
Prevalence of dental fluorosis based on gender predilection

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Abstract: The aim is to assess the gender predilection of dental fluorosis among the Chennai population. The retrospective study done using case records of patients. Patients with dental fluorosis were included in this study. Patients who were medically compromised and with other developmental anomalies of teeth were excluded from the study. Data about the dean fluorosis index and demographic details were retrieved from case sheets and tabulated. Analysis of the data was performed using SPSS version 23.0, both descriptive statistics and Chi square tests were performed. The present study showed the dental fluorosis was more prevalent in males (69.20%) than females (30.80%). Among the study population, mild fluorosis (50%) was found to be a more common type of severity of fluorosis followed by moderate fluorosis (30%) and there was significant association between the severity of fluorosis i.e dean fluorosis index and gender ($p < 0.05$) showing statistical significant difference. Within the limits of the present study, it can be concluded that dental fluorosis is more prevalent among males than females. Mild fluorosis was found to be a more common type of severity of fluorosis followed by moderate fluorosis and there was significant association between the severity of fluorosis and gender.

Keywords: Dental fluorosis; Gender predilection; Prevalence; Dean Fluorosis Index innovative technique

INTRODUCTION

Dental fluorosis is a specific disturbance in tooth formation caused by excessive fluoride intake during the development of teeth. The degree of fluorosis, as well as plasma and bone fluoride levels, is directly related to the concentration of fluoride in drinking water. Fluoride has always been known as a double-edged sword. When excess of fluoride is ingested during the years of tooth calcification, essentially during the first 7 years of life, it results in fluorosis. When mild or more severe forms of dental fluorosis are found prevalent in a community, steps should be taken to reduce fluoride ingestion during the ages of tooth development. Excessive levels of fluoride in the drinking water can lead to even more serious health problems than dental fluorosis, wherein it may progress to skeletal fluorosis. In its extreme form, skeletal fluorosis is a seriously debilitating disease. Because of excessive intake of fluoride in many parts of the world, skeletal fluorosis affects several millions of people today. (Taghipour *et al.*, 2016).

The principal sources of fluorine were drinking water and food such as sea fish, cheese and tea. Small quantity of fluoride is an essential component for normal mineralization of bones and formation of dental enamel. However, excess concentration may result in slow, progressive scourge known as fluorosis. Fluorosis is an important public health problem in 24 countries, including India, which lies in the geographical fluoride belt that extends from Turkey to China and Japan through Iraq, Iran and Afghanistan. Drinking water is a major source of fluoride in India. It affects the population of 20 states in India (Taghipour *et al.*, 2016) (fluoride level in drinking water >1.5 mg/L), and about 62 million people in India suffer from dental, skeletal and non-skeletal fluorosis. Out of these, six million are children below the age of 14 years. Groundwater is considered as the major source of drinking water in most places on earth. (Arlappa, Qureshi and Srinivas, 2013) Rajasthan and Gujarat in north India and Andhra Pradesh in south India are the worst affected states. Punjab, Haryana, Madhya Pradesh and Maharashtra are the moderately affected states, whereas the states of Tamil Nadu, West Bengal, Uttar Pradesh, Bihar and Assam are mildly affected (Mathur, no date).

One of the most efficient and effective measures studied in the prevention of caries is the use of fluoride, which has the property of reducing dental caries incidence and progression of incipient lesions. WHO declared that it modifies enamel structure and increases its resistance, decreasing the risk of dental caries. For about 3 decades, fluoride has been considered the key factor in the decline of dental caries in both children and adults.

The numerous literature are studies on prevalence of fluorosis in different parts of the world, but there is lack in literature on gender predilection of the fluorosis hence

Our department is passionate about research we have published numerous high quality articles in this domain over the past years (Abraham *et al.*, 2005; Devaki, Sathivel and BalajiRaghavendran, 2009; Neelakantan *et al.*, 2010, 2015; Arja *et al.*, 2013; Ramshankar *et al.*, 2014; Sumathi *et al.*, 2014; Surapaneni and Jainu, 2014; Surapaneni, Priya and Mallika, 2014; Ramamoorthi, Nivedhitha and Divyanand, 2015; Manivannan *et al.*, 2017; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; J *et al.*, 2018; Ravindiran and Praveenkumar, 2018; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Krishnaswamy *et al.*, 2020; Samuel, Acharya and Rao, 2020; Sathish and Karthick, 2020) the main of this study was to find the gender predilection of dental fluorosis among the patients visiting Private Dental College and Hospitals .

MATERIALS AND METHOD

Study design and setting: It is a university setting study conducted in Private Dental College and Hospital. Ethical Approval was obtained from the institutional ethical committee(SDC/SIHEC/2020/DIASDATA/0619-0320). Number of people involved in this study were 2 examiners.

Sampling: The data were collected from June 2019 to March 2020. Patients with dental fluorosis less than 18 years of age were included in this study. Patients who were medically compromised and with other developmental anomalies of teeth were excluded from the study. Sample size was 250 and were included in the study after considering the exclusion criteria. Cross verification of photographs. Simple random sampling and more data were looked into to minimize sampling bias. Eligibility criteria of sampling was designed.

Data collection and analysis : The data was collected by reviewing 10,000 case sheets of patients visited Private Dental College and Hospitals, from which 250 dental fluorosis patients who had a complete record of Dean fluorosis index were selected. Data was verified by two external examiners. Patient's age, gender, fluorosis score were gathered and the obtained data was tabulated in excel and was imported to SPSS version 20.0 where the variables were defined. IBM SPSS version 20 was used for statistical analysis. Descriptive analysis of the gender, severity of fluorosis was done. Chi square test was done for association between gender and severity of fluorosis. Results were tabulated and represented graphically.

RESULTS AND DISCUSSION

In the present study overall prevalence of fluorosis involved in the study population based on gender was represented in figure 1 which showed that males (69.20%) were more prevalent to dental fluorosis than females (30.80%). These obtained data were in accordance with the previous study conducted by Michel et al which proved males were more prevalent than females.(Michel-Crosato, Biazevic and Crosato, 2005). In contrast, Singh and Singh (Singh *et al.*, 1963) and Sukhabogi (Sukhabogi *et al.*, 2013) found that females were more prevalent than males which might be due to population diversity and geographic isolation.

The severity of dental fluorosis among the study population were represented as per Dean's fluorosis index (Figure 2). Out of 250 dental fluorosis patients, 18(7.2%) were questionable, 20(8%) were very mild, 125(50%) were mild, 75(30%) were moderate, 12(4.8%) were severe. The increasing prevalence and severity of dental fluorosis with increasing fluoride concentration may be explained by the fact that dental fluorosis is a developmental defect which occur because of exposure to water containing high fluoride concentrations(Christabel and Gurunathan, 2015; Somasundaram *et al.*, 2015; Gurunathan and Shanmugaavel, 2016; GovinDaraju and Gurunathan, 2017; Govindaraju, Jeevanandan and Subramanian, 2017a, 2017b, 2017c; Jeevanandan, 2017; Packiri, Gurunathan and Selvarasu, 2017; Ravikumar, Jeevanandan and Subramanian, 2017; 'Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', 2018; Jeevanandan and Govindaraju, 2018; Nair *et al.*, 2018; Panchal, Jeevanandan and Subramanian, 2019; Subramanyam *et al.*, 2019). This relation between water fluoride concentration and severity of dental fluorosis is dose dependent with increasing concentration leading to higher risk. (Srivastava *et al.*, 2011). Previously our team had conducted numerous clinical trials((Christabel and Gurunathan, 2015; Somasundaram *et al.*, 2015; Gurunathan and Shanmugaavel, 2016; GovinDaraju and Gurunathan, 2017; Govindaraju, Jeevanandan and Subramanian, 2017a, 2017b, 2017c; Jeevanandan, 2017; Packiri, Gurunathan and Selvarasu, 2017; Ravikumar, Jeevanandan and Subramanian, 2017; 'Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review', 2018; Jeevanandan and Govindaraju, 2018; Nair *et al.*, 2018; Panchal, Jeevanandan and Subramanian, 2019;

Subramanyam *et al.*, 2019) over the past 5 years. Now we are focusing on epidemiological surveys. The idea for this survey stemmed from the current interest in our community. Also the positive correlation between fluoride concentration and dental fluorosis index score was found in many epidemiological studies in the past. (Mann, Tibi and Sgan-Cohen, 1987; Kumar *et al.*, 2000; Sampaio *et al.*, 2000).

The severity of dental fluorosis was represented in figure 3 and table 1 which depicts that there was a highest prevalence of a mild score of fluorosis (37.20%) among males and females with (12.80%). Moderate score of fluorosis also was predominantly seen among males (23.60%) when compared to females (6.40%). The severe scores of fluorosis patients were seen among females (4%) when compared to males (0.80%). There was a significant association between gender and severity of dental fluorosis (Pearson Chi-square test - 27.34, $p < 0.00$) which denotes statistically significant $p < 0.05$. In the present study severity of fluorosis as per Dean's fluorosis index severe scores were commonly seen among females though the overall prevalence was less. This statement is supported by another study on Gender association with dental fluorosis, where girls had a 1.5-times greater severity of dental fluorosis than boys. In our study though boys were affected with maximum very mild and mild scores, severity being found less (0.80%). In a study with students born and residing in São Paulo, where the public water supply has a concentration of 0.7 ppm of fluoride, the youngest female children showed severe score of fluorosis might be due to chronic intoxication by fluoride (Buscariolo, Penha and Rocha, 2006). Similar results were found in different locations of the country (Moysés *et al.*, 2002). This proves that though the prevalence of fluorosis was common among males, the severity based on Dean's fluorosis index, females showed to develop severe scores when compared to males. Conversely, some studies did not find any association between gender and fluorosis in subjects living in the states of Minas Gerais, Bahia and Santa Catarina, located in the Southeast, Northeast and South regions of Brazil, respectively (Mendonça *et al.*, 1998; Alves, 2003) which can be attributed to geographic location. The limitations of the study include the geographic isolation subject to error/bias and sample size and also extensive study to be done with larger sample size.

CONCLUSION

Within the limits of the present study, It can be concluded that dental fluorosis is more prevalent among males than females. Mild fluorosis was found to be a more common type of severity of fluorosis followed by moderate score and there was significant association between the severity of fluorosis and gender.

AUTHOR CONTRIBUTIONS

Jitesh.S performed the analysis, interpretation and wrote the manuscript.

Second author Jessy P contributed to conception, data design, analysis, interpretation and critically revised the manuscript.

Madhulaxmi M participated in the study and revised the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

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TABLE

Table 1: shows the association between gender and severity of dental fluorosis based on Dean’s fluorosis index. Males had the highest prevalence of (mild and moderate) fluorosis . Chi-Square value - 27.34, p value - 0.000(<0.05) which is statistically significant.

	Dean’s fluorosis score	Total	Statistical
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		QUESTIONABLE	VERY MILD n(%)	MILD	MODERATE	SEVERE		values
GENDER	MALE	8(4.6%)	11 (6.3%)	93 (53.7%)	59(34.1%)	2(1.1%)	173	Pearson Chi-Square =27.345 Pvalue =0.000*
	FEMALE	10(12.9%)	9 (11.6%)	32 (41.5%)	16(20.7%)	10 (12.9%)	77	
Total		18(7.2%)	20 (8%)	125 (50%)	75(30%)	12 (4.8%)	250	

FIGURES

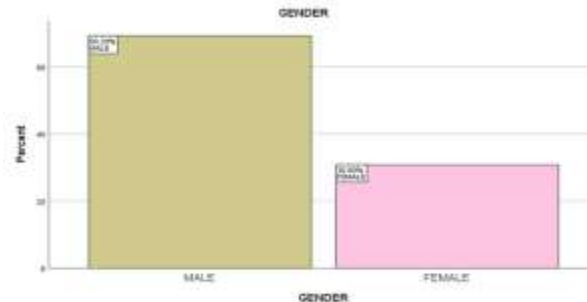


Fig.1: Bar chart depicts the gender distribution of the present study.X axis represents the gender and Y axis represents the percentage of the study population. 69.20% of the study population were males (brown) and 30.8% were females(pink).

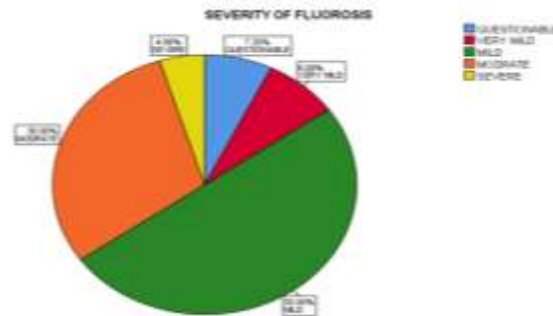


Fig.2: Pie chart depicting the percentage of severity of dental fluorosis using Dean's fluorosis index. In the present study, 7.2% were questionable(Blue), 8% were very mild(red), 50% were mild(green), 30% were moderate(orange),4.8% were severe(yellow).

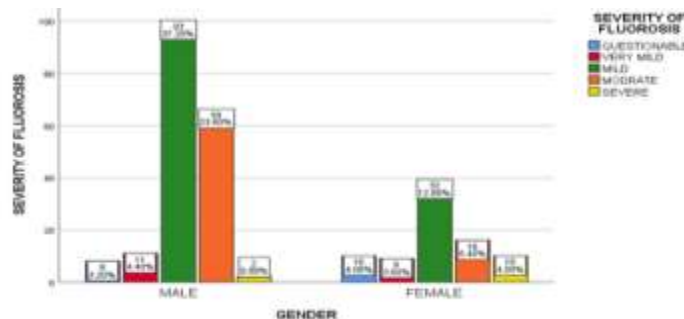


Fig.3: Bar graph depicts the association between the gender and Dean’s fluorosis index. X axis represents the gender and Y axis represents the severity of fluorosis(Dean's fluorosis index).There was significant association in severity of fluorosis and gender. Milder and moderate score of dental fluorosis was found to be highly prevalent (37.20%) among males than females.(Pearson Chi-square test - 27.34, p value - 0.000 (< 0.05) ; statistically significant).