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EVALUATION OF ASSOCIATION BETWEEN DENTAL FLUOROSIS AND ORAL HYGIENE

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ABSTRACT

Fluorosis is a calcification disorder, which occurs in the enamel due to the chronic ingestion of small amounts of fluoride. Mottled enamel in dental fluorosis results in pitting of the tooth, which are more prone for calculus accumulation. It affects the oral health and also affects the esthetics which is a major concern among those who are affected. The aim of the study is to assess the impact of oral hygiene in patients with dental fluorosis. It is a university setting study. 135 patients who had dental fluorosis aged between 18-35 years were included in the study. The diagnosis of fluorosis was performed according to Dean's fluorosis index (1942) and oral hygiene was evaluated using Oral hygiene index-Simplified (OHI-S) given by Green and Vermilion, 1964. Patients who were medically compromised and those who didn't have fluorosis were excluded. Positive correlation was found between Dean's fluorosis index and OHI-S index. As fluorosis score increases, oral hygiene of the patients were reduced ($p < 0.001$). Mostly males (73%) were affected with Dental fluorosis and oral hygiene was good in about 47% of the females when compared to men. Within the limits of the study, it is evident that as the degree of fluorosis increases, oral hygiene is compromised.

Keywords: Dental fluorosis, Esthetics, Hypocalcification, Oral hygiene, Self esteem

INTRODUCTION

Fluorosis is a calcification disorder, which occurs in the enamel due to the chronic ingestion of small amounts of fluoride [1, 2]. Clinically dental fluorosis is characterised by diffuse hypocalcifications distributed on the enamel surface of the tooth. It is a multifactorial disorder, where the degree of hypocalcifications depends on various factors like total amount of ingested fluoride, exposure time, the subject's age and weight and nutritional status [3, 4].

In mild and moderate forms of dental fluorosis, manifests as opaque lines and spots, whereas in more severe forms, the tooth structure becomes completely opaque & porous & gets accumulated by pigments from diet & results in brownish discolouration [5, 6]. Mottled enamel in dental fluorosis results in pitting of the tooth, which is more prone for calculus accumulation [7, 8]. It affects the oral health and also affects the esthetics which is a major concern among those who are affected. Esthetic changes produced by severe dental fluorosis may trigger social constraints [9, 10]. Use of fluorides results in reduction in caries prevalence [11, 12]. So as a result of its use for individual and collective use, there has been an increase in the prevalence of dental fluorosis [13, 14]. Using fluoride

toothpastes have been associated with an increase in the prevalence of fluorosis [15, 16], but few studies were contradictory to this finding & stated that the association between use of fluoridated toothpaste and occurrence of fluorosis was severe and unreliable [17, 18]. Studies have shown impact on functional oral activity [19, 20].

Oral health is a very important component of general health [21, 22]. So oral disease like dental fluorosis affects not only the oral health of the patients, but also their quality of life and esthetics [23, 24]. This in turn results in their lower self esteem and they restrict themselves from the rest of the society, due to their appearance of teeth [25]. There are studies evaluating the impact of dental fluorosis on oral hygiene [26], and have shown conflicting results because perceptions regarding dental fluorosis depend on esthetics and degree of severity [27]. So this study aims to assess the impact of oral hygiene in patients with dental fluorosis.

MATERIALS AND METHODS

Study design:

Patients with dental fluorosis aged between 18-35 years were included in the study. Those patients who were medically compromised were excluded from the study.

Study setting:

It is a university setting study, conducted in Saveetha Dental College predominantly. The pros of the study are flexible data retrieval, automated data collection and less time consumption. The cons of the study are it is limited to a certain population. Approval for the study was obtained from the Institutional Ethical Committee (IEC), Saveetha Dental College. Two examiners were involved in the study.

Sampling:

The data were collected from June 1, 2019 to November 30, 2019. A total of 250 case sheets were reviewed and from this 135 were included in the study after considering the exclusion criteria. Cross verification of data for errors was done through evaluation of photographs. Simple random sampling and more data sources were looked into to minimise sampling bias. Eligibility criteria of the sample was defined.

Data collection:

Data were collected after reviewing case sheets of patients, which included the demographic details, Dean's fluorosis index and Oral hygiene index-Simplified of the patients. Data was entered in a methodical manner in Excel and was imported to SPSS and variables were defined. Incomplete and censored data were excluded from the study.

Analytics:

IBM SPSS 2.0 software was used for statistical analysis. Correlation analysis - Chi square test was used to compare the association between dental fluorosis and oral hygiene. Descriptive analysis was used to describe the age and gender distribution of the study population. Independent variables were time, geographic location and dependent variables are age.

RESULTS AND DISCUSSION

The results inferred from the study is as follows: In relation to gender distribution of the population it was found that out of 135 patients, 96 were males and 39 were females [Figure 1]. In relation to association between Dean's fluorosis index and oral hygiene of the patient, it was found that as the degree of severity of fluorosis increases oral hygiene is compromised ($p < 0.001$) which is statistically significant [Figure 2 and Table 1]. In relation to the association of gender with oral hygiene it was found that females had good oral hygiene (47%) when compared to men (41%), but were not statistically significant ($p > 0.05$) [Figure 3 and Table 2]. In relation to the association of gender with dental fluorosis it was found that males (72%) were affected with greater degree (moderate and severe) of fluorosis when compared to females (18%). These findings

were not statistically significant ($p>0.05$) [Figure 4 and Table 3].

Dental fluorosis is recognised as an oral health disease of public health importance by WHO [28]. Dental fluorosis results in poor oral hygiene and also affects esthetic appearance which may have a psychological bearing and lead to low confidence. In today's competitive world, these factors have gained much importance [29]. This study assesses the importance of oral hygiene maintenance in the patients with dental fluorosis after assessing the impact of oral hygiene in patients with dental fluorosis. Patients in the age group of 18-35 years who had dental fluorosis were included in the study.

In relation to the association between Dean's fluorosis index and oral hygiene index, it was found that as the degree of severity of fluorosis index increases, oral hygiene is compromised which was found to be statistically significant. This finding was similar to the study conducted by Michael *et al* [17] and Archarya *et al* [30]. The reason for this could be as the severity of fluorosis increases, the enamel becomes more mottled, which results in the pitting of enamel and it becomes more prone to calculus accumulation, As a result of which oral hygiene is compromised [31]. However the

results were contradictory to the study performed by Zimmermann *et al* 1955 [32], where he stated that there is no association between fluorosis and oral hygiene. The reason for this could be differing sample size and geographic location.

In relation to the association between gender and oral hygiene index, females (47%) had better oral hygiene than males (41%) which may be due to the fact that females usually are more conscious about their oral health and its maintenance when compared to males. Males also have smoking habits, which could be the reason for their reduced oral hygiene [33]. This was in line with the study by Grembowski [34]. However the results were contradictory to the literature done by Vandana *et al* [35], where males had good oral hygiene when compared to females. The reason for this could be the differing sample size, geographic location, examiner's subjectivity.

In relation to the association between gender and Dental fluorosis, males (72%) were affected with greater degree of fluorosis (moderate and severe) when compared to females (18%). These findings were in line with the study performed by Michel *et al* [17] and Varenne *et al* [36] where males were affected more than the females. However, Idon *et al* [37] and Aguilar *et al*

[38] said that females were affected more than the males, which was contradictory to the present study. The reason for this would be differing sample size, geographic location & examiner's subjectivity.

Oral health problems can have a significant impact on social, physical and psychological well being of the population [39]. So proper oral hygiene maintenance is of utmost importance in compromised conditions like dental fluorosis. It is the responsibility of the dentist to educate people on the importance of oral hygiene maintenance, brushing

frequency, use of non fluoridated toothpastes, newer brushing devices etc .The limitations of the study include geographic location, differing sample size and examiner's subjectivity.

The future scope of the study is to do extensive research with large sample sizes in different geographic locations so as to educate patients with dental fluorosis on the effects caused due to it on oral health and educate them accordingly to maintain proper oral hygiene and prevent the progression of deteriorating oral health.

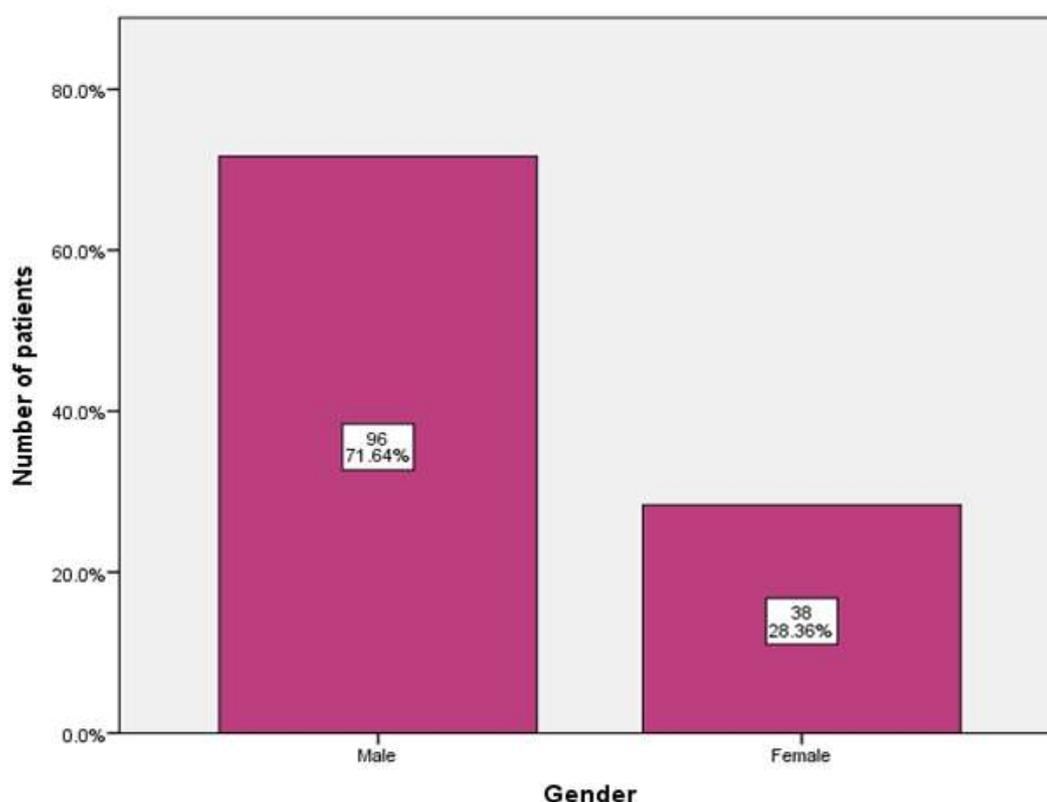


Figure 1: Bar graph showing the gender distribution of the study population. X axis represents the gender and Y axis represents the number of participants with dental fluorosis. Dental fluorosis was more prevalent in males when compared to females

Table 1: Descriptive distribution of association between patients with oral hygiene score and dental fluorosis score. As the degree of severity of fluorosis increases oral hygiene is compromised; *P value <0.05 - Statistically significant

Dean's fluorosis score	OHI score			Total (n)	Pearson Chi square test P value
	Good (n)	fair (n)	poor (n)		
Questionable	2	1	0	3	
very mild	23	9	0	32	
Mild	19	25	0	44	
Moderate	11	30	1	42	0.001*
Severe	3	8	2	13	
Total	58	73	3	134	

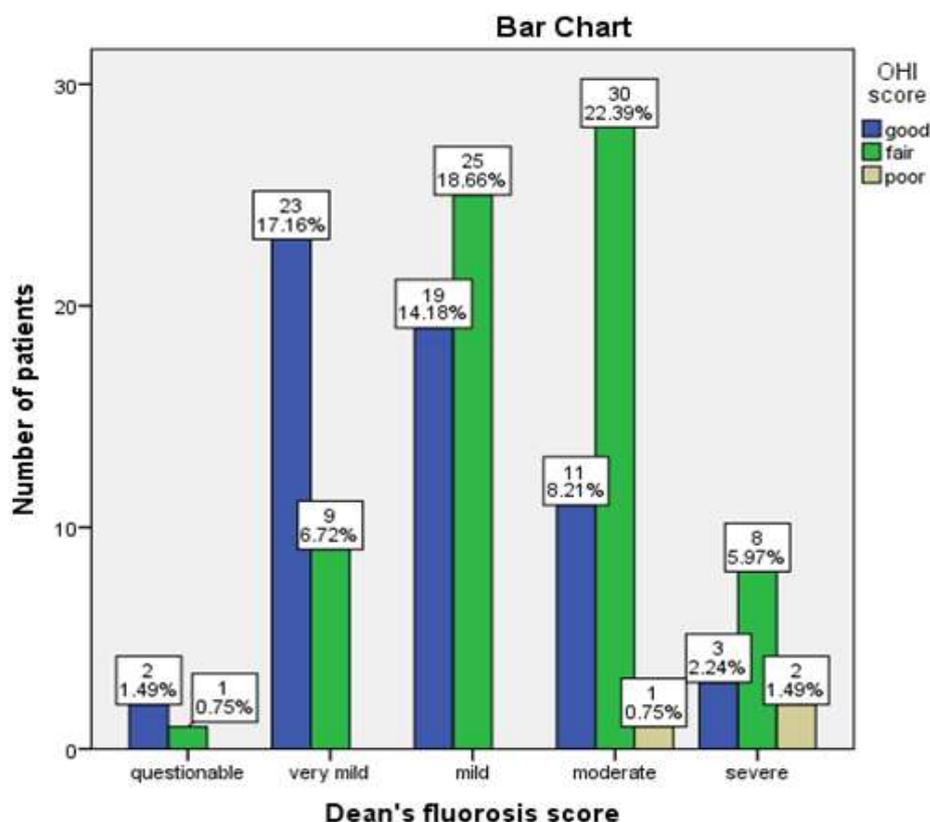


Figure 2: Bar graph showing association between oral hygiene score and dental fluorosis score. X axis represents the Dean's fluorosis score and Y axis represents the number of patients with dental fluorosis. [Pearson Chi square test, p value- 0.001 (<0.05), hence statistically significant]. As the degree of severity of fluorosis increases oral hygiene is compromised, which is statistically significant

Table 2: Descriptive distribution of association between dental fluorosis patients and their oral hygiene based on gender. Females had good oral hygiene when compared to males. P value >0.05 - Statistically not significant

Gender	OHI score			Total (n)	Pearson Chi square test P value
	Good (n)	fair (n)	poor (n)		
Male	40	53	3	96	0.327
Female	18	20	0	38	
Total	58	73	3	134	

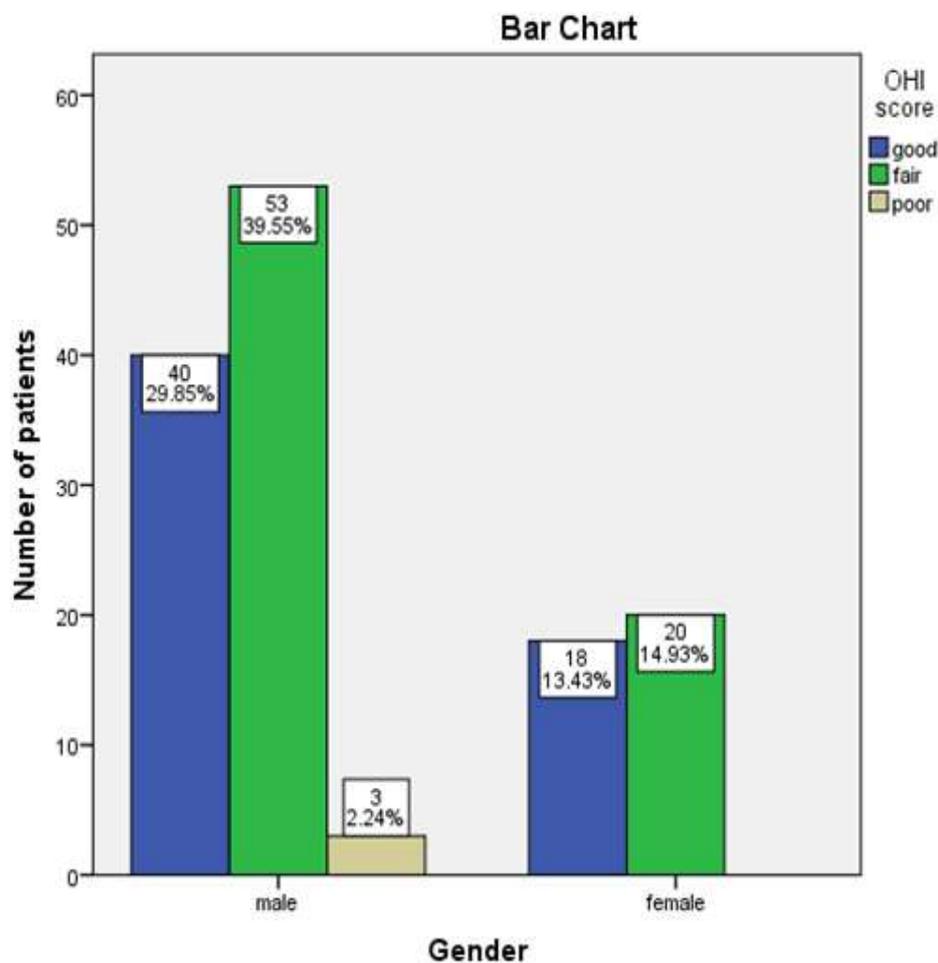


Figure 3: Bar graph shows association between dental fluorosis patient and oral hygiene score based on gender . X axis represents the gender and Y axis represents the number of patients. [Pearson Chi square test, p value- 0.327 (>0.05), hence statistically insignificant]. Females had good oral hygiene when compared to males, which is not statistically significant.

Table 3: Descriptive distribution of association between gender and severity of dental fluorosis based on Dean’s fluorosis index. Males were affected with greater degree (moderate and severe) of fluorosis when compared to females. P value >0.05 - Statistically not significant

Gender	Dean's fluorosis score					Total (n)	Pearson Chi square test P value
	questionable (n)	very mild (n)	mild (n)	moderate (n)	severe (n)		
male	2	24	31	28	11	96	0.743
female	1	8	13	14	2	38	
Total	3	32	44	42	13	134	

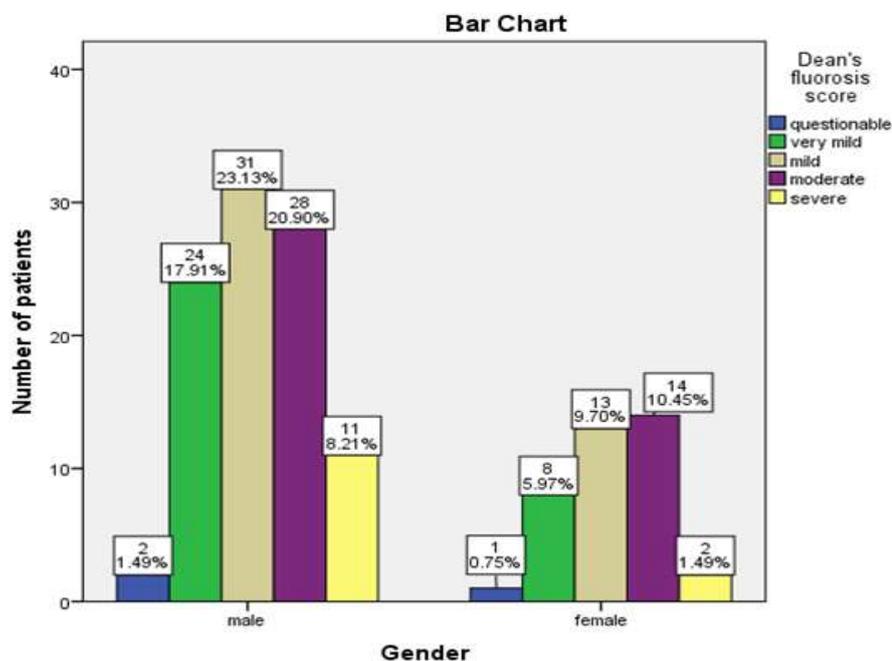


Figure 4: Bar graph shows association between gender and severity of dental fluorosis based on Dean's fluorosis index. X axis represents the gender and Y axis represents the number of patients with dental fluorosis. [Pearson Chi square test, p value- 0.743 (>0.05), hence statistically insignificant). Males were affected with greater degree (moderate and severe) of fluorosis when compared to females, which is not statistically significant.

CONCLUSION

Within the limits of the study, we conclude that as the degree of severity of fluorosis increases, oral hygiene is compromised. So it is important to educate those patients with dental fluorosis on the importance of oral hygiene and its maintenance, brushing frequency, non fluoridated toothpaste and newer brushing devices. So proper oral hygiene maintenance ultimately results in prevention of dental caries and good oral health.

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Author's Contribution

First author (Vaishali. S) performed the analysis and interpretation and wrote the manuscript. Second author (Dr. Jessy) contributed to conception, data design, analysis, interpretation and the third author (Dr. Revathi Duraisamy) critically revised the manuscript. All the authors have discussed the results and contributed to the final manuscript.

Conflict Of Interest:

Nil

REFERENCES

- [1] Jälevik B, Norén JG, Klingberg G, Barregård L. Etiologic factors influencing the prevalence of demarcated opacities in

- permanent first molars in a group of Swedish children. *Eur J Oral Sci.* 2001 Aug;109(4):230–4.
- [2] Jeevanandan G. Kedo-S Paediatric Rotary Files for Root Canal Preparation in Primary Teeth – Case Report [Internet]. *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH.* 2017. Available from: <http://dx.doi.org/10.7860/jcdr/2017/25856.9508>
- [3] Robinson C, Connell S, Kirkham J, Brookes SJ, Shore RC, Smith AM. The effect of fluoride on the developing tooth. *Caries Res.* 2004 May;38(3):268–76.
- [4] Govindaraju L, Jeevanandan G. Comparison of quality of obturation and instrumentation time using hand files and two rotary file systems in primary molars: A single-blinded randomized *European journal of [Internet].* 2017; Available from: https://www.thieme-connect.com/products/ejournals/html/10.4103/ejd.ejd_345_16
- [5] Drummond BK, Kilpatrick N. *Planning and Care for Children and Adolescents with Dental Enamel Defects: Etiology, Research and Contemporary Management.* Springer; 2014. 175 p.
- [6] Govindaraju L, Jeevanandan G, Subramanian EMG. Knowledge and practice of rotary instrumentation in primary teeth among indian dentists: A questionnaire survey. *Journal of International Oral Health.* 2017 Mar 1;9(2):45.
- [7] Buzalaf MAR. *Fluoride and the Oral Environment.* Karger Medical and Scientific Publishers; 2011. 178 p.
- [8] Somasundaram S, Ravi K, Rajapandian K, Gurunathan D. Fluoride Content of Bottled Drinking Water in Chennai, Tamilnadu. *J Clin Diagn Res.* 2015 Oct;9(10):ZC32–4.
- [9] Connett PH, Beck JS, Micklem HS. *The Case Against Fluoride: How Hazardous Waste Ended Up in Our Drinking Water and the Bad Science and Powerful Politics that Keep it There.* Chelsea Green Publishing; 2010. 372 p.
- [10] Jeevanandan G, Govindaraju L. Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial. *Eur Arch Paediatr Dent.* 2018 Aug;19(4):273–8.
- [11] García-Camba de la Muela J-M, García-Hoyos F, Varela Morales M, González Sanz A. [Demonstration of fluoride systemic absorption secondary to toothbrushing with fluoride dentifrice in children]. *Rev Esp Salud Publica.* 2009 May;83(3):415–25.
- [12] Govindaraju L. Clinical Evaluation of Quality of Obturation and Instrumentation Time using Two Modified Rotary File Systems with Manual Instrumentation in Primary Teeth [Internet]. *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH.* 2017. Available from:

- <http://dx.doi.org/10.7860/jcdr/2017/30069.10602>
- [13] Wong MC, Glennly A-M, Tsang BW, Lo EC, Worthington HV, Marinho VC. Topical fluoride as a cause of dental fluorosis in children. *Cochrane Database Syst Rev*. 2010 Jan 20;(1):CD007693.
- [14] Ravikumar D, Jeevanandan G. Evaluation of knowledge among general dentists in treatment of traumatic injuries in primary teeth: A cross-sectional questionnaire study. *European journal of [Internet]*. 2017; Available from: https://www.thieme-connect.com/products/ejournals/html/10.4103/ejd.ejd_357_16
- [15] Tenuta LMA, Cury JA. Fluoride: its role in dentistry [Internet]. Vol. 24, *Brazilian Oral Research*. 2010. p. 9–17. Available from: <http://dx.doi.org/10.1590/s1806-83242010000500003>
- [16] Panchal V, Jeevanandan G, Subramanian EMG, Others. Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial. *J Indian Soc Pedod Prev Dent*. 2019;37(1):75.
- [17] Michel-Crosato E, Biazevic MGH, Crosato E. Relationship between dental fluorosis and quality of life: a population based study. *Braz Oral Res*. 2005 Apr;19(2):150–5.
- [18] Christabel SL, Linda Christabel S. Prevalence of Type of Frenal Attachment and Morphology of Frenum in Children, Chennai, Tamil Nadu [Internet]. Vol. 6, *World Journal of Dentistry*. 2015. p. 203–7. Available from: <http://dx.doi.org/10.5005/jp-journals-10015-1343>
- [19] Barbosa TS, Tureli MCM, Gavião MBD. Validity and reliability of the Child Perceptions Questionnaires applied in Brazilian children. *BMC Oral Health*. 2009 May 18;9:13.
- [20] Packiri S, Gurunathan D, Selvarasu K. Management of Paediatric Oral Ranula: A Systematic Review. *J Clin Diagn Res*. 2017 Sep;11(9):ZE06–9.
- [21] Do LG, John Spencer A. Oral health of Australian children: The National Child Oral Health Study 2012–14. University of Adelaide Press; 2016. 367 p.
- [22] Gurunathan D, Shanmugaavel AK. Dental neglect among children in Chennai. *J Indian Soc Pedod Prev Dent*. 2016 Oct;34(4):364–9.
- [23] Pahuja M, Pradhan S, Nagar V. Knowledge, attitude, and esthetic perceptions about dental fluorosis amongst the rural population in Meerut District, Uttar Pradesh [Internet]. Vol. 11, *Indian Journal of Dental Sciences*. 2019. p. 12. Available from: http://dx.doi.org/10.4103/ijds.ijds_65_18
- [24] Govindaraju L, Gurunathan D. Effectiveness of Chewable Tooth Brush in Children-A Prospective Clinical Study. *J*

- Clin Diagn Res. 2017 Mar;11(3):ZC31–4.
- [25] Subramanyam D, Gurunathan D, Gaayathri R, Vishnu Priya V. Comparative evaluation of salivary malondialdehyde levels as a marker of lipid peroxidation in early childhood caries. *Eur J Dent.* 2018 Jan;12(1):67–70.
- [26] Fluoride, Fluoridated Toothpaste Efficacy And Its Safety In Children - Review. *IJPR* [Internet]. 2018 Oct 1;10(04). Available from: <http://www.ijpronline.com/ViewArticleDetail.aspx?ID=7041>
- [27] Nair M, Jeevanandan G, Vignesh R, Subramanian EMG. Comparative evaluation of post-operative pain after pulpectomy with k-files, kedo-s files and mtwo files in deciduous molars - a randomized clinical trial [Internet]. Vol. 21, *Brazilian Dental Science.* 2018. p. 411. Available from: <http://dx.doi.org/10.14295/bds.2018.v21i4.1617>
- [28] Fawell JK, Bailey K, World Health Organization, Chilton J, Dahi E. Fluoride in Drinking-water. *World Health Organization*; 2006. 134 p.
- [29] Govila V, Govila S, Gupta S, Singh D. Prevention of Dental Fluorosis and its Varied Treatment Options “A Case Series” [Internet]. Vol. 2, *International Journal of Oral Health Dentistry.* 2016. p. 50. Available from: <http://dx.doi.org/10.5958/2395-499x.2016.00008.3>
- [30] Acharya S, Tandon S. The effect of early childhood caries on the quality of life of children and their parents [Internet]. Vol. 2, *Contemporary Clinical Dentistry.* 2011. p. 98. Available from: <http://dx.doi.org/10.4103/0976-237x.83069>
- [31] Sun L, Wong HM, McGrath CPJ. The factors that influence oral health-related quality of life in young adults [Internet]. Vol. 16, *Health and Quality of Life Outcomes.* 2018. Available from: <http://dx.doi.org/10.1186/s12955-018-1015-7>
- [32] Zimmermann ER, Leone NC, Arnold FA. Oral aspects of excessive fluorides in a water supply [Internet]. Vol. 50, *The Journal of the American Dental Association.* 1955. p. 272–7. Available from: <http://dx.doi.org/10.14219/jada.archive.1955.0053>
- [33] Locker D, Allen F. What do measures of “oral health-related quality of life” measure? *Community Dent Oral Epidemiol.* 2007 Dec;35(6):401–11.
- [34] Grembowski D, Fiset L, Spadafora A, Milgrom P. Fluoridation effects on periodontal disease among adults. *J Periodontal Res.* 1993 May;28(3):166–72.
- [35] Vandana KL, Sesha Reddy M. Assessment of periodontal status in dental fluorosis subjects using community periodontal index of treatment needs [Internet]. Vol. 18,

- Indian Journal of Dental Research. 2007. p. 13
67. Available from:
<http://dx.doi.org/10.4103/0970-9290.32423>
- [36] Varenne B, Petersen PE, Ouattara S. Oral health status of children and adults in urban and rural areas of Burkina Faso, Africa [Internet]. Vol. 54, International Dental Journal. 2004. p. 83–9. Available from: <http://dx.doi.org/10.1111/j.1875-595x.2004.tb00260.x>
- [37] Idon PI, Enabulele JE. Prevalence, severity, and request for treatment of dental fluorosis among adults in an endemic region of Northern Nigeria [Internet]. Vol. 12, European Journal of Dentistry. 2018. p. 184–90. Available from: http://dx.doi.org/10.4103/ejd.ejd_260_17
- [38] Aguilar-Díaz FC, Irigoyen-Camacho ME, Borges-Yáñez SA. Oral-health-related quality of life in schoolchildren in an endemic fluorosis area of Mexico [Internet]. Vol. 20, Quality of Life Research. 2011. p. 1699–706. Available from: <http://dx.doi.org/10.1007/s11136-011-9897-4>
- [39] Singh MR, Prakash LCP, Lt Col Vijaya Kumar, Awasthi LCP. Esthetic Rehabilitation of a Patient with Dental Fluorosis using Porcelain Laminate Veneers - A Case Report [Internet]. Vol. 5, International Journal of Contemporary Medical Research [IJCMR]. 2018. Available from: <http://dx.doi.org/10.21276/ijcmr.2018.5.11>