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ASSESSMENT OF CHLORIDE, FLUORIDE AND NITRATE LEVELS IN SELECTED GROUNDWATER SITES OF HINGOLI, MAHARASHTRA

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ABSTRACT:

Water is one of the important constituents for life. The Surface water and Groundwater are the sources of water. Further, Groundwater is considered as important source of water in many parts of country. Especially in rural area because sometimes it is the only available source of water for primary use. Quality of Groundwater is the matter of debate across the globe. The present-day study conducted in selected groundwater sites from district of Hingoli, Maharashtra. Analysis and assessment of groundwater samples for constituent of chloride, fluoride and nitrate levels done as per the standard guidelines from world health organization (WHO) and American public health association (APHA). The results illustrate that some of water samples possesses excess amount of fluoride and nitrate. Present study reveals amount of chloride, fluoride and nitrate from selected villages and their possible impact on humans.

Keywords:- Water, Groundwater, Chloride, Fluoride, Nitrate.

INTRODUCTION :

Water is one of the natural resources. Water is vital component for life. It is well known fact that about around 70% of the earth's surface is covered with water. In case of India, various reports showed that majority of population reliant on groundwater sources such as wells, boars, tube wells, handpumps etc. because, sometimes groundwater is the only resource available for intake of water. This is common scenario found in rural part of India. Quality of groundwater is one of the major challenges across the globe. Rising of Various contaminants in groundwater give rise to serious health impact on humans as well other organisms.

Chloride, Fluoride and Nitrate are the naturally occurring constituents. Various Geogenic and Anthropogenic reasons causes rise in levels of Chloride, Fluoride and Nitrate respectively. A normal range of Chloride in Groundwater is 35-125 mg/litre whereas less than 1.5 mg/litre of fluoride in water considered as safe for drinking purpose as well as less than 45 mg/litre of nitrate considered for domestic use.

High amount of Chloride causes problems to aquatic organisms. High amount of Chloride also causes disturbances in osmoregulation of aquatic organisms. Fluoride is naturally occurring mineral which found in water. It often known as double edged weapon, as permissible limit is good for human's body but more than that are harmful for humans. Many health-related problems can be occurred due to high intake of fluoride such as dental fluorosis, skeletal fluorosis, osteoporosis, etc. Nitrate is one of the commonly occurring contaminants in groundwater resources. High nitrate concentrations in drinking water pose threat to human and animal health and may cause eutrophication of aquatic systems threatening fish, biodiversity, aesthetics and economics

METHODOLOGY:

The area of study selected for present research lies up to the 50 km part of Hingoli district in between latitudes 19.32982° N and 19.87529° N longitudes and 76.92209° E and 77.24329° E including 10 villages of Hingoli district. Water samples are collected in sterile plastic bottles to avoid unpredictable changes from different locations as well as sources such as wells, boars, hand pumps etc. Collection of water samples was done as per the standard guidelines by APHA (1995). The presence of fluoride in the samples was evaluated by SPANDS spectrophotometric method.

RESULTS AND DISCUSSION:

Table 1 shows names of villages and its geographical position through latitude and longitude. 10 Villages considered as area of study for the amount of fluoride and nitrate. Maps shows graphical presentation of India, Maharashtra and District Hingoli. Results are shown in tabular format of table 2.

Table 2 shows that all the Ten samples shows normal range of chloride where as Nine out of ten water samples contains high amount of fluoride and three water sample shows high amount of nitrate. In the Nine water samples the amount of fluoride is slightly higher than the permissible limits, i.e. 1.5 mg/litre, Only the village - Borja shows 2.01 mg/litre of fluoride and it's the highest fluoride concentration observed as compared to other villages where as other Eight villages namely, Pimpaldari, Sawarkheda, Sirsam, Amba, Parola, Jamrun Tanda, Hatta Tanda and Ajegaon shows fluoride range in 1.5- 2.0 mg/litre.

On the other hand, three water sample shows high amount of nitrate than permissible values, i.e. more than 45 mg/litre. Pimpaldari, Amba and Parola are the villages which shows more than permissible value of nitrate. However highest nitrate concentration observed in Amba which is 97.1 mg/litre.

The presence of fluoride and nitrate in may be because of local situation, anthropogenic/geological reasons. The samples which shows high amount of fluoride (more than 1.5 mg/litre) and nitrate (more than 45 mg/litre) are unfit for consumption as per the guidelines of World Health Organization. During the collection of water samples, common phenomenon observed about fluoride and nitrate is its unawareness and this may be one of the reasons behind large number of people facing health problems. It is need of time to aware the local people about quality of water and its effects. During study, red marked handpumps and closed handpumps by government authorities also observed due to excess amount of fluoride in some of the localities.

Health Problems due to intake of excess amount of fluoride

Several Diseases such as Yellowing of teeth, Dental Fluorosis, Skeletal Fluorosis, Increase in thyroid levels, abdominal pain, abnormalities in RBC's etc. Dental Fluorosis is one of the widely observed problem due to intake of excess amount of fluoride. Risk causes due to intake of excess fluoride amount leads to several health hazards.

- **Fluorosis –** Dental and Skeletal fluorosis are common diseases occurs due to excess amount of fluoride. In Dental fluorosis, damage to teeth and enamel takes place while in skeletal fluorosis, accumulation of fluoride leads to weakening of bone. Both the conditions are known as the irreversible health conditions.
- **Thyroid Problems**– In some cases, excess of fluoride can damage the parathyroid gland. This can result in hyperparathyroidism, which involves uncontrolled secretion of parathyroid hormones. This can result in depletion of calcium in bone structures and higher than normal concentrations of calcium in the blood.

Health Problems Due to Excess amount of Nitrate

- **Blue Baby Syndrome (or methemoglobinemia)** - Nitrate can affect how our blood carries oxygen. Nitrate can turn hemoglobin (the protein in blood that carries oxygen) into methemoglobin. High levels can turn skin to a bluish or gray color and cause more serious health effects like weakness, excess heart rate, fatigue, and dizziness. Nitrate can affect babies more seriously because their bodies interact with nitrate differently.
- **Thyroid Disease** – High levels of nitrate in drinking water may increase the risk of thyroid disease. Nitrate can affect how the thyroid functions by blocking the uptake of iodine. The thyroid needs iodine to make hormones. Low levels of thyroid hormone levels can cause fatigue, weight gain, dry skin, hair loss, and goiters (enlarged thyroid).

CONCLUSION:

The higher amount of fluoride and nitrate observed in various samples whereas amount of chloride was normal. Nine water samples Out of Ten, shows slightly high amount of fluoride as well as Three water samples shows high amount of nitrate than the permissible values. However, the readings of fluoride and nitrate observed are pre monsoon. Later, due to monsoon dilution of fluoride and nitrate may happen. During the study, red marked hand pumps and closed water sources also observed.

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Table 1: Showing Name of Villages and its geographical position

Sr. No.	Name of Village	Latitude	Longitude
01	Pimpaldari	19.57272°	77.16820°
02	Sawarkheda	19.71035°	77.18769°
03	Pangra (Shinde)	19.54756°	77.22001°
04	Sirsam	19.84483°	77.24329°
05	Amba	19.45943°	77.17369°
06	Parola	19.78466°	77.14738°
07	Borja	19.61651°	77.08538°
08	Jamrun Tanda	19.78607°	76.95142°
09	Hatta Tanda	19.32982°	76.94211°
10	Ajegaon	19.87529°	76.92209°

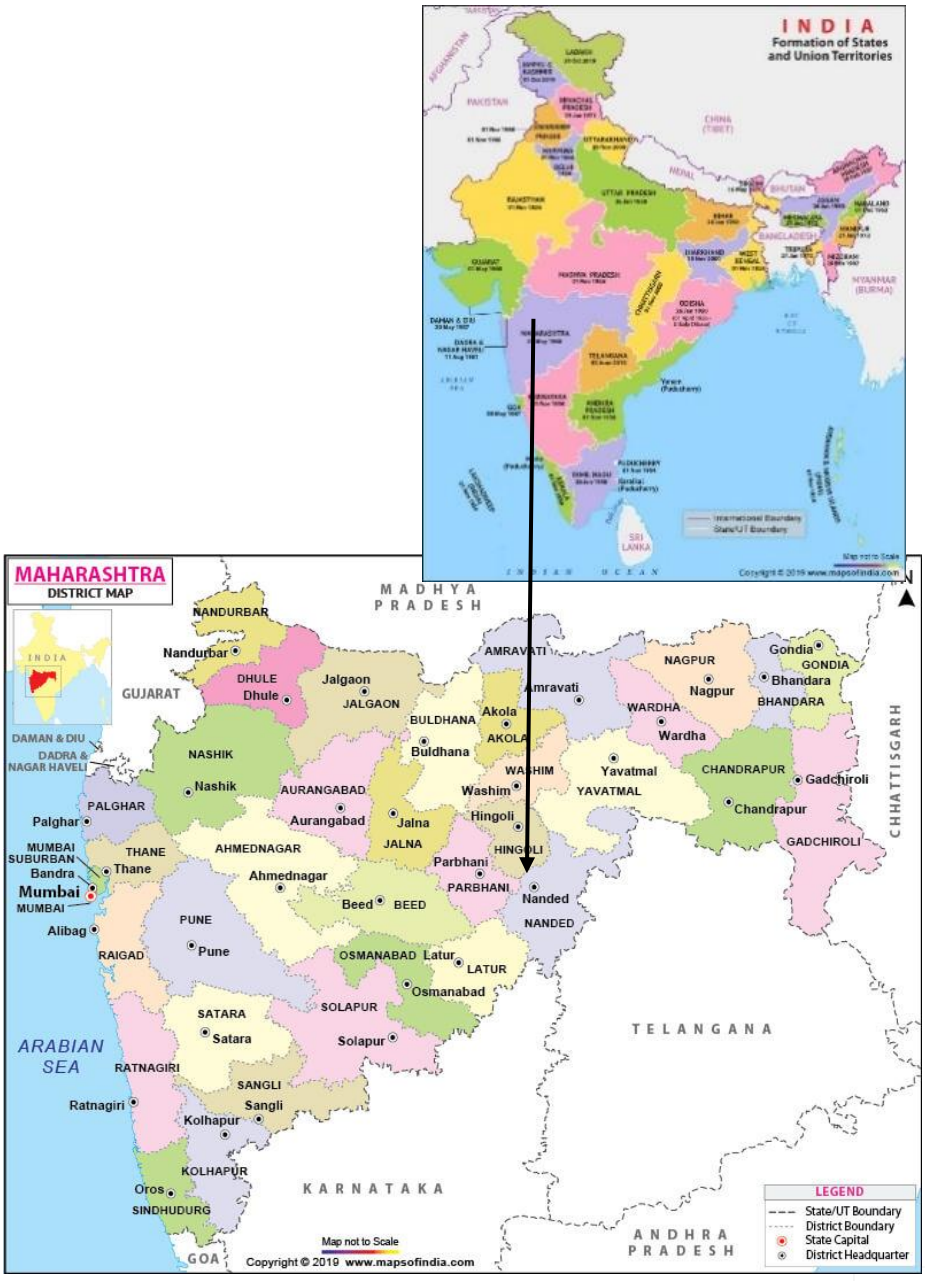

Table 2: Shows Amount of fluoride per Litre and type of groundwater source

Sr. No.	Name of Village	Amount of Chloride Per Litre	Amount of Fluoride Per Litre	Amount of Nitrate Per Litre	Type of Groundwater Source
01	Pimpaldari	90	1.71	46.0	Well
02	Sawarkheda	94	1.68	15.0	Well
03	Pangra (Shinde)	204	1.58	13.3	Hand Pump
04	Sirsam	97	1.72	22.5	Borewell
05	Amba	172	1.77	97.1	Hand Pump
06	Parola	88	1.90	47.0	Hand Pump
07	Borja	96	2.01	42.0	Borewell
08	Jamrun Tanda	44	1.92	44.0	Hand Pump
09	Hatta Tanda	74	1.60	25.0	Hand Pump
10	Ajegaon	86	1.64	12.0	Well