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FLUOROSIS AND ITS IMPACT ON PUBLIC HEALTH IN JODHPUR, RAJASTHAN

*Vibha Joshi¹ and Nitin Kumar Joshi²

¹Department of Public Health, Lachoo Memorial College, Jodhpur, Rajasthan ²Jodhpur School of Public Health, Jodhpur National University, Rajasthan *Author for Correspondence

ABSTRACT

Fluorosis is an endemic problem in Rajasthan, out of 32 districts (PHED Habitation survey 1997-98); Jodhpur is one of the worst affected areas. The purpose of the study was to assess fluorosis and its public health impact. Emphasis is laid on dental fluorosis because dental tissues are affected at an early stage and it makes a person socially and culturally crippled. Study was designed with both cross-sectional and retrospective component; sample for this study was collected from Jodhpur Dental College, which is situated in village, Narnadi, in outskirts of Jodhpur city. Majority of population reported to dental OPD were affected by fluorosis. Significant number of population had mild to moderate form of dental fluorosis. Females seem to have more socio-psychological impact of fluorosis than males. Majority of population affected by dental fluorosis have never been to dentist/medical professional for their problem. This shows lack of awareness and poor access to health care. Females seem to have more physical manifestations than males among the reported cases. Fluorosis in Rajasthan is continuing as a serious public health problem, it appears the measures taken to prevent fluorosis are inadequate. At later stage of fluorosis, the hard tissue changes are irreversible and are difficult to treat, and in dental fluorosis at an early age are the only measures to prevent health hazards of fluorosis.

Keywords: Dental Fluorosis; Fluorotic Areas; Water Fluoride; Skeletal Fluorosis; Public Health; Rajasthan, India.

INTRODUCTION

The disease fluorosis is caused by an element known as fluorine, the 13th most abundant element available in the earth crust. Fluorine is the Element of Halogen group with molecular weight 19 and atomic number 9. Fluorine is the most electro negative of all elements. As a result it is highly reactive and has strong affinity to combine with other elements to produce compounds known as Fluoride.

Fluorosis

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. WHO standards permit only 1.5 mg/l as a safe limit of fluoride in drinking water for human consumption (WHO standards and BIS: 10500-1993). Fluorosis is a kind of hypoplasia or structural disorder of enamel which develops due to chronic and excessive use of fluoride compounds by the patient. The most common causative factor for the development of dental fluorosis to be the over use of drinking water containing higher levels of fluoride, especially during the first 6 years of age when the teeth are developing (Murray, 1994).

Children in the age group of 0 to 12 years are most prone to fluorosis as their body tissues are in formative / growth stage during this period. Fluorosis, which is considered to be a problem related to teeth also has serious health hazard. It seriously affects bones and problems like joint pain, muscular pains etc. are its well-known manifestations. It not only affects the body of a person but also renders them socially and culturally crippled.

Extent of the Problem

Endemic fluorosis has been identified in 20 states of India. About 62 million people, including 6 million children are at risk in India suffering from dental, skeletal and/or non-skeletal Fluorosis (Srikanth, 2008). The problem has reached alarming proportions affecting at least 17 states:

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(I) 50-100% districts are affected - Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Gujarat, Rajasthan
 (II) 30-50% districts are affected - Bihar, Haryana, Karnataka, Maharashtra, Madhya Pradesh, Punjab, Orissa, West Bengal

(III) < 30 % districts are affected - J & K, Delhi, Kerala (Sharma 2004).

All the 32 districts have been declared as fluorosis prone areas. The worst affected districts are Nagaur, Jaipur, Sikar, Jodhpur, Barmer, Ajmer, Sirohi, Jhunjhunu, Churu, Bikaner, Ganganagar etc.

Public Health Implication

Fluoride has been classified by the United States National Academy of Sciences (31) as an essential nutrient. Its beneficial as well as its toxic effects in humans has important public health implications. While daily intake of 1–3 mg of fluoride prevents dental caries, long-term exposure to higher amounts may have deleterious effects on tooth enamel and bone; single doses of 5–10 mg/kg body weight cause acute toxic effects, and death was reported following ingestion of 16 mg/kg. The usual lethal concentration range is 70–140 mg/kg.

Purpose of the Study

The purpose of the study was to assess fluorosis and its impact on public health in outdoor patients of Jodhpur Dental College, Jodhpur, as fluoride is an endemic problem in parts of Rajasthan. Emphasis is laid on dental fluorosis because dental tissues are affected at an early stage and it makes a person socially and culturally crippled. Objective of this study includes assessment the severity of the dental fluorosis, awareness regarding fluorosis and socio psychological impact of discoloration of teeth due to fluorosis in the outdoor patients.

MATERIALS AND METHODS

Study Design:

This study was designed with both cross-sectional and retrospective component. The data collected were: retrospective fluoride history, current socio-economic status, history of drinking water supply and current drinking water source, awareness about fluorosis, socio-psychological impact of fluorosis and physical manifestation including dental manifestation. These details were drawn from the pre formed questionnaire. The pre testing of the questionnaire was done before the initiation of study.

Study Population:

The study population comprised of outdoor patients of Jodhpur Dental College which is situated in village, Narnadi, in outskirts of Jodhpur city.

Study Sample:

The study sample comprised of 500 outdoor patients of dental college of all the age who were resident of Jodhpur district for more than one year. It included all males and females.

Research Methodology:

Data collection instrument included number of data types and different data collection instruments. It consisted of retrospective data collection and concurrent data

Study Questionnaire:

Fluoride exposure in the childhood was the main objective of the study along with awareness about fluorosis, socio-psychological impact of fluorosis and physical manifestation including dental manifestation. Residential history was specifically collected to enable the calculation of lifetime exposure to fluoride. Information was collected on the use of dental services, general health and family socio-economic status. The awareness and socio-psychological impact of fluorosis among the respondents was also collected. The draft of the questionnaire was pilot tested among the outdoor patients of Jodhpur dental college. The number of changes was subsequently done based on the pilot test and group discussion. The draft of the questionnaire was reviewed by the experts and then finalized.

Dental Caries Measurement

The presence or absence of caries was recorded while doing the clinical examination.

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Measurement of Dental Fluorosis:

The fluorosis specific Index-Dean Index (Dean, 1942) was used to record dental fluorosis and its range of severity level.

Category	Description
Normal	The enamel surface is smooth, glossy and usually a pale creamy-white colour
Questionable	The enamel shows slight aberrations from the translucency of normal enamel, which may range from a few white flecks to occasional spots. This classification is used where the classification "normal" is not justified.
Very mild	Small opaque paper-white areas scattered irregularly over the tooth but involving less than 25% of the labial tooth surface.
Mild	The white opacity of the enamel of the teeth is more extensive than in category 2, but covers less than 50% of the tooth surface
Moderate	The enamel surface of the teeth show marked wear and brown stain is frequently a disfiguring feature
Severe	The enamel surface is badly affected and hypoplasia is so marked that the general form of the tooth may be affected. There are pitted or worn areas and brown stains are widespread; the teeth often have corroded appearance

Table 1: Dean Index

Ref: Dean, 1942

Dental Appearance Perception:

A number of questions were used to ask the participants' opinions about their dental appearance. Questions covered perception of tooth color and satisfaction with their appearance.

Fluorosis Examination Procedures:

Standard infection control guidelines were applied. Patients were examined in supine position in the dental chair with the examiner sitting at the 11 o'clock position using mouth mirror. Standard clinical light was used for all the cases. Cotton rolls were used to clean and isolate the teeth to be examined.

Analytic Plan

The data were stratified into groups by sex, current residential location, and other socioeconomic characteristics. Similar stratification was conducted by birth cohorts to identify the time trend of each fluoride exposure. Code book was prepared and data analysis was done using SPSS17E and Epi Info.

RESULTS

Among the total population surveyed 37.3% female and 38.8% males from were having questionable to very mild form of dental fluorosis. 18% female and 17.6% males have mild form of dental fluorosis. 7.2% female and 11.4% males from were having moderate form of dental fluorosis. 5.4% female and 6.5% males were having severe form of dental fluorosis.

Dental Fluorosis	Questionable	Mild	Moderate	Severe	
Male	38.8%	17.6%	11.4%	6.5%	
Female	37.3%	18%	7.2%	5.4%	

Table 2: Prevalence of Dental Fluorosis

Out of those who consumed ground water till the age of 14 years and above 72.7% of population had dental fluorosis and Out of those who consumed tap water (municipal supply) till the age of 14 years and above only 18.7%% of population had dental fluorosis.

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14.5% of female and 11.1% of males among fluorosis affected population feels that fluorosis has affected their physical appearance.

18% of female and 5.5% of males among fluorosis affected population feels psychological pressure because of fluorosis.1.8% of female and 2.7% of males among fluorosis affected population had a professional problem because of fluorosis. 14.5% of female and 11.1% of males among fluorosis affected population feels social embarrassment. 3.6% of female and 1.3% of males among fluorosis affected population had a marriage problem because of fluorosis.

Table 5. Socio physiological problems due to hubrosis					
	Psychological pressure	Professional Problem	Social embarrassment	Marriage-related problems	
Male	5.5%	2.7%	11.1%	1.3%	
Female	18%	1.8%	14.5%	3.6%	

Table 3: Socio physiological problems due to fluorosis

18% female and 8.3% males among fluorosis affected population have difficulty in movement of joints.9.1% female and 8.3% males among fluorosis affected population feel weakness / stiffness and pain in the muscles.12.8% female and 9.6% males among fluorosis affected population feel tingling sensation in finger and toes.

37.3% females and 49.8% males have dental caries among the fluorosis affected population.3.6% females and 2% male have got restored their caries affected teeth.

	Difficulty in Joint Movements	Stiffness and pain in muscles	Tingling sensation in finger and toes.	Dental caries
Male	8.3%	8.3%	9.6%	49.8%
Female	18%	9.1%	12.8%	37.3%

Table 4: Physical problems due of fluorosis

Out of lower income group 5.6% of population has not taken treatment of fluorosis because of high cost, Out of middle income group 2.3% of population has not taken treatment of fluorosis because of high cost, Out of total population 19.4% have not underwent treatment because of lack of awareness about the treatment available

Only 7.2% females and 5.6% of males have taken treatment for fluorosis and 38.2% females and 36.1% males having dental fluorosis think that their color of teeth is normal. Out of fluoride affected population 25.4% females and 22.2% males have visited dentist/dental surgeon for the problem of dental fluorosis.

DISCUSSION

Endemic fluorosis related with the presence of fluoride in water is a public health problem in most of the Indian States. Fluorosis is proving to be addition to disease burden with wide spreading non communicable disease Majority of the population who reported to the outdoor patient department were affected by fluorosis. A significant number of the patients had mild to moderate form of dental fluorosis. Female patients had more physical manifestations than males among the reported cases. These patients seem to have more socio-psychological impact of fluorosis than men. A high proportion of the study participants had never been to a dentist or a medical professional for their problem. This shows a lack of awareness and poor access to health care services. It has been known that fluorosis is irreversible kind of disease which cannot be cured and the cost of aesthetic and rehabilitation treatment available in dentistry is high; which seems to be the reason for not taking treatment by the fluoride affected population surveyed. Fluorosis in Rajasthan is continuing as a serious public health problem, it appears the measures taken to prevent fluorosis are inadequate. At later stage of fluorosis, the hard tissue changes are irreversible and are difficult to treat, and in dental fluorosis the rehabilitation treatment is very costly.

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Preventive measures, health education and treatment of fluorosis at an early age are the only measures to prevent health hazards of fluorosis.

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