

KNOWLEDGE, AWARENESS AND PERCEPTION OF FLUOROSIS AMONG FAMILIES  
RESIDING IN FLUOROTIC ENDEMIC AREAS IN NORTH GUJARAT AFTER  
RECEIVING DHAROI WATER SUPPLY AS MITIGATION MEASURE TO CURB  
FLUOROSIS.



## Dental Science

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## ABSTRACT

**Introduction:** Endemic fluorosis remains a challenging and extensively studied national health problem in India. It not only affects the body of a person but also renders them socially, economically and culturally crippled.

**Objectives:** The purpose of this study was to assess the awareness, knowledge and perception regarding water quality, socioeconomic and clinical aspect of Dental and skeletal fluorosis among families residing in endemic areas for Fluorosis in North Gujarat after receiving Dharoi water supply as mitigation measure to curb fluorosis.

**Methods:** A population based survey was done in hundred families of the ten villages of North Gujarat which were selected through Random Sampling technique

**Results:** Around 100 families including 473 members were surveyed. Only 8 families have awareness about Fluorosis and 53% of families strongly agree that the water causes ugly teeth and joint pain. Nearly 89% and about 80% of families had agreed that skeletal Fluorosis severely reduced the capacity for work and earning income and Dental Fluorosis reduces self-confidence, especially in girls respectively. Around 70% of families responded that, there is no relief in joint and back pain at all after using Dharoi water supply.

**Conclusion:** It can be concluded that Fluorosis is a major Public Health problem in these ten villages of North Gujarat affecting people physically, socially and economically, even after the introduction of Dharoi water supply. It can be attributed to irregular and insufficient utilization of Dharoi water supply along with various myths and ostentations attached to usage of this water.

## KEYWORDS

Dharoi water supply, Dental Fluorosis, Skeletal Fluorosis

## INTRODUCTION

Fluorosis is water borne Non Communicable disease. Fluorosis is a disease caused due to excessive ingestion of fluoride in human or animal body.<sup>[1]</sup>

Endemic fluorosis remains a challenging and extensively studied national health problem in India. In India over 50% of ground water sources have excess of fluoride and affect more than 150000 villages.<sup>[2]</sup> The groundwater of 4341 or 52.6% villages of the total 8252 villages in Gujarat is contaminated with more than 1.5 mg/litre of fluoride.<sup>[3]</sup>

Lack of knowledge of the causes of dental fluorosis may be considered one of associated risk factors which enhances dental fluorosis problem because that will be reflected on people's practice and attitude. Various studies have found very low knowledge on risk factors of dental fluorosis and its disadvantages.<sup>[4, 5]</sup> Regarding public perception, previous studies revealed that more than half of the children having dental fluorosis were avoiding smiling and not accepting their appearance leading to loss of self confidence.<sup>[6]</sup> In addition, parents also felt worried and embarrassed for their children who had dental fluorosis.<sup>[7]</sup>

To a certain extent (as per WHO; 0.6 ppm) fluoride ingestion is useful for bone and teeth development, but excessive ingestion causes Fluorosis.<sup>[8]</sup>

The villages of North Gujarat which were chosen for this study are

already endemic for fluorosis. It will reveal exact picture of knowledge, awareness and perception of study families regarding Fluorosis and water quality after introduction of Dharoi water supply as a measure to curb menace of Fluorosis.

## Objectives

- To assess the knowledge and awareness regarding fluorosis and water quality in the endemic areas of North Gujarat.
- To assess the perception of the people regarding socioeconomic and clinical aspects of Fluorosis.

## MATERIALS AND METHODS

**Study Design:** Population based survey.

**Duration of study:** From 1 April to 30 June 2010.

**Study Area:** Ten fluorosis endemic villages of Mehsana and Patan districts.

**Study Tools:** Population sample Survey was done using a self administered short semi-structured questionnaire.

## Sampling Technique:

Considering the limited time available for this study, the 10 villages were selected out of the same 25 villages, which were surveyed by the team headed by Dr. Rajnarayan Indu and Dr. Tushaar Shah in 2004. This project was surveyed as International Water Management Institute (IWMI) Study in 2004 under the name of "Fluorosis in Gujarat: A Disaster Ahead".<sup>[5]</sup>

**Selection of ten villages:**

Each one of 25 census villages of North Gujarat were arranged according to Average Fluoride levels in ppm of IWMI's Study (2004) [3] in a descending order. Out of this, six villages were selected having Fluoride levels above 4 ppm and four villages were selected having Fluoride levels below 2 ppm in a randomized manner for having the better perception of the Fluorosis afflicted persons using water having more and less fluoride levels. Once the villages were selected, the same families who were surveyed in 2004 were listed out. Following this, the families were stratified and ten were finally selected randomly for the study. The detailed information was then collected from 100 households in 10 out of the 25 villages through a structured questionnaire. Data of knowledge and public perception of fluorosis was collected through interview questionnaires with the families.

**Ethical clearance and informed consent:**

Before starting the study, ethical clearance was obtained from the Ethical Committee of Indian Institute of Public Health, Gandhinagar. Verbal with written consent was obtained from the respondents of the families before commencement of the study as there were no invasive procedures or drug intervention in the study. The identities of the respondents were kept confidential during the study period and also during analysis and after publication of study.

**RESULTS:**

**1. Demography: In this census survey hundred families were examined in ten villages with total of 473 members.**

Total Families examined: 100

- Total no. of Male = 250
- Total no. of Females = 223
- Total Family members = 473

**A. Education:**

Majority of people have attained education upto Non SSC and SSC-HSC.

**B. Occupation:**

Out of 100 families, 68 are engaged in Farming, 14 are in service/teacher, 5 are in business and 12 are in others. Majority of families are engaged in farming. One family has both service/teacher and Farming as their business.

**2. Water supply**

**A. Distribution of study families according to availability of Dharoi water supply**

Out of 100 families 61 families receive water from Dharoi and 39 families don't receive Dharoi water supply as shown in Table 1.

**Table 1: Distribution of study families according to availability of Dharoi water supply**

Water supply	Dharoi water supply	No Dharoi water supply
No. of families	61	39

**B. Perception of Dharoi water quality among the families:**

Out of 61 families 6 families say that Dharoi water is of bad quality as shown in Table 2

**Table 2: Perception of Dharoi water quality in study families**

Dharoi water	Good Quality	Bad quality
No. of families	53	6

**C. Distribution of Dharoi water used for drinking and cooking purpose:**

Around 82% of the families are using only 50% of the daily usage of Dharoi water for drinking and cooking as shown in Table 3. None of the family is using 100% of Dharoi water for drinking and cooking which itself potentiate the fact of the grim condition of Fluorosis.

**Table 3: Distribution of study families according to use of Dharoi water**

% age of Dharoi water used for drinking and cooking	No. of Families
0 - 25%	25
25-50%	25
50-75%	11
75-100%	0

**D. Perception of pain with duration of Dharoi water supply:**

Out of 100 families majority of the families were of the view that there is no relief in pain at all after using Dharoi water as shown in Table 4. The duration of Dharoi water supply is not regular and on top of it majority of families are using only 50% of Dharoi water for drinking and cooking purposes. The people also have certain misconceptions about non usage of Dharoi water. All these factors support the above mentioned fact of non relief in the joint and back pain.

**Table 4: Perception of Joint and back pain after supply of Dharoi water**

Symptoms	Remained same (No. of families)(%)	Decreased (No. of families)(%)	Increased (No. of families)(%)	Not replied (No. of families) (%)	Total HHs
Joint pain	42 (70)	12 (20)	6 (10)	40 (40)	100
Back pain	32 (66.7)	10 (20.8)	6 (12.5)	52 (52)	100

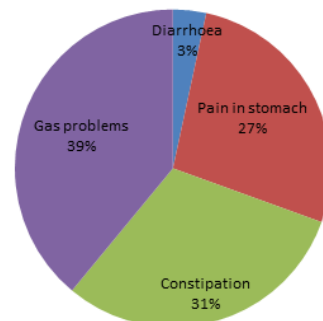
**3. Gastric problems**

This analysis of gastric problems was absent in Shah and Indu. [3] The hundred families were surveyed for gastric problems. It was observed that Out of 61 families receiving Dharoi water 41 families i.e. 67.2% suffers from gastric problems as. Out of 39 families which don't receive Dharoi water supply 18 families i.e. 46.2% have gastric problems.

It was also observed that out of 100 families questioned for gastric problems, 59 families had gastric problems and out of that 19 families said that it's due to water source like bore well or mixture of bore well and Dharoi water.

Majority of the families that is almost 70% complains of Gas problems and constipation as shown in Fig.1 which is considered as early warning signals of Fluorosis as quoted by Dr. A.K Susheela. [3]

**Gastric problems in afflicted families**



**Fig: 1**

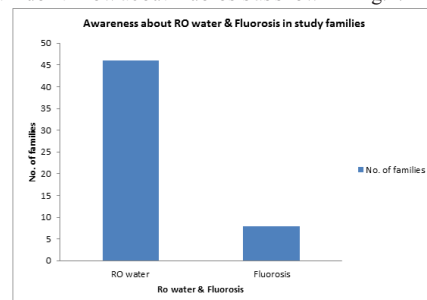
**4. Awareness of Drinking Water**

**A. Opinion about water quality**

In this survey the opinion of the respondents of the 100 families was taken regarding quality of the water used by them for drinking purposes. Around 67% of them said that the water they drink is of good quality and 32% of them said that it's of bad quality.

**B. Awareness about RO water and Fluorosis:**

It was observed that out of 100 families 46 families have awareness about RO water and 8 families have awareness about Fluorosis. Out of 46 families 43 families drink RO water. It reveals that majority of the people still don't know about Fluorosis as shown in Fig.2.



**Fig.2**

Those families who use RO water were of the opinion that there was a difference in the quality of water between the water supplied in the village and the packaged drinking water. These families were using this water after they were advised either by doctor or friends or relatives. Some families even demanded subsidy on RO water. Around 20 families were willing to spend money for packaged RO water. Majority of the families couldn't afford to spend money on RO water. About 92% percent of the families had 'no-idea' about causes of Fluorosis and 95% also did not know that anybody got cured or recovered from the sufferings of Fluorosis after using demineralized water.

### 5. Perception of 'Good' water and 'Fluorosis':

In this survey the feedback was also taken about the perception of respondents regarding Fluorosis and its consequences through six different queries. Nearly 89% percent respondents had agreed that skeletal Fluorosis severely reduced the capacity for work and earning income. About 80% had agreed that Dental Fluorosis is a major problem for young people, especially girls, because it reduces their

self-confidence. Around 78% of the families agree that there is difficulty in marriages because of Dental Fluorosis. However, there was no such strong opinion that the skeletal Fluorosis reduces the patient's interaction with other members of the community and leads to loneliness or isolation. Reason may be mostly people stay in a joint-family, or there are relatives and neighbours around the afflicted person. There is a community/family bond still prevailing in Indian village-life that may be working for not feeling so much lonely even though an afflicted person is not able to move much.

Further, there was no strong opinion or rather only 49% strongly agree with the perception that better quality of drinking water would reduce the skeletal Fluorosis. At the same time they agree (strongly 40% and softly (42%) that the damage in the body due to 'Fluorosis' was irreversible and no medicinal remedy was available for skeletal Fluorosis. Furthermore about 53% strongly agree that the water causes ugly teeth and joint pain as shown in Table 5. Hence, a solid belief that the water is 'the cause' for dental and skeletal Fluorosis is still to be 'hatched' in the mind of the people of the study location in Gujarat.

**Table: 5 Perception regarding dental and skeletal fluorosis by study families**

Perception	n= Number of Families				
	Strongly agree (n)	Agree (n)	Do not know (n)	Disagree (n)	Strongly disagree (n)
The water causes ugly teeth and joint pain	53	19	14	14	0
Skeletal Fluorosis severely reduces capacity for work and earning income.	4	89	6	1	0
Better quality drinking water would reduce Skeletal Fluorosis	49	25	16	10	0
The damage in your body due to 'Fluorosis' is irreversible and no medicinal remedy for Skeletal Fluorosis	40	42	15	3	0
Difficulty in marriages because of Dental Fluorosis	9	78	6	7	0

### DISCUSSION

Various studies have been conducted to investigate the perception of dental fluorosis around the world, and the results of most of them were at par with the present study.

Dharoi water supply was introduced in these villages as one of the mitigation measure to curb fluorosis. In hundred families studied, around 60% of families receive Dharoi water and 40% of families still don't receive Dharoi. Incidentally those who are receiving still don't have regular supply. There are also other problems for irregular supply like pipeline leakage or lack of pressure or hefty bill payments to get Dharoi water. There were certain misconceptions linked to the non utilization of Dharoi water like water is very cold and filthy and dirty. Some families said that it causes cough and has foul odor and taste. All these factors potentiate the inadequate utilization of Dharoi water having less fluoride level. In present study, there is lack in knowledge about fluorosis. Levallois et al. found that knowledge of advantages and disadvantages of fluoride was rare in communities with fluoridated or non-fluoridated water supply in Quebec City region, and he warned of its reflect on people's practice and attitude.<sup>[5]</sup>

In our study, Only 8 families out of 100 have awareness about Fluorosis. It correlates with study conducted in Gaza strip, where most of the families do not know what dental fluorosis is and have not received any information about dental fluorosis<sup>[9]</sup> It can be concluded from our study that this could lead to increase the risk of exposure to fluorosis. It is evident in our study that, almost 80% of families had agreed that Dental Fluorosis reduces self-confidence, especially in girls and 78% of the families agree that there is difficulty in marriages. It can be correlated with study conducted in Gaza strip, wherein, the participants who believe that people with dental fluorosis (stained teeth) have lack social skills are 100% of children and 97.1% of mothers, 98.6% of children and 95.4% of mothers believe that they are less intelligent and 98.9% of children and 97.1% of mothers expect that they suffer of poor social adjustment.<sup>[9]</sup> A study in Tanzania found that children with dental fluorosis could suffer from social and psychological problems<sup>[10]</sup> and others declared that children's personality will be adversely affected.<sup>[11,12]</sup>

Ours study proves the fact that there, is no improvement in condition of fluorosis even after the introduction of Dharoi water supply as a mitigation measure to curb fluorosis. The people residing in these ten villages are aggrieved and afflicted physically, mentally, economically and socially by this menace. There are certain limitations of this study as perception of people might not reflect exact situation. The more

extensive research needed in this area to present exact condition of people thereby drafting new policy to tackle the problem of fluorosis.

### CONCLUSION:

This study concludes that there is still very grim condition of Fluorosis in these ten villages of North Gujarat. There seems to be insignificant improvement in the Fluorosis condition in these families even after the mitigation measure taken to curb Fluorosis like change in water supply from borewell water to Dharoi dam. It might be due to irregular and dirty supply of the Dharoi water supplemented by the non usage of this water by the people due to misconceptions attached to it as mentioned above.

One of the MDG is to "Ensure environmental sustainability".<sup>[13]</sup> In context to India it means "the proportion of population without sustainable access to safe drinking water and sanitation is to be halved by 2015" but it seems to be a distant dream especially in these villages of North Gujarat. Hence all above mentioned problems should be sorted out by making appropriate policy changes by effective implementation of Dharoi water supply. The efforts should be made to provide safe, qualitative and regular supply of Dharoi water. The Fluorosis doesn't cause mortality but it makes the person crippled socially, culturally as well as physically which is more deplorable rather than being dead. In spite of the progressive spread of disease so far no established data exists to determine the extent of disease, no specialized water testing facilities are available and even the doctors 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. The Fluorosis should be taken seriously as the national agenda by the govt. as its incurable but it can be prevented by providing safe drinking water. The present study acts as a pointer to public health physicians, dentists, chemists, planners, administrators, engineers and water supply authorities.

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### Conflicts of Interest:

The conflicts of interest are hereby declared as none.

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