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Assessment of Dental Caries and Periodontal Status Among Patients with Dental Fluorosis Visiting A Dental College, Chennai.

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Abstract: Fluoride (F) is known to be one of the various chemicals that have proven to leave substantial effects to the human body especially through our drinking water. This chemical can be described as a double edged sword since in its deficiency, it enables the formation of dental caries while in excess, it can result in both dental and skeletal fluorosis. The aim of this study was to analyse both the dental caries and periodontal status in dental fluorosis patients. A total of 182 patients who were diagnosed with dental fluorosis was evaluated. Their age, gender, DMFT index and periodontal status was obtained from the patient records from the institution between June 2019 to March 2020. Results were analysed and compared using the SPSS Statistical Software by doing both the frequency tests and correlation tests (Chi-square test). In this study, we observed that there is negative association between dental caries (p=0.70) and the periodontal status (p=0.20) with dental fluorosis. Within the limits of the study, there is no significant association between the severity of dental caries and periodontal status with dental fluorosis. However, dental fluorosis is at a higher prevalence in males and at an age group of 21-25 years old.

Keywords: Dental fluorosis, Dental caries, Periodontal status

INTRODUCTION

Dental fluorosis or known in other terms as mottled enamel, is defined as a developmental disturbance of the dental enamel; which results from an extensive exposure to large concentrations of fluoride during the period of tooth development. It also resembles that of enamel hypoplasia that is characterised by lower mineral content as well as an increase in porosity. [(Abanto Alvarez *et al.*, 2009)]

India, a close estimate of 12 million out of the 85 million tons of fluoride deposit on the Earth's crust is identified., makes it more severely affected with fluorosis. [(Haritash *et al.*, 2018)] In response to the growing population and economic development, fluoride usage in drinking water has become a normal occurrence as most fresh water bodies in India are continuously polluted. [(Kumar, Pradeep Kumar and Preethi, 2017)] The method of using water fluoridation to limit caries prevalence is considered to be a proven strategy. However, the dangers of fluorosis surpasses its benefits.[(Samuel, Acharya and Rao, 2020a)]

Dental Professionals should be aware of benefits and risks in order to advise as well as to educate their patients. [(Pavithra, Preethi Pavithra and Jayashri, 2019)] The early identification of its risks will enable the patient to be more cautious in their fluoride intake and also helps reduce the postoperative effects.[(Neralla *et al.*, 2019)]

Fluorosis has the ability to produce serious health issues in three forms, dental, skeletal and non-skeletal fluorosis when a higher concentration is consumed. [(Kumar, Pradeep Kumar and Vijayalakshmi, 2017)] There are numerous therapies that have advised to treat fluorosis-stained teeth ranging from ceramic veneers to abrasive chemical procedures. However, the main problem with such invasive procedures is that particularly in young adults, the option of veneers or crowns will result in excessive removal of tooth materials which will untimely cause further destruction of tooth structure at such an early age. Not to mention that such treatments are also both time consuming as well as expensive. [(Ardu, Stavridakis and Krejci, 2007)]

Good oral health is a vital part of good general health.[(Khatri *et al.*, 2019)] Hence, in areas where fluoride intake is at a normal range and at an adequate amount, it is proven to help not only in the development of dental enamel but also aids in the prevention of dental caries. [(Fomon, Ekstrand and Ziegler, 2000)],[(Burgstahler, 1965)] Dental caries and its consequences have continued to become a public health problem especially in many

low to middle income countries and the socially disadvantaged groups in high income countries [(Prabakar, John and Srisakthi, 2016)]. One of main reasons is because teeth that have recently erupted are the ones that have the highest susceptibility to carious lesions. [(Prabakar, Joseph John, I. M. Arumugham, Kumar and Sakthi, 2018)] However, the incidence and prevalence of dental caries has decreased significantly over the last few decades, especially in the young, an evident protective effect which can be attributed to the widespread use of fluoride. [(Freitas *et al.*, 2013)] A study done by Mohapatra S et al have further elaborated about the usage of the fluoride element in treatments with Nova Min, Bio Min and Remin Pro containing toothpastes. [(Mohapatra *et al.*, 2019)] Nevertheless, as a result of the various side effects in the usage of fluoridated toothpaste, the search for other safe alternatives continues till this day. [(Prabakar, John, I. Arumugham, Kumar and Sakthi, 2018)] Unlike tobacco usage which is proven to be difficult in quitting, fluoride usage can be monitored and controlled. [(Harini and Leelavathi, 2019)] Thus, knowledge and awareness is of key importance. Para1. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar, Joseph John, I. M. Arumugham, Kumar and Srisakthi, 2018; Rajeshkumar *et al.*, 2018, 2019; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020b)
In this study, the aim was to assess dental caries and periodontal status of dental fluorosis patients. The main purpose is to understand the prevalence and association between these factors, for better understanding to provide proper treatment..

MATERIALS AND METHODS

Study Setting

The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

Study Design

The study was designed to include all dental fluorosis patients. The patients who did not fall into this inclusion criteria were excluded.

Sampling Technique

The study was based on a non probability consecutive sampling. To minimise sampling bias, all cases sheets of patients who were diagnosed with dental fluorosis were reviewed and included.

Data Collection and Tabulation

Data collection was done using the patient database with the timeframe work of 01 June 2019 to 31 March 2020. About 86,000 case sheets were reviewed and those fitting under the inclusion criteria were included. Data such as age, gender, DMFT index and periodontal status were documented. Cross verification was done with the help of photographic evidence. To minimise sampling bias, all data were included. The exclusion criteria was patients with systemic illness. Data was downloaded from DIAS and imported to Excel, tabulation was done. The values were tabulated and analysed.

Statistical Analysis

Descriptive statistics were performed using SPSS Statistical Analyzer (23.0 Version) by IBM on the tabulated values. Both the frequency distribution and the Chi-square tests were done.

RESULTS

A total sample size of 182 patients who were diagnosed with dental fluorosis were obtained through case records from the institution. The study result showed that fluorosis was found more common among the 21-25 age group compared to other age groups. (Figure 1). Based on gender, a higher prevalence was observed among males (70.9%) compared to females (29.1%). (Figure 2).

Dental Caries and Dental Fluorosis

The study result showed that among subjects exhibiting the questionable form of dental fluorosis showed 66.7% of them had a DMFT score ranging between 0-3. It was also found that 50% of patients with very mild fluorosis had DMFT score between 0-3.Around 11.5% of patients had DMFT Score ranging between 10-12 and 34.4% had DMFT score 4-6 among the mild fluorosis category. Among the moderate fluorosis category, 49.1% had DMFT Score between 0-3 and 9.4% had DMFT Score 10-12. Among patients with severe fluorosis,

36,8% had the DMFT score 0-3 and 4-6 while 26.3% had DMFT Score 7-9. (Figure 3) But, there was no statistical significance between the severity of dental fluorosis and the dental status of the patient.

Periodontal Status and Dental Fluorosis

Among patients with questionable fluorosis, 33.3% had healthy gingiva, localised chronic periodontitis and generalised chronic gingivitis and 26.1% had Localised Chronic Gingivitis. More than 50% of subjects had generalised chronic gingivitis among patients with Very mild form of dental fluorosis. More than half of the patients with mild fluorosis(65.6%) generalised chronic gingivitis while(1.6%) had generalised chronic periodontitis. In cases of moderate fluorosis, generalised chronic gingivitis (43.4%) was more compared to (43.4%) generalised chronic periodontitis (11.3%). Among patients with a severe form of dental fluorosis, generalised chronic gingivitis (47.4%) was more prevalent than generalised chronic periodontitis(5.3%). (Figure 4) The results were found to not be statistically significant.

DISCUSSION

In this study, it was observed that the highest distribution of dental fluorosis was seen in the age group 21-25 years old , compared to age group 51-55 years and 56-60 years. Similar to that of a study done by Idon PK et al. This could be because the with the increase of age, there could be a lack of desire to improve esthetics. [(Idon and Enabulele, 2018)]

The present study showed that fluorosis is more prevalent among males compared to females, which is similar to a study done by Mane AB et al and Elfaki N et al. The difference in the gender distribution could be based on the demographic of study setting as well as the higher clinical attendance of males compared to females. [(Mane, A.B., Revathi, S.V., Savale, P., Paul, C.N., & Hiremath, S.G., 2011)],[(Elfaki, N., Elsheikh, A., Assiry, A., 2018)]

In regard to the association between dental caries and dental fluorosis, the presence of dental caries was more common among patients with very mild fluorosis which is in contrast to the results obtained by Sharma I et al. The reason behind this is could be less the study population [(Dubey *et al.*, 2015)],[(Kola, S., Mallela, M., Puppala, R., Kethenaeni, B., Tharasingh, P., Reddy, V., 2019)] Based on a study done by Prabakar et al,dental caries studies were commonly conducted among ages of 12–15 years with deep occlusal pits and fissures [(Prabakar, John, I. Arumugham, Kumar and Srisakthi, 2018)]. In the present study the sample size was higher among 17 years, which could have affected the association between dental caries and dental fluorosis. Further studies which encompasses a larger sample would be essential to clarify such findings. [(Kannan *et al.*, 2017)]

The periodontal disease was more severe among patients with severe fluorosis and most of the patients exhibited healthy gingiva among mild and very mild fluorosis categories. Similar to a study done by Chopra A et al, as the degree of fluorosis increases the severity of periodontitis increases [(Chopra *et al.*, 2016)]. This could be explained by the fact that increased fluoride intoxication results in a toxic effect on resorption of cementocytes. The toxic action on the alveolar bone and root portion as well as the calcification of muscular attachments, ligaments and ossification, further predisposes to periodontal disease. [(Vazirani and Singh, 1968)],[(Reddy, Mallikharjunarao and Sarada, 1969)],[(Krook *et al.*, 1983)] Such findings could also be influenced by the presence of crown restorations since plaque accumulation can occur around the crown and result in inflammation of the surrounding gingival tissues. [(Mebin George Mathew *et al.*, 2020)] For the purpose of achieving a more thorough investigation, the patient's saliva PH should in the future be evaluated as it is considered to be a diagnostic biomarker for periodontal diseases.[(Pratha, Ashwatha Pratha and Prabakar, 2019)] Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; M. G. Mathew *et al.*, 2020)

During the course of the study, some limitations were encountered which included a limited sample size, the study demographic being limited to the urban population.

In future studies, to produce an even more significant study, the sample size, Source of water and fluoride concentration should be evaluated for an extended duration.

CONCLUSION

Within the limits of our study, although there were no significant relation between the severity of dental fluorosis with both dental caries and the periodontal status, it showed that dental caries and periodontal diseases were a common occurrence in patients with dental fluorosis. From that, we can assume that the oral hygiene practice of a majority of fluorosis patients are not satisfactory. Thus, dentists should particularly educate these patients about proper oral hygiene measures so that they can implement them in their daily lives.

Author Contributions

All authors have equal contribution in bringing out this research work.

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CONFLICT OF INTEREST
Nil

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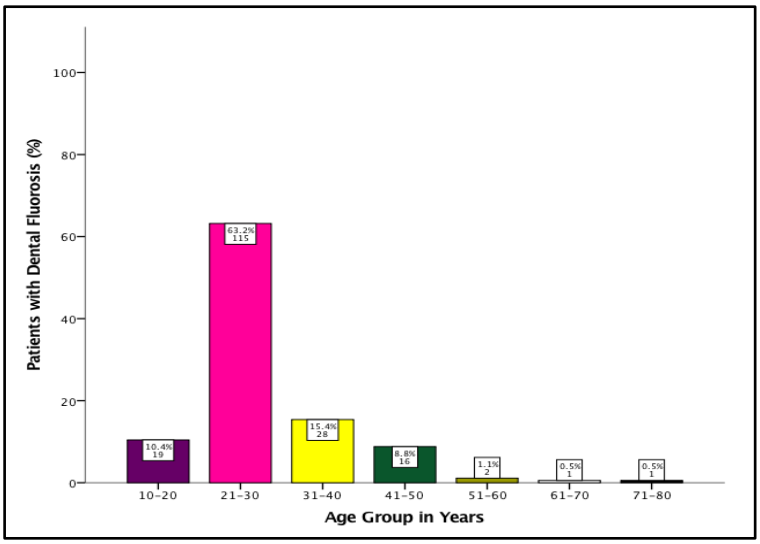

Fig.1: Bar chart represents the percentage distribution across the age group of dental fluorosis patients. The highest prevalence of dental fluorosis was seen in the age group ranging from 21-30 years old (pink).

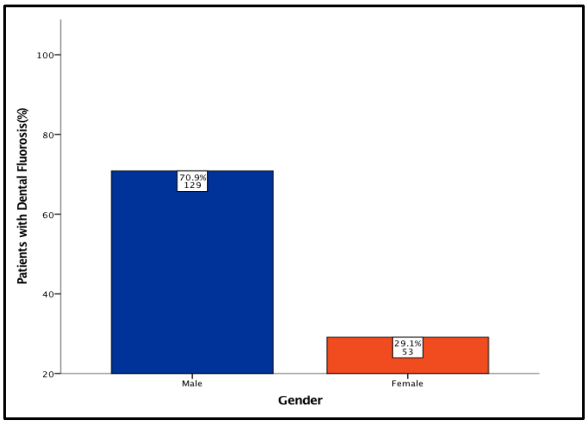

Fig.2: Bar chart represents the percentage distribution across genders of dental fluorosis patients. Dental fluorosis was more prevalent in males (dark blue) compared to females (orange).

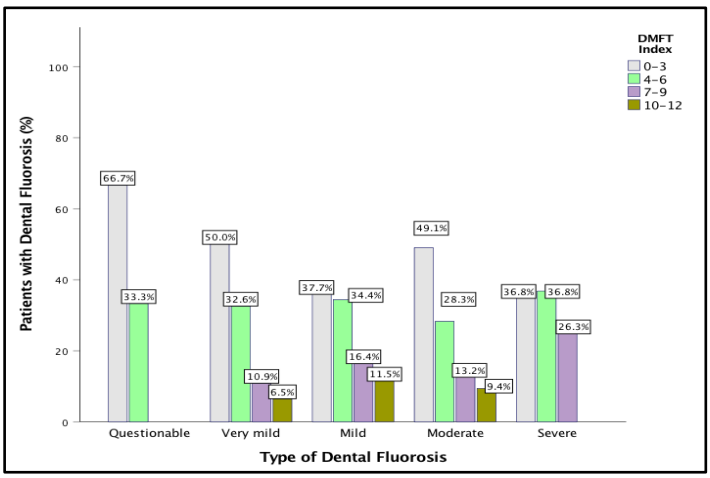

Fig.3: Bar chart shows the association between the severity of dental fluorosis and the DMFT index. X-axis represents the severity of dental fluorosis and Y-axis represents the percentage of patients with dental fluorosis. The DMFT index ranging between 0-3 (white) was seen to be the most prevalent in all levels of dental fluorosis. However, there was no statistical significance between the DMFT index and the severity of dental fluorosis. (Chi-square test; p=0.70, P>0.05-not significant).

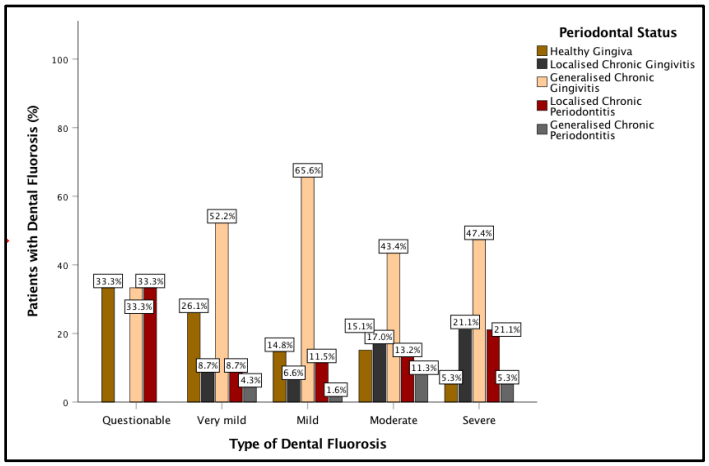

Fig.4: Bar chart shows the association between the severity of dental fluorosis and the periodontal status. X-axis represents the severity of dental fluorosis and Y-axis represents the percentage of patients with dental fluorosis. Generalised chronic periodontitis (dark grey) was seen to be the most prevalent in all levels of dental fluorosis. However, there was no statistical significance between the periodontal status and the severity of dental fluorosis. (Chi-square test; p=0.20, P>0.05-not significant).