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Chemical, Physical and Biological Properties of the Kinds of Water used for Drinking in the Baghdad Province -Al Karada Area

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Abstract
Water is a main component of all living things. It is irregular in numerous of its physical and chemical properties. a number of are necessary for life while others have profound effects on the size and shape of living organisms, how they work, and the constraint within which they must operate. Field study was conducted for the three sites of water in the province of Baghdad province, al- Karada area (river water and piped water and water tank) where the samples were collected during the month of November 2014. Measured temperature, electrical conductivity and the function of acid and ions of positive and negative (chlorine cl^{-} and sulfates so^{-2}, carbonat $co3^{-2}$, nitrates $No3^{-2}$, sodium Na^{-2}, calciumCa^{+2}, magnesiumMg^{+2} and total hardness and TDS and total suspended solids as well as the estimation of heavy metals (copper Cu, lead Pb, zinc Zn and iron Fe) in addition to bacterial totals included total bacteria (TB) , total colon bacteria (Tc) and Fecal coliform bacteria (Fc).
Keywords: Water, Chemical, Physical, Biological, Baghdad

1. Introduction

Ecological pollution is the global concern of the day. The increase of industrial area is quick and very fast thus related anthropogenic activities have also been increased like waste discharge from industries, transportation and domestic activities. The home waste generated is directly enters into the dissimilar sites of water bodies without any treatment. Too the continuous flow from agricultural waste water contaminates the water source of surrounding area. This entire difficulty affects the water resources and ultimately human health. Water is one of the three main components of the environment; so, there exists a close linkage between the quality of water and the environment which bears an almost significance for eco-system. Natural bodies of water are not absolutely pure as a variety of organic compounds and inorganic elements remain in dissolved form. Numerous kinds of macroscopic flora and fauna grow in dissimilar types of aquatic habitats(Pratiksha Tambekar, 2012). The physical and chemical quality of water vary according to the basin shape and size, depth, light penetration, precipitation, location, temperature, chemical nature of surrounding soil and dissolved minerals, pH, etc, and the biological components of the habitats depend upon them If all the physical, chemical and biological parameters are in optimum condition the balance between these is maintained (Pratiksha Tambekar, 2012). The aquatic environment is one of the environmental elements and exists side by side with the environment (air, soil) and is associated with a range of factors and conditions influence the living organisms(Warren 1971). In connection with the pollution, one of the elements of the environment or the debris, this can include any change in the balance of the elements of the natural environment (Hodage, 1973). The water pollution of both types (natural and industrial) is the most important problems faced by most countries of the world, but the amount of pollution is different from one country to another. However, the major pollution of the water comes from the population and the industrial basis (Connell, 1998). The idea of studying the impact of the city of Baghdad waste disposal in the waters of the Tigris River using the application of the general index of the quality of water for drinking, giving a wide range to evaluate the people activities and industry of the city and their effects on river water, especially that there is a clear reduction in the discharge of the river in recent years. The health and economic importance lies in giving a clear picture of health and environmental impact in the population of the city of Baghdad and cities south of Baghdad, which depends on the withdrawal of water from the river and directly used for different purposes (domestic and industrial) using general index of the quality of drinking water for human use. Tigris is the biggest river in Iraq and the main source of drinking water for Baghdad (Razzak, 2009), any pollution of Tigris River may cause a direct pollution to Euphrates River and the related water sources since both rivers connected through Al Tharthar Lake (Rahi, 2010). According to UNICEF report, about 800 million people in Asia and Africa are living without access to safe drinking water. Consequently this has caused many people to suffer from various diseases. Contamination of water has been frequently found associated with transmission of diseases causing bacteria, Vibrio, Salmonella, bacterial and parasitic dysentery, and acute infectious diarrhea caused by E.coli(Al-Bayatti, 2012). Wastewater generated from hospitals usually contain pathogens, human tissues and fluids, pharmaceuticals, substances with genotoxic properties, chemical substances, heavy metals, and radio-active wastes, which may endanger public health, and contribute to oxygen demand and nutrient loading of the water bodies and in the process promote toxic algal blooms and leading to a destabilized aquatic ecosystem, if discharged without treatments into water bodies (Ojo, 2012). One of the main environmental problems putting by the hospital effluents is their discharge, in the same

way as the urban classic effluents, towards the urban sewer network without preliminary treatment (Emmanuel, 2002). Water quality is a growing global concern. Polluted water and inadequate sanitation kill two children every minute worldwide. Water quality is the physical, chemical and biological characteristics of water in relationship to a set of standards. The primary uses considered for such characterization are parameters which relate to drinking water, safety of human contact, and for health of ecosystem. Interest in water analysis is due to the enormous importance of water to all categories of living things. It is necessary for the healthy development of man, animals and plant(Naveen K. Singh, 2007) The study the physical and chemical properties for drinking and raw water for Baghdad Province al- Karada area, the samples are took from Tigris river surfaces and water clarifying station. The properties including the acidity of water (pH) and its effect on water quality, concentration of total dissolved salts (T.D.S), electrical conductivity (E.C), oxygen dissolved in water (D.O) and its effect on tastes of water, total hardness of water (T.H) through the concentration of calcium (Ca) and magnesium (Mg) elements and study the turbidity (T) of water because. The studying includes both physical and chemical tests carried out in the laboratories of al- Karada area environmental office. The purpose of present study is to investigate the effect of Baghdad Province al- Karada area waste disposal on the water quality of the Tigris River. The Index of Aquifer Water Quality (IAWQ) method is used to indicate the impact of selected pollutants resulting from human and industrial activities of Baghdad Province al- Karada area on Tigris River.

2. The Study Area

The study area is located in Baghdad Province al- Karada area, within the alluvial plain sector, which represents the western part of the unstable shelf, between latitudes (33°25'-33°44') and longitudes (44°16'- 44°29'). Tigris River runs through the city of Baghdad in the mature stage forming river meandering and a number of islands due to the decrease of river velocity and increase in sedimentation. Tigris River divides Baghdad into two parts (Karkh and Rusafa). Diyala River with a (300) km length meets the Tigris River south of east of Baghdad. Also, the military channel receives water from the Tigris River in the northern part of the study area and flow in the southern part of the Diyala River. On the other hand, the city of Baghdad consists of nine units, five of them belong to Municipality of Rusafa and the other four to the Karkh district, and each unit contains a number of small municipal districts, and linked to all units of the municipal network of highways. The area of the Municipality of Baghdad is about (869.031) km2.

3. Sample Collection and Analyses

Water drinking samples have been collected from al- Karada area drinking water clarifying station about one sample per each week and take average the results of four tests per each month through (September) for 2014, and the raw water samples are collected from the Tigris river per each week and make average the results of four tests per each week, and these samples are collected from different points at deeps (30 cm) from the surface of river at the center of al- Karada area. The both of water types are taken to special water laboratories of al- Karada area environmental office. The examination procedures were performed by using the standard methods for the tests of water and waste water and include: Turbidity, Acidity, Total Dissolved Salts, Electrical Conductivity, Total Hardness, Calcium and Magnesium concentration, Dissolved Oxygen and Turbidity. Samples were collected from river water, piped water and tank water. The analysis process, as shown in the following tables

Table 1. The results of the analysis of the chemical and physical factors in selected waters in the al- Karada district

Site	PH	TDS Mg/ Liter	T.s.s Mg/ Liter	Tmc^0c	Conductivity ms/ cm
River water	7.8	528	145	30.0	870
Piped water	8.2	890	32.0	29.7	645
Tank water	8.1	900	31.2	30.1	642

Table 2. The results of the analysis of ions and total of brackish in some selected areas in the al- Karada district

Site	$so4^{-2}$ mg/ liter	cl^{-} mg/liter	$co3^{-2}$ mg/ liter	$No3^{-1}$ mg/ liter	Na^{+1} mg/ liter	ca^{+2} mg/ liter	mg^{+2} mg/ liter	Total brackish mg/ liter
River water	190	80.2	20.3	9.1	53.5	70.3	24.0	196.2
Piped water	369	150	190	0.24	189	23.0	8.9	197.2
Tank water	371	142	189	0.22	187	22.0	8.1	198.1

Table 3. The results of the analysis of elements in selected waters in the al- Karada district

Site	pb mg/ liter	Zn mg/liter	Cu mg/ liter	Fe mg/ liter
River water	0.001	0.001	0.03	0.171
Piped water	0.007	0.001	0.013	0.17
Tank water	0.006	0.001	0.012	0.16

Table 4. The preparation of bacterial colonies located in obtained samples of al- Karada district

Site	TB 100mg	Tc 100mg	F.c 100mg	F.s 100mg
River water	145	53	10	31
Piped water	18	9	3	2
Tank water	21	15	2.9	1

Table 5. Global standards and Iraqi for drinking water

Property	Standard specifications according to the World Health Organization		Iraqi standards for drinking water
	Lower Concentration Permitted mg/liter	Highest Concentration Permitted mg/liter	Highest Concentration Permitted mg/liter
Total solids	500	1500	1500
Color	Colorless	Colorless	Colorless
Taste	Palatable	Palatable	Palatable
Smell	Palatable	Palatable	Palatable
Turbidity	5	25	25
Chlorides	200	600	600
Iron	0.1	1	0.3
Manganese	0.05	0.5	0.1
Copper	0.005	1.5	0.005
Zinc	5	15	15
Calcium	75	200	200
Magnesium	30	150	150
Sulphates	200	400	400
Total brackish	100	500	500
Nitrates	45	-	50
Phenol	0.001	0.002	0.002
Detergents	0.02	1	1
Fluorides	0.6	-	-
PH	7.8	Min 6.5	Min 6.5
Vital requirement for oxygen	0.25	1	1
Arsenic	-	0.01	0.01
Cadmium	-	0.003	0.003
Chrome	-	0.05	0.05
Cyanide	-	0.05	0.02
Mercury	0.001	0.001	0.001
Celeom	0.01	0.01	0.01
Hydrocarbons	0.002	0.002	0.002

From the results obtained in this study, it is recommended that consumers around the sampling points whose values of results were outside the recommended threshold limits should be cautioned of the associated dangers that may manifest in future as a result of excessive accumulation in the body. Water from such sources may therefore be used for other purposes than drinking. Frequent monitoring of water quality from these sources should also be considered in order to detect early signs of hazards, just as there is the need for further studies to be carried out to investigate the levels of other parameters. Overall evaluation of the different types of bottled water are shown in tables 1–4 as an average for all of the analytical measurements that were carried out on all of the different types of bottled waters i.e., spring water fortified tap water, purified tap water, carbonated water and

distilled waters. In table 1 presents the average values for pH and conductivity results. All brands of water showed similar pH values except carbonated water, which was significantly more acidic than all others. On the other hand, conductivity, which reflects the total amount of dissolved solids was found to vary greatly among different types of water. And as expected, carbonated water showed the highest level of conductivity while distilled water showed the least. Carbonated water showed the highest concentrations among all brands and distilled water brands were the least in their contents. Sulfate was found in the highest concentration among the anions and calcium was the highest among the cations. Although the majority of the brands of bottled water sold in the greater al- Karada district comply with guidelines for water quality set nationally or internationally, it does not guarantee higher quality or more safety compared to tap water

4. Conclusion

From the average value of ground water sample, we can conclude that all these samples need some treatment to reduce the TDS, Cd & Cr if the water is to be used for drinking purpose. While the water sample no. 2 can be safely used for irrigation and other household purposes, it is not suitable for drinking purpose. In the light of correlation regression study, we can conclude that all the parameters are more or less correlated with each other. The linear correlation is very useful to get fairly accurate idea of quality of the ground water by determining just a few parameters experimentally.

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