ejpmr, 2017,4(5), 477-480

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

PHYSICO-CHEMICAL EVALUATION OF WATER OUTLET FROM TWO WATER STATIONS AT AL-QUWAYIYAH GOVERNORATE, KSA

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Article Received on 15/03/2017 **Article Revised on 05/04/2017** **Article Accepted on 26/04/2017**

ABSTRACT

This study aims to evaluate the quality of treated (outlet) water samples taken from Al-Qurna and Lubkhah water stations at Al- Quwayiyah governorate. These water samples were subjected to physico-chemical analyses in laboratories of Ministry of water and electricity at Al-Quwayiyah governorate branch. The results of physico-chemical tests showed that the values of pH, Nitrate, Iron and Free Chloride were within the specifications of drinking water issued by the Saudi Arabia Standards Organization (SASO, 2000) and World Health Organization standards (WHO, 2006). On the other hand, the values of Total Dissolved Solids, Conductivity and Total Hardness were higher than the SASO (2000) and WHO (2006). Accordingly, these water sources obtained from Al-Qurna and Lubkhah water stations at Al- Quwayiyah governorate are not use as a drinking water due to the higher values of Total Dissolved Solids, conductivity and total hardness.

KEYWORDS: Al-Quwayiyah governorate, Al-Qurna and Lubkhah water stations, drinking water, Physico-chemical analyses.

INTRODUCTION

Water is one of the most important and most precious natural resources. It is essential in the life of all living organisms from the simplest plant and microorganisms to the most complex living system known as human body.[1,2] For the youngest children the water that is treated provides excellent water sources free of microbiological pollution and with the proper chemical composition can be used. Although water covers about 70 % of the Earth, less than 1 % is available as fresh water for human use.[3] The vast majority of the water on this blue planet is found in the ocean, too salty to drink and unfit for many other applications. Of the fresh water available on Earth, about two - thirds are frozen in ice caps and glaciers, which leave only a small fraction accessible for human use.[4, 5]

Surface water, *i.e*. lakes, reservoirs, rivers and streams are the primary water source for humans. Ground water is very important as the only source of water to supply human needs especially in arid regions like Saudi Arabia where there is scarce surface water and the rainfall is scarce, irregular and the evaporation rates are very high.[6] Hence, the ground water is a key resource for urban and rural supplies and it is considered as the only source, which can supply domestic and agricultural needs in town and villages. In Saudi Arabia, there are increasing needs of water as there is rapid growth of population and agricultural activities in increasing around the country.[7]

The usage of ground water is gradually increased because of the increase of water demand and the shortage of surface water during growth of population.

In many cases ground water is polluted by the inflow of pollutants such as sewage and industrial waste water.[8] The residents who use contaminated ground water as drinking water may suffer from health problems in the near future. But it is very difficult to elucidate or predict the pollution pattern because potential sources which include land disposal of solid wastes, sewage disposal on land, agricultural activities and other sources are various, and pollutants move through ground water.[9]

Ground water that is, water underground in aquifers (highly permeable rocks, soil, and sand), can be extracted through wells or found as springs. Technically speaking, ground water resources exceed salt free surface water on Earth, but humans use surface water more often because it is easier to access in large quantities.[10,11]

This study aims to evaluate the quality of treated (outlet) water samples taken from Al-Qurna and Lubkhah water stations at Al-Quwayiyah governorate.

MATERIAL AND METHODS

Two different sources of water samples were taken from Al-Qurna and Lubkhah water stations at Al-Quwayiyah governorate.

The Physico-chemical parameters, *i.e.* pH, total dissolved solids, conductivity, total hardness, nitrate, iron, free chloride and turbidity were determined according to standard methods of laboratory of Ministry of water and electricity at Al-Quwayiyah governorate branch.[12]

RESULTS AND DISCUSSION

Physico-chemical Analyses

The following parameters were measured in all water samples in outlets system: pH, Total Dissolved Solids, Conductivity, Total Hardness, Nitrate, Iron, Free Chloride and Turbidity of water samples obtained from Al-Qurna and Lubkhah water stations. The results are shown in **Table 1** and **Fig. 1 (a-g).**

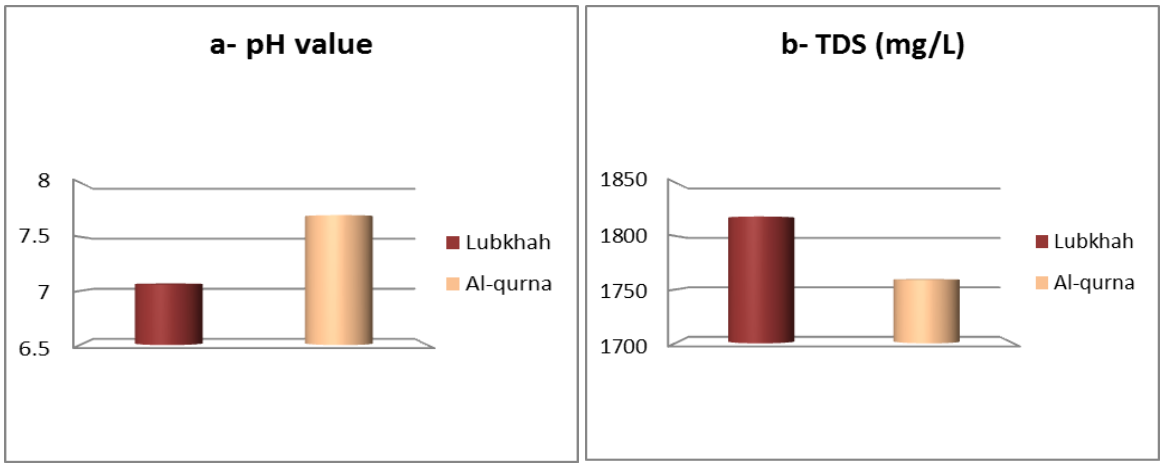
Table: 1. Results of Physico-chemical parameters.

Parameters	Unit	Al-Qurna station	Lubkhah station
pH	------	7.70	7.06
TDS	$mg.L^{-1}$	1759	1818
Conductivity	$\mu s.cm^{-1}$	2376	2452
Total hardness	$mg.L^{-1}$ as $CaCO_3$	568	945
Nitrate (NO_3^-)	$mg.L^{-1}$ as NO_3^-	29.0	14.2
Iron (Fe)	$mg.L^{-1}$	0.025	0.050
Free $C1_2$	$mg.L^{-1}$	0. 5	0.6
Turbidity	NTU	<1	<1

By comparison of laboratory results with the drinking water standards set by the World Health Organization (WHO, 2006)[13,14] and Saudi Arabian Standards Organization (SASO, 2000) (Table 2) show that the values of pH, nitrate, iron, free chloride and turbidity were within the (WHO, 2006) and (SASO, 2000). On the other hand, the values of total dissolved solids, conductivity and total hardness (Table 2) were higher than the WHO (2006) and SASO (2000).

Table 2. WHO and SASO standards for drinking water.

Parameters	World Health Organization standards (WHO)	Saudi Arabian Standards Organization (SASO)
pH	6.5-8.5	6.5-8.5
TDS	1000	100-700
Conductivity	1600	1600
Total hardness	500	300
Nitrate (NO_3^-)	45	45
Iron (Fe)	0.3	0.3
Free Cl_2	0. 5	0.5
Turbidity	5	5



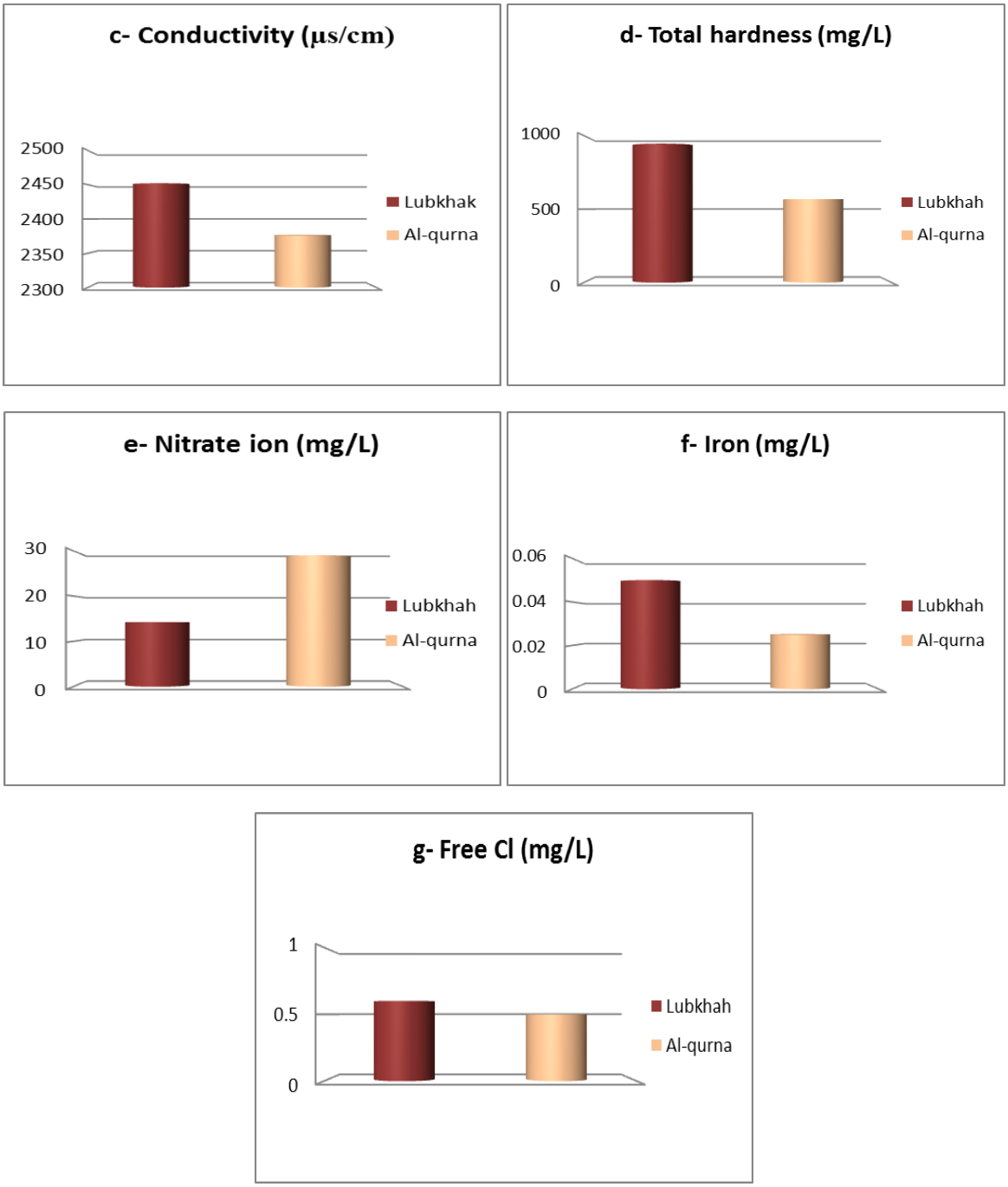


Fig. 1: (a-g). Various physical-chemical parameter analysis of drinking water samples in two stations samples, pH value (a), TDS (b), conductivity (c), total hardness (d), nitrate (e), Iron (f) and free chloride (g).

CONCLUSION

Two different sources of water obtained from Al-Qurna and Lubkhah water stations at Al-Quwayiyah governorate were subjected to physico-chemical analyses in laboratories of Ministry of water and electricity at Al-Quwayiyah governorate branch. By comparison of laboratory results with the drinking water standards set by the World Health Organization (WHO, 2006) and Saudi Arabian Standards Organization (SASO, 2000) show that the values of pH, nitrate, iron and free chloride were within the (WHO, 2006) and (SASO, 2000). On the other hand, the values of total dissolved solids, conductivity and total hardness were higher than the WHO, 2006) and (SASO, 2000).

Accordingly, these water sources obtained from Al-Qurna and Lubkhah water stations at Al- Quwayiyah governorate are not use as a drinking water due to the higher values of total dissolved solids, conductivity and total hardness.

ACKNOWLEDGEMENTS

We would like to thank the manager and laboratory team of Ministry of water and electricity at Al-Quwayiyah governorate branch, for providing us with the

information and valuable data which without work on this research would not be performed.

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