Research Article

PREVALENCE OF DENTAL FLUOROSIS AMONG THE ADULT POPULATION LIVING IN RURAL AREAS OF NALGONDA DISTRICT, TELANGANA

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ABSTRACT

Background: Fluorosis is endemic in 20 states of India, including newly formed Telangana state. Nalgonda district in Telangana state is severely affected by fluorosis, rocks in this area contain excessive amounts of fluoride, as a result water contaminated with high fluoride levels. Since, many years' people living in the rural areas of the district are depending on fluoride contaminated water for drinking purposes, as a result people are suffering from fluoride related health issues and dental fluorosis is being one of the major problems.

Objectives: The main objective of this study is to assess the prevalence of dental fluorosis among the adult population living in the study area, this study also aimed at determining various factors increasing the risk of dental fluorosis.

Materials and Methods: For the purpose of current study a secondary data from the fluorosis unit of District Medical and Health Office, Nalgonda has been obtained for 20 villages of 10 fluorides affected Talukas.

Results: A total number of 1,077 adults of ages between 18 to 59 were included in the analysis out of which 50.7% (546) are females and 49.3% (531) are males, the mean age of the respondents was 35.4 years. The overall prevalence of dental fluorosis was found to be 68.9% (95% Cl: 68.4 to 69.4).

Conclusion: High prevalence of dental fluorosis among the adult population living in the rural areas of the district indicating the disease as a major public health problem. Thus, there is a need to take preventive and control measures for dental fluorosis through supply of Safe drinking water,

INTRODUCTION

Fluorosis is a major health problem in India, out of 36 states and union territories the disease is prevalent in 20 states of the country, including the newly formed Telangana state. The first case was detected in India in the year of 1937, since then the disease remains backstage for 77 years (A.K Susheela 1999). India is one of the worst fluorosis affected countries, with large number of people suffering. This is because a large number of Indians rely on groundwater for drinking purposes and water at many places is rich in fluoride. In India 62 million people including 6 million children are estimated to have serious health problems due to consumption of fluoride contaminated water (Arlappa *et. al* 2013).

Among Indian states Andhra Pradesh, Telangana in southern part and Rajasthan, Gujarat in North are severely affected. Maharashtra, Punjab, Haryana, Madhya Pradesh are

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moderately affected, while the states West Bengal, Tamil Nadu, Uttar Pradesh, Assam and Bihar are affected mildly. Apart from the above mentioned states Chhattisgarh, Delhi, Jammu & Kashmir, Jharkhand, Karnataka, Kerala and Orissa are endemic for the disease (Arlappa *et. al* 2013).

Fluorine is an element of halogen family with atomic number nine and the element is essential for growth and development of teeth, its deficiency results in dental carries while excessive levels of daily intake results in dental fluorosis. Hence, fluoride is often said to be double edged sword [1]. According to BIS (Bureau of Indian Standards) permissible limit of fluoride in drinking water in the absence of alternative sources is 1.5 mg/L. Fluorosis is endemic in 20 states of the country including the newly formed state of Telangana.

Telangana state consists of 10 districts out of which 8 are known to be endemic for fluorosis [2], rocks in these areas contains excessive amounts of fluoride as a result of this water in these areas contaminated with fluoride to a greater extent. Since, many years the people living in these districts are

depending on the water contaminated with excessive amounts of fluoride for their drinking and domestic usage. As a result, people living in the areas are being exposed to fluoride toxicity and suffering from dental, non-skeletal and skeletal form of fluorosis.

The Nalgonda is one among the 8 fluoride affected districts in the Telangana state. As per the census 2011 the district consists of 59 mandals and the total area is 14,240 Sq.k.m. The population of the district was 3.5 million (34, 88,809) in 2011, out of which 50.4% are males and 49.6% are females. Among total population 18.9% are living in urban areas and 81.0% are living in rural areas. District average literacy rate was64.2% and 60.1% in rural areas. Overall sex ratio was 983 females per 1000 males, total 18 to 59 age group population accounts for 56.6% [3].

Need for the study

There is a need to state severity of fluorosis in rural areas of Nalgonda district. The objective of this study is to assess the prevalence of dental fluorosis among the adult population living in the study area, it is also aimed at determiningvarious factors increasing the risk of dental fluorosis.

MATERIALS AND METHODS

Methodology for the survey

Fluorosis unit of District Medical and Health Office (DMHO), Nalgonda was conducted a village level fluorosis survey across the 47-fluoride affected mandals of the district during the years 2010 to 2015. The survey used a multi stage random sampling design, at first level all the fluoride affected mandals were selected, then two villages from the each of the taluka were selected using the simple random sampling without replacement, at the third level 20 households from each village were selected using Systematic sampling, and then each and every person above 2 years of age in the selected households were assessed for dental, skeletal and non-skeletal fluorosis by using standardized assessment techniques.

Assessment techniques used in the survey

A total number of 47 out of 59 mandals in the district were identified as fluoride affected based on testing of water levels for fluoride using ion chromatography technique. Water samples from each of the selected villages were collected in plastic bottles and examined for fluoride levels on the same day by certified lab technicians. All the persons of ages above 2 years residing in the selected households were examined for dental, skeletal and non-skeletal fluorosis. Assessment of dental fluorosis was done as per Dean's fluorosis index, and skeletal fluorosis was according to chin test and coin tests by registered medical practitioner. The information was collected on paper based questionnaires. Informed consent was taken from the respondents prior to the assessment of fluorosis, and the consent was obtained from parents if the respondent is a child.

Data for the current study

A total number of 10 mandals (each contains 2 surveyed villages) out of 47 surveyed were selected using simple random selection technique. Due to certain limitations of time and logistics obtaining data on all the surveyed mandals were not possible. The information recorded on paper based questionnaires obtained for 20 villages of 10 select mandals

has been entered into electronic databases for the purpose of statistical analysis. Although, the survey included people of ages above 2 years, the current study focused on prevalence dental fluorosis among adult population of ages 18 to 59.

Ethical Approval

Ethical approval for the study was obtained from the International Institute of Population Sciences (IIPS) Mumbai. Secondary data from the fluorosis unit of the District Medical and Health Office (DMHO), Nalgonda was obtained by permission. Since, this study utilizing secondary data, informed consent was not required.

Plan of analysis

Prevalence of dental fluorosis was calculated along with 95% confidence interval. Chi-square test of significance was used to test for the statistical association between dental fluorosis and substances that contains fluoride (tea, black salt, rock salt and fluoride tooth paste). Logistic regression technique was performed to determine to what extent the risk factors are significantly contributing in increasing the risk of dental fluorosis. Data analysis was performed using IBM SPSS V20.0 statistical software.

RESULTS

A total number of 1,077 subjects were analyzed out of which 50.7% (546) are females and 49.3% (531) are males, the mean age of all the subjects was 35.4 years. Overall prevalence of dental fluorosis was 68.9% (95% CI: 68.4 to 69.4) and 61.7% in females, 76.2% in males.The disease was higher among 50-59 years of age group than others.

Prevalence among consumers of substances rock salt, black salt and fluoride tooth pastewas significantly higher than non-consumers; details are given below in table2. Risk of dental fluorosis is 3.2 times (*Odds Ratio=3.23, degrees of freedom=1, p-value=0.000*) more likely among consumers of rock salt than non-consumers. The details of analysis are given below in table3.

Table 1 Prevalence of dental fluorosis across gender and age (n=1,077)

Category	Number of cases	Prevalence in % (95% CI)
Gender		
Female	337	61.7 (61.1-62.4)
Male	405	76.3 (75.5-77.0)
Age group		
18-29	258	65.8 (65.0-66.6)
30-39	159	62.1 (61.1-63.1)
40-49	175	70.6 (69.5-71.6)
50-59	150	82.8 (81.5-84.2)
Overall prevalence	742	68.9 (68.4-69.4)

DISCUSSION

Geographical existence of higher amount of fluoride levels inside the earth in the Nalgonda district leading to water contamination with fluoride.

Table 2 Prevalence of dental fluorosis among consumers and non-consumers of various substances (n=1,077)

Substance Consumption		Dental fluorosis				
		Present	Absent	Total	Chi-square	p-value
		Number	Number	Number	(χ^2)	
		(%)	(%)	(%)		
Tea*	Yes	696 / 68.6%	318 / 31.4%	1014 / 100.0%	0.53	0.467
	No	46 / 73.0%	17 / 27.0%	63 / 100.0%		
Black salt***	Yes	7 / 87.5%	1 / 12.5%	8 / 100.0%	7.94	0.005
	No	735 / 68.8%	334 / 31.2%	1069 / 100.0%		
Rock salt***	Yes	345 / 82.7%	72 / 17.3%	417 / 100.0%	60.811	0.000
	No	397 / 60.2%	263 / 39.8%	660 / 100.0%		
Fluoridated tooth paste**	Yes	508 / 71.1%	206 / 28.9%	714 / 100.0%	5.019	0.025
	No	234 / 64.5%	129 / 35.5%	363 / 100.0%		

*** *Significant at 99% level of confidence,* ** *Significant at 95% level of confidence,* * *Non-significant*

Table 3 Logistic regression for estimation of odds ratio

Risk factor	B	S.E.	Wald	d.f	Sig.	Odds ratio	95% C.I.for Odds ratio	
							Lower	Upper
Rock salt***	1.174	.159	54.754	1	.000	3.236	2.371	4.416
Constant	.417	.113	13.596	1	.000	1.518		

*** *Significant at 99% level of confidence, Reference category-Non consumers*

Consumption of water contaminated with high amounts of fluoride for drinking, cooking and other domestic purposes being the major risk factor for the disease among the rural population of Nalgonda district. Lack of knowledge in using fluoride rich substances are being additional risk factors in increasing the risk of dental fluorosis among the study population. The overall prevalence of dental fluorosis among the study population was 68.9%. Nirgude *et al.*, in their study conducted on 265 individuals residing in 92 households of five colonies of Panagal area, of Nalgonda district, found the prevalence of dental and skeletal fluorosis among adult population to be 30.6% and 24.9%[4]. Padma k Bhatt *et al.*, in Hanumantharayanapalya, Ramanagara district of Karnataka state, found 89.6% of the total studied population was affected with various grades of dental fluorosis and the community fluorosis index constructed was 1.76, which denotes a "medium" category of public health significance [5]. A cross sectional study conducted by S Saravanan *et al.*, on 525 school children of 5 to 12 years old (255 boys and 270 girls) showing that, overall prevalence of dental fluorosis was 31.4% and the disease increased with age (*p<0.001),* whereas gender difference was not statistically significant, correlation between water fluoride content and CFI values in four villages was noted to be positively significant [6].

CONCLUSION

High prevalence of dental fluorosis among the adult population living in the rural areas indicating the disease as a major public health problem. There are differences observed in prevalence rates among various age groups, the disease wasobserved to be lesser in young adults than older population.

This may be due to the increased awareness of people living the areas about the fluoride toxicity. The role of risk factors (fluoride containing substances) is notable in increasing the risk of disease among study population. Substances including rock salt, black salt and fluoride tooth pastes are being additional risk factors for the disease among the study population. Thus, there is a strong need to create awareness about the fluoride toxicity of ground water, and training the people about low cost, home based de-fluoridation techniques for making safe drinking water is recommended to minimize the existing state of disease as well to prevent new cases. People in the study area are already at high risk for fluorosis, thus, it is strongly recommended for the people not to use fluoride containing substances like rock salt, black salt, fluoride tooth pastes etc.

Limitations

Due to certain limitations of time and logistics the study could not utilize the information from all the surveyed villages. Since, the grades of dental fluorosis were not recorded for all the study respondents, construction of community fluorosis Index for each surveyed village could not carried out.

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