



MASTER OF PUBLIC HEALTH

A cooperative Program of

JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH
&
INDIAN INSTITUTE OF HEALTH MANAGEMENT RESEARCH

Capstone Project
at
Department of Health & Family Welfare

By
Dr. Rahul Pathak

IIHMR/JHSPH MPH
2013-2015

MASTER OF PUBLIC HEALTH

A cooperative Program of

JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH
&
INDIAN INSTITUTE OF HEALTH MANAGEMENT RESEARCH

Capstone Project
At
Department of Health & Family Welfare

***An Assessment of Fluorosis Control Programs in
Nagaur district, Rajasthan***

By
Rahul Pathak

Under the guidance of
Dr. Suresh Joshi

Master of Public Health

Year 2013-15

Year 2014



MASTER OF PUBLIC HEALTH

A cooperative Program of

JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH
&
INDIAN INSTITUTE OF HEALTH MANAGEMENT RESEARCH

TO WHOMSOEVER MAY CONCERN

This is to certify that Dr. Rahul Pathak a student of the Master of Public Health Program offered by the Institute of Health Management Research; Jaipur in cooperation with Johns Hopkins Bloomberg School of Public Health, Baltimore has undergone capstone training at Department of Health & Family Welfare on the topic Fluorosis Control from 2013 to 2015.

The Candidate has successfully carried out the study designated to him during capstone training and his approach to the study has been sincere, scientific and analytical.

The Capstone is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.

Dean, Academics and Student Affairs

IIHMR, Jaipur
Baltimore

Capstone Advisor/ Advisors

IIHMR, Jaipur / JHSPH,



JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH



MASTER OF PUBLIC HEALTH

A cooperative Program of

JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH
&
INDIAN INSTITUTE OF HEALTH MANAGEMENT RESEARCH

CERTIFICATE BY SCHOLAR

This is to certify that the Capstone Project titled An assessment of Fluorosis control programs in Nagaur district, Rajasthan and submitted by Rahul Pathak Enrollment No.7 under the supervision of Dr. Suresh Joshi for award of **Master of Public Health** carried out during the period from 2013 to 2015 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.


Signature

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

ABSTRACT

Fluoride in minute quantities is beneficial to the skeletal system and teeth. In large continuous doses fluoride results in various deformities. Fluoride is endemic to many nations globally but is specially a problem of developing countries such as India due to a lack of a government regulated water supply and large quantities of fluoride being present in the ground water supply which is consumed regularly through drinking and cooking. Currently in Rajasthan there are 2 main programs running which are dedicated to combating the severe Fluoride problem in various areas of the state. The two programs are the Rajasthan Initiated Fluoride mitigation program (RIFMP) and the National Program On Prevention And Control of Fluorosis (NPPCF).

The purpose of these programs is to relieve the burden of diseases caused by excessive fluoride ingestion such as skeletal and dental fluorosis. One of the most severely fluoride effected districts in Rajasthan is Nagaur. The people affected include people from all age groups and gender, but the very young and pregnant / lactating women are especially at greater risk. The purpose of this study is to understand the various fluorosis mitigation programs in Nagaur and to determine their effectiveness via: a survey conducted in rural Nagaur.

The survey consisted of random interviews with 100 residents of the rural communities of Nagaur. The main purpose of the survey was to assess the rural community's knowledge of the causes, methods to prevent Fluorosis as well as their usage and satisfaction with the RIFMP installed Defluoridation units.

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

The results of the survey show that majorities of people are aware of the causes of and dietary methods to prevent Fluorosis. The findings also determined that the Defluoridation units are being utilized by a majority of the intended population in order to prevent Fluorosis though the compliance of the users is not 100%.

ACKNOWLEDGEMENTS

The cooperation of the Department of Health and Family welfare in Jaipur is greatly appreciated as well as the PHED Jaipur. The data collection in the rural areas would not have been possible without participants of the respondents as well as the accompaniment of Rajat Sharma's whose awareness of local the language and geographic layout was a great asset.

I would like to thank Dr. Nutan Jain for her guidance in attaining the IRB approval required in order to conduct this study. This study would not have been possible without the guidance of my capstone advisor Dr. Suresh Joshi who urged me to collect the data from Nagaur.

TABLE OF CONTENTS

ABSTRACT	1
ACKNOWLEDGEMENTS	2
ABBREVIATIONS	5
INTRODUCTION	6
<i>Objectives of the study</i>	6
LITERATURE REVIEW	7
<i>Background</i>	7
Chart # 1 Countries with endemic fluorosis	7
<i>Fluorosis in Rajasthan</i>	8
<i>Number of villages affected over time</i>	10
Chart # 3 Year wise increment of the number of villages effected	10
<i>Groundwater Quality</i>	10
<i>Fluorosis</i>	11
<i>Manifestations of Fluorosis</i>	11
<i>Victims of the disease</i>	12
Chart # 4 Child affected by Dental Fluorosis	13
Chart # 5 Children affected by Skeletal Fluorosis showing (Genu Valgum & Genu Varum)	13
Chart # 6 Man with severe skeletal fluorosis crippled by fluoride	13
<i>Nagaur district</i>	14
<i>Table 1: Details of Nagaur District (Census 2011) ^[14]</i>	14
<i>Table 2: Blocks and Tehsils in Nagaur district, Rajasthan ^[14]</i>	15
METHODOLOGY	15
<i>Study Method</i>	15
RESULTS	16
<i>Sources of Fluoride</i>	16
<i>Fluorosis Control Programs in Rajasthan</i>	17
Rajasthan Initiated Fluoride mitigation program (RIFMP) ^[15]	17
Goal of RIFMP	17
Strategies	18
National Program on Prevention and Control of Fluorosis ^[14]	18
Goals of NPPCF	18
Objectives of NPPCF	18
Strategies	20
Activities Carried out	20
Table no # 3 list of all districts involved in Rajasthan under NPPCF	21
Activities carried out under NPPCF in Nagaur district	21
STUDY FINDINGS	22
Table 4: Awareness among stakeholders about Fluorosis among selected villages of Nagaur	22
	3

<i>Chart 7: Awareness of Fluorosis among respondents (%)</i>	22
Table # 5: Distribution of source of awareness among stakeholders in selected villages of Nagaur	22
Table 6: Respondent awareness of causes of Fluorosis in selected villages of Nagaur	23
Chart 8: Respondent awareness of causes of Fluorosis in selected villages of Nagaur	23
Table 7: Awareness of various sources of Fluoride by respondents in rural Nagaur	24
Chart 9: Awareness of various sources of Fluoride by respondents in rural Nagaur	24
Chart 10: Awareness of Defluoridation Units in the Villages	25
Table 8: Respondents reported accessibility to DFU (%)	26
Table 9: Reasons for using water from the DFU (%)	26
Chart 11: Respondents reported accessibility to DFU (%)	27
Table 10: Percentage of rural Nagaur respondents using DFU	27
Chart 12: Percentage of rural Nagaur respondents using DFU	28
Chart 13: Water collection frequency of rural Nagaur district respondents	29
Table 12: Duration of DFU usage by rural Nagaur respondents	30
Chart 14: Duration of DFU usage by rural Nagaur respondents	30
Table 13: Satisfaction and recommendation	30
<i>Bottlenecks and constraints in program implementation</i>	32
Chart 15: DFU distance, Non users and Inconveniences faced by Respondents (%)	32
DISCUSSION	34
RECOMMENDATIONS & CONCLUSION	37
BIBLIOGRAPHY	39
REFERENCES	40
SUPPLEMENTARY	41
<i>Instrumentation</i>	41
APPENDIX	47
<i>IRB Approval 1</i>	47
<i>IRB Approval 2</i>	48

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

ABBREVIATIONS

ANM	AUXILARY NURSE MIDWIFE
ASHA	ACCREDITED SOCIAL HEALTH ACTIVIST
AWW	ANGAN WADI WORKER
DDU	DOMESTIC DEFLUORIDATION UNIT
DFU	DEFLUORIDATION UNIT
IEC	INFROMATION EDUCATION COMMUNICATION
LPCD	LITERS PER CAPITA DAILY
NPPCF	NATIONAL PROGRAM ON PREVENTION AND CONTROL OF FLUOROSIS
PHED	PUBLIC HEALTH ENGINEERING DEPARTMENT
PPM	PARTS PER MILLION
PRI	PANCHYAT RAJ INSTITUTION
RIFMP	RAJASTHAN INITIATIVE FOR MITIGATING FLUOROSIS

INTRODUCTION

Fluorosis is a major issue due to the quality of water especially in regards to the presence of the fluoride ions in the underground water supply. Fluorosis is especially a problem in developing countries. India has been struggling with this particular water related disease for decades, to mitigate this disease the National Fluorosis Control Program was started. The (National Program on Prevention and Control of Fluorosis) NPPCF was approved by the planning commission of the Government of India in 2007. In Rajasthan the Rajasthan Initiated Fluoride mitigation program was also implemented. One of the districts in Rajasthan with the most severe shortages in water is Nagaur leading to dependence on ground water supply. In Nagaur, health problems such as dental and skeletal fluorosis are prevalent and the ground water supply contains excess fluoride content. This study will examine the effectiveness of the fluoride mitigation programs by conducting a survey, which determines the use of DFU (Defluoridation units) as well an awareness of fluorosis in rural Nagaur.

Objectives of the study

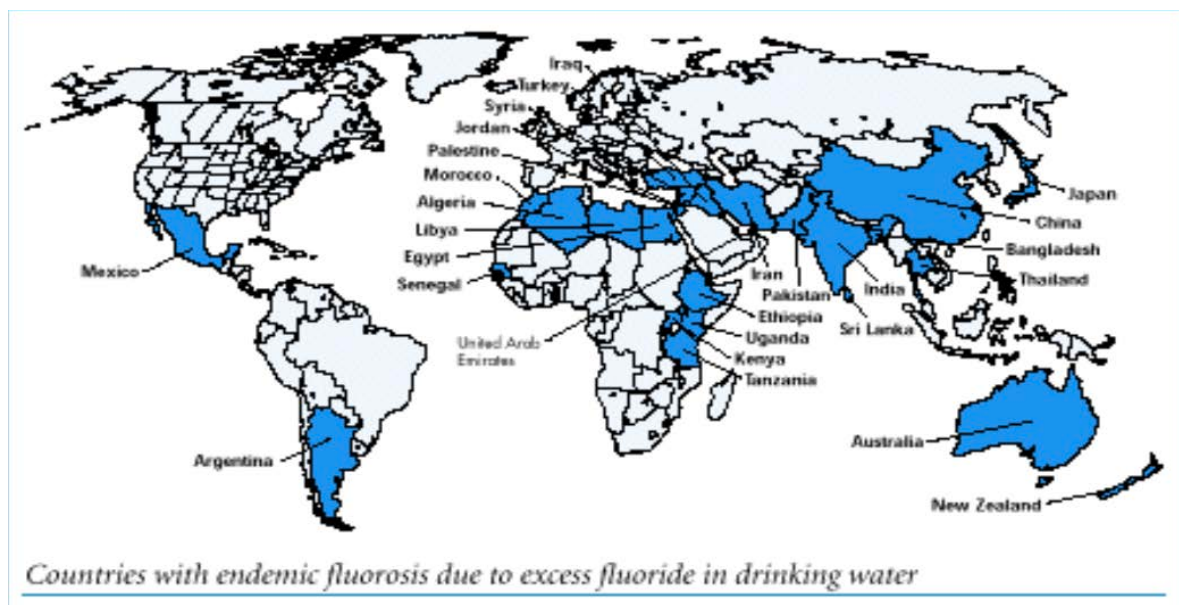
- To understand the various sources of fluoride
- To understand the fluorosis control programs in Rajasthan
- To understand the bottle necks and constraints in implementing the programs by interviewing DFU users

LITERATURE REVIEW

Background

Fluorosis is a worldwide health problem and occurs in areas where the fluoride level in drinking water is higher than the recommended limit. There are 27 nations around the world that have fluorosis occurring due to high fluoride in drinking water.

Chart # 1 Countries with endemic fluorosis

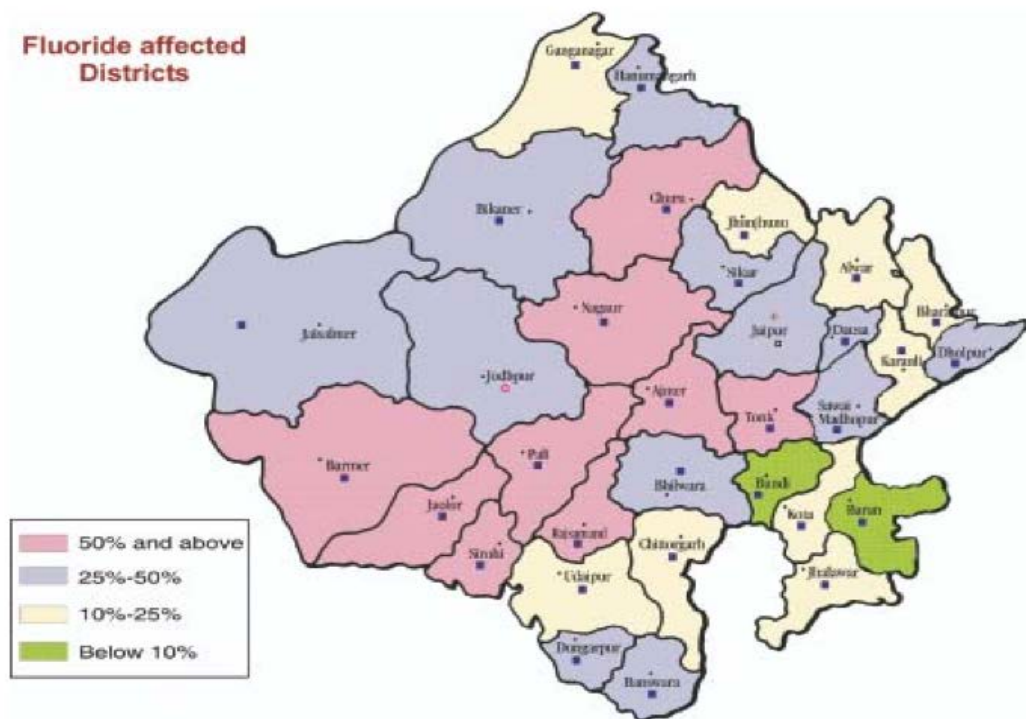


Source: http://www.nofluoride.com/Unicef_fluor.cfm

The mineralization of bones and formation of dental enamel requires minute quantities of fluoride. If the level of fluoride exceeds the minimum intake level over long durations fluorosis may result. The of Indian standards Bureau allows fluoride in drinking water between 0.5- 1.5 PPM while the world health organization allows for between .1-.5 parts per million. ^[1,16]

Fluorosis in Rajasthan

Chart # 2 Districts in Rajasthan affected by Fluoride



Source: J. Fawell et.al [], K.Bailey, J.Chilton, E. Dahi, L. Fewtrell and y. magara/ WH, 2006. Fluoride in drinking water, p-100

Due to the poor quality of underground water, fluorosis is a special concern, especially due to the presence of excess fluoride ions in the underground water supply. Developing countries are affected more than their developed counterparts due to the presence a safe water distribution system in those nations. India has been struggling with this particular water related disease for decades and so the National Fluorosis Control Program was implemented. The (National Program on Prevention and Control of Fluorosis) NPPCF was approved by the planning commission of the Government of India in 2007.

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

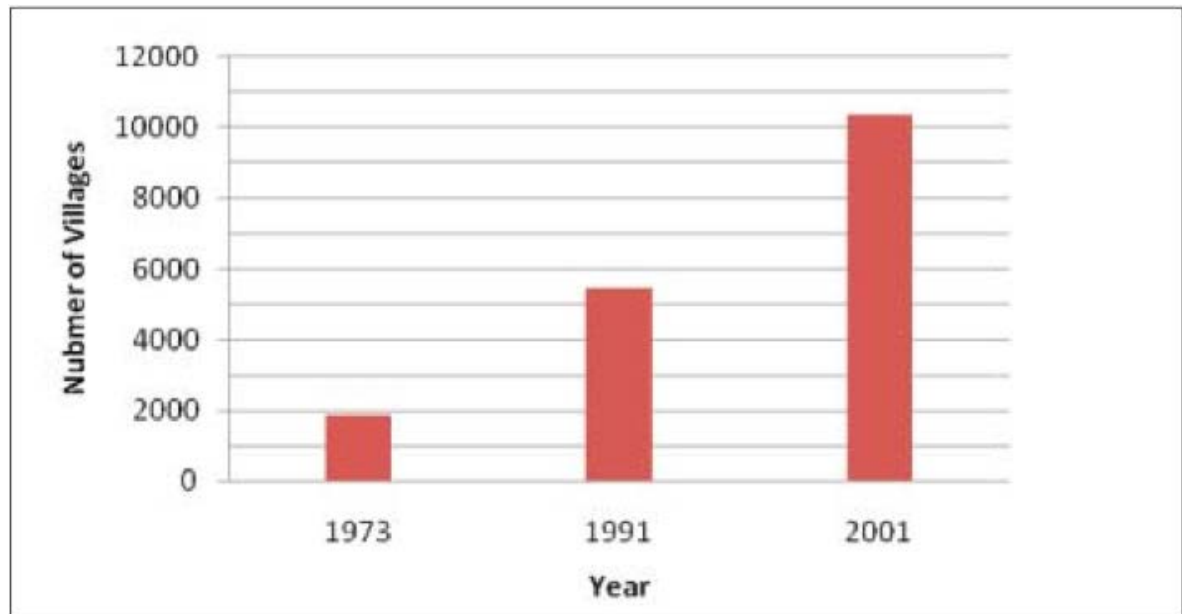
The NPPCF program is executed through the Department of Health and Family Welfare. Dependence on ground water has lead to many in Nagaur with health problems such as dental and skeletal fluorosis.

With the rapid growth of population and economy, the gap between water demand and supply has been increasing. The 69th report of national sample survey organization (December 2013) shows that 88.5% of rural households and 95.3% urban households in India having an improved drinking water sources. By improved drinking water source it is inferred that the water is piped from a safe source for consumption. [2]

”According to the PHED the 69th NSSO report of Rajasthan 791 out of 1000 households in rural areas have access to improved sources of drinking water but only 747 households received the efficient drinking water throughout the year. As compared to the urban situation of 928 households out of 1000 drinking water from improved sources and only 814 have a year-round supply of water. Improved sources of water means piped water reaching the house or sourced from a protected well or spring.” [3] [4]

Number of villages affected over time

Chart # 3 Year wise increment of the number of villages effected



Social Inclusion: John Hustedt, Aji John, Natasha Mistry, Sakshi Saini, Anne-Line Sandåker^[6]

As the graph clearly depicts the number of villages in Rajasthan affected by fluoride has been growing slowly yet steadily for decades. The cause of this growth may be attributed to the Rajasthan's lack of rainfall / dry climate as well as its increasing use of groundwater for livestock and agriculturally related purposes. The use of groundwater without its full replenishment through annual rainfall causes the remaining groundwater fluoride concentration to increase thus making it even more harmful for long-term use.

Groundwater Quality

R. Gautama's Studies from January 2011 of Nagaur district determine that fluoride levels change with geographic locations in Rajasthan. The water quality in Nagaur District is gen-

erally brackish to saline with a few pockets of freshwater. The content of fluoride in Nagaur district shows vast differences from as little as 1mg/L to as great 14.82 mg/L in some areas [7,14]

Fluorosis

The symptoms, signs and manifestations of Fluorosis appear differently from person to person depending on body physiology, nutrition and hormonal levels of the individual. A wide range of health complains accompany those afflicted with fluorosis from extreme weakness, fatigue, nausea, stomach pain, loss of appetite, polyuria, polydipsia, low hemoglobin, joint pains, and stiffness of joints. The great variation of signs and symptoms of this disease make it difficult to diagnose and thus victims of fluorosis often gets misdiagnosed ^[15].

Manifestations of Fluorosis

1. Non-skeletal Fluorosis: effects the soft tissues of the body and causes a loss of appetite, diarrhea and stomach pain
2. Dental Fluorosis: This condition occurs in both adults and children caused due to consumption of heavy amounts of fluoride. It manifests by teeth developing yellowish- brown streaks, chalk white appearance, and white/ yellow spots over the teeth.
3. Skeletal Fluorosis: may cause irreversible damage to bones, which leads to deformities of the bones, which are manifested by the bone's becoming curved.
 - Symptoms of skeletal Fluorosis
 - o Severe pain and stiffness in the joints
 - o Severe pain and stiffness and neck and backbone

- o Severe pain and virginitis in the hip region
 - o Increased girth, thickening and density of bone
 - o Inability to squat
- Types of Skeletal Fluorosis
 - o Genu Valgum (knock knee): the legs are bowed inwards in the standing position. The bowing occurs at or around the knee, and when standing with knees together the feet are far apart.
 - o Genu Varum: the legs are bowed outwards in the standing position.
 - o Kyphosis: Forward bending spine. Fixed and rigid thoracic cage as well as the occurrence of spinal cord compression.

Victims of the disease

People of all ages and both genders are victims of fluorosis but fluoride toxicity takes an extra toll on developing children and women's reproductive health. "Fluoride levels of more than 1.0 mg/l in urine results in anemia. Anemia in pregnancy is a serious problem that leads to maternal mortality. Through consumption of excessive fluoride, women become anemic which leads to delivery of low birth babies, pre-term babies as well as the occurrence of intrauterine deaths, abortions and stillbirths." [8][9]

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

Chart # 4 Child affected by Dental Fluorosis



Chart # 5 Children affected by Skeletal Fluorosis showing (Genu Valgum & Genu Varum)



Chart # 6 Man with severe skeletal fluorosis crippled by fluoride



Nagaur district

“In India the average rainfall is 1,100 millimeters. In comparison Rajasthan is one of India’s arid and dry climate states where the average rainfall yearly is 574 millimeters with a 47% chance of drought”.^[9] Since there is a lack of rainfall, increase in population and economic growth the groundwater supply and the surface water supply are exhausted, leading to water shortages. These sources of water also do not meet the drinking water standards of the Rajiv Gandhi National Drinking Water Mission initiative and the world health organization as it contains higher than permissible levels of Fluoride in the under ground water supply. The rural communities use these sources of water due to no other source of water being available. The continuous usage of untreated water from this source leads to health conditions which range from mild to severe depending on the duration and quantity of ingestion.¹

“In 2010 it was found through surveys that approximately 34 percent of children in the district between the ages of six and fourteen had fluorosis. About 80 percent of the populations in the district do not have access to safe water, placing the district as having one of the most dire water shortages in the state”.^[10]

Table 1: Details of Nagaur District (Census 2011)^[14]

Number	Description	Details
1	Total population	3,307,743
2	Rural population	2,670,539
3	Urban population	637,204
4	Blocks	11
5	Villages	1589
6	Area square kilometers	17,718
7	Average literacy	62.80%

Table 2: Blocks and Tehsils in Nagaur district, Rajasthan ^[14]

Number	Blocks	Number	Tehsils
1	Degana	1	Nagaur
2	Didwana	2	Kheemsar
3	Jayal	3	Jayal
4	Kuchaman	4	Kuchaman
5	Ladun	5	Ladnun
6	Makrana	6	Makrana
7	Merta	7	Merta
8	Mundwa	8	Degana
9	Nagaur	9	Parbastar
10	Parbastar	10	Didwana
11	Riyan		

METHODOLOGY

Study Method

To understand the various sources of fluoride in Nagaur district secondary data sources were reviewed. This review includes various published reports by the Government departments and research studies conducted in the state of Rajasthan and Nagaur district.

Reviewing the current Fluorosis control programs in Rajasthan helped in understanding the implementation strategies and involvement of various stakeholders.

To identify the bottlenecks in implementing the programs a community level study was conducted. The study used a mix of quantitative and qualitative techniques. The quantitative technique included a household questionnaire in which most closed and a few open-

ended questions are included. The quantitative methods included interviews with village residents.

The key components of the study and the methods used to cover these components were as follows: A purposive sample was taken. Due to budget and time constraints the number of interviews was limited to 100. At present there are 937 DFU's installed and spread across 32 villages / hamlets based on their fluoride levels in ground water. No statistical analysis is required for this study. The respondents were interviewed randomly with the criteria that there be a functional DFU in the village. Information about the knowledge of Fluorosis and sources of fluoride, source of knowledge, De-fluoridation unit awareness and usage, reasons for not using the DFU were collected through interviews from the village respondents. A bi-lingual questionnaire with close ended and open-ended questions was prepared to collect the information.

Ethical approval for the study has been obtained from the Institutional review board at IIHMR Jaipur.

RESULTS

Sources of Fluoride

The main sources of fluoride intake are from drinking water, food, drugs and industrial emissions. Permissible limits for fluoride as per bureau of international standards is one part / million in drinking water ^[14].

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

In Nagaur district dietary intake is the secondary source of fluoride untreated ground water consumption being the primary source of fluoride intake. Listed below are items, which should and should not be included in the diet in order to prevent secondary ingestion of fluoride Ions.

In order to mitigate fluorosis the following items are not to be ingested: Supari, Tobacco, Black Rock salt, items that contain black rock salt, fluoridated toothpaste, black tea.

The following should be included in the diet to combat fluoride ingestion: calcium rich foods (Yogurt, milk products etc.) green leafy vegetables, bananas, lemon, carrots, citrus fruits, tomatoes, cereals, ginger, onion, sweet potato, guava [15].

Fluorosis Control Programs in Rajasthan

Two major Fluorosis control programs are being implemented currently in the state of Rajasthan. The details of which are mentioned below.

Rajasthan Initiated Fluoride mitigation program (RIFMP) ^[15]

Govt. of Rajasthan has undertaken a Rajasthan Integrated Fluoride Mitigate Program (RIFMP) ^[15], to facilitate safe potable water to the habitants presently served with excessive Fluoride contaminated water. The Government has installed (DFU) De-Fluoridation units to providing relief for the affected population.

Goal of RIFMP

The goal of The Rajasthan Initiated Fluoride Mitigation Program is to provide water safe for consumption to the residents of Rajasthan's fluoride affected areas.

Strategies

The main components of RIFMP strategy are: providing of safe drinking water through the treatment of contaminated ground water using DDU and DFU's, promoting traditional methods of rainwater harvesting, Educations of residents of Fluoride endemic areas about information on dietary needs that will help combat excessive Fluoride ingestion and generating awareness about fluorosis / how it may be controlled and prevented.

National Program on Prevention and Control of Fluorosis^[14]

“The national program on prevention and control of Fluorosis (NPPCF) was approved by the planning commission of the government of India in 2007 during the first year of the 11th fifth year plan. The funds were released by the government of India to the Ministry of health and family welfare program implementation. As of 2014 the program for publication funds have been released by the Union Ministry of health and family welfare to 52 districts selected from 17 endemic States for fluorosis in the country, which includes Rajasthan. The funds are ear marked for the purchase of equipment as well as hiring of personnel, which includes consultants, Technicians and field workers as well as for the training of consultants and technicians”.^[14]

Goals of NPPCF

To prevent and control fluorosis cases in India

Objectives of NPPCF

1. To collect, Process and use the baseline survey data of fluorosis to start the project

2. Management of Fluorosis in the selected areas.
3. Capacity building for prevention, Diagnosis and management of fluorosis cases.

The program has four phases:

Phase 1 [2008-2009]

The baseline data was collected from the department of drinking water supply. The identified districts were given Community diagnosis, I'll be detection and rapid management, Capacity building through this transmission labs, Training of medical and laboratory personnel, Surgery. Also IEC materials were organized during this period.

The following areas were chosen for the programs initial implementation.

- South eastern zone- Nellore, Andhra Pradesh
- Western zone – Jamnagar, Gujarat
- Northeastern zone – Nagaur, Rajasthan
- Eastern zone – Nayagarh, Orissa
- Central zone – Ujjain, Madhya Pradesh

Phase 2 [2009 – 2010]

Phase 1 of the program was continued into the second year as well as the addition of 15 more districts to the program.

Phase 3 [2010 – 2011]

During this period 40 more districts were added to the program.

Phase 4 [2011 – 2012] During this time period 40 additional districts were added to the program.

Strategies

The following strategies are used in the (NPPCF)

- Training -training of health personnel to ensure prevention, Health promotion, early diagnosis, Prompt intervention, Deformity correction and rehabilitation.
- Capacity building – capacity building of district and medical college hospitals for reconstructive surgery and rehabilitation.
- Laboratory support development- establishment of diagnostic facilities in the district hospitals
- IEC materials-Health education for prevention and control of Fluorosis cases

Activities Carried out

- Community diagnosis of fluorosis by (Village/Block)
- Facility mapping for prevention, Health promotion, Diagnostic facilities, Request that the surgery and medical rehabilitation.
- Gap analysis and facilities and organization of physical and financial support for bridging the gaps in order to facilitate strategies listed above.
 - o Diagnosis & treatment of individual cases and providing it with managing support
 - o Public health intervention on the basis of Community diagnosis.
 - o Behavior change through the use of IEC material

In Rajasthan currently out of 33 districts in the state 18 districts have been chosen for the programs implementation. Listed below are the names of all the districts involved.

Table no # 3 list of all districts involved in Rajasthan under NPPCF

Ajmer	Banswara	Bhilwara	Bikaner
Churu	Dawsa	Dungarpur	Jaipur
Jaisalmer	Jalore	Jodhpur	Nagaur
Pali	Rajasamund	Sikar	Sawai Madopur
Tonk	Udaipur		

Activities carried out under NPPCF in Nagaur district

- Procurement of ion meter and capacity building of consultants and laboratory technicians
- School dental fluorosis surveys children 8yrs – 11yrs age
- Community level dental and skeletal fluorosis surveys
- Capacity building of medical officers, paramedical staff, ANM, ASHA
- Testing of urine in Fluorosis suspected cases
- Raising community awareness and behavior change through IEC materials.

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

STUDY FINDINGS

Table 4: Awareness among stakeholders about Fluorosis among selected villages of Nagaur

Serial Number	Item / Source of Information	Percentage (n=91)
1	Proportion of respondents who are aware of Fluorosis disease (n=91)	93

Chart 7: Awareness of Fluorosis among respondents (%)

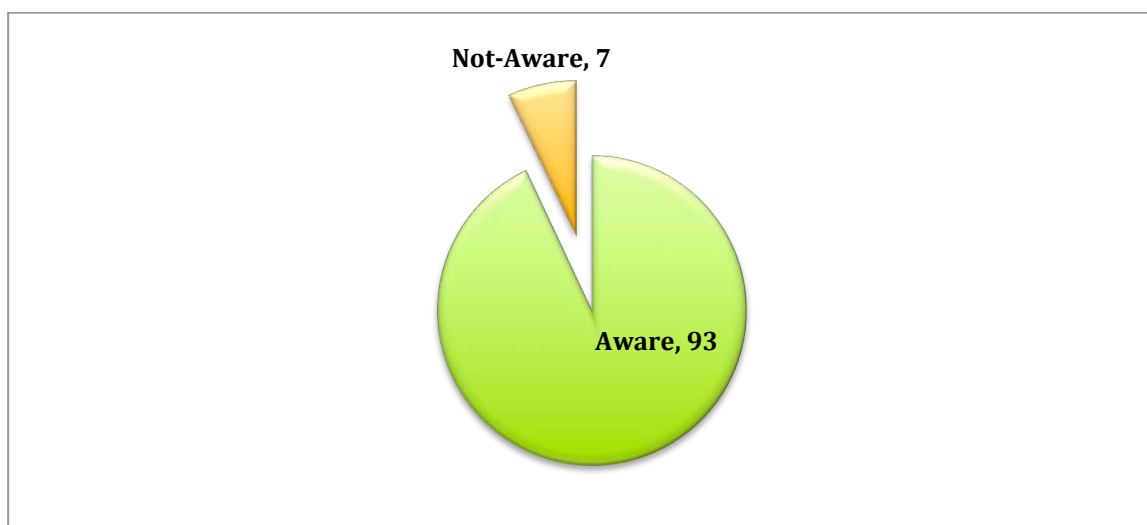


Table # 5: Distribution of source of awareness among stakeholders in selected villages of Nagaur

Serial Number	Item / Source of Information*	Percent (n=91)
1	Doctor	86.0
2	ANM	93.5
3	Anganwadi worker	90.3
4	PRI Member	93.5
5	Friend/Relative	89.2
6	Community meeting	83.9
7	Poster/Wall writing	77.4
8	TV/Radio	98.9
9	News Paper	98.9
10	Others	1.1

Note: Multiple responses, percentage may not add up to 100.

Table # 5 / chart # 7 shows that ninety-three percent of the respondents are aware about the occurrence of the disease called Fluorosis in their community. Table # 5 shows the various sources from which the respondents gained knowledge about the disease, which are as follows doctors, ANM, AWW, PRI members, and community meetings. Most participants cited multiple sources as a source of information about Fluorosis. The media also played a role in informing respondents about the disease, with newspapers and radio playing equal roles in delivering the information.

Table 6: Respondent awareness of causes of Fluorosis in selected villages of Nagaur

Serial Number	Item	Percentage (n=85)
1	Respondents aware of Various causes of fluorosis	91.4

Chart 8: Respondent awareness of causes of Fluorosis in selected villages of Nagaur

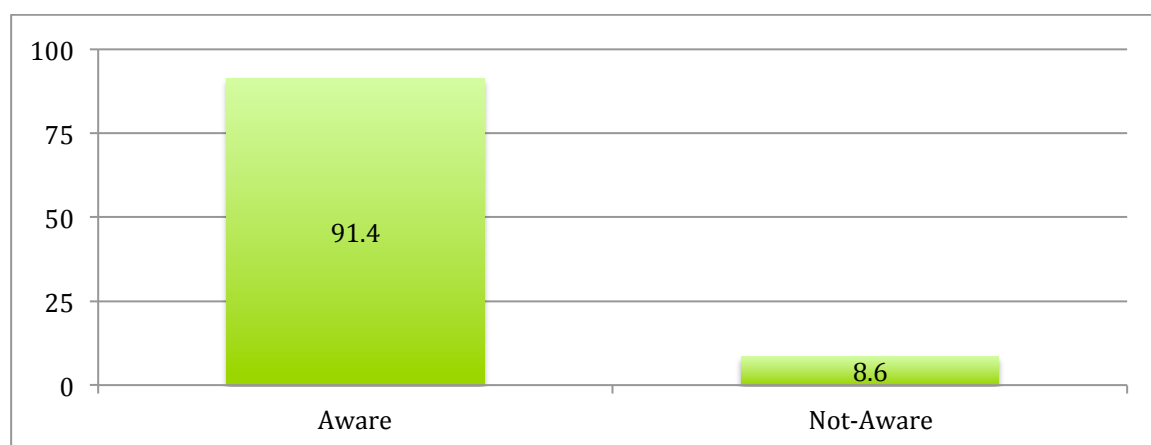


Table 7: Awareness of various sources of Fluoride by respondents in rural Nagaur

Serial Number	Source of Fluoride	Percentage (n=80)
1	Water	98.8
2	Food	94.1
3	Environment	83.5
4	Other	10.6

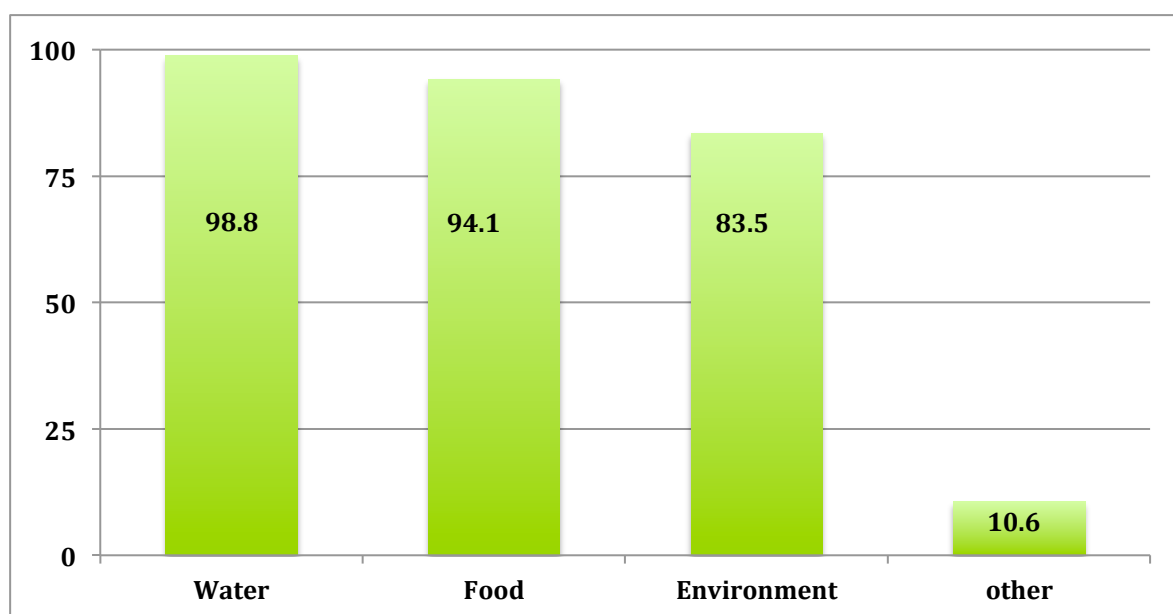


Chart 9: Awareness of various sources of Fluoride by respondents in rural Nagaur

Note: Multiple responses percentage may not add up to 100

Table # 6 / Chart # 8 shows that Ninety-one percent of respondents are aware of the various causes of fluorosis and cited multiple responses when questioned. A majority of respondents were aware of the various sources of fluoride that lead to the disease of Fluorosis. Table # 7 / Chart # 9 shows that almost ninety nine percent of the respondents are aware of

water being a major source of Fluoride. Ninety four percent of those same respondents also know that various foods in their diet contain Fluoride and are harmful if consumed continuously over long periods and that by including certain foods they can mitigate the effects of fluoride ions on their long term health.

Chart 10: Awareness of Defluoridation Units in the Villages

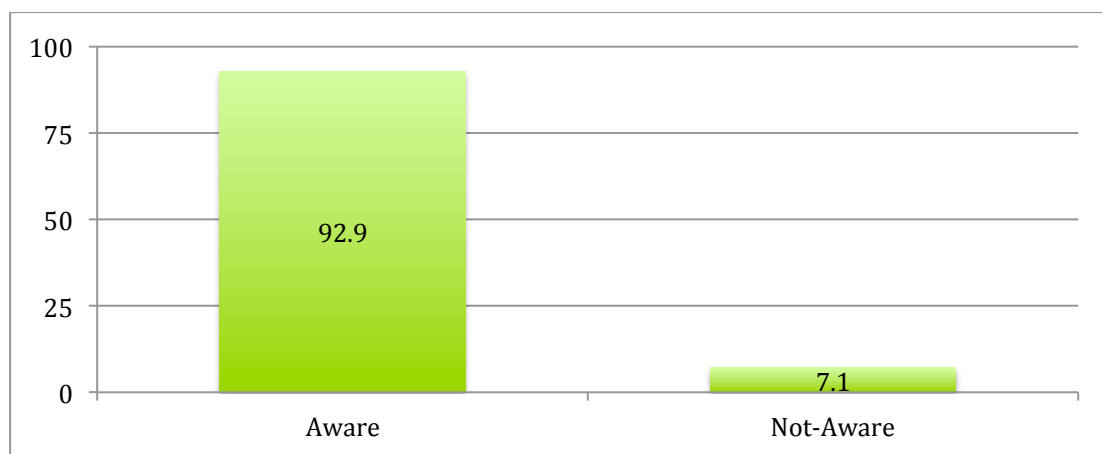


Chart # 10 shows that Ninety three percent of respondents are aware of the existence of a functional Defluoridation unit in their locality. They received the information of the functional Defluoridation unit from a variety of source. Many respondents claimed to have received the information from multiple sources. The sources of information are as follows Panchayat Raj Institution (PRI), friends/relatives, community meetings and other means.

Table 8: Respondents reported accessibility to DFU (%)

Serial number	<u>Accessibility of DFU</u>	Percentage n=73
1	Within 100-200m	53.2
2	Within 200- 500m	34.2
3	More than 500m	12.7
	<u>Time required to collect water</u>	
4	<30 minutes	75.7
5	30-60 minutes	22.9
6	>60 minutes	1.4

Table 9: Reasons for using water from the DFU (%)

Serial number	<u>Reasons for using water from The DFU</u>	Percentage (n=73)
1	Good for health	100
2	Good for children	95.7
3	No other source of safe water	91.4
4	Very close to home	81.4
5	Other	7.1

Note: Multiple responses, percentage may not add up to 100.

Table # 8 / Chart # 11 shows that slightly more than half of the respondents are within 100-200 meters of a functional DFU. Thirty four percent live within 200-500 meters of a functional DFU. Nearly thirteen percent of the respondent's accessibility to the DFU is greater than 500 meters. Most respondents (75.7%) require less than 30 minutes in order to collect DFU water and 23% require between half an hours to an hour to collect water from the DFU. A small percentage of the respondents 1.4% require more than an hour in order to collect safe water for their household consumption.

Table #9 gives the various reasons that the respondents claimed for using the water from DFU. The various reasons as stated in table # 9 are that the respondents know the DFU wa-

ter is good for their health and essential to their developing children's health. Many respondents (91.4%) claimed that there was no other safe source of drinking water. Eighty one percent cited that it was conveniently located to their residence's location as a reason for the use of the DFU. Most respondents claimed multiple reasons. The citing of the usage of DFU water as being good for their health as well as being good for children's health shows the respondents awareness of the dangers of fluorosis, its connection with ground water and the success of the fluorosis control programs in generating awareness as well as behavior change through only using the DFU water for consumption.

Chart 11: Respondents reported accessibility to DFU (%)

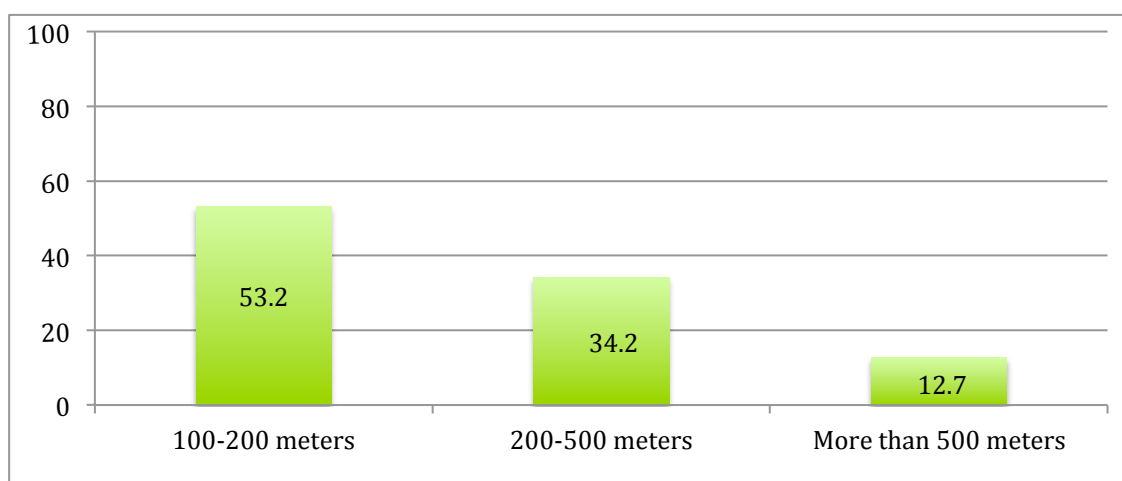


Table 10: Percentage of rural Nagaur respondents using DFU

Serial number	Usage of DFU	Percentage n=73
1	Percent of respondents using water from the DFU	88.6

Chart 12: Percentage of rural Nagaur respondents using DFU

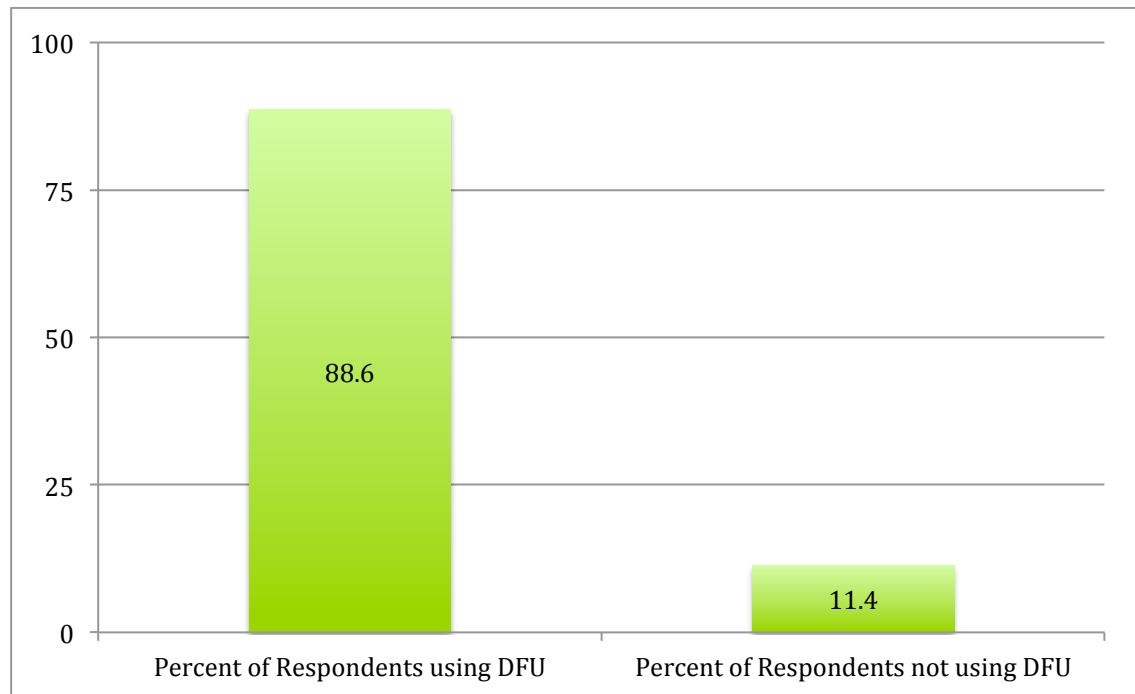


Table # 10 / Chart # 12 shows that out of the 73 respondents questioned about usage of the DFU eighty eight percent used the DFU. Great majorities of the people live within a reasonable distance from the DFU making it easily accessible and convenient for fetching water on a daily basis or even multiple times everyday. The remaining people who didn't avail the safe drinking water from the DFU cited reasons such as the distance of the DFU from their home, which led to greater travel time required to fetch water or they had had some type of water filtration system at home.

Chart 13: Water collection frequency of rural Nagaur district respondents

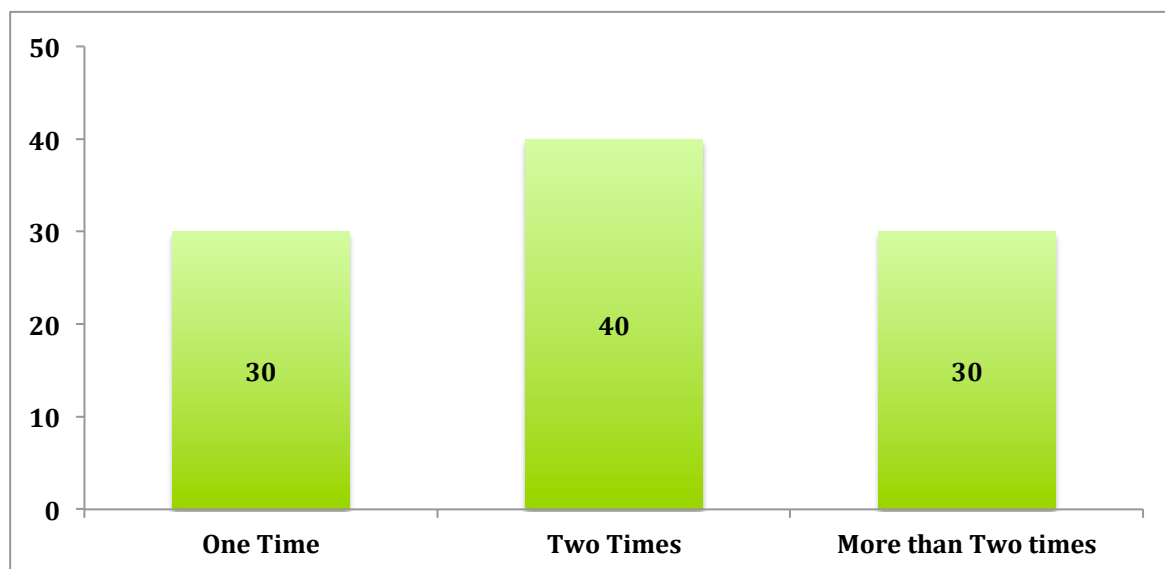


Table 11: Water collection frequency of rural Nagaur district respondents

Serial Number	Water collection Frequency	Percentage n=73
1	Once Daily	30
2	Twice Daily	40
3	More than two times	30

Table # 11 / chart # 13 shows that when respondents were questioned about the number of times they collected water from the DFU, of the seventy-three respondents nearly 70% claimed to collect water from the DFU multiple times daily. The successful adoption of the DFU water usage can be attributed to the successful educational campaigns of the fluorosis programs.

Table 12: Duration of DFU usage by rural Nagaur respondents

Serial Number	Duration of DFU usage	Percentage (n=61)
1	Less than 6 months	47.1
2	6 Months -1 year	24.3
3	More than a year	28.6

Chart 14: Duration of DFU usage by rural Nagaur respondents

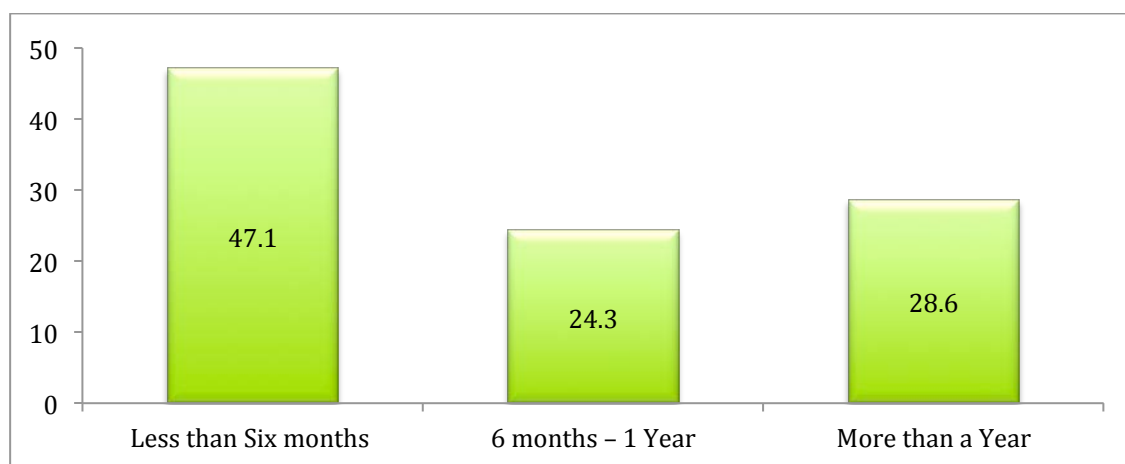


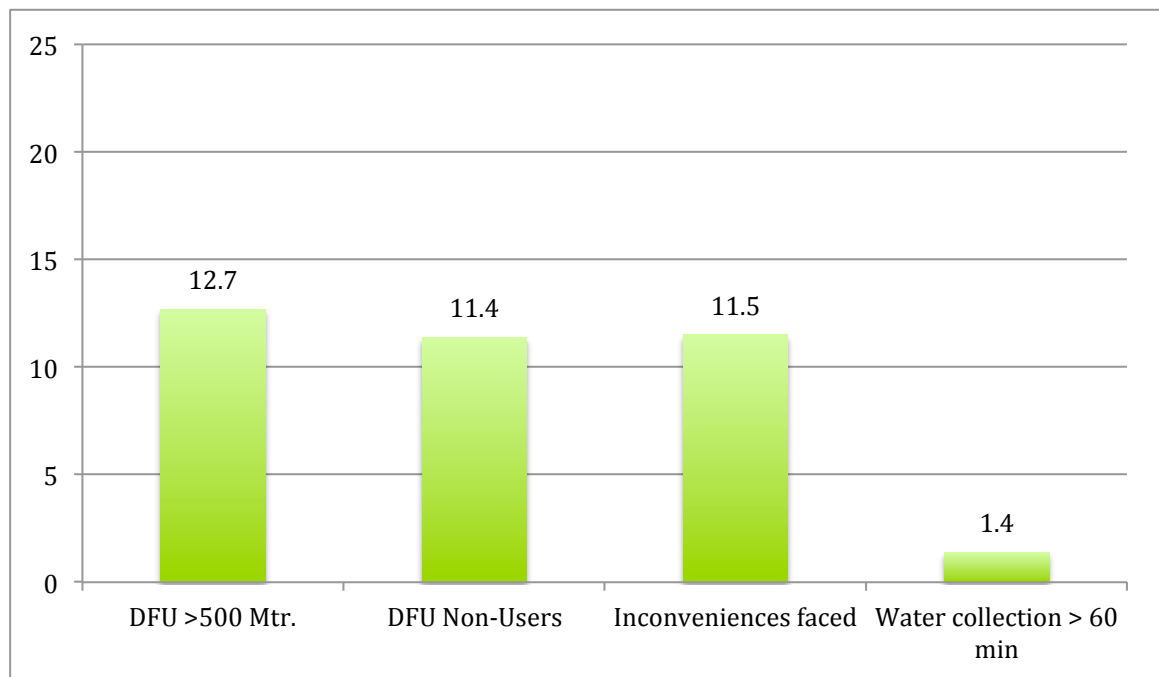
Table 13: Satisfaction and recommendation

Serial number	Item	Percentage
1	Percent of respondents satisfied with water from DFU (n=59)	96.7
2	Percent of respondents who noticed changes in health after using water from DFU (n=61)	85.7
3	Percent of respondents willing to recommend DFU water to other (n=59)	96.7
4	Percent of respondents faced inconveniences in getting water from DFU (n=7)	11.5
5	Percent of respondents or family members suffering from Fluorosis (n=46)	75.4
6	Percent receiving treatment	100.0

The data from Table 13 concentrates on the satisfaction and usage of the DFU by the respondents of rural Nagaur. Four factors were chosen to elaborate upon the success or failure of the NPPCF and RIFMP program. As it is evident from data in table 13 a majority of the rural residents of Nagaur are satisfied with the water they are receiving from the filtration system and would highly recommend the use of this water to friends and relatives. Many respondents of the survey even claim to have noticed a change in their health upon using the water from the filtration system. The changes in health claimed by the respondents are whiter teeth, more hair, less pain in joints and more energy. Of the 46 respondents 75.4% claimed to have a family member that was afflicted with fluorosis or they claimed to be the victims of fluorosis. According to the respondents all of the people diagnosed with fluorosis that required medical attention have been receiving treatment. These positive results can be attributed to the activities of the NPPCF & RIFMP.

Bottlenecks and constraints in program implementation

Chart 15: DFU distance, Non users and Inconveniences faced by Respondents (%)



Although a great majority of people are benefiting from the programs there are still a section of the rural community, which is not utilizing the water from the DFU. Chart # 15 shows that 12.7% of respondents who use the DFU must travel more than 500 meters 1.4% of the DFU users must travel more than 60 min in order to collect water. Of the respondents surveyed 11.4% claimed to not use the water from the DFU, 11.5% claimed to have faced various inconveniences in collecting water from the DFU. These inconveniences included DFU being far from home and the great amount of time required to collect DFU water in case of power outage or long line.

The respondents who used the DFU and as well as those who did not use the DFU complained of the filtration unit requiring electricity to pump water daily, as there are frequent power outages in the rural areas. Over the years the under ground water table levels have decreased beyond the capacity of traditional hand pumps, due to the ground water being exhausted through its use for both residential and commercial purposes. For this reason the use of traditional hand pumps to gain water from underground is not possible, therefore an electric motor has been fitted to pump the water out. The use of the electric pump hinders the water collection, as electricity is not continuously available and no backup power supply is attached to the pump. Although there is a water storage tank the water requirements of those living closest to the DFU leave it empty during situations of extended power outages. Thus, people who have to travel greater distances sometimes arrive to a DFU and must wait or make another trip when the power returns, in case of a power outage. Due to the ground water being filtered the water dispenses very slowly as it is being filtered if the water storage tank has been emptied, a factor which also inhibits some from using the DFU water on a regular basis. It was observed that even though the filtration unit was located on a cement slab the area around the cement slab was muddy from the water runoff. The watery – muddy soil produces an unhygienic situation.

During interviews with key officials at state level and employees at the implementation level in the NPPCF program, incomplete reporting was identified. The nature of the inconsistent reporting consisted of a lack of diagnosed persons with fluorosis from all of the 18 districts, which are involved, in the NPPCF. During the period of April 2013-2014 there were no confirmed cases of fluorosis from many districts and in case of Nagaur only 5 cas-

es were reported while other districts such as Dungarpur reported 27 cases. The April 2013-2014 report from the NPPCF program contained discrepancies in respect to the number of people diagnosed among community and school students from the survey conducted by the department. These difficulties maybe attributed to the current use of a paper based reporting system, which consists of the various districts creating a list of activities and diagnosis made monthly and sending that list to the Department of Health and Family welfare, where a computer operator is employed to enter the records into the database which is used for the assessment of the programs progress. It was observed that the computer operator had bundles of reports wrapped in cloth, which were yet to be entered into the database. This issue of in accurate reporting was brought to the attention of the project manager at the department of health and family welfare in Jaipur, who was surprised as he was under the assumption that the reporting was accurate.

DISCUSSION

This study was done to understand the current situation of fluorosis in Nagaur, Rajasthan with regards to the effects of the RIFMP and NPPCF programs. It is evident from the survey that the objective of the program of RIFMP in cooperation with PHED concentrated upon providing rural populations with defluoridated water as well as the NPPCF has been successful thus far in creating awareness and also promoting the usage of DFU'S in a majority of the rural respondents. The study findings suggest that the majority of the respondents are aware about fluorosis disease through various sources like Doctors, AWW, Pri-members, Posters, radio, news paper, Television, as the NPPCF main objective is to create

awareness among community through various IEC activities. “A similar study was conducted during the period of 1997-2003 in the Village of Tilapani, Mandala district; Madhya Pradesh, which revealed similar, results. After determining that the fluoride levels were too high for consumption a baseline survey was conducted to detect fluorosis in the community. The survey led to the implementation of a safe water supply with acceptable levels of fluoride, being implemented as well as the commencement of awareness programs about the importance of nutrition and diet to mitigate fluorosis. The study in Tilapani revealed that by 2003 knock-knee, bowleg and mottled teeth occurrence had decreased severely as compared to data from 1997.”^[11] Although the study in Nagaur has not been done to the same length of time, 87.5% of people in the survey have commented that they noticed health improvements upon following the dietary recommendations and upon consistently using water from the DFU.

The nature of the DFU requires maintenance and constant upkeep. The electric motor for the water pump needs to be turned on in order for the water filtration process to begin otherwise the water storage tank cannot be replenished, the sludge which is produced as a by-product of filtration must be removed periodically for adequate filtration to occur, also the activated alumina which is used to remove the fluoride ions from the groundwater must be replenished on time depending on the usage of the unit. For the above-mentioned reasons the communities in which the DFU are installed must take responsibility for the up keep of the units. Currently the PHED program contractors are handling these actions. In order to make the DFU's sustainable the community must be given responsibility as well as the competence required to carry out these actions. Another fact that affects sustainability of

the DFU's is that the water table levels are decreasing each year, thus in rural areas holes are dug deeper each year in order to access groundwater. The cause of this decrease maybe attributed to a steady increase in population as well as the groundwater being used for both agricultural and domestic purposes in an area that has very low annual rainfall.

As mentioned above the demand for water adequate for consumption is growing steadily and the only sources of water in the region are tainted with fluoride ions and being depleted. "According to the PHED and a study by J. Stearns, the Government of Rajasthan has drilled approximately 250,000 times into the earth to install water pumps, every year 15,000 new pumps for water in rural areas."^[12] The constant search for new underground water sources points to the steady decrease in the water tables due to increasing requirements leading to overexploitation of the Area's water table.

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

RECOMMENDATIONS & CONCLUSION

Although the government through the RIFMP and NPPCF has done an excellent job of detecting and treating the victims of Fluorosis, as well as raising awareness through educating the rural populations about the causes of the disease and how it may be prevented through the consumption / elimination of many dietary items as well as only the consumption of DFU water for both drinking and cooking by using IEC materials for Behavior change. It has not been able to ensure 100% usage of the water from the DFU by the rural Nagaur residents. It is recommended that a program be devised to reach the section of the rural population not utilizing the DFU. The provision of safe drinking water through the use of DFU's is nearsighted due to its sustainability issues arising from the depleting ground water levels as mentioned previously.

The use of an alternate power supply is recommended to power the DFU water pump during periods of blackouts to prevent water shortage thus decreasing the inconvenience faced by many respondents thus increasing possible compliance with the fluorosis programs.

The use of DFU's prevents the government of India from achieving its goal of a piped water supply for rural households of by 2022 through the (NRDWP) National Rural Drinking Water Program. ^[14] The constant drilling of new bore wells and the construction and maintenance of DFU's is expensive. The funds being spent on temporary solutions could be better spent towards addressing the water problem through the provision of a piped water supply from a safe and sustainable water source. Through this solution there would be no need for continuous community participation or any maintenance required for filtrations

Systems as well as a decrease in the prevalence of Fluorosis cases that require medical interventions bases upon there level and time of exposure to the Fluoride ion. It has been well established that poverty and health are linked; in this case the health concerns are linked directly with water supply.

A piped water supply may seem a more expensive solution initially but over the long term it would prove to be a more cost effective method of delivering both safe water and health for the people of rural Rajasthan especially when the economic cost of the disease is added to the cost of implementing the programs as well as the cost of lost opportunity caused due to time spent collecting water, being treated for fluorosis, or being debilitated by the disease causing dependence on family / relatives who must utilize time and resources.

As the study found in Madhya Pradesh that supplementation of vitamins along with safe drinking water reduced and in some cases reversed bone deformity^[11]. Provision of vitamin supplementation through the current programs would benefit the fluorosis effected the population.

The establishment of a robust monitoring and information system is recommended as the current system has inconsistencies in reporting.

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

BIBLIOGRAPHY

- http://planningcommission.nic.in/aboutus/committee/wrkgrp11/wg11_comble.pdf. Accessed 10/2014
- <http://timesofindia.indiatimes.com/city/jaipur/Rajasthan-touches-rock-bottom-in-drinking-water-sanitation-facilities/articleshow/28719982.cms>. Accessed 9, 2014
- <http://www.news18.com/news/rajasthan/nso-69th-report-rajasthan-lags-behind-in-providing-water-facilities-326026.html>. Accessed 10/2014
- Sharma S. Rajasthan touches rock bottom in drinking water, sanitation facilities
 - available at <http://timesofindia.indiatimes.com/city/jaipur/Rajasthan-touches-rock-bottom-in-drinking-water-sanitation-facilities/articleshow/28719982.cms>
- Hustedt J. Social Inclusion: A Case Study of the Rajasthan Integrated Fluorosis Mitigation Program .
- Gautam R. Study of fluoride content in groundwater of Nawa Tehsil in Nagaur, Rajasthan.
- Anemia in pregnancy: easily rectifiable problem . Current science 2010 10, 25 MAY;VOL. 98(1320).
- Susheela A. K Effective interventional approach to control anemia in pregnant women
- <http://www.nicra-icar.in/nicarevised/images/State%20Action%20Plan/Rajasthan-SAPCC.pdf>. Accessed 09, 2014.
- Rajasthan Rural Water Supply and Fluorosis Mitigation Project (Nagaur). Available at: <http://www.jica.go.jp/english/news/press/2012/120928.html>. Accessed 10, 2014.
- Tapas Chakma, Pradeep Meshram, P Vinay Rao, H S Verma A Reversal of Bony Deformities Due to Fluorosis among Children and Young Adults in Central India
- Stearns J. Supplying clean water to Jaipur
- Ministry of drinking water and sanitation (Govt of India / Unicef) Drinking water Advocacy and Communication Strategy Framework (2013-2022)
- National Program on Prevention and control of Fluorosis (NPPCF), program documents of the Government of Rajasthan.
- Rajasthan Initiated Fluoride mitigation program (RIFMP), program documents of PHED Government of Rajasthan.
- Faywell J. Fluoride in drinking water 2006 , World Health Organization (WHO)
 - http://www.who.int/water_sanitation_health/publications/fluoride_drinking_water_full.pdf

REFERENCES

1. Available at: http://planningcommission.nic.in/aboutus/committee/wrkgrp11/wg11_comble.pdf. Accessed 10/2014
2. Available at: <http://timesofindia.indiatimes.com/city/jaipur/Rajasthan-touches-rock-bottom-in-drinking-water-sanitation-facilities/articleshow/28719982.cms>. Accessed 9, 2014
3. Available at <http://www.news18.com/news/rajasthan/nsso-69th-report-rajasthan-lags-behind-in-providing-water-facilities-326026.html>. Accessed 10/2014
4. Sharma S. Rajasthan touches rock bottom in drinking water, sanitation facilities
 - a. available at <http://timesofindia.indiatimes.com/city/jaipur/Rajasthan-touches-rock-bottom-in-drinking-water-sanitation-facilities/articleshow/28719982.cms>
5. Hustedt J. Social Inclusion: A Case Study of the Rajasthan Integrated Fluorosis Mitigation Program .
6. Gautam R. Study of fluoride content in groundwater of Nawa Tehsil in Nagaur, Rajasthan.
7. Anemia in pregnancy: easily rectifiable problem . Current science 2010 10, 25 MAY;VOL. 98(1320).
8. Susheela A. K Effective interventional approach to control anemia in pregnant women
9. Available at: <http://www.nicra-icar.in/nicrarevised/images/State%20Action%20Plan/Rajasthan-SAPCC.pdf>. Accessed 09, 2014.
10. Rajasthan Rural Water Supply and Fluorosis Mitigation Project (Nagaur). Available at: <http://www.jica.go.jp/english/news/press/2012/120928.html>. Accessed 10, 2014.
11. Tapas Chakma, Pradeep Meshram, P Vinay Rao, H S Verma A Reversal of Bony Deformities Due to Fluorosis among Children and Young Adults in Central India
12. Stearns J. Supplying clean water to Jaipur
13. Ministry of drinking water and sanitation (Govt of India / Unicef) Drinking water Advocacy and Communication Strategy Framework (2013-2022)
14. National Program on Prevention and control of Fluorosis (NPPCF), program documents of the Government of Rajasthan.
15. Rajasthan Initiated Fluoride mitigation program (RIFMP), program documents of PHED Government of Rajasthan.
16. Faywell J. Fluoride in drinking water 2006 , World Health Organization (WHO)
 - a. http://www.who.int/water_sanitation_health/publications/fluoride_drinking_water_full.pdf

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

SUPPLEMENTARY

Instrumentation

Informed consent

Namaste!

My name is Rahul Pathak I am from IIHMR University, Jaipur. A study is being conducting to find out the bottlenecks in preventing and mitigating fluoride.

Your participation in the study will be most valuable. I would like to ask you some questions about your household. The survey usually takes about 10 minutes to complete. If you agree to participate, I would like you to know that you have certain rights. Firstly, your participation in this study is voluntary. You have the freedom to refuse to answer a particular question and withdraw from the study without giving any reasons. You also have the right to seek clarification and information about any aspect of the study.

I would like to assure you that all information provided by you will be kept confidential and in safe custody. No identifying information like your name etc. will appear in any part of the report in this study.

Participation in this survey is voluntary and you can choose not to answer any question or all of the questions.

However, we hope that you will participate in this survey since your participation is important

May we begin the interview?

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

CONFIDENTIAL
For research purpose only
गोपनीय
केवल शोध कार्य के लिए

Assessment of Fluorosis Control Program in Nagaur District of Rajasthan

राजस्थान के नागौर जिले में फ्लोरोसिस नियंत्रण कार्यक्रम का आंकलन

Serial Number क्रम संख्या

1. Date of interview (dd/mm/yy) / /
साक्षात्कार की दिनांक (दिन/माह/वर्ष)
2. Name of interviewer
साक्षात्कारकर्ता का नाम
3. District Nagaur
जिला नागौर
4. Name of Village
गांव का नाम
5. Name of Block
ब्लॉक का नाम

General Information सामान्य जानकारी																				
Name of the Head of the Household घर के मुखिया का नाम																				
6.	What is your Age? (In completed years) आपकी उम्र क्या है? (पूर्ण वर्षों में)																			
7.	What is the highest qualification obtained by you? (Please mention highest qualification obtained) आपके द्वारा प्राप्त उच्चतम शिक्षा का स्तर क्या है? (कृपया प्राप्त उच्चतम शिक्षा का उल्लेख करें)	<table border="1"> <tbody> <tr> <td>Illiterate अनपढ़</td> <td>1</td> </tr> <tr> <td>Literate (read/write) शिक्षित (पढ़ना/लिखना)</td> <td>2</td> </tr> <tr> <td>Primary प्राथमिक</td> <td>3</td> </tr> <tr> <td>Matriculation (Xth Standard) दसवीं (10वीं तक)</td> <td>4</td> </tr> <tr> <td>Senior secondary (XIIth Standard) उच्च माध्यमिक (12वीं तक)</td> <td>5</td> </tr> <tr> <td>Graduate स्नातक</td> <td></td> </tr> <tr> <td>Postgraduate स्नातकोत्तर</td> <td>6</td> </tr> <tr> <td>Other (specify).....</td> <td>7</td> </tr> <tr> <td>अन्य (स्पष्ट करें)</td> <td>99</td> </tr> </tbody> </table>	Illiterate अनपढ़	1	Literate (read/write) शिक्षित (पढ़ना/लिखना)	2	Primary प्राथमिक	3	Matriculation (Xth Standard) दसवीं (10वीं तक)	4	Senior secondary (XIIth Standard) उच्च माध्यमिक (12वीं तक)	5	Graduate स्नातक		Postgraduate स्नातकोत्तर	6	Other (specify).....	7	अन्य (स्पष्ट करें)	99
Illiterate अनपढ़	1																			
Literate (read/write) शिक्षित (पढ़ना/लिखना)	2																			
Primary प्राथमिक	3																			
Matriculation (Xth Standard) दसवीं (10वीं तक)	4																			
Senior secondary (XIIth Standard) उच्च माध्यमिक (12वीं तक)	5																			
Graduate स्नातक																				
Postgraduate स्नातकोत्तर	6																			
Other (specify).....	7																			
अन्य (स्पष्ट करें)	99																			
8.	What is your caste? आपकी जाति क्या है?	<table border="1"> <tbody> <tr> <td>General सामान्य</td> <td>1</td> </tr> <tr> <td>Schedule caste अनुसूचित जाति</td> <td>2</td> </tr> <tr> <td>Schedule tribe अनुसूचित जनजाति</td> <td>3</td> </tr> <tr> <td>Other backward classes अन्य पिछड़ा वर्ग</td> <td>4</td> </tr> </tbody> </table>	General सामान्य	1	Schedule caste अनुसूचित जाति	2	Schedule tribe अनुसूचित जनजाति	3	Other backward classes अन्य पिछड़ा वर्ग	4										
General सामान्य	1																			
Schedule caste अनुसूचित जाति	2																			
Schedule tribe अनुसूचित जनजाति	3																			
Other backward classes अन्य पिछड़ा वर्ग	4																			

9.	What is your religion? आपका धर्म क्या है?	Hindu हिन्दू Muslim मुस्लिम Sikh सिख Christian ईसाई Other (specify) अन्य (स्पष्ट करें)	1 2 3 4 99
10.	What is your occupation? आपका पेशा (व्यवसाय) क्या है?	Unemployed बेरोजगार Labourer श्रमिक Farmer किसान Private job निजी क्षेत्र में व्यवसाय Government job सरकारी क्षेत्र में व्यवसाय Business व्यापार Other (specify)..... अन्य (स्पष्ट करें)	1 2 3 4 5 6 99
11.	Are you aware of the disease called Fluorosis/Fluoride (Use local term) क्या आपने कभी फ्लोरसिस/फ्लोराइड के बारे में होने वाली बिमारी के लिए किसी को बुलाया? (स्थानीय शब्द का प्रयोग)	Yesहाँ..... No नहीं.....	1 2 → END
12.	Who told you about this disease? इस बीमारी के बारे में किसने बताया? (Multiple responses possible) (बहुउत्तर संभव)	1. Doctor चिकित्सक 2. ANM एएनएम 3. Anganwadi worker आंगनवाड़ी कार्यकर्ता 4. PRI member पीआरआई सदस्य 5. Friend/Relative मित्र/रिश्तेदार 6. Community meeting समुदाय की बैठक 7. Poster/Wall writing पोस्टर/दीवार लेखन 8. TV/Radio टीवी/रेडियो 9. News paper समाचार पत्र 10. Other Specify (.....) अन्य स्पष्ट करें	A B C D E F G H I X
13.	Do you know what causes Fluorosis? क्या आप जानते हैं किस कारण से फ्लोरसिस बनता है?	Yes हाँ..... No नहीं.....	1 2 → END
14.	What are the sources of Fluoride? फ्लोराइड के स्रोत क्या हैं? (Multiple responses Possible) (बहुउत्तर संभव)	Water पानी Food भोजन Environment पर्यावरण Other(Specify) अन्य स्पष्ट करें	A B C X
15.	Are you aware of the De-fluoridation Unit in your locality/Village आपके गाँव/स्थानीय में डीएफयू के बारे में पता है?	Yesहाँ..... No नहीं.....	1 2 → END
16.	Who told you about DFU आपको डीएफयू के बारे में किसने बताया? (Multiple responses possible) (बहुउत्तर संभव)	PRI member पीआरआई सदस्य Friend/Relative मित्र/रिश्तेदार Doctor चिकित्सक Community meeting समुदाय की बैठक Other (Specify) अन्य स्पष्ट करें	A B C D X

17.	How far is the DFU accessible to you? डीएफयू आपके यहाँ से कितनी दूरी पर है?	1. Accessible within 100-200m 100 से 200 मीटर तक 2. Accessible within 200-500m 200 से 250 मीटर तक 3. Accessible morethan 500m 500 मीटर से अधिक	1 2 3
19.	Are you using the water from DFU for drinking? क्या आप पीने के लिये डीएफयू पानी का उपयोग कर रहे हैं?	Yes हाँ..... No नहीं.....	1 → Q.21 2
20.	Why are you not using the water from the DFU? क्या आप डीएफयू से पानी का उपयोग नहीं कर रहे हैं? (END interview after this Question) (इस प्रश्न के बाद आप अपना साक्षात्कार समाप्त करें)	Reasons कारण: 1. 2. 3. 4.	
21.	Frequency of water collection per day प्रतिदिन पानी की एकत्र करने की फ्रीक्वेंसी (आवृत्ति)	One time एक बार Two times दो बार More than two times दो बार से अधिक	1 2 3
22.	How much time does it take to bring water from DFU? डीएफयू से पानी लाने के लिए कितना समय लगता है?	Lessthan 30 min. 30 मिनट से कम Between 30-60 min 30 से 60 मिनट के मध्य तक Morethan 60 min 60 मिनट से ज्यादा	1 2 3
23.	Why are you using the water from DFU? आप डीएफयू पानी का उपयोग क्यों कर रहे हैं? (Multiple responses possible) (बहुउत्तर संभव)	a. Good for health स्वास्थ्य के लिए अच्छा b. Good For Children बच्चों के लिए अच्छा c. No other source of water पानी का कोई अन्य स्रोत नहीं d. Very close to home घर के नज़दीक x. Other Specify (_____) अन्य स्पष्ट करें	A B C D X
24.	Since how long have been using water from DFU डीएफयू से पानी का उपयोग कितने देर तक किया जाता है?	Less than Six months छः माह से कम Six Months to One year छः माह से एक वर्ष तक More than a Year साल भर से ज्यादा	1 2 3
25.	Did you notice any Changes in your or your family members health condition after using the water from DFU क्या आपने कभी यह नोट किया कि डीएफयू से पानी का उपयोग करने के बाद आपके या आपके परिवार के सदस्यों में स्वास्थ्य की स्थिति में कोई परिवर्तन आया?	Yesहाँ..... No नहीं.....	1 → Q. 26 2 → END
26.	What change(s) did you notice? क्या परिवर्तन आया? क्या परिवर्तन देखा?	Change(s): 1. Les staining of teeth दाँतों में धुंधला का कम हो जाना 2. Less joint pains जोड़ों में दर्द का कम होना 3. 4. 5.	

27.	Are you satisfied with the DFU water क्या आप डीएफयू के पानी से संतुष्ट हैं?	Yes हाँ..... No नहीं.....	1 2
28.	Do you recommend using DFU water to others, like friends and relatives? क्या आप दोस्तों और रिश्तेदारों को व अन्य लोगों को डीएफयू पानी का उपयोग करने के बारे में बताएंगे?	Yes हाँ..... No नहीं.....	1 2
29.	Did you face any inconvenience in getting water from DFU? क्या डीएफयू से पानी प्राप्त करने में आपको कोई असुविधा का सामना किया था?	Yes हाँ..... No नहीं.....	1 2 → Q.32
30.	If Yes, what inconveniences you faced? यदि हाँ, तो किस प्रकार की असुविधा का सामना करना पड़ा	1. 2. 3 4. 5.	
32.	Were you asked to pay money or something else to get water from DFU? डीएफयू से पानी लाने के लिए आपको पैसे या कुछ और भुगतान करने के लिए कहा गया था?	Yes हाँ..... No नहीं.....	1 2
33.	Are you or is anybody in your family affected with Fluorosis? क्या आप या आपके परिवार में कोई भी फ्लोरिस से प्रभावित है?	Yes हाँ..... No नहीं.....	1 2
34.	If Yes, then have you or they been receiving treatment? यदि हाँ, तो आपने उपचार करवाया है?	Yes हाँ..... No नहीं.....	1 2

Thank you
धन्यवाद

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

APPENDIX

IRB Approval 1

Institutional Review Board	
IORG #: IORG0007355	
Ethical Declaration Format	
1	Serial No. of Institutional Committee for Ethics and Review of Health Management Research office
2	Project Title
3	Name of Faculty In-charge/ Project Coordinator
4	Date of Submission to the Committee
5	Date of Submission to the Agency
6	Review Category of the Proposal
7	Expedited Review
8	Full review
9	Date of Review
10	Reviewer's Name/
11	Reviewer's Feedback (Please tick the following, if you are satisfied)
12	Respect for person
13	Fair subject selection
14	Informed consent
15	Maintaining privacy
16	Maintaining confidentiality
17	Final Comment
18	Approved without suggestions
19	Approved with suggestions
20	Sent back for revision and re-submission
21	Not approved
22	Signature of the reviewer
23	Dr S V Vinod Kumar
24	Dr Nutan P Jain
25	Dr Arindam Das

Institutional Review Board
Chairperson
Dr S D Gupta
Members
Dr Barun Kanjilal
Dr Nutan P. Jain
Dr Anoop Khanna
Dr SV Vinod Kumar
Dr Vivek Lal
Mr M M Ranjan
Alternative Members
Dr Deoki Nandan
Dr Rajeshwari Gupta

Rahul Pathak

IIHMR-JHU Cohort-1

Capstone Project: *An Assessment of Fluorosis control programs in Nagaur district in Rajasthan*

IRB Approval 2

Serial No. of Institutional Committee for Ethics and Review of Health Management Research office		2014	9
1	Project Title	Assessment of Fluorosis program in Nagaur, a district in Rajasthan	
2	Name of Faculty In-charge/ Project coordinator	Dr Rahul Pathak	
3	Date of Submission to the Committee	1	4
4	Date of Submission to the Agency	0	6
5	Review Category of the Proposal	1	4
	Expedited Review		
	Full review		
6	Date of Review	1	6
7	Reviewer's Name	0	6
	Dr S V Vinod Kumar	1	4
	Dr Nutan P Jain		
	Dr Arindam Das		
Comments if any			
Approved			

Institutional Review Board
Chairperson
Dr S D Gupta

Members
Dr Barun Kanjilal
Dr Nutan P. Jain
Dr Anoop Khanna
Dr SV Vinod Kumar
Dr Vivek Lal
Mr M M Ranjan

Alternative Members
Dr Suresh Joshi
Dr Rajeshwari Gupta
Dr Arindam Das

Indian Institute of Health Management Research (IIHMR)
Pratibha Deyal Marg, Sangreeta, Airport, Jaipur - 302011, India Phone: +91-141-2924790 Fax: +91-141-2924778, ihmr@iihmr.org