Water, water, everywhere, and not a drop to drink

Sir,

Residents, young and old of the villages comprising the Saiyan block of the historic Indian city of Agra do not really have a reason to smile; not just because their teeth perennially bear ugly stains but more so because children and adults alike have been 'cursed' to lead a life of crippling disability. Yes, as they themselves put it proverbially, that they were destined to be children of the lesser god.

This time, the adjacent villages of Gandeshpura, Ladhukheda and Lachipura were in news for rather bad reasons. A majority of the inhabitants in these villages were afflicted by varying grades of skeletal problems ranging from mild disability to major impairment and handicaps. Children bore the maximum brunt of all with a lot many born with deformed limbs that progressed further into their crippling forms in toddlerhood and later age groups.

A preliminary survey was conducted by our team in these villages in order to decipher the likely cause and nature of the inciting problem that led to this high a magnitude of disability and its clustering among selected villages and hamlets.

Majority of the inhabitants constituting around three hundred households were farmers, though only a handful of them owned their own piece of cultivable land. Most of the people were illiterate. The sole source of water supply was ground water harvested through government installed hand pumps (India Mark II) and few privately installed hand pumps. Though electricity was present in the village, there were no electrically driven ground water harnessing mechanisms. Wheat was the staple of the region, and along with potato, was the chief crop being cultivated. A majority of the population consumed uniodized salt, available in the form of salt bricks at a price cheaper (Rs 18 for 5 kg) than the conventional iodized salt, which priced at Rs 10 for 1 kg.

We interviewed women and men from all age groups and found that females, including adolescent girls complained of low back ache which was mild, persistent and worse during the day. Sometimes, the pain used to aggravate which got relieved by taking medicines from local practitioners. Backache was a complaint among males as well; and it was communicated to us that a majority of the young and middle aged male population had this complaint, but were shy to disclose the same.

Deformities were more common and more severe in the middle aged female population in the form of round kyphosis, neck stiffness and antalgic gait. The villagers reported that all the women appeared to age prematurely. Guddi devi stands a stark example to this. She is 36, but looks like a 60-year-old with grey hair and a thin body. Her son is crippled with a disabling lower limb deformity.

Children and teenagers in the age group of 10-20 years were also afflicted by a variety of similar musculoskeletal problems [Figure 1]. Three children from the same family in the above mentioned age group; one female and two males had genu valgum deformity and deformity of the elbows [Figure 2]. All were short statured as well. One teenager of 18 years had short stature and had severe flexor deformity of bilateral tibial bones. To add to the woes, a few of these children had subnormal intelligence and significant lag in motor and psychosocial development. A nearly similar picture was observed from the family of Mrs. Shanti, who along with her three children had varying degrees of lower limb and spinal deformities. Her husband complained of chronic lower backache.

A remarkable observation was the clustering of similar cases within the same family. Besides, a typical yellowing and decaying of teeth

Figure 1: Bilateral tibial bone deformity in a teenager

Figure 2: Genu valgum deformity in three siblings

was observed in even small children, reflecting the early onset of disease activity in its natural history.

The findings of the afflicted people were consistent with a chronic musculoskeletal disorder with dental involvement, and a likely culprit in the immediate microenvironment as suggested by the clustering of cases among families. X-rays of cervical spine, rib cage, lumbar-dorsal spine with pelvis, forearm, and lower limb of selected subjects from each village showed increased bone mass and density as well as exostoses, calcification of ligaments and interosseous membranes, and osteosclerosis. These were significant indicators of fluorosis. Sample test by the Water Works department confirmed that the fluoride level was of the order of 10 ppm, which is much beyond the W.H.O standards of potable water.[1]

Fluorine occurs in rocks in the form of fluoride-bearing minerals like fluorite and fluorapatite. India has large resources of these minerals. In such areas, groundwater drawn through wells, hand-pumps and especially tube-wells is likely to contain excess fluoride due to the dissolution of fluoride from the fluoride bearing minerals. Lack of rainfall in this relatively arid region of Agra district has meant that the area is largely dependent on groundwater, both for irrigation and drinking water requirements. Fluorides and other dissolved salts in drinking water have exceeded the safe limit of potability (1.5 g/l) in these areas.

Fluoride can be a double edged sword even in areas where ground water is not the principal source of consumption by virtue of the fact that it is added to drinking water in low concentrations to inhibit the occurrence and slow progression of dental caries. Chronic excessive exposure to high levels of fluorine can result in dental or skeletal fluorosis.[2]

Besides, the all too conspicuous undernutrition and allied micronutrient deficiencies, particularly among children were compounding their plight. Evidence has it that these children are rendered exponentially more susceptible to the toxic effects of fluoride, particularly in concomitance of poor calcium, iodine, vitamin C and E and antioxidant nutrition through diet. Also, these very children are likely to be benefitted the most in the wake of micronutrient supplementation.[3] How far could the practice of consuming non-iodized salt in this region have synergized with excess fluoride manifestations remains conjectural though.

This is perhaps still the 'tip' of the iceberg. The 'epidemic' of preventable disability consequent to fluorosis has assumed grave proportions. Ironically, the same has not received deserving attention from health care and environment sectors. Even medical and public health teachings have laid more emphasis on dental morbidity due to fluorosis. The more sordid variety, skeletal fluorosis has largely taken a backseat and condoned for reasons unknown. Time is therefore high for a prompt and sustainable solution to the problem in endemic areas.

The preferred alternative to escape fluorosis is to find a supply of safe drinking water with safe fluoride levels. But, in an environment of water scarcity and poverty, de-fluoridation may be the only way out. De-fluoridation of drinking water using domestic water filters, has been found to be by and large the most effective way to prevent excessive fluoride intake in fluorosis endemic villages. An innovative technique for domiciliary defluoridation of water was devised by the National Environmental Engineering Research Institute at Nagpur, popular as the 'Nalgonda Technique'.[4] The method utilizes the properties of alum, lime and bleaching powder, added in succession to water meant for treatment. However, removal of excessive fluoride from drinking water is difficult and expensive on a larger scale and does not seem to be a very pragmatic approach towards long term solution. Furthermore, the method cannot be employed unless proper mechanisms for disposal of sludge with very high concentration of fluoride can be ensured beforehand.

These communities are extremely poor and do not have the necessary financial resources for water treatment and treatment of fluorosis lesions. Changing the water supply source also might not offer very promising prospects. "This is a place of very poor and downtrodden - all from large families. We are concerned they would not be able to afford the water and would not have enough money for other expenses." narrated a village leader.

Rainwater harvesting is also an alternative that seems feasible but there can be few contentions and mental barriers related to the process and usage of this water for drinking. Queries like "How would they distribute water? Is rainwater worth drinking? How would they manage contamination? Who will do it? Where will the finances come from? Who will maintain it? Where will the structure for water storage be constructed?" need to be anticipated and addressed judiciously.

Essentially, the wishes of the community need to be taken into account before the government starts selling dreams to them. The community interest should be considered primary. Problems relating to wrong choice of water for defluoridation to inadequate distribution of the defluoridated water are bound to arise if the approach is vertical instead of a decentralized strategy, wherein community has a pivotal role to play in deciding their health options. Fortunately, the government of India has taken a serious note of this and health planning entails integration of several crucial health programs into a common National Rural Health Mission (NRHM), of which the National Program for Prevention and Control of Fluorosis is a component.[5] The program envisages planning and implementation of long and short term strategies pertaining to 'fluoride safe' water provision and water treatment modalities. However, the government while implementing the program should simultaneously provide alternative source of drinking water in the affected areas lest the services should turn counterproductive.

Indeed this is a complex and challenging problem with umpteen pros and cons to be addressed. All the same cannot assume effect unless supplemented by sustained health education activities. Education of the communities on methods of reducing fluoride ingestion

and the significance of the defluoridated water, rationalizing the distribution of defluoridated water, facilitating collection of rain water, protection of available low fluoride surface water from contamination with agro-chemicals and household defluoridation can be recommended. Awareness campaigns on preventive measures, such as eating proper foods, micronutrient supplementation, rainwater harvesting and the use of defluoridation kits should also be undertaken.

A concerted approach with sound planning and community participation remains the only answer towards alleviation of the problem and thus winning the lost smiles back.

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