Research Article

Study on the Characteristics of Ground Water in Nanauta Town Region (UP)

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ABSTRACT

This study focused on the determination of various physico-chemical characteristics of groundwater and to perform a statistical analysis to determine the relationship between the measured parameters. Materials and Methods: The study was carried out during for more than year from 2018-19 in Nanauta town region, India. The several physico-chemical characteristics such as pH, electrical conductivity, chlorides, total dissolved solids, alkalinity, dissolved oxygen, chemical oxygen demand, biological oxygen demand and hardness were determined by following the procedure arranged by American Public Health Association standard methods. This study was approved to ensure the quality of groundwater to make usage of it for domestic purpose by relating the analytical results with the World Health Organization (WHO) drinking water quality standards. After laboratory procedure, it is concluded that water Samples from Nanauta region are not within the limits for some parameters as compared to WHO standards. Hence these sample water can't be used for drinking and also not sustainable for the human health and the environment. The water samples are slightly higher values in physical and chemical parameters which may not be much fit for a long period for drinking, cooking purposes. So, water samples may be subjected to adsorption techniques, boiling, cooling, filtration and then used for drinking and cooking purposes.

Key words: *Ground water, Water quality, Water analysis*

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INTRODUCTION

Due to rapid industrialization and increasing human population, the pressure on natural resources is increasing and their maintenance is one of the chief challenges for mankind. Groundwater is a most vigorous supply for millions of people for both drinking and irrigation. The quality of groundwater is as important as its quantity because it is the main aspect in determining its appropriateness for drinking, domestic, irrigation and industrial purposes**[1]**. The concentration of chemical elements which is greatly influenced by geological developments and anthropogenic actions regulate the groundwater quality. Both the agricultural and anthropogenic actions caused weakening of water quality interpretation serious threats to human beings. The quality of groundwater cannot be restored once it is polluted. Fluoride occurs naturally in groundwater and affords protection in contradiction of dental caries, particularly in children. But the fluoride concentration less than 0.5 mg/L leads to the risk of tooth decline although higher concentration causes dental fluorosis in the study done**[2]**. Nitrate concentration above 45 mg/L may verify harmful to human health producing methemoglobinemia (blue babies) which generally disturbs bottle-fed infants High concentration of sulfate

may encourage diarrhea and abdominal disorders. Elevated concentrations of Fe in natural water properties can lead to several serious health problems like cancer, diabetes, liver and heart diseases as well as neurodegenerative diseases**[3].** Arsenic in drinking water is linked to existence of skin scratches .Ground water is an essential and vital component of our life support system. The ground water resources are being used for drinking, irrigation and industrial purposes. There is rising worry on worsening of ground water quality due to geogenic and anthropogenic actions**[4].** The quality of ground water has suffered a change to a level that the usage of such water could be harmful. Increase in total salinity of the ground water and/or presence of high concentrations of fluoride, nitrate, iron, arsenic, total hardness and rare toxic metal ions have been observed in large areas in some states of India. Ground water contains wide varieties of dissolved inorganic chemical elements in various concentrations as a result of chemical and biochemical connections between water and the geological ingredients through which it flows and to a minor level because of contribution from the atmosphere and surface water bodies**[5].**

Good drinking water quality is crucial for the well-being of all people which has affected the health and financial status of the populations. Groundwater is the main source of water for drinking, agricultural and industrial needs. In this study, concentrations of chemical parameters such as pH, DO, BOD, COD, alkalinity, chloride, o-phosphate, nitrate, TDS, conductivity, TH, fluoride, ammonia and iron in groundwater samples were determined by using standard analytical procedures.

STUDY AREA

The study zone lies in Saharanpur district. Nanauta is a town which is having Nagar Panchayat. Nanauta is situated on Saharanpur Delhi Highway. It is 32 km away from Saharanpur city. It is 35 km from Shamli towards Saharanpur on Delhi Saharanpur road. This village is famous for its spicy and delicious street food available in the central market.

As per Indian census of 2011 , Nanauta town had a population of 22,551. Males constitute 52.53% of the population and females 47.46%. Nanauta has a normal literacy rate of 68.26%, lesser than the national average of 74.04%: male literacy is 75.84%, and female literacy is 59.9%. In Nanauta, 14.51% of the population is below 6 years of age.

MATERIALS AND METHODOLOY

Materials required for analysis are Groundwater sample, pH meter, conductivity meter, calcium carbonate, k2Cr2O7, ammonium acetate solution, sodium acetate solution, potassium dichromate and other chemicals.The groundwater samples were collected from 4 locations of the study area. The samples were collected after 10 min of pumping and kept in good quality polythene bottles of 1 L capacity before soaked in 10 % nitric acid (HNO3) for 24 h and cleaned with deionized water. All samples were transported to the laboratory for further analysis.Analyses of pH andconductivity were carried out at the site of sample collection following the standard protocols and methods of American Public Health Organization (APHA) and using different calibrated standard instruments. The pH of the water samples was measured by using a pH meter. The pH meter was calibrated, with three standard solutions (pH 4.0, 7.0, and 10.0), before taking the measurements. The value of each sample was taken after submerging the pH probe in the water sample and holding for a couple of minutes to achieve a stabilized reading. After the measurement of each sample, the probe was rinsed with deionized water to avoid cross contamination among different samples. The conductivity of the samples was measured using a conductivity meter. The probe was calibrated using a standard solution with a known conductivity. The probe was submerged in the water sample and the reading was noted after the disappearance of stability indicator. After the measurement of each sample, the probe was rinsed with deionized water to avoid cross contamination among different samples. TDS in water samples were carried out according to the standard methods of APHA. Total

alkalinity (as CaCO3) was determined by acid titration method (0.1 N HCl) using methyl orange as an indicator. The total hardness (TH) of water was analyzed volumetrically by ethylene diamine tetra acetic acid (EDTA, 0.01 M) titration method using Eriochrome Black T a indicator. Concentration of chloride (Cl) was determined by Argentometric method by titrating against silver nitrate solution (AgNO3, 1/50 N). DO and BOD was determined by titrimetric method. COD was determined by titrating the sample against standard Mohr's salt solution using ferroin as indicator as per APHA standards**[6].**

RESULTS & DISCUSSION

All the parameters are given in table-1, in which values have been compared with WHO standards.

PH- pH is a scale used to determine hrodgen ion concentration in solution. Acidic solutions have a lower pH, although basic solutions have a higher pH. At room temperature (25°C or 77°F). Pure or general ground water is neither acidic nor basic and has a pH in neutral range. Samples were found to have valid pH range between 7to 8.5

Electrical conductivity (EC): Conductivity defines a material's ability to conduct electricity, due to presence of metal ions electrical conductivity increases. Due to presence of ions metal conductivity was found to be on higher side.

Total hardness (TH): Total hardness involves temporary as well as permanent hardness which is caused due to bicarbonates, chlorides and sulphates of calcium and magnesium.

Hard water may does not produce leather easily with soaps. Due high content of chlorides, sulphate problems in digestion system or kidney stones may be created. Hardness was found to be high as more than 780 mg/l in one area which indicates the presence of high calcium and magnesium salts. Alkalinity is the capacity of water to resist changes in PH that would make the water more acidic. Alkalinity was found to be higher side between 250 to 825 mg/l in this study.

Total solids are dissolved solids plus suspended and settleable solids in water. In river water, dissolved solids contain calcium, chlorides, nitrate, phosphorus, iron, sulfur, and other ions elements that will pass over a filter with holes of around 2 microns (0.002 cm) in size. Suspended solids contain silt and clay elements, plankton, algae, fine organic fragments, and other particulate matter. TDS were also found to be on higher ise , results are given in table.1. These are elements that will not pass through a 2-micron filter. The concentrate ion of total dissolved solids disturbs the water stability in the cells of aquatic creatures. Chloride (Cl-) is a naturally occurring major anion found in all natural waters. Chloride behaves as a conservative ion in most aqueous environments, meaning its movement is not retarded by the contact of water with soils, sediments, and rocks. As such, it can be used as an indicator of other types of contamination. Anomalously high concentrations can act as an "advance warning" of the presence of other more toxic contaminants. Concentrations of Cl- in natural waters can range from less than 1 milligram per liter (mg/L) in rainfall and some freshwater aquifers to greater than 100,000 mg/L for very old ground waters within deep intracratonic basins.Chloride ions were also observed on higher side. The chloride content of water samples were found in the range from 46.5 to 142 mg/L**[7,8].**

DO: Dissolved oxygen refers to the level of free, non-compound oxygen present in water or other liquids. It is an important parameter in measuring water quality because of its effect on the organisms living inside a body of water. It was found to be less than 8 ppm.

BOD is the quantity of dissolved oxygen required by aerobic microorganism to break down organic material present in a given water sample at certain temperature over a definite time period. BOD was also observed on higher side which indicates polluted ground water. Similarly COD was also found to be higher than the prescribed limit **[9].**

In this study it can be concluded that water quality is getting deteriorating year by year, it might be due to increasing population and their activities. Industrial

activites in nearby area are major cause of it. Now there is need to take preventive measure for protection of ground water quality so that it can be used for drinking purpose along with other purposes.

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Table 1: Physico-chemical characteristics of ground water samples in Nanauta Region

Parameter	Sample 1	Sample 2	Sample 3	Sample 4	WHO
pH	7.4	7.1	7.0	7.2	6.5-8.5
EC	0.29	0.41	0.63	0.29	---
TH	645	620	780	470	500
Alkalinity	380	525	825	400	250
TDS	1333.34	2000	1333.34	1333.34	500
Chlorides	60.35	63.9	142	46.5	250
DO	4	7	5	6	8
BOD	NIL	5	2	4	-
COD	5	12	15	20	-