Study of Fluoride Contamination in Water Resources at Pratappur Village, Garhwa, Jharkhand

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Table of contents

01

INTRODUCTION

Water, the elixir of life, is under siege. Our most precious resource faces a growing threat from three interconnected activities: deforestation, mining, and the hazardous minerals in ground level. These seemingly disparate actions share a devastating impact on water resources, jeopardizing the very foundation of sustainable development, healthy ecosystems, and secure livelihoods. This study delves into these issues across international, national, and state levels, highlighting the urgency of addressing this multifaceted crisis.

The State of Jharkhand has high dependence on groundwater for domestic and agricultural needs, with over 80% of rural households relying on groundwater sources for drinking water. Rapid extraction has led to falling groundwater levels in many areas of the state. Communities also face issues of groundwater contamination affecting public health. Local governance mechanisms for sustainable groundwater management in Jharkhand remain weak with lack of community participation and limited monitoring under the Water (Prevention and Control of Pollution) Act, 1974.

Cont..

The Garhwa district of Jharkhand face prominent issues related to groundwater depletion and contamination of fluoride, impacting drinking water resources. The selected villages of Pratappur block in Garhwa district face particular challenges. The present study focuses on its impact on health, ecosystem including people. This study also aims to analyze directly or indirectly at deforestation, mining, minerals etc.

By examining the interconnected issues of deforestation, mining, and hazardous mineral on water resources across international, national, and state levels, we gain a comprehensive understanding of this complex challenge. This multi-layered approach allows us to develop effective solutions that address the multifaceted threats at each stage. Ultimately, this study aims to pave the way for a future where clean water remains a source of life, not a source of peril, for all communities around the globe.

02

How did it became a hot topic for discussion?

How did it became a hot topic of discussion?

Newspaper

In 2016, Hindustan Times reported that in Pratappur Village of Garhwa district around 60 people died in last 5 years due to fluorosis.

Articles

In 2017, article was published that the Garhwa district is yet to tackle the dreaded disease of fluorosis in Pratappur and Garbandh villages due to presence of alarming levels of fluoride in its ground water, there is more bad news for the district. The drinking water and sanitation department (DWSD) has begun a survey of hand pumps that have become unfit for use because of presence of fluoride in the water.

the pioneer

Wednesday, 31 May 2017

Garhwa battles excessive fluoride in water

Wednesday, 31 May 2017 | Nityanand Dubey | Garhwa

Even as the Garhwa district is yet to tackle the dreaded disease of fluorosis in Pratapur and Garbandh villages due to presence of alarming levels of fluoride in its ground water, there is more bad news for the district. The drinking water and sanitation department (DWSD) has begun a survey of hand pumps that have become unfit for use because of presence of fluoride in the water.

Fluorosis that leaves people crippled is threatening to spread across the district as 15 out of 19 blocks has high levels of fluoride content in the potable water. It should be below 1.5 pm. According to data available by the Public Health and Engineering Department, Garhwa fluoride content excess found at 393 colonies in the district.

The excessive water fluoride content are in 124 colonies of Meral block,71 colonies of Bhandariya block, 27 colonies of Bhawnathpur block, 35 colonies in China block, 10 colonies of Dandai block,46 colonies of Dhurki block, 3 colonies of Garhwa Sadar, 7 colonies Of Ketar block, 3 colonies of Manjhiaon block, 12 colonies of Nagar Untari block, 25 colonies of Ramkanda block, 26 colonies of Bisunpura block , 2 colonies of

Sagma block and one colony each of Ramkanda - Ranka blocks. The data on the basis of water sample study revealed startling facts, said Superintending Engineer of PHED.

Garhwa DC Neha Arora said that the district administration has taken several steps to address the problem. PHED Executive Engineer has been asked to immediately put red marks on the hand pumps and prevent people from taking water from the tube wells. It has also been instructed to make available water to them through tankers.

She also said to the Civil Surgeon to hold medical checkup camps at affected colonies. It is reported that excessive flouride is found in deep water so when the water comes up plantation would be done in these colonies. Besides this, pounds, check dams would also be constructed, she added.

The DC said that purifier machine would be installed at every affected hand pumps and water supplied will be made available through pipeline. The work of construction of a Water Treatment Plant would start. After construction of plant pure drinking water would be supplied through pipeline, the DC informed.

Hindustan Times

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In Jharkhand's fluorosis-crippled village, 'hapless' govt counts bodies

Hindustan Times | By B Vijay Murty, Pratappur (garhwa)

Jun 09, 2016 04:40 PM IST

Pratappur, a dalits village, in Garhwa district is highly fluorosis endemic. Around 60 people have died in last five years, seven in the last one and half months and still counting. Every family here has at least one or two member with crippled bones, bent joints, and bed ridden patients with multiple fractures in legs and arms. Bone deformities have transformed some patients into horror movie char

OPEN APP

The government doesn't have a concrete

Hindustan Times first highlighted Pratappur residents' plight in August 2011.

After the intervention of the then Union rural development minister Jairam Ramesh, a five-member team from New Delhi's Fluorosis Research and Rural Development Department (FRRDD) travelled to Pratappur. The team, led by executive director AK Susheela, suggested several measures to save people from the crippling disease and eventual deaths.

Five years hence, HT revisited the village and found that none of the suggestions made by the team have been implemented. Only one tube well in the entire village was fitted with a fluoride removal filter but that too had stopped functioning.

"I am aware of the problem persisting in Pratappur and have raised the issue in the assembly quite a few times," BJP legislator, Dr Dipu Charan Ram, said assuring to take up the matter with the government again.

Cont..

Reports & Journals

According to CGWB (Central Ground Water Board) it is demonstrated that the chemical quality of groundwater is dependent on the source of water and on the course over which it flow. Ground water carries a higher mineral content than surface water due to the slow circulation and longer period of contact with the rocks formation. In order to assess the chemical quality of ground water of phreatic aquifers of Jharkhand state ground water samples have been analysed for major 15 parameters viz. EC, pH, HCO_3, CO_3, Cl, TH, Ca, Mg, K, Na, F, SiO_2, PO_4 and NO_3.

WHO recommends that the upper limit of fluoride in drinking water should be 1.5 milligrams per liter (mg/l) for several countries, including India. The effects of fluoride on human health include:

1.0 mg/l: Safe limit

1.0–3.0 mg/l: Dental fluorosis, which causes discoloration, mottling, and pitting of teeth

3.0–4.0 mg/l: Stiffened and brittle bones and joints

4–6 mg/l and above: Deformities in knee and hip bones, and finally, paralysis, making the person unable to walk or stand in a straight posture

Shashank Shekhar, Pandey A.C and Nathawat.M.S in their study involve field and laboratory testing of various sources of potable water in six blocks of Garhwa districts. The 4012 water samples were collected out of which 295 (7.4%) samples were tested in laboratory for estimating the concentration of fluoride. Fluoride concentrations in the water samples vary between 0.018 mg/L to 5.92 mg/L with highest concentration in Kharaundhi and Untari blocks making these blocks prone to dental and skeletal fluorosis. Abnormally high concentration was found in the depth range of 0-100 feet.

03

Case Study

Audience’s attention

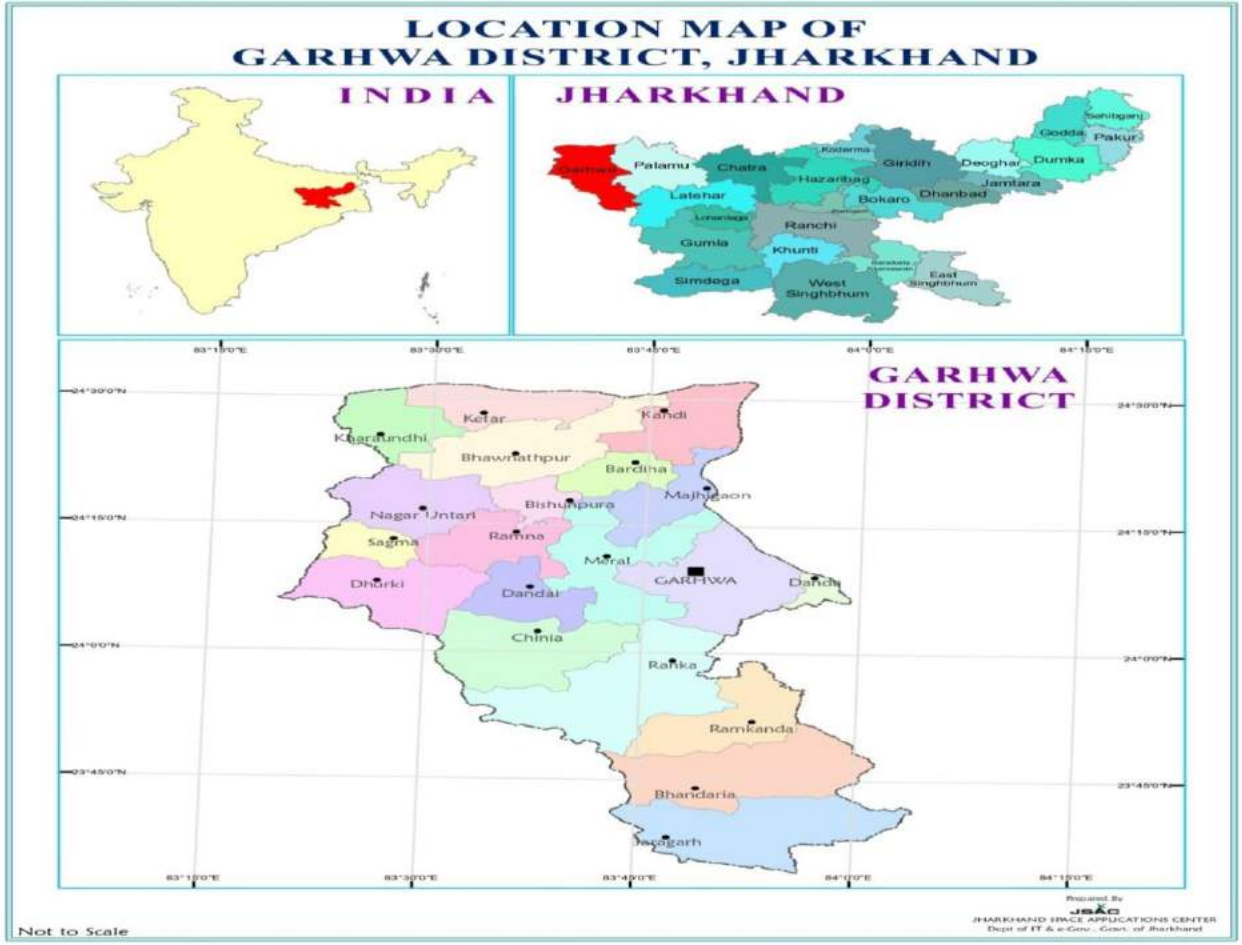
Case Study of Garhwa

The erstwhile Garhwa Subdivision of Palamau district consisting of 8 Blocks was separated from Palamau district as an independent district “Garhwa” with effect from 1st April 1991. It is situated on Southwest corner of Palamau division and the district is surrounded by river Sone in the north. Garhwa district is a part of Palamau Commissionery consisting of 20 blocks and three subdivisions namely Garhwa, Ranka & Nagar-Untari.

Garhwa, located in the mineral-rich state of Jharkhand, has seen extensive deforestation and mining activities over the past few decades. These activities have led to significant environmental degradation, including soil erosion and water contamination. Fluoride, a naturally occurring mineral, has been found at hazardous levels in the groundwater, primarily due to mining runoff and disturbed geological formations.

The rural villages of Garhwa in Jharkhand are facing an environmental and public health crisis. This study examines how deforestation, chemicals used for mining and the presence of hazardous minerals have contributed to fluoride contamination in the region's water supply. The research aims to understand the multifaceted nature of this issue and its impact on local populations.

Where is it?


LOCATION MAP OF
GARHWA DISTRICT, JHARKHAND
INDIA
JHARKHAND
Palamu
Chatra
Giridih
Deoghar
Dumka
Hazaribag
Jamtara
Latehar
Bokaro
Dhanbad
Ranchi
Gumla
Khunti
Simdega
West Singhbhum
East Singhbhum
Pakur
GARHWA DISTRICT
Kutar
Kandi
Kharaundhi
Bhawnathpur
Bardiha
Majhigaon
Nagar Untari
Bishunpura
Ramna
Sagma
Meral
Dhurki
Dandai
GARHWA
Dandi
Chinia
Ranka
Ramkanda
Bhandaria
Nagarh
Not to Scale
JSAC
JHARKHAND SPACE APPLICATIONS CENTER

04

Study Area

Study Area

About Pratappur

According to Census 2011 information the location code or village code of Pratappur village is 347731. Pratappur village is located in Garhwa subdivision of Garhwa district in Jharkhand, India. It is situated 13km away from Garhwa, which is both district & sub-district headquarter of Pratappur village. As per 2009 stats, Pratappur village is also a gram panchayat.

The total geographical area of village is 829.47 hectares. Pratappur has a total population of 2,765 peoples, out of which male population is 1,445 while female population is 1,320. Literacy rate of pratappur village is 45.82% out of which 55.50% males and 35.23% females are literate. There are about 559 houses in pratappur village. Pincode of pratappur village locality is 821124. Garhwa is nearest town to pratappur village for all major economic activities.

Village:	**Pratappur**
Gram Panchayat :	Pratappur
Block :	Garhwa
District :	Garhwa
State :	Jharkhand
Location:	24.219365N 83.838045E
Villages in Pratappur Gram Panchayat	
Darmi	Patsa
Patsi	Pratappur

05

Discussion

DISCUSSION

The pratappur village and villages of Pratappur under Gram Panchayat such as Darmi, Patsi and patsa consist of total 1405 households which have approximately 7736 population in the village. The primary source of water in the village is municipal supply water, bore-well and well. Currently the village has its drainage system from Koel River, 97 bore-wells are present in the village and 19 wells are there. The village neither has any ground water recharge system nor has it rain water harvesting system to control the effect of fluoride. The village doesn't have any water management system and the action taken by the government and other organization for implementation of defluoridation techniques are also failed due to lack monitoring and management system. After having devastating issues in the village there is a lack of information and awareness about calcium rich diet which helps to control the effects of fluorosis.

Industrial Waste

Graphite Factory near Koel River

Discharge of Chemicals from the Graphite factory in the way of Koel River

PHED Lab Report, Garhwa

According to the lab report of Garhwa District and the water testing officers, it has been clearly identified that on around 344 samples has been tested and 122 samples of water has been found fluoride contamination. The level of contamination is high according to the guideline of WHO and it is unfit for drinking purpose. Due to environmental constraints in pre-monsoon the ground water level decreases and villagers has to face water crisis problem.

District level water testing laboratory, drinking water and sanitation division, Garhwa						
Water sample testing report of EDF Plant						
Sl.no.	**Panchayat**	**Gram**	**Hamlet**	**Location**	**Fluoride in Raw water in PPM**	**Fluoride in treated water in PPM**
1	Pratappur	Patsa	Khas	Doman Ram	2.4	0.59
2	Pratappur	Pratappur	Monhah	Mohan Ram	3.1	0.62
3	Pratappur	Darmi	Khas	Sheikh Kudus	2.5	0.81
4	Pratappur	Darmi	Khas	Ghulam Mustafa	2.7	0.48

Source:- PHED Office, Garhwa

Defluoridation Technique

EDF Plant

Electrolytic defluoridation process is a water purification system suitable for fluoride affected area with water containing excess fluoride. The defluoridation process is based on the principle of electrolysis, using aluminium plate electrodes placed in the raw water containing excess fluoride. During the electrolysis, anode gets ionized and fluoride is removed by complex formation, adsorption, precipitation, coagulation and settling.

There were two EDF plants in the pratappur village but unfortunately none of them are functional and this is just because of lack of monitoring, electricity problem, and no maintenance has been done since it was implanted.

Filtration Cylinder in Bore Well

Before implantation of EDF technique the villagers have a setup of filtration cylinder on their bore well which helps in defluoridation but this technique was also failed because of electricity problem and lack of maintenance of the setup.

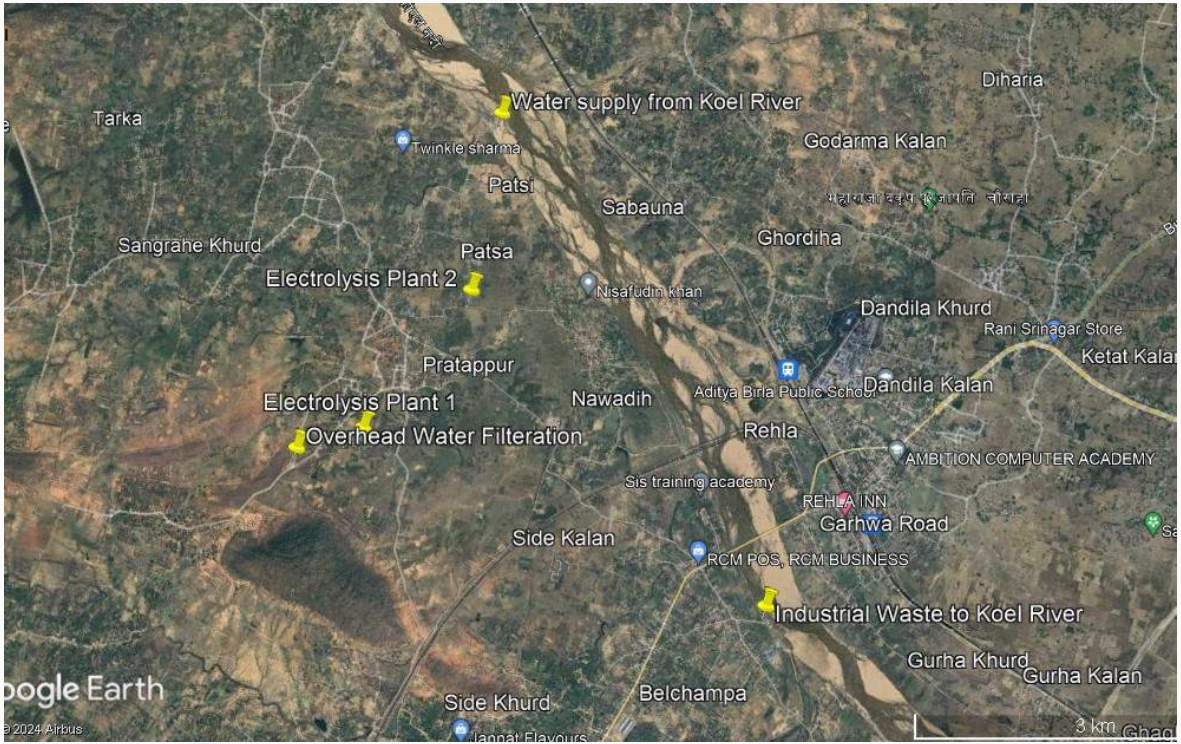
Overhead Water Tank System

Currently the village has an access to piped water supply from overhead tank system. Though this overhead head water tank filtration technique does not help in defluoridation but this tank store the surface water from Koel river which has less disinfectants and this system has different layer of bedding process which remove the disinfectants from the water and make it suitable for dinking purpose.

Health Impacts

The common health issues identified by them are dental fluorosis, stomach pain, skeletal fluorosis, liver issue and gastrointestinal problems etc.

Location Map



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Suggestions

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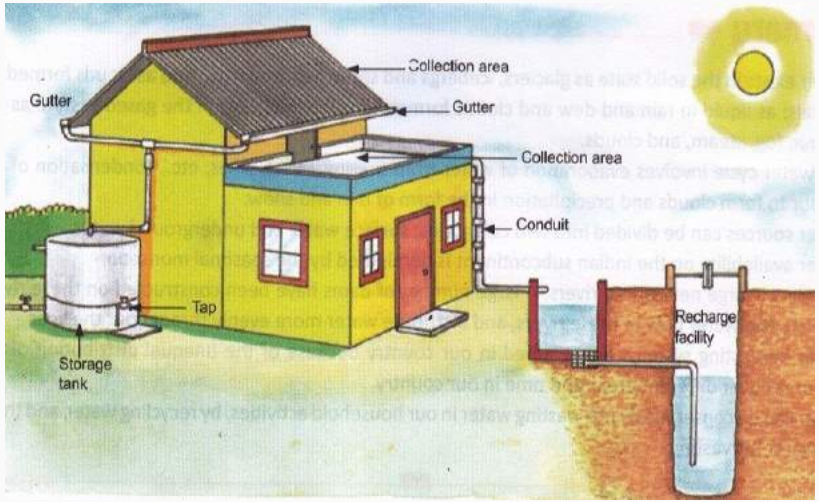
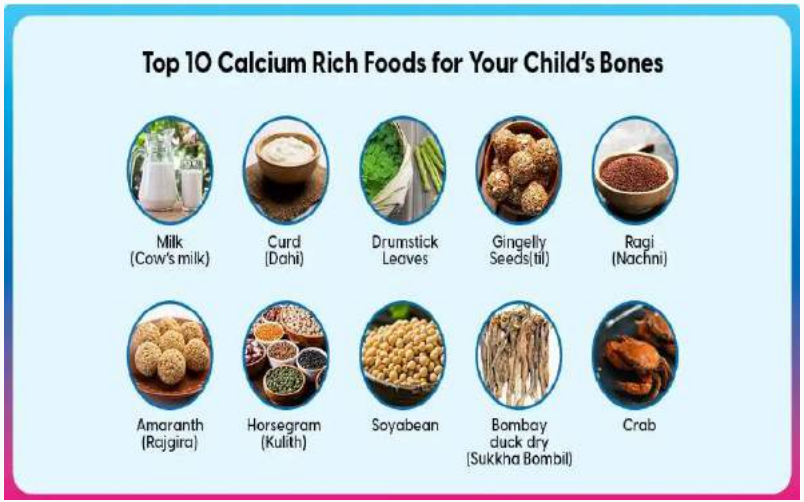
Rain water harvesting to recharge the ground water



02

Change in the habituation of calcium rich diet helps to dilute fluoride level



03

Reforestation
&
Afforestation

04

Implementation of Proper Filtration system with regular maintenance and regular water testing

Thanks!