

Executive Summary

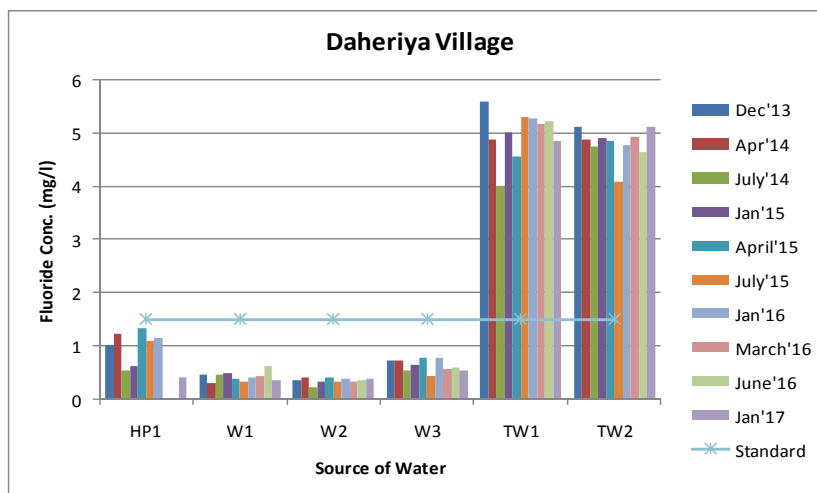
Fluorosis is a crippling disease which is affecting vulnerable population groups and children in Dhar district of Madhya Pradesh due to dependence on groundwater for drinking water purposes. Interventions like handpump based defluoridation units have been unsuccessful in this region owing to their difficult operation and maintenance. Peoples' Science Institute (PSI), Dehradun has successfully implemented community based safe drinking water supply systems in nine villages of Dhar with the financial support of Frank Water, UK. The interventions were based on local hydrogeological studies, groundwater quality monitoring and strong community mobilization which resulted in preparation of operation and maintenance plans, monthly contributions and sharing of groundwater resources by the communities. The initiative has set a successful example of decentralized management of groundwater resources and promises a sustainable and cost effective solution to fluorosis without the use of defluoridation techniques.

Background

Fluorosis is endemic in more than 200 districts of 20 states and union territories of India making it one of the worst fluorosis affected countries. According to information from the PHED, Government of Madhya Pradesh, out of 3763 water sources monitored by them in 13 blocks of Dhar, 1683 sources were found to be contaminated with fluoride. Dhar is a drought prone area which has high geogenic concentration of fluoride in its groundwater. People are dependent on ground water which they traditionally withdrew from open wells. With the increase of irrigated agriculture and use of motor pumps, the ground water level started depleting forcing people to draw water from deeper aquifers using handpumps and tube wells.

The Issues

As per our hydrogeological and water quality monitoring studies in this area, most of the tube wells (TW) and hand pumps (HP) here have higher concentration of fluoride (>1.5 mg/L) as compared to wells (W). This is because deeper sources allow for



Fluoride concentration in different sources of water

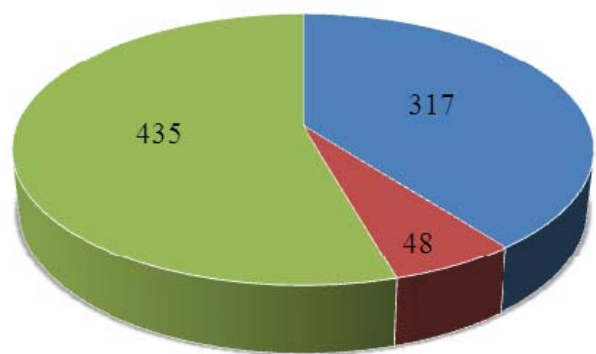


more contact of water with the rocks containing fluoride bearing mineral. But due to easy accessibility, the unsafe sources (hand pumps and tube wells) are being used for domestic purposes whereas safer sources (wells) are mostly being used for irrigation purposes.

Few years ago, PHED had initiated fluorosis mitigation measures by installing hand pump attached de-fluoridation units in 56 villages of Dhar. However, their intervention could not achieve desired level of success as the program design had no scope of community involvement and proper operation and maintenance of installed units making them dysfunctional after sometime.

Health Concerns

As per the household survey conducted in 2014 in seven villages - Kalapani, Badichetri, Daheriya, Maalpura, Bankpura, Sankota and Katchwanya covering a surveyed population of 3332 people, 24% of the surveyed population was found to be affected by fluorosis.

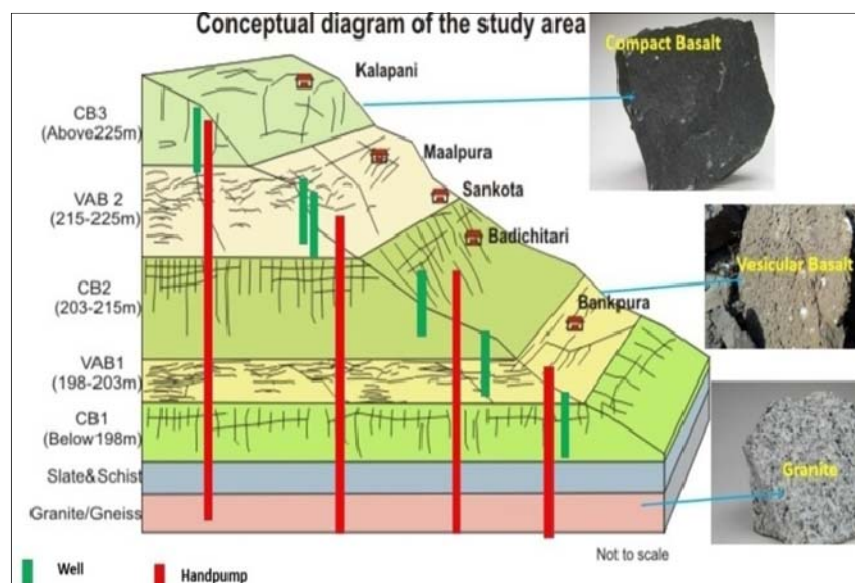


■ Dental Fluorosis ■ Skeletal Fluorosis ■ Arthritis

Fluorosis cases in the surveyed villages

Our Approach

Initially, a pilot program on community based safe drinking water supply was developed in 3 fluoride affected villages - Kalapani, Badichetri and Daheriya of district Dhar. The program was based on the principles of Participatory Groundwater Management (PGWM) which includes recognizing groundwater as a common pool resource, studying the local hydrogeology in assessing the extent of geogenic contamination and working towards the sustainable and equitable use of the safe water source by involving the local communities. The programme was later extended to more villages.



Conceptual diagram of the study area



Uniqueness of our approach

Use of the PGWM concept in fluoride affected area is probably the first of its kind. Here, the science of hydrogeology has been used to correlate the depth of fluoride mineral bearing rocks and water contamination. We insisted on use of well water rather than defluoridation units or rainwater harvesting. The reason was simple -- change is hard. The closer things are to what the people are accustomed to, to what is 'natural', the more likely it is that people will adopt them and people's routines are also not changed in anyway.

Outcome

Community based safe drinking water supply systems using wells have been implemented in 13 villages of district Dhar benefitting more than 1000 families covering around 6600 people belonging to the marginalized communities. Water tanks have been constructed in each village and water user groups have been formed which supply well water twice in a day to the villagers. The entire system is being operated and managed by the communities themselves.

Impact

Comparison was made between the conditions before and after implementation of safe drinking water supply system through impact assessment survey. The data gathered through the survey (sample size 225/315 HHs) reveals that there are some positive behavioral changes in the people. They are more conscious about water quality and hygiene now. Safe drinking water sources made available nearby has not only reduced the drudgery of women and children in collecting water but there are some health improvements as well. Fluoride level in urine has also got reduced.

Conclusion

This kind of participatory and scientific approach is safe, sustainable and less expensive than the installation of defluoridation units attached to hand pumps or large water filtration units which become dysfunctional after sometime. There is an urgent need to

Achievements

Community managed drinking water supply system

- Operation and maintenance plans prepared by the communities of all the three villages.

Sharing of water sources

- Donation of well by a villager in Kalapani village
- Fair sharing of water within the village
- Sharing of common well between villages
 - Badichetri & Chhotichetri
 - Daheriya & Gujar

3. Groundwater management

- Agreement signed by the villagers that the source well water will not be used for gardening, irrigation or construction purposes.



promote safe drinking water sources for fluorosis mitigation. To make this effort sustainable there is also a need to promote operation & maintenance of these water supply systems by the local communities as is presently being done by PSI in Dhar. A rapid extension of this approach is required to end the water woes of fluoride affected rural populations in India.



One of the water tanks supplying safe drinking water

Links

<http://www.indiawaterportal.org/articles/well-water-makes-difference>

<http://www.indiawaterportal.org/articles/how-water-brought-village-together>

<http://www.indiawaterportal.org/articles/bringing-potable-water-villagers-dhar>

<http://www.indiawaterportal.org/articles/using-community-support-battle-fluoride-contamination>

<http://www.indiawaterportal.org/articles/why-did-urmila-have-suffer>

<http://www.indiawaterportal.org/articles/how-bandu-singh-recovered-hope>

<http://hindi.indiawaterportal.org/node/49598>

<http://hindi.indiawaterportal.org/node/49600>

<http://hindi.indiawaterportal.org/node/49601>

References

- Abhijit Mukherjee, Dipankar Saha, Charles F. Harvey et al: *Groundwater systems of the Indian Sub-Continent*, Journal of Hydrology: Regional Studies, April 2015
- Surendra Roy, Gurcharan Dass: *Fluoride Contamination in Drinking Water – A Review*, Resources and Environment, Vol. 3 No. 3, 2013, pp. 53-58. doi: 10.5923/j.re.20130303.02
- Teotia M, Teotia SP, Singh KP. (1988): *Endemic chronic fluoride toxicity and dietary calcium deficiency interaction syndromes of metabolic bone disease and deformities in India*: year 2000. Indian Journal of Pediatrics 65:371-81.
- M A Lennon, H Whelton, D O'Mullane, J Ekstrand: *Rolling Revision of the WHO Guidelines for Drinking-Water Quality*, World Health Organization September 2004

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