION

Based on this review, it is concluded that insufficiency of data exists to determine prevalence and severity of dental fluorosis region- wise and indirectly for whole Saudi Arabia. The evidence based on published papers indicate that occurrence of dental fluorosis varies region wise. Madinah region seems to be the least affected probably because of use of bottled water, whilst Hail region seems to be the most affected in term of overall prevalence. Mild to very mild fluorosis were reported to be very dominant among people with fluorosis except in Riyadh where severe fluorosis was also experienced by many.

Recommendation

Based on available published and documented data on prevalence of Fluorosis in KSA, following is recommended;

- 1) Collection of comprehensive base line data on dental fluorosis from each region of Saudi Arabia
- 2) Determination of optimum level of fluoride in drinking water separately for rural and urban population of each region

- 3) Defluoridation of water in areas with high level of fluoride
- 4) Restriction on unnecessary use of topical fluoride in young children
- 5) Measurement of topical use of fluoride in the Kingdom
- 6) Promotion of balanced diet and measurement of dietary intake of fluoride- enriched food for instance consumption of tea and intake of sea food
- 7) A guide line shall be set by evaluating how formula milk is given by pediatrician, there knowledge of prescription with regard of dental fluorosis must be measured, and future guideline can be set hereforth.

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