

Combating fluoride contamination of water, a major challenge

India's water sector problems are compounded by competition for resources, excessive focus on increasing supply, and a lack of proper management. This is part of an environmental crisis that is quantified by the World Bank estimates to be 4.5 per cent of the GDP. The Communications Team at **S M Sehgal Foundation** compiled this report on fluoride contamination of water

Water is the most crucial resource for all life, for the protection of the environment, and to mitigate poverty. Having safe water for drinking, personal use and irrigation is key to development. The vast majority of the population of India lives with abysmal standards of hygiene and sanitation, with little or no access to uncontaminated water. Add water wastage to this, and we have an alarming situation in rural India and in its burgeoning metropolises. Unchecked extraction of groundwater to meet agriculture and industrial and domestic demands continues to harm rural and urban settlements, leading to an environmental crisis.

The silent killer

In the absence of a reliable water supply and purification infrastructure, India experiences high water stress, especially in

arid regions. Water is a renewable resource and requires abundant rainfall for recharging surface and groundwater reserves. However, scanty and erratic rainfall leads to depleting reserves. The population must rely on groundwater, which is assumed to be the purest form of water available. However, the deeper one goes, the more contaminated the water is. This groundwater passes through fluoride-rich rocks, and the result is an unacceptable level of fluoride in the water. The brackish water that is salty in taste which causes several health issues.

In addition, rock salt, often used in cooking, is leading to the consumption of high levels of fluoride. The World Health Organization (WHO) sets the safe limit of fluoride consumption at 1.5 parts per million (ppm), or milligram (mg) per liter. Rock salt is known to contain fluoride levels as high

as 157 parts per million, while groundwater concentration is as high as 48 milligrams per liter in some areas.

Fluoride overconsumption poses an array of health threats that often go undetected. Exposure to high concentrations of fluoride leads to a serious condition known as fluorosis – skeletal and dental. Excess consumption of fluoride causes loss of luster in the dental enamel. When severe, the stains turn yellowish brown to black, and the teeth start pitting.

Skeletal fluorosis affects children as well as adults. In the advanced stage, fluoride deposits in the joints of neck, knee, pelvic and shoulder bones make it difficult to move or walk. Symptoms include joint pain, back stiffness, burning sensation, tingling in limbs, muscle weakness, and chronic fatigue. In advanced stages, it causes osteoporosis

Photos: S M Sehgal Foundation



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and bony outgrowths. Vertebrae sometimes get fused and may lead to crippling. It can also lead to bone cancer, and damage the spine, major joints, muscles and the nervous system.

In extreme cases, fluoride leads to low hemoglobin, headache, skin rashes, nervousness, neurological problems, gastrointestinal problems, urinary tract malfunctioning, abdominal pain, reduced immunity, gynecological issues, male sterility, etc. Excess fluoride also leads to liver, kidney, digestive, and respiratory issues.

Preventing fluorosis

Dental fluorosis is irreversible, and its treatment entails expensive procedures that may not be available to the rural population. Skeletal fluorosis, on the other hand, has no specific treatment. Thus, prevention and control by way of safe water and safe food consumption is the best approach to mitigate fluorosis. Managing fluorosis requires interventions by way of safe drinking water and proper nutrition. The disease is preventable by bringing down of fluoride levels through water treatment, including by addition of chemicals to react with the fluoride, a method which is cost-effective, efficient, and can be used at the community level in arid and far-flung rural areas.

Rainwater harvesting through existing wells is also a proven, effective and affordable method to reduce the groundwater fluoride concentration in the long run. This involves the collection of rainwater from rooftops or other hard surfaces through surface runoff harvesting and rooftop rainwater harvesting. The water can then be stored or diverted to an artificial recharge system. This method is less expensive and highly effective.

A lack of a proper water supply system means that the vast majority of the population must rely

upon groundwater. Fluoride content in groundwater is a perennial problem. With the dependence of communities on groundwater for their personal and other needs, remedial measures are critical for the health of communities. People are unaware of the consequences of consuming contaminated water. The need of the hour is for community awareness, and sustainable rural development NGOs in India can play a pivotal role in this regard.

Working with fluoride-affected communities

The S M Sehgal Foundation (Sehgal Foundation) is a rural development NGO in India that is leading initiatives to improve the quality of life of rural communities. Established in 1999, the Foundation focuses on water management, agriculture development, local participation and sustainability. The skilled and dedicated team creates sustainable programmes to address rural India's most pressing needs.

Sehgal Foundation has been working to mitigate fluorosis through a pilot project in Nuh, Haryana. The approach comprises:

- A situation analysis to map the presence of fluoride in water through a geographic information system (GIS) and identify affected areas and safe water sources. In order to assess the impact of fluoride in water, particularly on children, a fluorosis survey was done in schools.
- Creating awareness using massive communication programmes
- Helping those already suffering from fluorosis to manage its impact on health. Promoting consumption of calcium, magnesium, and Vitamin C which stops the increase of fluorosis and curbs its impact. The Sehgal Foundation team facilitated the plantation of *moringa*, a natural source of Vitamin C, calcium,

magnesium, and protein that has proved useful for fluorosis management and prevention of problems associated with excess fluoride consumption.

- Implementing fluorosis mitigation – de-fluorination of water at the block, district, and state levels has been done, using a multifaceted approach of education and consultation with communities and stakeholders.

The Sehgal Foundation's effort on fluorosis mitigation is a step towards achieving India's goal for sustainable and inclusive development by providing access to safe drinking water. In addition to developing suitable technology, the initiative requires soft techniques such as awareness campaigns, sensitisation, setting examples, etc for behavioural change. The goals are to test the technology's suitability in varied conditions, achieve contextual adoption and scale up successful solutions, and advocate for their adoption by the State Public Health Engineering Department. ■

