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Impact of Drinking Water Quality On Human Health In Selected Areas, Near Tirupati, India

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ABSTRACT

The impact of drinking water quality at different locations of Ramapuram, near Tirupati, India has been assessed to study its effects on human health. Water samples were collected from different locations and analyzed for physicochemical parameters such as pH, hardness, alkalinity, calcium, magnesium, iron, nitrates, chlorides, sulphates, electrical conductivity, total solids (TS), total dissolved solids (TDS), total suspended solids (TSS), dissolved oxygen (DO), chemical oxygen demand (COD) and bio chemical oxygen demand (BOD). The results were compared with the World Health Organization (WHO) water quality standards. Correlation studies reveal that drinking water of some of the areas was not suitable for drinking purpose and needs purification before drinking.

Keywords: Water quality, Human health, BOD, TSS, TDS, Correlation coefficient.

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INTRODUCTION

Ground water is ultimate and most suitable fresh water resource for human beings. For healthy living of human society, the importance of groundwater cannot be overemphasized[1-3]. The Government of India is determined to rectify this situation and consequently supplying safe drinking water to rural and urban populations has been identified as one of the "Technology Missions" to be pursued by the nation. The quality of water may be described according to its physico-chemical and micro-biological characteristics[4-7].

On an average 55,000 people visit Tirupati daily and on peak days the number crosses 1, 50,000. The day by day increase in pilgrimage is phenomenal, beyond all calculation and prediction and it made Tirupati as the most important pilgrimage city in the entire world.

Most of the people in rural areas of Tirupati depend upon ground water for drinking and other domestic needs. Many pharma, plastic, cement, battery, beverage etc., industries were established in this area. Most of the industries do not treat waste water due to prohibitive costs. So these industries dispose waste water on land. Some of the industries inject waste water in to ground water thereby contaminating the ground water of Tirupati and surroundings.

MATERIALS AND METHOD

Ground water of different polluted locations at Ramapuram, near Tirupati was studied. Electrical conductivity values were measured using Elico CM 180 Conductivity Bridge. Total alkalinity was evaluated by titration with standard 0.1M HCl using methyl orange and phenolphthalein as indicators. Standard procedures involving spectrophotometry, flame photometry and volumetry were used for the determination of hardness, total dissolved solids (TDS), sulphate, chloride, nitrate, calcium, magnesium and iron[8-10]. All the chemicals used were of AR grade.

RESULTS AND DISCUSSION

pH

The intensity of the acid or alkaline condition of a solution is expressed by pH. Most of the water is slightly alkaline due to presence of carbonates and bicarbonates. High pH induces the formation of trihalomethanes which are toxic. pH below 6.5 starts corrosion in pipes, thereby releasing toxic metals such as Zn, Pb, Cd and Cu etc. pH value in the studied industrial area varied between 6.6-8.6. Most of the sampling points showed pH values within the limit prescribed by WHO. Abnormal values of pH causes bitter taste to water, affects mucous membrane, causes corrosion and also affects aquatic life.

Hardness

Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of water. Hardness of water depends upon the amount of calcium and magnesium salts. Hardness value in the studied area varied between 401-516 mg/L. 36 sampling points showed hardness values within the limit prescribed and 4 sampling points showed higher hardness values than the limit prescribed by WHO. Exceeding the permissible limit of hardness causes poor lathering with soap, deterioration of the quality of clothes, scale formation and skin irritation

Alkalinity

Alkalinity of water indicates its capacity to neutralize a strong acid. It is due to the presence of bicarbonate, carbonate and hydroxide compounds of calcium, sodium and potassium. The major portion of alkalinity in natural water is caused by hydroxide, carbonate and bicarbonate. Alkalinity itself is not harmful to human beings. Alkalinity value in the studied area varied between 241-603 mg/L. Water with high amount of alkalinity results in unpleasant taste to water and it turns boiled rice to yellowish color.

Calcium

Calcium value in the studied area varied between 86-328 mg/L. If calcium is present beyond the maximum acceptable limit causes incrustation of pipes, poor lathering and deterioration of the quality of clothes.

Magnesium

Too high magnesium causes nausea, muscular weakness and paralysis in human body when it reaches a level of about 400mg/L. Magnesium value in the studied area varied between 50-83 mg/L. Too high magnesium will adversely affect crop yields as the soils become more alkaline.

Iron

Iron value in the studied area varied between 0.12-0.47 mg/L. The excess amount of iron causes slight toxicity gives stringent taste to water and can cause staining laundry and porcelain.

Nitrates

Groundwater contains nitrate due to leaching of nitrate with the percolating water and by sewage and other wastes rich in nitrates. Nitrate value in the studied area varied between 1-30 mg/L. All the sampling points showed nitrate values within the limit prescribed by WHO. In the present study, the sampling points in which nitrate has been found to be high, can result in formation of nitroso-amines which are carcinogenic.

Chlorides

Soil porosity and permeability also has a key role in building up the chlorides concentration. Excessive chloride concentration increase rates of corrosion of metals in the distribution system.

This can lead to increased concentration of metals in the supply. Chloride value in the studied area varied between 232-332 mg/L. The higher values of chloride can cause corrosion and pitting of iron pipes.

Sulphates

Sulphate occurs naturally in water as a result of leaching from gypsum and other common minerals. Sulphate content in drinking water exceeding the 400 mg/L impart bitter taste and may cause gastro-intestine irritation and cantharsis. Sulphate value in the studied area varied between 124-212 mg/L. Ingestion of water with high sulphates cause laxative effect and gastro-intestinal irritation.

Dissolved Oxygen (DO)

The higher value of dissolved oxygen can impart good aesthetic taste to drinking water. DO value in the studied area varied between 2.5-5.9 mg/L. 31 sampling points showed DO values within the prescribed limit and 9 sampling points showed higher DO values than the prescribed limit by WHO. High amount of DO imparts good taste to water.

COD

COD in the studied area varied between 8.1-40.2 mg/L. Water with high COD indicates that there is inadequate oxygen available in the water samples.

BOD

BOD value in the studied area varied between 1.7-3.5 mg/L. All the sampling points showed BOD values within the prescribed limit by WHO. Ground water with high value of BOD is due to microbial activities related to the dumpsites.

Conductivity

Electrical conductivity is a measure of water capacity to convey electric current. It signifies the amount of total dissolved salts. This is a direct function of its total dissolved salts. Hence it is an index to represent the total concentration of soluble salts in water. Conductivity value in the studied industrial area varied between 1258-2564 µS/cm. If drinking water has high conductivity, it indicates the presence of high amount of dissolved inorganic substances in ionized form.

Solids

High values of TDS in groundwater are generally not harmful to human beings but high concentration of these may affect persons who are suffering from kidney and heart diseases. Water containing high solids may cause laxative or constipation effects.

Correlation Studies

The degree of a linear association between any two of the water quality parameters can be measured by correlation coefficient. Correlation coefficient values of amongst various parameters of water samples are presented in table. Alkalinity shows significant correlation with calcium indicating that calcium salts are main cause of alkaline nature of the studied ground water. Calcium shows good correlation with chlorides indicating that calcium is associated with chlorides in ground water which confirms the hardness of ground water is permanent in nature in the studied area. Conductivity shows significant correlation with calcium, chlorides and DO which reveals that conductance of water samples is mainly due to calcium and chlorides in the ground water of the studied area.

CONCLUSION

Based on the results obtained for physicochemical analysis of ground water samples collected from different locations in the studied area, it can be concluded that in some samples, water quality parameters (Total alkalinity, pH, hardness, TDS, sulphate, chloride, nitrate, calcium, magnesium iron etc.,) were beyond the permissible limit prescribed by WHO. Hence drinking water pollution should be controlled by the proper environment management plan. Ground water of this area should be pretreated to make suitable for drinking and to maintain proper health conditions of people living in this area.

REFERENCES

1. Dorai Raju SV, Narasimha Rao C, Bujagendra Raju M, Chalapathi PV. Analysis of drinking water quality and its impact on human health in Chandragiri, near Tirupati, India. Biosci., Biotech. Res. Asia. . 2013; 10(1): 379-381.
2. Dorai Raju SV, Narasimha Rao C, Bujagendra Raju M, Chalapathi PV. Chemical properties of Drinking water of Renigunta, near Tirupati, Andhra Pradesh, India and its Impact on human health. Curr. World Environ. 2012; 7(1): 37-39.
3. Dilli Rani G, Suman M, Narasimha Rao C, Reddi Rani P, Prashanth VG, Prathibha R, Venkateswarlu P. Assessment of Ground water quality and its impact in and around Mangalam, near Tirupathi, Andhra Pradesh, India. Curr. World Environ. 2011; 6(1): 191-193.
4. Kiran Kumar V, Jianjun W, Long C, Tianma Y, McCarthy AJ, Sekar R. Assessment of Water Quality and Identification of Pollution Risk Locations in Tiaoxi River, China. Water 2018, 10(183): 1-18.

5. Snehalata K, Sandhya Kiran JK. Physico-Chemical Analysis of Ground Water. Int. J. Innov. Res. Sci. Eng. Technol. 2018; 7(1): 269-276.
6. Shahidul Islam M, Mohanta SC, Bakar Siddique MA, Al-Mamun MA, Hossain N, Hafsa Bithi U. Physico-chemical assessment of water quality parameters in Rupsha river of Khulna region, Bangladesh. Int. J. Eng. Sci. 2018; 7(1): 57-62.
7. Ignatius Navis K, Tharaa K, Dheenadayalanb MS. Physico-Chemical Study of the Ground Water Quality at Selected Locations in Periyakulam, Theni district, Tamilnadu, India. Mater Today. 5 (2018) 422–428
8. Faiza T,Risjani Y, Sasmito Djati M, Yanuwiadi B, Setyo Leksono A. The Analysis of the Physical and Chemical Properties of the Water Quality in the Rainy Season in the Sumber Maron River - Kepanjen, Malang – Indonesia. Resources and Environment 2018, 8(1): 1-5.
9. Kanungo S, Kumar Bhuyan N, Hemanta Kumar P. Assessment of the Water Quality Standard of Brahmani River in terms of Physico-Chemical Parameters. Int. J. Sci. Res. Manag. 2018, 6(4): 50-57.
10. Nidhi Jain N. Physico-chemical assessment of water quality in one part of Hinjewadi, Pune Maharashtra (India). Int. J. Sci. Res. Eng. Tech. 2018; 7(1): 1-9.