

# SEVERITY OF DENTAL FLUOROSIS AMONG PATIENTS VISITING A PRIVATE DENTAL INSTITUTION- A RETROSPECTIVE STUDY

B. John Rozar Raj<sup>1</sup>, Samuel Raj Srinivasan<sup>2</sup>, Niveditha.M.S<sup>3</sup>

<sup>1</sup>*Saveetha Dental College and Hospitals, Saveetha Institute Of Medical and Technical Science, Saveetha University, Chennai, India*

<sup>2</sup>*Reader, Department of Public Health Dentistry, Saveetha Dental College and Hospitals, Saveetha Institute Of Medical and Technical Science, Saveetha University, Chennai, India*

<sup>3</sup>*Professor and Head of academics, Dept of Conservative dentistry and Endodontics Saveetha Dental College and Hospitals, Saveetha Institute Of Medical and Technical Science, Saveetha University, Chennai, India*

<sup>1</sup>[151501065.sdc@saveetha.com](mailto:151501065.sdc@saveetha.com)

<sup>2</sup>[samuelrajs.sdc@saveetha.com](mailto:samuelrajs.sdc@saveetha.com)

<sup>3</sup>[nivedhitha@saveetha.com](mailto:nivedhitha@saveetha.com)

## ABSTRACT

Dental fluorosis is a specific disturbance in tooth formation caused by excessive fluoride intake during the development of tooth. The aim of this study was to assess the severity of dental fluorosis in a private dental institution. This was a retrospective institutional study. Samples were collected from June 2019 to March 2020 from patient records who visited a private dental hospital. Data of dental fluorosis was collected. Excel tabulation was done. SPSS results were obtained.  $P < 0.05$  considered significant. In the present study, 191 patients had dental fluorosis. Among patients with dental fluorosis, percentage of mild fluorosis was 50%, percentage of moderate fluorosis was 26%, percentage of very mild fluorosis was 12% and 7% percentage of severe fluorosis was found. Further, 7% had questionable fluorosis. From the present study we can conclude that the frequency of mild dental fluorosis was more among the patients who visited our dental institution in Chennai. Males had higher prevalence of dental fluorosis as compared to females and greater frequency of dental fluorosis was found in the age group of 16 to 30 years. However, the results were not statistically significant.

## Keywords

Dental fluorosis, Mild, Moderate, Severe.

## INTRODUCTION

Fluoride, an element essential for human health, plays a critical role in the calcification of bones and teeth. Deficiency of fluoride intake leads to dental caries while excess consumption leads to dental and skeletal fluorosis. Experience from developed countries suggests that fluoridation of water to prevent caries is always at the expense of a certain degree of dental fluorosis. Fluoride content has always been a concern for health care professionals as the deficiency of the element fluoride has been seen associated with defective enamel formation. Fluoride plays an important role in preventive dentistry due to cariostatic potential. India lies in the geographical fluoride belt, which extends from Turkey up to China and Japan through Iraq, Iran and Afghanistan. Of the 8 million tons of fluoride deposits found on earth's crust, nearly 12 million tons are in India (Mollert, 1993; Organization and Others, 1994).

Consequently, fluorosis is an endemic condition prevalent in 17 states of India. The main dietary source of fluoride content in drinking water is approximately 1mg/L in temperate climates. In tropical countries where people drink more water due to hot climate, the desirable fluoride content of drinking water may be 0.5mg/L. Dental fluorosis occurs when excessive fluoridated water is ingested during the year of calcification and usage of fluoridated tooth pasted before the age of 2 years also contributes to this condition. About 62 million people are affected by dental fluorosis (Ayoob and Gupta, 2006). Tamil Nadu is one of the 18 states affected by fluorosis in India(Kumar *et al.*, 2007).

Dental fluorosis is characterised by hypo mineralization of tooth enamel. This hypo mineralization is mainly due to in situ toxic effects of fluoride on the ameloblasts of the enamel formation and not caused by the general effects of fluoride on the calcium metabolism. Dental fluorosis is a condition which can be easily detected clinically. It is characterised by mottling of enamel, change in colour from yellow to brown to black. In moderate to severe form the tooth may get physically damaged. The clinical findings depend on the degree of dental fluorosis. People with fluorosis are relatively resistant to dental caries. Dental fluorosis is endemic in some areas of Tamil Nadu but it is also encountered in non endemic areas like Kanchipuram. Dental fluorosis is commonly classified using dean's fluorosis index. It was first published in 1942 (Trendley Dean, 1934). Grade 0 is normal, Grade 1 is questionable, Grade 2 is very mild fluorosis, Grade 3 is mild fluorosis, Grade 4 is moderate fluorosis, Grade 5 is severe fluorosis.

Previously our team had conducted numerous clinical trials and studies (Prabakar, John, I. Arumugham, *et al.*, 2018; Neralla, Jayabalan and George, 2019; Pavithra, Preethi Pavithra and Jayashri, 2019) randomized control trials (Prabakar, John, I. M. Arumugham, *et al.*, 2018b; Khatri *et al.*, 2019; Pratha, Ashwatha Pratha and Prabakar, 2019; Mathew *et al.*, 2020; Samuel, Acharya and Rao, 2020) and surveys(Prabakar, John and Srisakthi, 2016; Kannan *et al.*, 2017) and isotopic study (Kumar and Preethi, 2017; Kumar and Vijayalakshmi, 2017) and systematic reviews(Leelavathi and Others, 2019) and in-vitro studies(Prabakar, John, I. M. Arumugham, *et al.*, 2018a; Mohapatra *et al.*, 2019) over the past 5 years. Of late recently we are focussing on epidemiological surveys. Fluorosis has become a major emerging area of research since dental fluorosis has been described as a biomarker of exposure to fluoride. The aim of this study was to assess the severity of dental fluorosis in a private dental institution in chennai.

## **MATERIALS AND METHODS**

This was a retrospective study. The study setting was a university setting and ethical approval was obtained from IRB. Samples were collected from June 2019 to March 2020. All the cases of dental fluorosis who visited our institute were included in the study. Cross verification was done by photos obtained during patient examination and recorded in the information management system. Sampling bias was minimised by convenience sampling. Data was entered in a methodological manner using microsoft excel tabulation, and imported into SPSS for data analysis. Incomplete data were excluded from the study. Descriptive statistics and chi square test was done using SPSS software, V23, IL, CH. Independent variables were gender, age, water source and location. Dependent variable was severity of Dental fluorosis.  $P < 0.05$  was considered significant

## **RESULTS AND DISCUSSION**

In our study, 191 patients had dental fluorosis. Among patients with dental fluorosis, percentage of mild fluorosis was 50%, percentage of moderate fluorosis was 26%, percentage of very mild fluorosis was 12%, percentage of severe fluorosis was 7%, percentage of questionable fluorosis was 5%.

Figure 1 shows that the percentage of mild fluorosis was seen more in the age group of 16 to 30 years. In the study by Anand Varma.et.al ([Verma et al., 2017](#)) the prevalence of moderate fluorosis was more. In another study by Punitha.et.al ([Punitha et al., 2014](#)), the prevalence of severe fluoride was more. In the study by Dixit.et.al ([Mahantesha et al., 2016](#)) the prevalence of questionable fluorosis was more. In the study by Monica.et.al ([Chaudhry et al., 2017](#)), the prevalence of severe dental fluorosis was more. In the study by Arpitha.et.al ([Kotha et al., 2017](#)), the prevalence of mild fluorosis was more. The result was similar to our study.

Figure 2 showed that in our study, dental fluorosis was seen more in male patients. In the study by Maya Ramesh.et.al ([Ramesh et al., 2014](#)), the prevalence of dental fluorosis was more in male patients. In the study by Mane.et.al([Mane et al., 2011](#)), the prevalence of dental fluorosis was more in male patients. In this study by Arpitha.et.al ([Kotha et al., 2017](#)), distribution of dental fluorosis was more in female patients just by one percentage. The difference was not statistically significant. In the study by Dixit.et.al ([Mahantesha et al., 2016](#)), dental fluorosis was more prevalent among girls than boys. In the study by Monica.et.al ([Chaudhry et al., 2017](#)),the prevalence of dental fluorosis was marginally higher in females, but was not statistically significant. Even in the studies by Arif.et.al ([Arif et al., 2013](#)) and Aravind.et.al ([Arvind et al., 2012](#)),the prevalence of dental fluorosis was found to be more in female patients.

Figure 3 showed the distribution of grades of fluorosis based on age groups. There was a gradual increase from very mild to severe fluorosis on the mean of age. There was a sudden decline from severe to questionable fluorosis on the mean of age. In the study by Dixit.et.al ([Mahantesha et al., 2016](#)) there was an inverse association between age and prevalence of dental fluorosis. Higher prevalence was noted in the younger people compared to the older ones. In the study by Swetaa.et.al ([Swetha et al., 2019](#)) the children were mostly affected by dental fluorosis more than adults. In the study by Monica.et.al ([Chaudhry et al., 2017](#))and Asif.et.al ([Arif et al., 2013](#)), the prevalence of dental fluorosis varied significantly with age. But in the study by Sukhabogi.et.al ([Sukhabogi et al., 2014](#)), there was no such significance.

The findings of the present study add to the consensus of the previous study. Limitation of the study was smaller sample size so it does not provide results of the entire population. Future studies can be performed with the large population. Other factors like sources of drinking water can be analysed.

## CONCLUSION

From the present study we can conclude that the males had higher prevalence of dental fluorosis when compared to females and greater frequency of dental fluorosis was found in the age group of 16 to 30 years. Mild fluorosis was the most common type of fluorosis in both male and female patients among all the age groups followed by moderate fluorosis.However, the results were not statistically significant among various age groups and between the genders.

## AUTHOR CONTRIBUTIONS

First author (B.John Rozar Raj) performed the analysis, interpretation and wrote the manuscript. Second author (Dr.Samuel Raj Srinivasan) contributed to conception, data design, analysis, interpretation and critically reviewed the manuscript. Third author (Dr. Niveditha.M.S) participated in the study and reviewed the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

## ACKNOWLEDGEMENT

The authors are thankful to Saveetha Dental College for providing permission to access the database and for giving a platform to express our knowledge.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest

## REFERENCES

- [1] Arif, M. et al. (2013) 'Assessment of Fluoride Level in Groundwater and Prevalence of Dental Fluorosis in Didwana Block of Nagaur District, Central Rajasthan, India', *The international journal of occupational and environmental medicine*, 4(4 October), pp. 247–178–84.
- [2] Arvind, B. A. et al. (2012) 'Prevalence and severity of dental fluorosis and genu valgum among school children in rural field practice area of a medical college', *Asian Pacific Journal of Tropical Disease*, pp. 465–469. doi: 10.1016/s2222-1808(12)60101-7.
- [3] Ayoob, S. and Gupta, A. K. (2006) 'Fluoride in Drinking Water: A Review on the Status and Stress Effects', *Critical reviews in environmental science and technology*. Taylor & Francis, 36(6), pp. 433–487.
- [4] Chaudhry, M. et al. (2017) 'Prevalence of Dental Fluorosis Among Adolescents in Schools of Greater Noida, Uttar Pradesh', *Journal of Indian Association of Public Health Dentistry*. Medknow Publications and Media Pvt. Ltd., 15(1), p. 36.
- [5] Kannan, S. S. D. et al. (2017) 'AWARENESS AND ATTITUDE TOWARDS MASS DISASTER AND ITS MANAGEMENT AMONG HOUSE SURGEONS IN A DENTAL COLLEGE AND HOSPITAL IN CHENNAI, INDIA', *Disaster Management and Human Health Risk V*. doi: 10.2495/dman170121.
- [6] Khatri, S. et al. (2019) 'Retention of moisture-tolerant fluoride-releasing sealant and amorphous calcium phosphate-containing sealant in 6–9-year-old children: A randomized controlled trial', *Journal of Indian Society of Pedodontics and Preventive Dentistry*, p. 92. doi: 10.4103/jisppd.jisppd\_173\_18.
- [7] Kotha, A. et al. (2017) 'Prevalence of dental fluorosis in school children of age range 8-15 years', *International Journal of Applied Dental Sciences*, 3(4), pp. 188–190.
- [8] Kumar, R. H. et al. (2007) 'Assessment of Current Status of Fluorosis in North-Western Districts of Tamil Nadu Using Community Index for Dental Fluorosis', *Journal of human ecology*. Routledge, 21(1), pp. 27–32.
- [9] Kumar, R. P. and Preethi, R. (2017) 'Assessment of Water Quality and Pollution of Porur, Chembarambakkam and Puzhal Lake', *Research Journal of Pharmacy and Technology*. A & V Publications, 10(7), pp. 2157–2159.
- [10] Kumar, R. P. and Vijayalakshmi, B. (2017) 'Assessment of fluoride concentration in ground water in Madurai district, Tamil Nadu, India', *Research Journal of Pharmacy and Technology*. A & V Publications, 10(1), pp. 309–310.
- [11] Leelavathi, L. and Others (2019) 'Nicotine Replacement Therapy for Smoking Cessation-An Overview', *Indian Journal of Public Health Research & Development*, 10(11).
- [12] Mahantesha, T. et al. (2016) 'Prevalence of dental fluorosis and associated risk factors in Bagalkot District, Karnataka, India', *International journal of clinical pediatric dentistry*. Jaypee Brothers Medical Publishing (P) Ltd., 9(3), p. 256.
- [13] Mane, A. B. et al. (2011) 'Study of dental fluorosis among primary school children residing in rural area of Raichur District, Karnataka', *Medicinal chemistry research: an international journal for rapid communications on design and mechanisms of action of biologically active agents*, 2(3), pp. 716–720.
- [14] Mathew, M. G. et al. (2020) 'Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: Randomized controlled trial', *Clinical oral investigations*. Springer, pp. 1–6.
- [15] Mohapatra, S. et al. (2019) 'Assessment of Microhardness of Enamel Carious Like Lesions After Treatment with Nova Min, Bio Min and Remin Pro Containing Toothpastes: An in Vitro Study',

- Indian Journal of Public Health Research & Development. Prof.(Dr) RK Sharma, 10(10), pp. 375–380.
- [16] Mollert, I. J. (1993) 'Endemic dental fluorosis', Oral diseases in the tropics. Oxford University Press: Delhi, p. 68.
- [17] Neralla, M., Jayabalan, J. and George, R. (2019) 'Role of nutrition in rehabilitation of patients following surgery for oral squamous cell carcinoma', Journal of Research .... pharماسcope.org. Available at: <https://www.pharماسcope.org/index.php/ijrps/article/view/1622>.
- [18] Organization, W. H. and Others (1994) 'Fluorides and oral health: report of a WHO Expert Committee on Oral Health Status and Fluoride Use [meeting held in Geneva from 22 to 28 November 1993]'. Geneva: World Health Organization.
- [19] Pavithra, R. P., Preethi Pavithra, R. and Jayashri, P. (2019) 'Influence of Naturally Occurring Phytochemicals on Oral Health', Research Journal of Pharmacy and Technology, p. 3979. doi: 10.5958/0974-360x.2019.00685.1.
- [20] Prabakar, J., John, J., Arumugham, I., et al. (2018) 'Comparative evaluation of retention, cariostatic effect and discoloration of conventional and hydrophilic sealants - A single blinded randomized split mouth clinical trial', Contemporary Clinical Dentistry, p. 233. doi: 10.4103/ccd.ccd\_132\_18.
- [21] Prabakar, J., John, J., Arumugham, I. M., et al. (2018a) 'Comparative evaluation of the viscosity and length of resin tags of conventional and hydrophilic pit and fissure sealants on permanent molars: An In vitro study', Contemporary clinical dentistry. Wolters Kluwer--Medknow Publications, 9(3), p. 388.
- [22] Prabakar, J., John, J., Arumugham, I. M., et al. (2018b) 'Comparing the effectiveness of probiotic, green tea, and chlorhexidine-and fluoride-containing dentifrices on oral microbial flora: A double-blind, randomized clinical trial', Contemporary clinical dentistry. Wolters Kluwer--Medknow Publications, 9(4), p. 560.
- [23] Prabakar, J., John, J. and Srisakthi, D. (2016) 'Prevalence of dental caries and treatment needs among school going children of Chandigarh', Indian journal of dental research: official publication of Indian Society for Dental Research. Medknow Publications and Media Pvt. Ltd., 27(5), p. 547.
- [24] Pratha, A. A., Ashwatha Pratha, A. and Prabakar, J. (2019) 'Comparing the effect of Carbonated and energy drinks on salivary pH- In Vivo Randomized Controlled Trial', Research Journal of Pharmacy and Technology, p. 4699. doi: 10.5958/0974-360x.2019.00809.6.
- [25] Punitha, V. C. et al. (2014) 'Prevalence of Dental Fluorosis in a Non-Endemic District of Tamil Nadu, India', Biosciences, biotechnology research Asia, 11(1), pp. 159–163.
- [26] Ramesh, M. et al. (2014) 'Prevalence of dental fluorosis in the district of Salem, Tamil Nadu, South India: A pilot study', Journal of orofacial sciences. Medknow Publications and Media Pvt. Ltd., 6(1), p. 37.
- [27] Samuel, S. R., Acharya, S. and Rao, J. C. (2020) 'School Interventions–based Prevention of Early-Childhood Caries among 3–5-year-old children from very low socioeconomic status: Two-year randomized trial', Journal of public health dentistry, 80(1), pp. 51–60.
- [28] Sukhabogi, J. R. et al. (2014) 'Dental fluorosis and dental caries prevalence among 12 and 15 year old school children in Nalgonda district, Andhra Pradesh, India', Annals of medical and health sciences research, 4(3), pp. 245–252.
- [29] Swetha, N. S. et al. (2019) 'A Systematic Review on Prevalence of Dental Fluorosis in Tamil Nadu', Research journal of pharmaceutical, biological and chemical sciences. Journal of Pharmaceutical Sciences and Research, 11(9), pp. 3314–3319.
- [30] Trendley Dean, H. (1934) 'Classification of Mottled Enamel Diagnosis', Journal of the American Dental Association . Elsevier, 21(8), pp. 1421–1426.
- [31] Verma, A. et al. (2017) 'High prevalence of dental fluorosis among adolescents is a growing concern: a school based cross-sectional study from Southern India', Environmental health and preventive medicine, 22(1), p. 17.

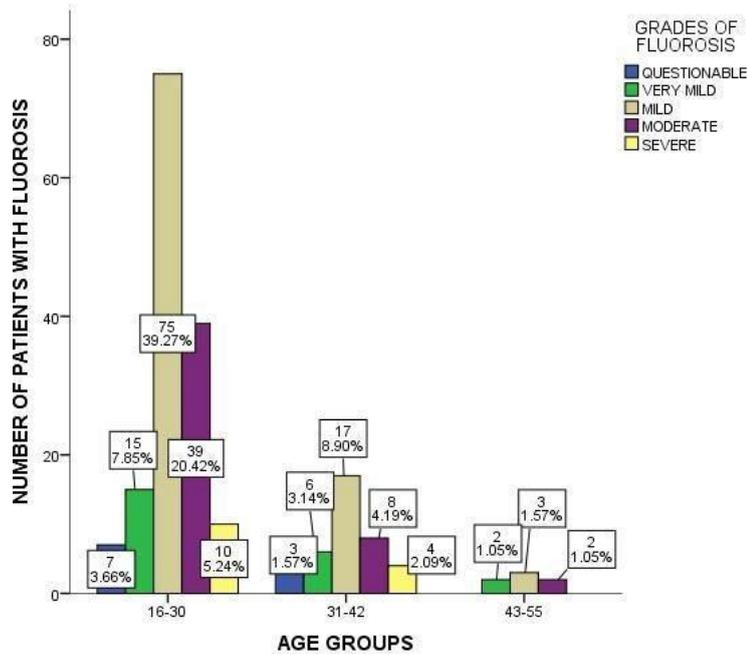


Figure 1: Bar chart shows the association between fluorosis grades and age groups. X-axis denotes the age groups. Y-axis denotes the number of patients with fluorosis. Chi-square test was done and was found to be statistically not significant (Pearson chi square, P value - 0.739 (>0.05)). This chart showed that the mild fluorosis was most common in the age group of 16 to 30 years and there was no statistically significant difference among various age groups.

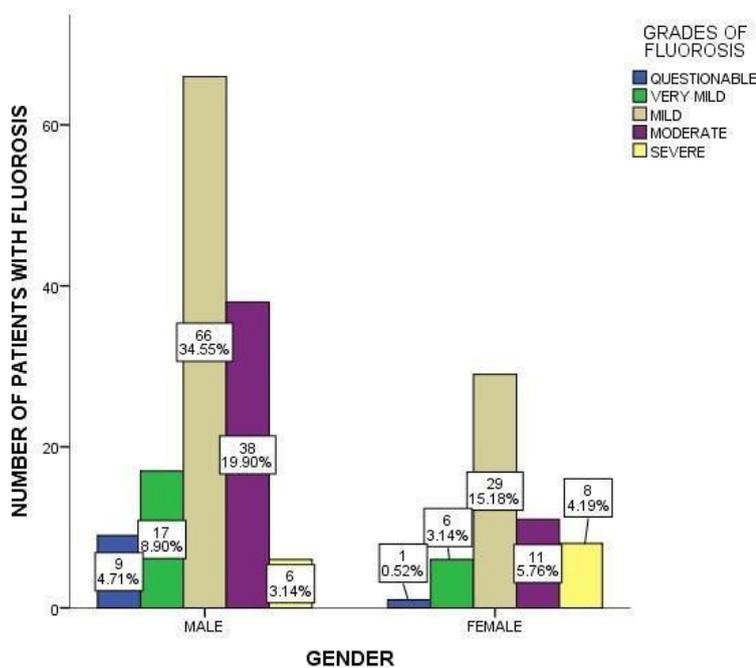


Figure 2: Bar chart depicts the association of grades of fluorosis with respect to gender. X-axis denotes the gender. Y-axis denotes the number of patients with fluorosis. Chi-square test was done and was found to be statistically not significant (Pearson chi square test, P Value-0.07(>0.05)). This chart showed that mild fluorosis was more common in male patients but there was no statistical significant difference between the genders.

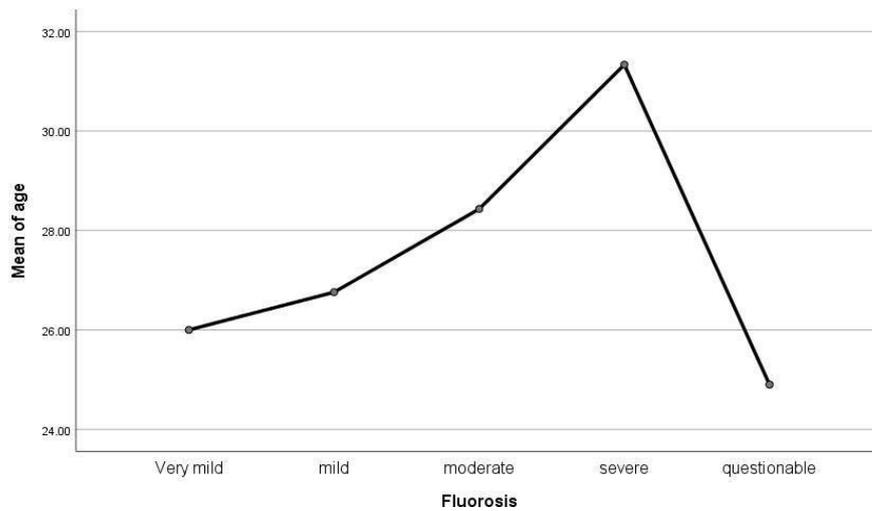


Figure 3: Scatter plot depicts the distribution of grades of fluorosis based on age. X-axis denotes the grades of fluorosis. Y-axis denotes the mean of age. This chart showed that there was a gradual increase from very mild to severe fluorosis on the mean of age. There was a sudden decline from severe to questionable fluorosis on the mean of age.