

Physicochemical Analysis of Surface and Ground Water in Karray Locality, Sudan

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Abstract: A study carried out to analyze Physicochemical of Surface and Ground Water in Karray locality, Omdurman, Sudan. One water sample was collected from al gamair station and 11 samples from wells in the study area. Analysis was done using standard methods for temperature, pH, total dissolved solids (TDS), total alkalinity (TA), total hardness (TH), calcium, magnesium, chloride, iron, nitrate, nitrite, fluoride. The results expressed that the pH was in minimum limits in Algamair station and some wells (World Health Organization standard; 6.5-8.5). Hardness of water in Algamair station, the main source of water, was 84 mg/l; while in ground water samples that taken from different wells in the study area, the hardness was found within the range from 84 to 232. Fluoride concentrations in Algamair station and all wells in the study area were very low. Zero concentration of ammonia was found in both surface and ground water. Water quality in the area should be analysed continuously due to potential risk of pollution.

Key words: physicochemical, water, analysis, hardness, Sudan

I. Introduction

Safe drinking water is very important to avoid different infectious diseases and chemical adverse effects. Most of developing countries depend on surface water bodies as a source of drinking water¹. Also ground water is the major source of drinking water in both urban and rural areas². Ground and surface sources of water are exposed to various pollutants either naturally or due to human and animal activities as a consequence of urbanization and industrialization³. Water quality is determined by the physical and chemical limnology of a reservoir and includes all physical, chemical and biological factors of water that influence the beneficial use of the water⁴. Rivers usually subjected to municipal and industrial wastewater and runoff from agricultural land, the former constitutes the constant polluting source whereas the later is a seasonal phenomenon⁵. Important physical and chemical parameters influencing the aquatic environment are temperature, rainfall, pH, salinity, dissolved oxygen and carbon dioxide. Others are

total suspended and dissolved solids, total alkalinity and acidity and heavy metal contaminants⁶. These parameters can cause adverse health effects if exceeding the standards values. World Health Organization sets water quality guidelines which include standards threshold values for a lot of parameters. However, most countries set national criteria to ensure the quality of drinking water. In Sudan, people use ground wells and rivers are sources of water for different purposes. This study was carried to measure certain physicochemical parameters of these sources.

II. MATERIAL AND MEETHODS

Study area

Karry Locality is located in Omdurman province and populated by approximately 200000 capita. The common source of water is public network supplied from Al Gamair reservoir which is mixed later on with water of eleven wells before reaching houses. The study area witnessed many problems associated with scarcity and contamination of drinking water.

Water samples

One sample was collected from Al Gamair station which serves the area and 11 samples from wells that distributed throughout the area. samples for chemical analysis were collected in clean plastic containers (500 ml capacity). The sample bottles were clearly labelled and the required information was recorded in a form and supplied with the sample.

Laboratory analysis

Analysis was carried out for various water quality parameters such as Temperature, pH, total dissolved solids (TDS), total alkalinity (TA), total hardness (TH), calcium, magnesium, chloride, iron, nitrate, nitrite, fluoride. Total Dissolved Solids meter was used to measure the temperature of water and the total dissolved solids while pH is measured by a pH meter. Concentration of chemicals was measured using standard method.

III. RESULTS AND DISCUSSION

In the present study it was found that temperature was 28.6 °C in sample from surface water while it was ranging from 28.4 °C to 29 °C. Although the temperature of water is not always stable, there was little variation similar to finding obtained In a study conducted in Odisha, India, which the

water temperature among the study sites ranging from 24.2°C – 30.9°C ⁷.

The results expressed that the pH was in minimum limits in Algamaier station and some wells (World Health Organization standard; 6.5-8.5). The range of pH was 6.5 – 8.1. These variations of temperature and pH also was reported by Faryal *et al* in their study the effects of seasonal variations on physicochemical properties and concentrations of faecal coliform in River Kabul⁸.

The findings of our study illustrated that hardness of water in Algamaier station, the main source of water, was 84 mg/l; while in ground water samples that taken from different wells in the study area, the hardness was found within the range from 84 to 232. There was association between the concentrations of calcium, magnesium and hardness. We found high concentrations of these parameters in all samples as well as high level of hardness, compared to the Sudanese guidelines of drinking water. Lina *et al* reported significant association between hardness and magnesium or calcium concentrations ⁸. The degree of hardness of drinking water is important for aesthetic acceptability by consumers and for economic and operational considerations. Many hard waters are softened for those reasons using several applicable technologies, and the mineral composition will be significantly affected.

The presence of some heavy metal and minerals with certain concentrations is important to supply the human body with essential nutrients. Despite this importance, the high concentration of heavy metals in the water could lead to adverse effect and influence the beneficial use of the water ⁴ this why the WHO stated a guideline for quality of water. The potential risk of chemicals is important because it is too difficult to treat them in water and metabolically degrade in human body. Most of developing countries have no means of chemical treatment due to limited financial ability. The minerals predominantly determining total hardness, namely calcium and magnesium, remained of interest for the World Health Organization ⁷.

Fluoride concentrations in Algamaier and all wells in the study area were very low. However, very low fluoride concentration (<0.5mg/L) may result in dental carries in children under the age of seven ¹.

The important thing in these results was zero concentration of ammonia, because lower concentration of ammonia indicates minimal influence of industrial effluents an indicator of organic contaminants ⁵. Other physicochemical parameters in both surface and ground water were not exceeding the standards of World Health Organization. However, many parameters were less than limits.

Table (1): Physicochemical analysis of surface water in Al Gamair station, Karray locality, Omdurman, Sudan.

No	Parameter	Unit	Result
1	pH	---	6.66
2	Temperature	° C	28.6
3	Total Dissolved Solid (TDS)	Mg/l	127.6
4	Hardness	Mg/l	84
5	Alkalinity	Mg/l	151.3
6	Calcium	Mg/l	19.2
7	Magnesium	Mg/l	64.8
8	Chloride	Mg/l	12.7
9	Iron	Mg/l	Nil
10	Nitrate	Mg/l	0.60
11	Nitrite	Mg/l	0.001
12	Ammonia	Mg/l	Nil
13	Fluoride	Mg/l	0.15

Table (2): Physicochemical analysis of well water in Karray locality, Omdurman, Sudan.

No	Parameter	Unit	Minimum	Maximum	Mean	Standard deviation
1	pH	---	6.5	8.1	7.4	±0.4
2	Temperature	° C	28.4	29	28.8	±0.17
3	Total Dissolved Solid (TDS)	Mg/l	140	262	195.6	±35.4
4	Hardness	Mg/l	84	232	195.1	±40.6
5	Alkalinity	Mg/l	80	297.6	140.7	±55.9
6	Calcium	Mg/l	26.4	60.8	42.4	±12.2
7	Magnesium	Mg/l	8.64	26.4	21.8	±7.1
8	Chloride	Mg/l	0.17	44	21.5	±11.8
9	Iron	Mg/l	0.09	1.17	0.216	±0.318
10	Nitrate	Mg/l	0.001	11.7	10.23	±3.42
11	Nitrite	Mg/l	0.001	0.01	0.00318	±0.00322
12	Ammonia	Mg/l	0	0	0	0
13	Fluoride	Mg/l	0.1	0.3	0.069	±0.155

IV. CONCLUSION

Some physicochemical parameters in the area were not satisfying the requirements in the World Health Organization. Water quality of surface and ground water should be subjected to analysis regularly.

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