

# Epidemiology Study of Dental Fluorosis in Rural Population of Kanyakumari District

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## Abstract

The Epidemiology of Dental Fluorsis in Kanyakumari District is studied using cross-sectional oral health survey from 2005-2008. 5000 individuals from rural areas (Viz) Azhagappapuram, Lakshmipuram, Punnarkulam, Bagavathypuram (South) and Nilapparai Villages. The Survey is restricted to a special study area with 7212 population. 45.24 indicates the percentage of Male, while is 2262 out of 5000 and 54.76 indicates the percentage of Female, which is 2738 out of 5000 people. Of the 2262 Males, the number of diseased cases are 399 (17.64%) and the rest 1863 (82.36%) are normal subjects, where as in Females out of 2738(54.76%), 456(16.65%) have been screened as dt +ve cases, and the remaining 2282 (83.35%) are normal subjects. The over all disease prevalence % in Male is 17.64 and in Female it is 16.65%.

**Key Words:** Epidemiology Study, Fluorosis, Dental Fluorosis, Dean's Index.

## 1. Introduction

Fluorosis, a crippling disease is a mundane problem. It is a highly advanced stage of fluoride poisoning and it is an irreversible, practically helpless body disorder. Fluorosis is caused by the intake of high amount of fluoride through water, food, and drugs, inhalation of air-contaminated with fluorine and dentrifices. Victims through out the globe are the witnesses of this slow killer. It ramifies it's horizon in the six continents.

To a certain extent (as per WHO: 0.6 ppm) fluoride ingestion is useful for bone and teeth development, but excessive ingestion causes a disease known as fluorosis. While the WHO standards (1984) and BIS: 10500-1991(BIS 1983) permit only 1.5 mg/L as a safe limit of fluoride in drinking water for human consumption, in many parts of the world where drinking water contains excessive amounts of fluoride (3-5 mg/L or ppm), endemic fluorosis has been observed (Valderhaugh, J. 1993, Clark, DC. 1994, Jackson, RD., Kelly, S.A., Katz, B.P., 1995).

Fluorosis continues to be an endemic problem. More and more areas are being discovered regularly that are affected by fluorosis in different parts of the world. Children in the age group of 0-12 years are most prone to fluorosis as their body tissues are in formative / growth stage during this period.

Expectant mothers are also to be protected, as there is growing concern about effects of fluoride on foetus.

Fluorosis, which was considered to be a problem related to teeth only, has now turned up to be a serious health hazard. It seriously affects bones and problems like joint pain, muscular pain etc. are its well-known manifestations. It not only affects the body of a person but also renders him socially and culturally crippled. In spite of the progressive spread of disease so far no established data exists to determine the extent of disease, no specialised water testing facilities are available and even the health centers do not have specific orientation to correlate the disease with specific symptoms. In these areas the response of the people is reactive rather than pro-active.

Fluoride is the agent factor for the onset of fluorosis in man and cattle. Fluorosis is an endemic disease resulting from ingestion of excess fluoride either through drinking water, food or dentifrices, which affect teeth and bones. Moderate amounts (i.e) concentration of 2 ppm (or mg/L) or above, fluorosis of teeth has been reported affecting the dental enamel. But, long term ingestion of large amounts (i.e) chronic fluorine intoxication through drinking water containing above 10 ppm of fluorine results in pathological changes of bone leading to skeletal fluorosis (Pareek, A. 1994).

### **1.1. National Scene**

Fluorosis problem has reached alarming proportions in India. Many of the states of India have alarmingly high concentrations of fluoride in their water resources.

Excessive intake of fluoride leads to serious effects on the teeth during tooth formation and abnormal hardening of bones, leading to a condition known as “fluorosis” that is exacerbated by poor diets deficient in calcium and vitamins. The problem has been noticed as very serious in at least 17 states of India affected with dental, skeletal and / or non-skeletal fluorosis with 62 million victims. The extent of fluoride contamination of water varies from 1.0 – 4.8 mg/L or ppm. The extent of the seriousness of fluorosis has been summarized as follows: (Susheela, A.K. 2007).

- 1) 50-100 percent districts are affected – Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Gujarat and Rajasthan.
- 2) 30-50 percent districts are affected – Bihar, Haryana, Karnataka, Maharashtra, Madhya Pradesh, Punjab, Orissa and west Bengal.
- 3) < 30 percent districts are affected – Jammu and Kashmir, Delhi and Kerala.

The main objectives of the present epidemiological study will try to explore the various pertinent reasons for the existence of dental fluorosis in the endemic and non-endemic areas in the following ways.

A cross sectional door to door survey will be conducted to find out the natural history of fluorosis in the study area.

It will try to explore the possibilities for the age and sex specific existence of the disease in the study population. To find out the endemicity rate of the disease in the study areas.

The present cross-sectional study investigates the dental fluorosis prevalence in Kanyakumari District.

## **2. Materials And Methods**

The present work includes the study on the epidemiological conditions on dental fluorosis in rural population of Azhagappapuram, Lakshmipuram, Punnarkulam, Bagavathypuram (South) and Nilapparai Villages in the south eastern part of Kanyakumari District in Tamil Nadu, the Southern land mark of the Indian sub – continent.

Most of the inhabitations are using bore well water and the rest is using well water and panchayat tap water for their domestic purpose, and the fluoride content of the water is within the permissible limit (i.e.) 1.5 ppm or mg/L.

### **2.1.1. Fluorosis diagnosis**

To assess the magnitude of the dental fluorosis, house to house survey is performed with a well designed questionnaire. The present study is carried out during the period 2005-2008 and is restricted to rural areas (viz) Azhagappapuram, Lakshmipuram, Punnarkulam, Bagavathypuram (south) and Nilapparai village. The survey is restricted to a 'special study area' with 7212 population. The target is to cover 69.33 percentage (i.e.) 5000 out of 7212 total population, 45.24 indicates the percentage of male, which is 2262 out of 5000 and 54.76 indicates the percentage of female, which is 2738 out of 5000 people.

Random selection of houses in the survey area are selected. The survey is made without any bias of occupation, religion (or) social class. Persons of all age-group, including men, women and children staying in the same household are examined whether with (or) without manifestation of apparent dental, skeletal and clinical fluorosis by making a door to door visit. This procedure eliminated selection with respect to age and sex as every person available in the household got an equal chance of being examined (George Joseph and Prasad. 1967).

The clinical examinations are performed by experienced dentists with otoscope, forceps, a Community Peridontal Index (CPI) probe, as indicated by the WHO, and gauze for drying the teeth before accomplishment of the dental fluorosis test. CPI probes (ball point pen) are used especially in epidemiological surveys to remove debris over tooth, thus improving the visualization (WHO 1997).

Dental fluorosis is assessed by the Dean's classification system. Dental fluorosis has been defined as follows: normal, questionable, very mild, mild, moderate, and severe (Dean, H.T. 1942).

## **3. Results And Discussion**

The data obtained are summarized in Table 2, 3 and 4.

Table.2. reveals the distribution of dental fluorosis cases on the basis of Dean's Index. Of the 855 df cases, 174 are noticed as questionable type and it comprises 20.35%. It is quite evident from the table that, the number of questionable type male df cases are 66 (37.93%) and the females are 108 (62.07%). There are 163 (48.22%) very mild male df cases and 175(51.78%) female df cases which denotes the total very mild df cases as 338 (39.53%) in number. The total mild cases accounts for 197 (23.04%) which includes 110 (55.84%) males and 87 (44.16%) females. 105 (12.28%) total moderate cases include 42 (40%) males and 63 (60%) females. 41 denotes the total severe df cases (4.8%), which includes 18 (43.9%) males and 23 (56.1%) females. Altogether there are 399 (46.67%) male df cases and 456 (53.33%) females and the total number of df cases are 855 (Figure: 1).

Table.3. depicted in the severity of dental fluorosis by age in male subjects are 2262 are screened for dental fluorosis and found that 399 individuals are having the disease at different levels. The male subjects are grouped into 7 categories such as 8-10 yrs., 11-20, 21-30, 31-40, 41-50, 51-60, and 60 plus yrs. Group. Of the 2262 males, 399 are having dental fluorosis and the rest 1863 individuals are detected as normal. 17.64% disease prevalence is noticed among male subjects(Figure: 2).

The severity of the disease is classified as per Dean's index. The inflected persons are grouped as questionable, very mild, mild, moderate and severe cases. In toto there are 66 (16.54%) questionable, 163(40.85%) very mild, 110 (27.57%) mild, 42 (10.53%) moderate and 18 (4.51%) severe df cases. The disease prevalence percentage in different age-groups such as 8-10 yrs., 11-20 yrs., 21-30 yrs., 31-40 yrs., 41-50 yrs., 51-60 yrs., and 60 plus yrs. Are as follows: 21.12, 17.68, 13.91, 15.9, 14.72, 20.93 and 17.02.

The df cases detected under the age-group 8-10 yrs. is 83, which comprises 20.8% of the total diseased cases in the male subjects. There are 9 questionable, 42 very mild, 29 mild and 3 severe df cases found in this age-group. 203 reveals 50.88% of the total df male cases found under the age-group 11-20 yrs. It includes 40 questionable, 105 very mild, 54 mild and 4 severe cases. Similarly the total number of df cases noticed in the age-group 21-30 yrs. are 32, which includes 7 questionable, 7 very mild, 5 mild, 11 moderate and 2 severe cases.

There are 31 fluorosed subjects detected in the age-group 31-40 yrs., which constitutes 4 questionable, 2 very mild, 4 mild, 19 moderate and 2 severe cases. The number of infected individuals seen under the age-group 41-50 yrs. are 24, which shows 3 questionable, 2 very mild, 6 mild, 11 moderate and 2 severe cases. 2 questionable, 3 very mild, 9 mild, 1 moderate and 3 severe cases (i.e.) 18 df cases have been identified under the age-group 51-60 yrs. The 60 plus age-group has 8 infected males, out of which 1 person is having questionable type of df, 2 subjects show very mild infection. 3 are with mild disease, and the rest 2 are having severe infection.

Table.4. pictures out the total number of female subjects with severity of dental fluorosis by age. There are 2738 females screened for dental fluorosis and it is observed that, 456 females are having df at different levels. Dental fluorosis cases are detected based on the criteria of Dean's index.

Of the 456 df female subjects, 108 (23.68%) are with questionable fluorosis, 175 (38.38%) are having very mild form of disease, 87 (19.08%) are expressing mild form of disease, 63 (13.82%) shows moderate level of df, and 23 (5.04%) are suffering from severe df. The disease prevalence percentage in different age-groups such as 8-10 yrs., 11-20 yrs., 21-30 yrs., 31-40 yrs., 41-50 yrs., 51-60 yrs., and 60 plus yrs. are: 17.82, 25.3, 7.24, 8.19, 7.05, 7.87, and 16.13(Figure: 3).

Of the 85 (18.64%) df cases found under the age-group 8-10 yrs. 9 are having questionable form of disease, 36 are with very mild df, 25 are showing mild disease, and 15 are having moderate level of df. There are 278 (60.97%) females with df, of which 76 are with questionable type of df, 111 are showing very mild disease, 49 shows mild disease, 30 are with moderate disease and 12 are having severe form of disease. There are 27 df cases detected under the age-group 21-30, in which 7 are with questionable form of df, 11 shows very mild df, 5 are with mild df, and 4 are having moderate type of df.

The number of df cases noticed under the age-group 31-40 yrs. are 19, of which 6 are having questionable form of disease, 3 are with very mild, disease, 4 are having mild form of df, 4 females have developed moderate df, and 2 are with severe form of df. In the age-group 41-50 yrs. the affected females are 17, where in 5 are having questionable form of disease, 5 are showing very mild disease, another 5 are with moderate df, and 2 are having severe df.

The number of df cases identified under the age-group 51-60 yrs. are 20, which includes 4 questionable cases, 7 very mild cases, 2 mild cases, another 2 moderate cases and 5 severe cases. The number of df cases, identified under the age-group 60 plus yrs. are 10, which comprises 1 question able case, 2 very mild cases, 2 mild cases, 3 moderate cases and 2 severe cases. 16.65% disease prevalence is noticed among the female subjects.

Many investigation showed that the prevalence of fluorosis was quite associated with the fluoride concentration in drinking water and the prevalence is directly related to water fluoride concentration (Segreto, V.A. Camann, D. Collins,E.M. Smith, C.T. 1984, Warren, J.J. Levy, S.M. Kanellis, M.J. 2001). Also some studies showed the prevalence is increasing with the increased water fluoride concentrations. (Evans, R.W. 1989).

In the present study fluoride concentration in water sampled in Azhagappapuram area is 1.76 (Mg/L) While the water fluoride concentration in other sampling site were less than 1 Mg/L.

#### 4. Conclusion

The seasonal variations in ground water sources, low water fluoride induced dental fluorosis, enrichment of fluoride in other sources such as food items, and the role of fluoride on biomarkers is the main reasons for Dental Fluorosis.

## 5. Acknowledgements

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**Table.1. Grading Of Dental Fluorosis (Dean, H.T. 1934)**

The Modified Dean's Index of Fluorosis was used. The classification is below

SL .No	Type	Weight	Description
1	Normal	0	The enamel presents the usual translucent semivitriform type of structure. The surface is smooth, glossy, and usually of a pale, creamy - white colour.
2	Questionable fluorosis	0.5	Slight aberrations from the translucency of normal enamel seen, ranging from a few white flecks to occasional white spots. This classification is used in instances where a definite diagnosis of the mildest form of fluorosis is not warranted and a classification of "normal" not justified.
3	Very mild fluorosis	1	Small opque, paper white areas scattered irregularly over the tooth but not involving as much as approximately 25% of the tooth surface. Frequently included in this classification are teeth showing no more than about 1-2 mm of white opacity at the tip of the summit of the cusps of the bicuspids or second molars.
4	Mild fluorosis	2	The white opaque areas in the enamel of the teeth are more extensive, but do not involve as much as 50% of the tooth.
5	Moderate fluorosis	3	All enamel surface of the teeth are affected and surfaces subject to attrition show market wear. Brown stain is frequently a disfiguring feature.
6	Severe fluorosis	4	All enamel surface are affected and hypoplasia is so market that the general from of the tooth may be affected. The major diagnosis of this classification is the discrete or confluent pitting. Brown stain are widespread, and teeth often present a corroded like appearance.

**Table.2. Reveals the distribution of the population on the basis of Dean's index (n = 5000 individuals)**

Sl. No.	Dean's Index	df cases				Total
		Male		Female		
1	Normal	1863	(44.95)	2282	(55.05)	4145 (100)
2	Questionable	66	(37.93)	1018	(62.07)	174 (20.35)
3	Very Mild	163	(48.22)	175	(51.78)	338 (39.53)
4	Mild	110	(55.84)	87	(44.16)	197 (23.04)
5	Moderate	42	(40)	63	(60)	105 (12.28)
6	Severe	18	(43.9)	23	(56.1)	41 (4.8)
7	<b>Total</b>	<b>2262</b>		<b>2378</b>		<b>5000</b>

(Figures in parentheses are percentage values)

**Table.3. Pictures out the total number of male subjects with severity of dental fluorosis by age (n = 5000 individuals)**

Sl. No	Age group	Examined	Normal	Dean's Index					Total df cases	Disease Prevalence (%)
				Questionable	Very Mild	Mild	Moderate	Severe		
1	8-10	393 (17.37)	310 (16.64)	9 (13.64)	42 (25.77)	29 (26.36)	-	3 (16.67)	83 (20.8)	21.12
2	11-20	1148 (50.75)	945 (50.72)	40 (40.61)	105 (64.41)	54 (49.09)	-	4 (22.22)	203 (50.88)	17.68
3	21-30	230 (10.17)	198 (10.63)	7 (10.60)	7 (4.29)	5 (4.55)	11 (26.19)	2 (11.11)	32 (8.02)	13.91
4	31-40	195 (8.62)	164 (8.8)	4 (6.06)	2 (1.23)	4 (3.64)	19 (45.24)	2 (11.11)	31 (7.76)	15.9
5	41-50	163 (7.21)	139 (7.47)	3 (4.55)	2 (1.23)	6 (5.45)	11 (26.19)	2 (11.11)	24 (6.02)	14.72
6	51-60	86 (3.8)	68 (3.65)	2 (3.03)	3 (1.84)	9 (8.18)	1 (2.38)	3 (16.67)	18 (4.51)	20.93
7	60 Plus	47 (2.08)	39 (2.09)	1 (1.51)	2 (1.23)	3 (2.73)	-	2 (11.11)	8 (2.01)	17.02
8	<b>Total</b>	<b>2262</b>	<b>1863</b>	<b>66 (16.54)</b>	<b>163 (40.85)</b>	<b>110 (27.57)</b>	<b>42 (10.53)</b>	<b>18 (4.51)</b>	<b>399</b>	

(Figures in parentheses are percentage values)

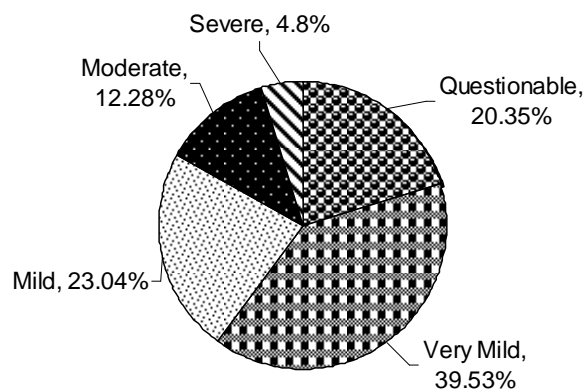


**Table.4. Pictures out the total number of female subjects with severity of dental fluorosis by age (n = 5000 individuals)**

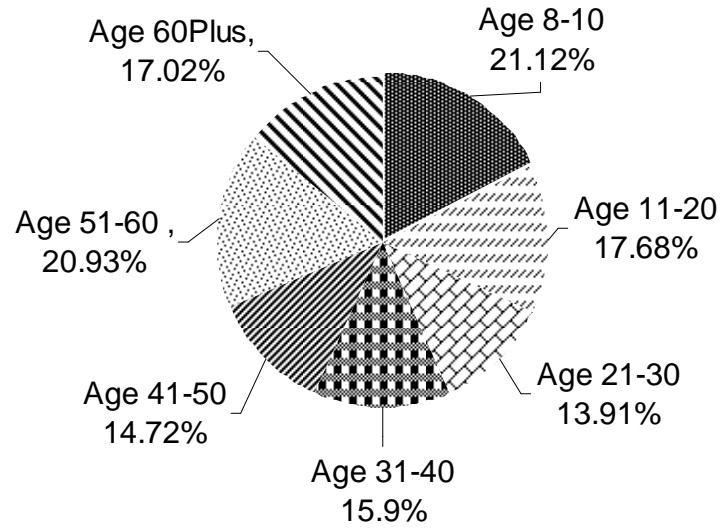
Sl. No	Age group	Examined	Normal	Dean's Index					Total df cases	Disease Prevalence (%)
				Questionable	Very Mild	Mild	Moderate	Severe		
1	8-10	477 (17.42)	392 (17.18)	9 (8.33)	36 (20.57)	25 (28.74)	15 (23.81)	-	85 (18.64)	17.82
2	11-20	1099 (40.14)	821 (35.98)	76 (70.37)	111 (63.4)	49 (56.32)	30 (47.62)	12 (52.17)	278 (60.97)	25.3
3	21-30	373 (13.62)	346 (15.16)	7 (6.48)	11 (6.29)	5 (5.75)	4 (6.35)	-	27 (5.92)	7.24
4	31-40	232 (8.48)	213 (9.33)	6 (5.56)	3 (1.71)	4 (4.59)	4 (6.35)	2 (8.70)	19 (4.17)	8.19
5	41-50	241 (8.8)	224 (9.82)	5 (4.63)	5 (2.86)	-	5 (7.94)	2 (8.70)	17 (3.73)	7.05
6	51-60	254 (9.28)	234 (10.25)	4 (3.70)	7 (4.00)	2 (2.30)	2 (3.17)	5 (21.73)	20 (4.38)	7.87
7	60 Plus	62 (2.26)	52 (2.28)	1 (0.93)	2 (1.14)	2 (2.30)	3 (4.76)	2 (8.70)	10 (2.19)	16.13
<b>8</b>	<b>Total</b>	<b>2738</b>	<b>2282</b>	<b>108 (23.68)</b>	<b>175 (38.38)</b>	<b>87 (19.08)</b>	<b>63 (13.82)</b>	<b>23 (5.04)</b>	<b>456</b>	

(Figures in parentheses are percentage values)

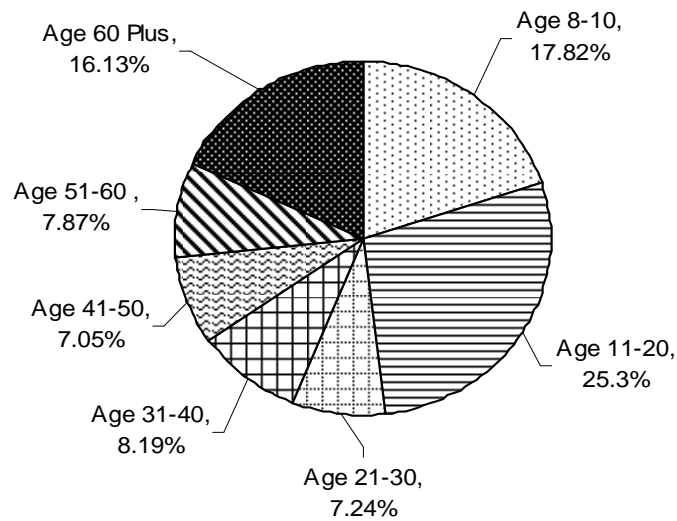
**Figure.1. Reveals the distribution of the population on the basis of Dean's index**



**Figure.2. Pictures out the total number of male subjects with severity of dental fluorosis by age**



**Figure.3. Pictures out the total number of female subjects with severity of dental fluorosis by age**



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