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Fluoride Contamination in Groundwater of Himayatnagar Area, Dist. Nanded, Maharashtra: A Case Study

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ABSTRACT

Fluorides can enter aquatic environment i.e. into surface as well as groundwater by natural processes as well as anthropogenic activities.The major part of the Maharashtra region is covered by basaltic rocks generated from lava, where fluoride is the chief constituent. The soil at the top of mountain is particularly likely to be high in fluoride from the weathering and leaching of bedrock with high fluoride content. The content of fluoride above the permissible limit is the great concern with respect to adverse health effects in human as well as animal beings. Water is major source of fluoride content and fluoride intake. Major fluorides can enter the human body through drinking water. Majority of the population from the study area of Himayatnagar is depend upon groundwater for their daily need as there is no major source of surface water is available in the area.

Keywords: ***Fluorides, Groundwater, Himayatnagar, Contamination.***

INTRODUCTION

All the living beings on the earth can survive without food for couple of weeks but will not survive without water for couple of days. Water has exceptional quality of dissolving a number of substances without changing their chemical nature and therefore plays an important role in transporting material not only in the living body but also in the nature. Hence water has unique importance amongst the natural resources.

The contamination of groundwater from manmade and natural sources is causing a great threat to the groundwater system. The increase in urbanization and industrialization are generating huge quantity of waste and wastewater. The disposal of these waste and wastewater without proper treatment on unlined surface is finding its way to groundwater through percolation. The increased use of chemical fertilizers, insecticides and pesticides in agricultural field has also contaminated the groundwater.

Near about 200 million people of 29 countries including India, are severely affected by fluoride pollution. In India near about 204 districts of 21 states and union territories are associated with fluoride problem. Most prominent states are Rajasthan, Punjab, Gujarat, Andhra Pradesh, Karnataka, Orissa, Maharashtra, Madhya Pradesh, Bihar, Uttar Pradesh, Tamil Nadu, and many more. Near about 62 million Indian population are at the risk of fluorosis, out of which, 6 million are children.(Shanmugam et.al. 2018).

Highly fluoride contaminated water in seven districts of Maharashtra is causing an increase in number of dental and skeletal fluorosis incidents.Nanded, Chandrapur, Latur, Washim, Yavatmal, Beed, and Nagpur districts have been found to have several cases of this chronic condition caused by excessive intake of fluoride.
Near about 53 villages in Nanded district where the groundwater is found to be contaminated with fluoride, rendering it poisonous for consumption by the people who are already grappling with acute water shortage, revealed a survey.(UWSDA, 2018).

As fluorspar is found in sedimentary rock (granite), these minerals are nearly insoluble in water. Hence fluorides will be present in groundwater only when conditions favor their solutions. The major part of Maharashtra region is covered by basaltic rocks generated from lava, where fluoride is the chef constituent (Patil and Shivanikar , 2013).

The fluorides present in the earth crust to the tunes of 0.08%, fluorides are emitted by natural and anthropogenic activities into the environment. Human requires fluoride as it is a mineral, fluorides are essential for bone, but due to increasing pollution fluoride levels are increasing in the environment and also in the human body. Human body requires minimum 0.5 P.P.M. and maximum 1.5 P.P.M. of fluoride intake, major fluorides can enter the human body through drinking water (Patil and Shivnikar , 2013).

Fluoride is present in ground water coming either from natural sources like weathering and volcanic processes or from wastewater of industries link fertilizers, glass, ceramic, brick, iron works and electroplating. Fluoride has both beneficial and harmful effects on the human health depending upon its level. Among the beneficial effects of fluorides in human body, strengthening of bones and preventing from tooth decay are significant. The permissible limit of fluoride in drinking water is 1.5 mg/l according to WHO standards. Above this limit fluoride can lead to Dental and Skeletal Fluorosis, brittle bones, cancer, infertility, brain damage, Alzheimer's syndrome and thyroid disorder. (AneezaRafique et.al., 2013).

Nature of drinking water is a major task in advanced days because of expansion in pollution of water bodies. Fluoride is one of such pollutant that undermines living life forms, specifically peoples. Fluoride is vital in little amount for mineralization of bones and assurance against dental caries, higher intake reasons decay of teeth enamel called Fluorosis .The issue of fluoride in water bodies is serious for tropical nations such as, India, Kenya, Senegal and Tanzania (Waghmare and Arfin, 2015).

Study Area:
The study area comprises Himayatnagar area of Nanded district from which ten sites has been selected randomly. In this region, there is no special reservoir or any large source of surface water. People from this region depend upon the underground water sources for the domestic as well as irrigation purposes.

MATERIALS AND METHODS

Water sample from the sampling site is collected in a clean 1 litre pet bottle. The water is collected preferably from bore wells of the study area. The water sample is then analyzed in the laboratory and the fluoride is determined by using FLUORIDE HIGH RANGE PORTABLE PHOTOMETER with CAL-CHECK (H197739, Fluoride HR), which determines fluoride concentration up to 20 mg/l.

RESULT AND DISCUSSION

Fluoride Concentration in Groundwater from Himayatnagar Area

No. of Sites	Fluoride Concentration in mg/l. Pre monsoon	Post monsoon
01	1.7	1.9
02	2.1	2.1
03	3.3	3.5
04	1.6	1.9
05	1.1	1.1
06	1.0	1.3
07	1.4	1.6
08	3.9	4.2
09	1.3	1.5
10	2.5	2.8

The present investigation shows that, majority of sites having fluoride concentration well above permissible limit. Particularly site no. 8 and site no. 3 shows very high concentration of fluoride. The fluoride concentration in some cases found within the permissible limit. The study also shows that the concentration of fluoride in majority of cases is slightly

increased in post monsoon period. This may be happened because when rain water slowly percolates into the ground after monsoon, leaching of fluoride bearing rocks and minerals may takes place gives rise to increase in fluoride concentration.

CONCLUSION

In the present study majority of samples were found exceedingpermissible limit. A more detailed study is necessary for better understanding of the source and effects of fluoride problem in the area. In the study area thelocalites consuming the groundwater must haveto receive medical attention as they are dependent on the groundwater for domestic use. So remedial measures such as de-fluoridation techniques and rain water harvesting are needed. Nutritional diet such as calcium and phosphorus rich food should be recommended to those affected with fluorosis as it decreases rate of accumulation of fluoride in the human body.

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