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Incidence of fluorosis in patients in a university hospital setting.

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Abstract: Dental fluorosis is recognized as an oral health disease of public health importance by the WHO.Dental fluorosis results in poor esthetic appearance which may have a psychological bearing and lead to low confidence. In today's competitive world, these factors have gained much importance.To assess the incidence of fluorosis patients in young adults underwent routine dental check up with regards to age and gender. This is a descriptive clinical study carried out in saveetha Dental college and hospitals, Poonamallee chennai which was conducted using the patient record from the Department of Endodontics. Sample data has been collected from reviewing the case record of patients who visited clinics for dental checkup. All the patients who suspected fluorosis and who came for routine dental check up were selected for assessment of DF, Deans fluorosis index is used. Total of 283 patients,69.1% were male and 30.9% were female.Mean age between 20-30 years of age group and the mild fluorosis is higher in percentage about 46.5%. In moderate fluorosis, P value is 0.03 which was statistically significant compared to other types of fluorosis and the male predilection is more compared to females. Within limits of the study,mild fluorosis is present more compared to Dean's fluorosis index and male preditection is more. It is necessary to conduct a community based programme to determine other factors that may contribute to its occurrence in this population.

Keywords: Dental fluorosis; Deans fluorosis index; young adults; incidence; fluoride.

INTRODUCTION

Oral health is a very important component of general health. The high prevalence and severity of oral diseases such as dental caries, periodontal disease, oral cancer, and various stages of malocclusion, and the crippling nature of these diseases lead to significant absenteeism in schools and economic loss in the working population.(Ramamoorthi, Nivedhitha and Divyanand, 2015)Dental illness thus contributes to considerable reduction in national production and overall national development. One of the latest innovations in the industrial and medical field is use of CBCT.(Ramanathan and Solete, 2015) Adequate intake of fluoride plays an important role in the development of tooth enamel and has so far been the most effective measure against dental caries, (Siddique *et al.*, 2019)but is also associated with the increasing prevalence of dental fluorosis (DF) as chronic excessive consumption interferes with the matrix formation and calcification of tooth enamel.(Adanir, Türkkahraman and Güngör, 2007) Dental fluorosis becomes evident in the population at consumption concentration above 1.5 mg/l.The therapeutic range of fluoride appears to be normal (1 to 1.2mg /L).(Erdal and Buchanan, 2005) The chronic toxic effect of excessive intake of fluoride has also been documented to include skeletal fluorosis,neurological manifestations such as lowering of the intelligence quotient(IQ), gastrointestinal tract(GIT), dyspeptic symptoms and urinary tract malfunctioning. (Bhagavatula *et al.*, 2018)These symptoms,unlike DF,have been noted mostly at higher concentrations of fluoride ranging from 2mg/l for low IQ in children,3.2mg/l for GIT symptoms, 8mg/l for renal symptoms and 10mg/l for crippling skeletal fluorosis.(Derryberry, Bartholomew and Fleming, 1963) Among all these ,DF is the most common unwanted effect of chronic exposure to fluoride and the importance of this condition is its role as the earliest indicator of excessive fluoride exposure in a population.(National Research Council *et al.*, 2007) Dental fluorosis is recognized as an oral health disease of public health importance by the WHO.Dental fluorosis results in poor esthetic appearance which may have a psychological bearing and lead to low confidence. In today's competitive world, these factors have gained much importance.(Rajendran *et al.*, 2019) Severity of the resulting DF is determined by several factors including duration of consumption, diet, duration of breastfeeding, use of fluoride supplements, age, weight, nutritional status, dentinal sensitivity and altitude. Increased risk of DF has been noted with decreased duration of breastfeeding and subsequent introduction of infant formulas; use of

fluoridated toothpaste at an early age (<2 years of age), younger aged children, as fluoride uptake by mineralized tissues decreases with increasing age, and the use of fluoride supplements. Similar doses of fluoride may therefore produce different levels of severity of DF depending on these factors. Studies have been carried out to explain the relationship between these factors and the prevalence and severity of DF. Endemic fluorosis resulting from high fluoride concentration in groundwater is a public health problem in India. Sometimes hypersensitivity is also associated with fluorosis.(Sandhya and Janani, 2019)Calcified roots are sometimes associated with dental fluorosis.(Kumar and Delphine Priscilla Antony, 2018) A few investigations revealed that fluorosed teeth are at high risk for root fracture. (R, Rajakeerthi and Ms, 2019) Water remains the major source of fluoride intake, with lesser amounts consumed in other sources such as fluoridated food supplements ,toothpaste and other dental products.(Yang and He, 2019)Concentration of fluoride in water sources for drinking of upto 1mg/l for temperate region and 1.2mg/l for the tropics have been recommended to provide a balance between anticaries effect and it causes the enamel defects.(Do, Ha and Spencer, 2016)Concentration below 0.5mg/l will not protect against dental caries while dental fluorosis may be seen at the concentration is 1mg/l. It is however agreed that concentrations above a threshold limit of 1.5mg/l will result in objectionable fluorosis.(Koch, 1984)Dental fluorosis is a specific condition due to chronic ingestion of excessive fluoride during enamel formation. The cleavage and removal of enamel proteins are disturbed. Retention of the proteins and water results in varying degrees of subsurface porosities related to the severity of fluorosis.(Samuel, Acharya and Rao, 2020)The porosities may attract extrinsic stains, causing enamel discoloration.(Jose, P. and Subbaiyan, 2020) Posteruptive, occlusal trauma may cause detachment of surface enamel weakened by the subsurface porosities and cause hypersensitivity.(Janani, Palanivelu and Sandhya, 2020) Tooth decay over the years has been a major public health problem. Fluoride has played a central role in oral health promotion for the past 50 years(Whelton *et al.*, 2004) but the ingestion of excessive fluoride during tooth development particularly at the maturation stage may result in dental fluorosis which has an extensive range of clinical signs.(Manohar and Sharma, 2018) Mildly fluorosed enamel is fully functional and may present as barely detectable whitish striations, whereas severely fluorosed enamel is more prone to wear and fracture and may present as pitted, stained and porous enamel described as mottling.(Montelius, McIntosh and Ma, 1933)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, John, 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, 2020)

Thus the present study aims to determine the incidence of fluorosis patients in young adults undergoing routine dental check up with regards to age and gender.

MATERIALS AND METHODS

Study design and setting:

This study setting is mainly a type of the university based and a single centered study.This descriptive study examined the records of patients from june 2019 to march 2020 undergoing treatment at Saveetha Dental College, Chennai. The study population included patients who underwent routine dental checks in young adults based on age and gender. The main advantage of this type of study is flexible data can be obtained immediately and less expensively but the drawback of this study is that they have geographical limitations and involve the people of the isolated population.Ethical approval was obtained from the institutional ethics committee,SIMATS.

Data collection:

Data was collected by reviewing the case record of patients who attended the clinics, which was used to identify the fluorosis patients who underwent routine dental checkup. All the patients aged above 20-40 years included. To determine dental fluorosis, Deans fluorosis Index is used. Deans fluorosis Index and its modification remains the gold standard index for dental fluorosis.

For assessment of DF,the teeth were dried with gauze and then the facial/buccal surface of all the permanent teeth was evaluated by visual impacion in natural light, using a dental mirror and explorer. The registry of Dental Fluorosis was based on the two most affected teeth using the DFI to classify the severity for each patient as normal, questionable, very mild, mild, moderate and severe which is coded as 0,1,2,3,4 and 5 respectively data such as Age, Gender, Severity of dental fluorosis were collected .Repeated patient records, incomplete data without proper notes were excluded from the data.The data were recorded, tabulated and the percentage calculated.

Statistical analysis:
Data was recorded in Microsoft excel and later exported to IBM SPSS (version 20.0 chicago USA) and subjected to Statistical analysis .Chi Square test was then employed with level of significance set at $P<0.05$.The statistical analysis between age , gender and severity of dental fluorosis was carried out in SPSS software. Chi square test was done to compare the parameters.The outcome was represented in a form of tables and bar charts. Ethical approval number SDC/SIHEC/2020/DIASDATA/0619-0320.

RESULTS AND DISCUSSION
Total of 283 patients were recorded with dental fluorosis during the study period. Mild fluorosis is more about 46.69%, moderate fluorosis is 28.22%, very mild fluorosis is 11.85%, severe fluorosis is 8.71% and questionable fluorosis is 4.53%[Figure 1]. The most number of fluorosis patients were under the age of 20-30 years(66.55%)[Figure 2]. Gender predilection is 68.9% were males(n=199) and 31.01% were female(n=89)[Figure 3]. In moderate fluorosis, P value is 0.03 which was statistically significant compared to other types of fluorosis and the male predilection(n=56) is more compared to females(n=26). P value of other types of fluorosis namely questionable, mild, very mild and severe is greater than 0.05 which was statistically not significant. In questionable fluorosis male predilection(n=10) is more compared to females(n=3), in very mild fluorosis, male predilection(n=20)is more compared to females(n=14), in mild fluorosis male predilection(n=94) is compared to females(n=40), and in severe fluorosis is also male predilection(n=6) is more compared to females(n=19).
The present study compared the effect of age, gender and type of fluorosis which was determined by Dean's fluorosis Index. Number of other studies have been used to determine Dental fluorosis by calculating the CFI for the population.(Idon and Enabulele, 2018) CFI is used in higher statistical weights assigned to higher levels of severity of DF, the CFI values would be higher in populations with more individuals in the higher level of DF severity. The present study used DFI to compare the effect of age, gender and type of fluorosis in young adults.
Prevalences have been found to vary between the genders, while some studies have found no association of DF to gender.(Chauhan *et al.*, 2012) With the higher male clinic attendance in this study, it is not surprising to find a higher prevalence of DF among males. This may be explained by the closer attention that males tend to pay to their health and appearance as shown by a higher proportion of males attending clinics primarily for the treatment of DF. The finding of this study where in the prevalence of DF was observed to increase with increasing age. This is due to desire for the improved esthetics concern in young adults. This is in accordance with many other studies(Chandu *et al.*, 2009) and few studies opposed our study by saying that male clinical attendance is low compared to female clinical attendance.(Yadav, Yadav and Oberoi, 2014)
In this study, DF of the esthetic concern was recorded as Dean's fluorosis severity levels of mild and accounted for the majority of those affected(46.5%). The request for the treatment among the affected patients was however low. The reason for this is unknown, but due to social norms and beliefs in the region that could have an impact on the perception of esthetics. On the other hand, few other researches have stated that severity levels of mild and below may not be associated with esthetic concerns. This may be the reason why the moderate and severe forms accounted for clinics to seek treatment for the condition. Hence though the proportion of the suffers seeking treatment in the present study is quite low, there seems to be more esthetic concerns with increasing degree of severity of Dental fluorosis which is similar to reports of other studies.(Browne *et al.*, 2011)
Our study shows that most fluorosis patients were under the age of 25 years ie, mean age- 20-30 years of young adults followed by 30-40 years. It is established that dental fluorosis results from prolonged exposure to excessive fluoride during tooth mineralisation. Therefore, if there is no exposure to excess fluoride during childhood, it is unlikely for DF to occur. This is in accordance with many researches who stated that young adults are easily prone and more concerned about esthetics.(Rigo, Lodi and Garbin, 2015)
Defluoridation of areas with high fluoride levels must be one of the goals in public health programs.(Prabakar, John, Arumugham, Kumar and Sakthi, 2018) The health-care workers at village level must be educated regarding small-scale methods of defluoridation so that they in turn can conduct it in the village. (Noor, S Syed Shihaab and Pradeep, 2016)Dental services in these areas must be improved with the help of village health workers and public–private partnerships to improve the provision of services may be considered as a long-term goal.(Patturaja and Pradeep, 2016)
The oral health status was found to be very poor with the high levels of fluorosis in the present population.(Teja, Ramesh and Priya, 2018)The therapeutic management options include bleaching, microabrasion, veneering and crowning(Ravinthar and Jayalakshmi, 2018). The bleaching agents break down the chromogens into smaller molecules, resulting in teeth with lighter and brighter shades. (Teja and Ramesh, 2019)The microabrasion is aimed at removing the superficial microporous zone together with the entrapped extrinsic stains, while laminate veneers and crowns provide esthetic masking of the discolored fluorosed enamel.(Nandakumar and Nasim, 2018)(Nasim *et al.*, 2018) It is suggested that mild-to-moderate fluorosis be treated by microabrasion and bleaching, while severe fluorosis, with loss of some surface enamel, is managed by veneering and crowning,

with local anesthesia depending on the extent of surface enamel loss.(Ranganathan, Ganapathy and Jain, 2017)Long-term clinical trials are needed to evaluate the appropriateness of the various management options for fluorosis of varying severity.(S *et al.*, 2017)

Figures:

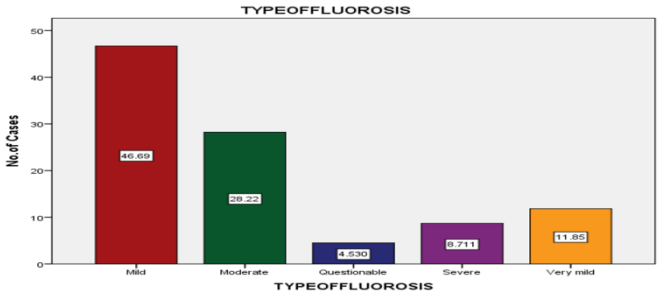

Fig.1: Bar chart represents the incidence of fluorosis based on severity according to Deans fluorosis index. Y axis represents the number of patients who underwent routine dental check up and X axis represents the severity of fluorosis. Red colour represents mild fluorosis, green colour represents moderate fluorosis,blue colour represents questionable fluorosis, violet colour represents severe fluorosis, and yellow colour represents very mild fluorosis. Inference shows that the mild fluorosis is more comparing other types of fluorosis.

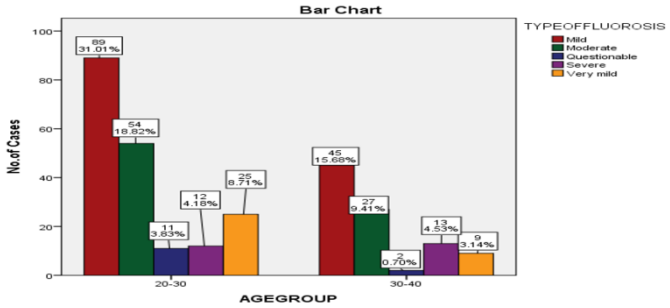

Fig.2: Bar chart represents the comparison of fluorosis type with age group. Y axis represents the number of patients who underwent routine dental check up and X axis represents the gender predilection. Red colour represents mild fluorosis, green colour represents moderate fluorosis,blue colour represents questionable fluorosis, violet colour represents severe fluorosis, and yellow colour represents very mild fluorosis. Inference shows that the mild fluorosis is more compared to other types of fluorosis in the age group of 20-30 years than 30-40 years.This is not statistically significant by Pearson Chi Square test; P value is .180 which is >0.05.

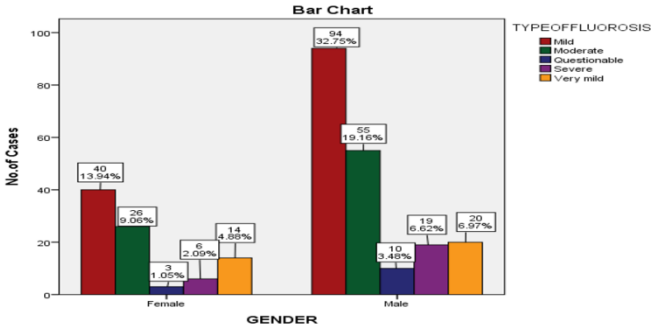

Fig.3: Bar chart represents the comparison of fluorosis type with gender predilection. Y axis represents the number of patients who underwent routine dental check up and X axis represents the gender predilection. Red colour represents mild fluorosis, green colour represents moderate fluorosis,blue colour represents questionable fluorosis, violet colour represents severe fluorosis, and yellow colour represents very mild fluorosis. Inference shows that the mild fluorosis is more compared to other types of fluorosis in male predilection than females.This is not statistically significant by Pearson Chi Square test; P value is .699 which is <0.05.

Study limitation
Very small sample size, More parameters, if assessed would give a much better quality

FUTURE SCOPE
Study needs to be done on a larger sample size
More grading samples are required and a prospective based study would help assess the long term prognosis.
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; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

CONCLUSION
Within limits of the study, the mild fluorosis is present more in number compared to Dean's fluorosis Index. The male predilection is more here comparing females and the mean age for the patient is between 20 to 30 years who seeks routine dental check up. The oral health status was found to be poor with high levels of fluorosis in the present population. So, public health programs, community awareness, school teacher and dentist awareness is much needed to educate the knowledge of fluorosis to the population. Further studies are recommended to evaluate the incidence of fluorosis and awareness about the knowledge of the people about fluorosis and treatment modalities.

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