

Original Article

Impact of Dental Caries and Dental Fluorosis on the Quality of Life of 12- year old Children in Tamil Nadu, India.

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Abstract

Background Dental caries and fluorosis are the two common childhood oral diseases which are attributed to variations in exposure to fluorides. Epidemiological studies have shown the prevalence of dental caries and fluorosis in India. There is a lack of evidence to show the impact of these conditions on the quality of life of children in India. Hence the aim of this study is to assess the impact of dental caries and dental fluorosis on the quality of life of 12 year old children in Tamil Nadu, India.

Materials and Methods This cross-sectional study was conducted in Sriperumbudur taluk, Kanchipuram district, India among 220 twelve year old children. Dental caries was recorded using DMFT Index by Klein, Palmer and Knutson; Dental fluorosis was recorded using Dean's fluorosis index and the quality of life of children was assessed using a Tamil version of the Child Perception Questionnaire CPQ.

Results Dental caries is present among (88) 40% of the study population and dental fluorosis affected 131 (60.6%) of the study population. CPQ used to assess the impact of dental caries and dental fluorosis on quality of life showed an increase in mean scores across each domain and overall score, with the increase in severity of dental caries and dental fluorosis. One way ANOVA showed significant difference between groups categorized based on the severity of dental caries and fluorosis.

Conclusion Dental caries and fluorosis had a considerable impact on the quality of life of children. With the increase in severity of the disease there is an increased impact on the quality of life of children.

Key words : Caries onset, Caregiver behaviour, Caries prevention, Epidemiology in school children.

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Background

Oral diseases and disorders during childhood can have a negative impact on the life of children and their parents. For example, dental caries can lead to toothache, which can be distressful and worrying for the affected children and their parents and dental fluorosis is regarded as a condition that may impact on the self-esteem and self-confidence of individuals at very early stages of life. Conversely, good oral health can have positive benefits for children. Children's confidence and self-esteem can be enhanced by the appearance of their teeth, reflecting the children's perception of the shape and colour of teeth and their occlusion¹.

Oral disease and disorders are measured in population studies using clinical measures recorded by dental clinicians during oral examinations such as the decayed, missing, and filled index for caries or the Thylstrup and Fejerskov (TF) Index for fluorosis. These indices indicate the presence and severity of an oral condition. However, they do not consider individuals' perception of dental appearance and the possible impact of

fluorosis on psychosocial well-being, which is also considered as an important factor in the comprehensive definition of health².

Since 1990s, there has been more studies on aesthetic perceptions as psychological indicators of oral health, and they have been shown to be powerful indicators of perceived need for dental care^{3,4,5}. However, children are rarely asked about their perception of dental fluorosis and the impact it may have on activities conducted daily such as smiling and interacting with other children⁶.

While fluorides provide a protective benefit against dental caries, fluoride consumed in greater amounts in early childhood can have the adverse effect of causing dental fluorosis, a developmental disorder of dental enamel. There exists, therefore, the potential for a clinical trade off in oral health with differing levels and timing of exposure to fluorides. Further, variation in the presence and severity of caries and fluorosis may be associated with a consequent trade-off in the impact of those clinical conditions on the oral health related

quality of life (OHRQoL) of children. On the one hand, there is potential for exposure to fluorides to reduce caries experience, and therefore to reduce negative impacts of dental caries on OHRQoL. Conversely, there is potential for excessive exposure to fluorides to cause dental fluorosis, which may change the appearance of teeth and cause negative impacts on OHRQoL¹.

The incidence of dental caries has declined worldwide⁷ and it has been mainly attributed to the use of fluorides. However in developing countries like India, about 50% of school children are suffering from dental caries⁸. India lies in a geographical fluoride belt, which extends from Turkey upto China and Japan through Iran, Iraq and Afghanistan. Of the 85 million tons of fluoride deposits found on earth's crust, 12 million tons are in India⁹. Fluorosis is an endemic condition prevalent in 22 states of India¹⁰. Out of six lakh villages in India atleast 50% have fluoride content in drinking water exceeding 1.0ppm¹¹. Endemic fluorosis also increases the risk of developing dental caries and it becomes aesthetically objectionable¹².

The magnitude of the prevalence of dental caries and dental fluorosis is high in India. Studies conducted in India have shown the prevalence of dental caries, dental fluorosis and its relation to fluoride levels in drinking water¹³⁻¹⁷. A better understanding of the oral health status of the patient is achieved when perceptions of oral health are reported by those individuals who experience the condition¹⁸. There is a lack of evidence to show the impact of these conditions on the quality of life of children in India. Hence this study was conducted with the aim to assess the impact of dental caries and dental fluorosis on the quality of life of 12 year old children in Sriperumbudur taluk, Kanchipuram district of Tamil Nadu, a fluoride endemic area in India.

Materials and methods

This cross-sectional study was conducted in Sriperumbudur taluk, Kanchipuram district, Tamil Nadu, a fluorosis endemic area in India. The sample size for the present study was estimated to be N = 202, 12-year old children based on the prevalence of caries free children from fluorotic area in the study conducted by Doc LG and Spencer A¹. Inclusion criteria are 12 year old children who were permanent residents of that region since birth, children with good general health and children who were present on the day of examination. Children who were excluded are children with developmental defects of teeth like enamel hypoplasia, children under fixed orthodontic treatment and children with past history of professional topical fluoride therapy. Prior to the start of the study ethical approval was obtained from Institutional ethics committee. Approval was also obtained from the concerned school authorities and informed consent was obtained from parents or guardian of the children.

The survey instrument consists of a self- administered questionnaire, containing demographic information on name, age, gender, class, section and name of the school followed by assessment of impact of dental caries and dental fluorosis on the quality of life using

Child Perception Questionnaire (CPQ) which addresses the frequency of events occurring during the previous three months. The questionnaire is composed of 37 items distributed among 4 domains:

- Oral symptoms (6 questions),
- Functional limitations (10 questions),
- Emotional well-being (9 questions) and
- Social well-being (12 questions).

A 5-point Likert scale was used with the following options:

- 'never' = 0,
- 'once/twice' = 1,
- 'sometimes' = 2,
- 'often' = 3, and
- 'every day/almost every day' = 4.

The CPQ¹¹⁻¹⁴ scores for each domain are computed by adding all of the item scores under that domain. The total score can vary from 0 to 148, with a higher score denoting a greater impact on QoL¹⁹. Children filled the questionnaire themselves, followed by clinical examination for recording dental caries using DMFT index by Klein, Palmer and Knutson (1938)²⁰ and dental fluorosis using Dean's fluorosis index – Modified given by Dean HT (1942)²¹.

Validation of the questionnaire was done after translating it to the native language (Tamil). A single examiner performed the clinical examination was trained through a series of clinical sessions. Intra-examiner reliability was assessed using Kappa statistics, by re-examining the DMFT scores of the first 20 patients examined in the day and the intra examiner reliability was found ($\kappa = 0.86$).

The data collected was analyzed and tested for significance using statistical software package, SPSS software for windows (version 17.0). Frequency tables were computed. ANOVA test was used to assess the impact of varying degrees of dental fluorosis and prevalence of dental caries on quality of life of children assessed using the CPQ.

Results

Among the 220 study subjects 115 (52.3%) were male and 105 (47.7%) were female. 60% of the study population were caries free and only 40% of the study population had normal enamel, Table – 1 shows the distribution of study subjects according to gender, prevalence of dental caries and dental fluorosis, mean DMFT of the study population is 0.97 ± 0.46 . Child Perception questionnaire was used to assess the impact of dental caries and dental fluorosis on quality of life of 12 year old children. Table – 2 shows the mean domain score and CPQ overall score for oral health related quality of life based on dental caries status. The scores increased with the severity of dental caries with the mean overall score for caries free children was least at 8.58 ± 5.175 and for children with ≥ 5 – DMFT the mean score was 22.86 ± 5.127 . One way ANOVA showed significant difference across groups categorized based on dental caries status.

Table – 3 shows the mean domain score and CPQ overall score for oral health related quality of life based on dental fluorosis status, the scores increased with the severity of dental fluorosis with the mean overall score for children with normal enamel was least at 8.88 ± 5.98 and for children with moderate fluorosis the mean score was 16.76 ± 6.119 . One way ANOVA showed significant difference across groups categorized based on dental fluorosis status.

The impact of dental caries and dental fluorosis on day to day life events was assessed using the global ratings of the extent to which overall life was affected. Figure -1 shows the global ratings of the extent to which overall life was affected based on dental caries status. 42.8% of children with DMFT- ≥ 5 indicated that their life was affected very much because of the oral condition and 70.4% of the caries free children indicated that they were not at all affected. Figure -2 shows the global ratings of the extent to which life overall was affected based on dental fluorosis status. 28% of children with moderate dental fluorosis indicated that their overall life was affected very much by the presence of dental fluorosis, only 60.6% children with normal enamel indicated that their life was not at all affected.

Table 1: Distribution of study subjects according to gender, prevalence of dental caries and dental fluorosis

Characteristics	N	%
Gender		
Male	115	52.3
Female	105	47.7
Dental caries		
0 - DMFT	132	60
1-2 - DMFT	44	20
3 - 4 - DMFT	30	13.6
≥ 5 DMFT	14	6.4
Total DMFT (Mean \pm SD)	0.97 ± 0.46	
Dental Fluorosis		
Normal	89	40.4
Questionable	12	5.4
Very mild	57	26
Mild	37	16.8
Moderate	25	11.4
Severe	0	0

Table 2: Mean Domain Scores and CPQ⁽¹¹⁻¹⁴⁾ overall score for oral health related quality of life based on dental caries status

Domain	Oral symptoms* Mean \pm SD	Functional limitations* Mean \pm SD	Emotional well-being* Mean \pm SD	Social well-being* Mean \pm SD	CPQ ⁽¹¹⁻¹⁴⁾ Overall score* Mean \pm SD
0 - DMFT*	3.06 ± 1.823	2.13 ± 1.324	1.83 ± 1.604	1.73 ± 1.497	8.58 ± 5.175
1-2 - DMFT*	4.93 ± 1.946	3.05 ± 1.478	2.55 ± 1.486	2.02 ± 1.422	12.55 ± 5.346
3-4 - DMFT*	5.87 ± 1.613	4.07 ± 1.413	3.43 ± 1.135	3.13 ± 1.833	16.57 ± 4.023
≥ 5 - DMFT*	7.93 ± 2.556	5.93 ± 2.018	4.64 ± 1.277	4.00 ± 1.881	22.86 ± 5.127
F - value	31.618	33.27	14.309	9.23	32.94
p - value	0.00	0.00	0.00	0.00	0.00

*One-way ANOVA, d.f = 219

Table 3: Mean Domain Scores and CPQ (11-14) overall score for oral health related quality of life based on dental fluorosis status

Domain	Oral symptoms* Mean \pm SD	Functional limitations* Mean \pm SD	Emotional well-being* Mean \pm SD	Social well-being* Mean \pm SD	CPQ ⁽¹¹⁻¹⁴⁾ Overall score* Mean \pm SD
Normal*	3.55 ± 2.159	2.21 ± 1.585	1.67 ± 1.521	1.39 ± 1.571	8.88 ± 5.98
Questionable*	4.08 ± 2.234	2.58 ± 1.240	2.08 ± 1.24	1.58 ± 0.900	10.58 ± 5.534
Very mild*	4.25 ± 2.565	2.81 ± 1.977	2.21 ± 1.359	1.91 ± 1.106	11.16 ± 5.903
Mild*	4.73 ± 2.479	3.19 ± 2.132	3.38 ± 1.622	2.95 ± 1.290	14.30 ± 6.119
Moderate*	5.04 ± 2.150	3.36 ± 1.630	3.84 ± 1.841	4.28 ± 1.768	16.76 ± 6.119
F - value	2.982	3.265	14.746	24.369	11.230
p - value	0.020	0.013	0.000	0.000	0.000

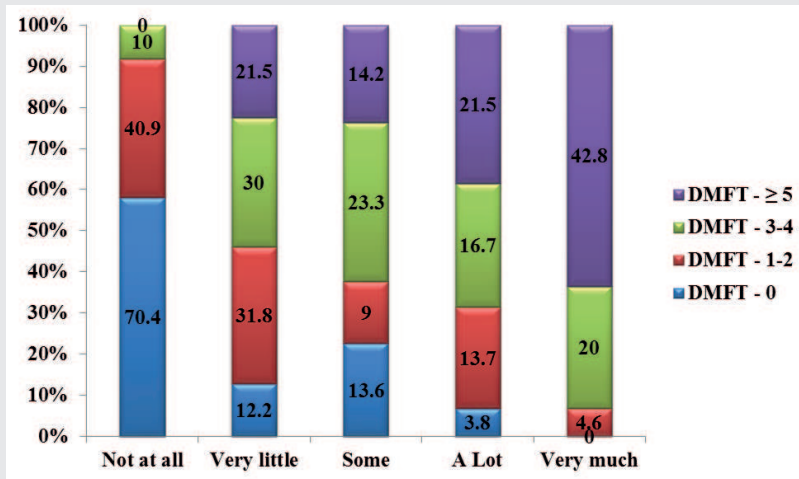


Fig 1: Global ratings of the extent to which life overall was affected based on dental caries

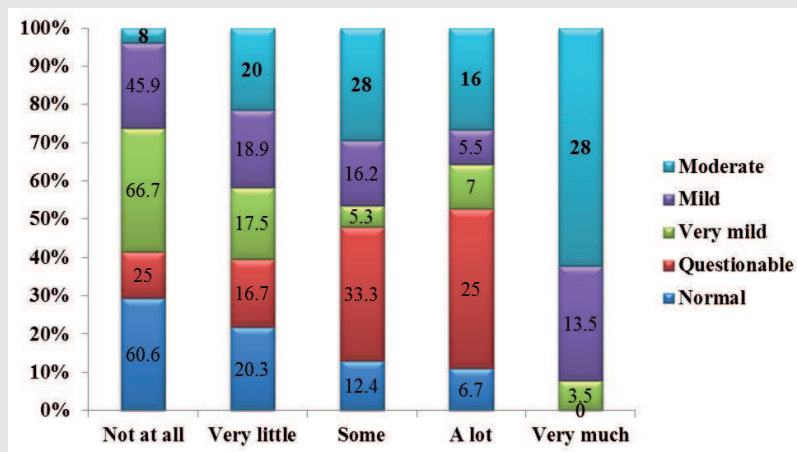


Fig 2: Global ratings of the extent to which life overall was affected based on dental fluorosis

Discussion

Dental caries and dental fluorosis are the two oral conditions associated with the usage and exposure to fluoride in early life¹. It is well established that fluoride protects against dental caries²². However clinical trade-offs between caries and dental fluorosis may exist with varying levels and timing of exposure to fluorides increasing the risk of dental fluorosis without having a fully protective effect against dental caries¹. Epidemiological studies have collected data regarding the prevalence of dental caries and dental fluorosis, however the impact of these oral diseases on quality of life is yet unknown. This cross-sectional study was conducted to assess the prevalence of dental caries, dental fluorosis and its impact on the quality of life of 12-year old children.

All over the world dental caries is the most common oral disease affecting children. In the present study dental caries was present among 40% of the study population with the mean DMFT – 0.97 lower than the studies by J Moses et al (2011)²³, Goyal A et al (2007)²⁴, Dhar V et al (2007)²⁵ conducted in other parts of India. As the children in the present study were exposed to higher levels of fluoride in drinking water

since childhood, which had contributed for the decline in dental caries among the study population.

Fluoride level in drinking water though resulted in a decline in dental caries among the study population, dental fluorosis is found to affect 59.5% of the study population. In the present study the children are not exposed to any professionally applied topical fluorides or any other fluoridation programmes, however most of the children used fluoridated dentifrices on a regular basis. High prevalence of dental fluorosis among the study population is attributed mainly to the natural high fluoride levels in drinking water²⁶. Prevalence of dental fluorosis in the current study was higher than the studies by Dhar V et al (2007)²⁷ and JK Baskardass et al (2008)¹⁷. Current study reported none of the study subjects with severe dental fluorosis, in contrast to the study conducted by Sudhir KM et al (2009)¹⁵ at Nalgonda a fluoride endemic area in Andhra Pradesh, India where 35% of the 12 year old children had severe dental fluorosis, this was due to the difference in fluoride concentration in drinking water sources.

From the epidemiological data it is clear that the fluoride levels in drinking water both benefited and

harmed the study population. Child perception Questionnaire was used to assess the impact of dental caries and dental fluorosis among the study population. In the present study there is an increase in the CPQ overall score and the mean scores across various domains like 'oral symptoms', 'functional limitations', 'social and emotional well-being' with the increase in severity of dental caries and dental fluorosis; similar to the studies by Loc DG et al (2007)¹ and Vargas Ferreria et al (2011)²⁸.

Dental caries and fluorosis have a measurable impact on the quality of life of affected children. This was evident from the results obtained from the study population and it was similar to the studies by Loc G Do et al (2007)¹, Vargas Ferreria et al (2011)²⁸, Tellez M et al (2012)²⁹. Caries experience was found to have a plausible link to oral symptoms and functional limitations, as dental caries can cause symptoms like pain and discomfort affecting the functions like mastication and sometimes even being absent from the school. In the present study presence of dental fluorosis was associated with the lower caries experience; this was in accordance to the findings by Loc G Do et al (2007)¹.

Persons with attractive appearance are assumed to possess more socially desirable personalities, and are happier and more successful than others who are less attractive. Oral cavity is an important area for the appearance of a person, so the dental diseases could not only affect the physical health of patients, but also influence the psychological health, which could impact their day-to-day living or life quality in turn³⁰. Social and emotional well-being is an important component of overall health. Dental fluorosis affected the social well-being of the children as fluorosis affecting the anterior teeth had an esthetic impact on the quality of life of the children; this was in accordance with the study by Williams DM et al (2006)³¹.

Further studies are required to analyse the association of other oral health disorders affecting childhood, the quality of life of children and to find the perception of parents of the children affected with dental caries and dental fluorosis.

Conclusion

Dental caries and dental fluorosis are the two common oral diseases during childhood which are mainly affected by fluorides during tooth development. This study was conducted to assess the prevalence of dental caries.

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