

Evaluation of the Efficiency of Public Drinking Water and Reverse Osmotic Water (RO) in Some Areas in the Province of Karbala

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ABSTRACT

Drinking water is one of the necessary and continuous human needs that cannot be dispensed for any reason and must meet the water quality standards in terms of taste and color in addition to the physical, chemical and biological specifications, and this study came to know some characteristics of the quality of public drinking water as well as drinking drinking water RO in some areas In the city of Karbala, physical and chemical quality assessment and comparison of results with Iraqi and international standards. Where some factors were measured, such as pH, turbidity, total soluble solids, hardness, calcium, magnesium, sulfate, and nitrates, and it was observed that all traits conform to Iraqi and international standards. The results also showed that all results of public drinking water were higher than the results of drinking RO water and most of the readings with regard to RO drinking water were much less than the limits permitted internationally and Iraq.

Keyword: public drinking water , Reverse Osmotic water , Physical and Chemical factors

INTRODUCTION

That water is the gift of God on earth to perpetuate life in it. By its existence, life existed and continued until now, that the spread of water and its coverage of these vast areas (since the volume of water on the globe is estimated at about 1435 billion kilometers) made him tremendous benefits that cannot be counted, and in return the water is more Environmental components are vulnerable to pollution due to the qualities that qualified them, so that it will be one of the most receiving environmental components for pollutants in the environment, and then the pollution that is expressed as undesirable changes in the characteristics of physical, chemical or biological water, which reduces the validity of water, negatively affects human life. Water pollution can also be defined as unwanted environmental changes through direct or indirect effects of transformations in energy patterns, radiation levels, physical or chemical composition, or abundance of living [1].

Drinking water is considered a necessary and continuous human need that is indispensable for any reason and must meet the water quality standards in terms of taste and color in addition to the physical, chemical and biological specifications [2]. Water pollution is one of the major problems, the damage to which is reflected in human health, ecosystems, and cultural development. Also published recent research confirming the high incidence of sickness transmitted cases of drinking water and the high number of deaths from its in addition to that 71% of the world's population still suffer from polluted unhealthy water [3].

That is why the recent period witnessed the world's interest in water in general and drinking water in particular, especially after the development witnessed by countries in the field of filtering and water purification. Drinking questioning due to doubts about its purity and safety From the health point of view, this has resulted in the recent resort to drinking water RO, and this difference varied according to the water quality.

This study came as an assessment of the efficiency of some public drinking water, as well as an evaluation of the quality of RO water in some areas of Karbala Governorate, as well as a comparison between them and international standards.

MATERIALS AND WORKING METHODS

Sample collection: collected Five samples of public drinking water and were expressed as W1, W2, W3, W4,W5 from different regions in the Karbala governorates. Also, five samples of RO type were collected and expressed as RO1, RO2, RO3, RO4, RO5, from some stations The regions in Karbala Governorate, samples

were transferred to public health laboratories in the holy city of Karbala, and the following tests were measured

Physical and Chemical Analysis:

- 1 pH The pH was measured using the .HI9811-5 pH meter.
- 2 Turbidity: Turbidity was measured using the Turbidity Meter Model (Ip2000) to measure the turbidity and expressed the results in a Nephelometric turbidity unit (NTU).
- 3 Total dissolved Solid (TDS): Total soluble matter of water was measured using a TDS device (HI9811-5) and expressed as mg / l.
- 4 Total hardness: The total hardness was estimated by correcting 50 ml of the diluted sample with the standard Na₂EDTA solution (0.01 M) after adding 2 ml of the buffer solution and using the Eriochrome Black T dye as evidence and expressing the results in mg / L units [4].
- 5 Calcium hardness: Calcium hardness was estimated by correcting 50 mL of the diluted sample with the standard Na₂EDTA solution (0.01 M) after adding 2 mL of sodium hydroxide solution (1N) to raise the pH value to (12-13) and using the peroxide tincture as evidence and expressing the results in mg / L units [4].
- 6 Magnesium: Magnesium hardness was measured by the following equation
Magnesium mg / L = (EDTA volume for hardness determination – EDTA volume for calcium determination) x 4.88 and the results expressed in mg / L units [4].
- 7 sulfate: Follow the Turbidimetric method described by the American Public Health Association [5] to estimate sulfate by adding 20 ml of buffer solution A to 100 ml of the diluted sample with mixing and then adding 0.1 g of barium chloride crystals (BaCl₂ crystal) the absorbance was then measured at a wavelength of 420 nm by the spectrophotometer and expressed in mg / l units.
- 8 Nitrate: followed the Ultraviolet Method to measure nitrates where a standard nitrate solution was prepared and 1ml of 1 N hydrochloric acid was added to 25 ml of the filtered sample. The absorbance was then measured by a spectrophotometer at a wavelength of 220 nm and then at a wavelength of 275 nm and expressed in mg / l [6].

RESULTS

In this study 10 samples are collected divided to 5 sample from public drinking water expressed as W1, W2, W3, W4,W5 and 5 samples of RO type expressed as RO1, RO2, RO3, RO4, RO5, from different stations in Karbala governorates.

Table 1: measured some standards chemical and physical for commoners drink water and RO in Karbala city

Sample	W1	W2	W3	W4	W5	RO1	RO2	RO3	RO4	RO5
Ph	8.5	8.4	8.3	8.2	8.2	8	7.3	7.2	8	8.3
Turbidity NTU	1.0	2.3	3.3	3.8	2.8	0.4	4.0	0.5	1.0	0.5
TDS	668	635	682	665	795	95	123	133	149	177
Total Hardness as CaCO ₃ mg/L	418	420	426	346	335	12	6	8	20	40
Magnesium (Mg ²⁺) mg/L	42	44	45	29	31	1.0	1	1	2.0	5.0
Calcium (Ca ²⁺) mg/L	98	98	100	90	94	3.2	2	2	4	8
(SO ₄) mg/L	180	187	190	150	166	40	60	55	42	31
(NO ₃) mg/L	4.0	3.4	2.1	4.8	5.0	0.5	1.0	6.0	0.8	2.2

Table 2: standards international and Iraq drink water

Character	Iraq 2001	Iraq 2009	WHO2008	WHO2011
Ph	6.5-8.5	6.5-8.5	6.5 – 9	6.5 -8.5
Turbidity NTU	5	5	<5	Accepted
TDS	1000	1000	1000	600
Total Hardness as CaCO ₃ mg/L	500	500	150-500	500
Magnesium (Mg ²⁺) mg/L	50	100	-	-
Calcium (Ca ²⁺) mg/L	50	150	100-300	300-100
No ₃ mg/L	50		50	50
So ₄ mg/L	250		250	250

Iraq 2001[7], Iraq 2009 [8], WHO2008 [9], WHO2011 [10].

DISCUSSION

That the Physical and chemical properties are important in determining the validity of water, whether it is river water or drinking water [11], as its importance comes through its association with each other and with the microorganisms present with it in the water [12] and some The physical and chemical factors of water are of particular importance in determining their suitability for human use or by affecting sterilization processes and other water characteristics.

The change in the value of pH will affect the chemical activities of the human body, as the value of pH of fluids within the human body ranges between (7.0-7.2) as the pH value decrease from 6,4 causes difficulty in absorbing vitamins and disrupting the work of enzymes, and its height above 8.5 makes the taste of water pungent . The results shown in Table (1) for the PH values of the drinking water samples were all within the permitted Iraqi and international borders [7- 8- 9- 10].

Turbidity is one of the important variables that must be taken into account when evaluating water for drinking purposes if it is considered the measure of the amount of minutes stuck in it, and caused by suspended and colloidal minutes such as clay and silt as well as organic and inorganic materials fragmented into smooth pieces, also contribute to phytoplankton and other microorganisms [13], which adversely affects consumer health. It also shows the efficiency of processing plants, The results showed in Table No. (1) that the turbidity values of all samples were within the international and Iraqi standards [7- 8- 9- 10] where the turbidity values for the RO water were clearly noticeable from the public drinking water and was due to the difference in the source of the supplied water for the treatment system and the different efficiency of the treatment systems [14 - 15] and also by cotton filtration, which has a major role in removing impurities and mud suspended in water, which is an excellent and supportive part of the reverse osmosis process.

Total soluble solids include all inorganic salts and some water-soluble organic substances such as calcium, magnesium, sodium, potassium, carbonate, chloride, sulfate, and nitrate. The amount and quality of dissolved and non-soluble substances present in water are widely varied and may contain substances consumed by the agents. . The increase in dissolved solids in drinking water causes the undesirable aftertaste, which requires efficient and high cost treatment. Show the search results As shown in Table No. (1) that the values of total dissolved solids for general drinking water were higher than the values of total dissolved solids for drinking water RO and the reasons for the different concentrations in all samples are the efficiency of the

treatment system and the effect of agricultural drains on the source water, which is characterized by its high content For dissolved salts [15] however all values were within permissible limits.

Total hardness is a numerical expression of the water content of minerals, foremost of which are calcium, magnesium, and other alkali metal ions, and is one of the main characteristics that vary with different water quality around the world [16] So hardness has two types: temporary hardness caused by calcium and magnesium bicarbonate and permanent hardness caused by sulfates, chlorides and calcium and nitrate nitrates. The results of the research showed that the hardness values for general drinking water are higher than the hardness values for drinking water RO, but all values were within Iraqi and international specifications [7- 8- 9- 10] .

As for magnesium, it is the ion that enters the composition of the chlorophyll molecule and transport enzymes in the phosphorylation process in algae. The magnesium compound is more soluble than the calcium compound, and its presence in a high concentration in water causes unpalatable taste with a change in the color of water and its turbidity, All magnesium values for all water types were within permitted Iraqi and international standards.

As for calcium, it is the largest mineral element in terms of its presence in the body. It constitutes (2-1.5)% of the body weight and (99%) of it is found in the bones and teeth, while the rest is distributed in plasma, body fluids and other tissues and the physiological functions of the calcium: the formation and building of bones and teeth, Blood clotting, muscle contraction, transfer of nerve impulses, permeability of cell membranes, activation of enzymes. Results showed Table (1) that the calcium values for general drinking water were higher than the values of calcium for drinking water RO and the highest values were at the W3 site as it reached 100 mg / L and the reason is due Perhaps due to the inefficiency of the filters used for purification and the failure to clean basins continuously and that all calcium values for all types of water were within the permitted Iraqi and international specifications [7- 8- 9- 10].

As for sulfates are important chemical elements and increasing the concentration of sulfates ions in drinking water exposes the person to infection (diarrhea), where the highest values were recorded at the W3 site as it reached 190 mg / L, but all results were within the limits of international and Iraqi specifications.

and the results of RO water All of them are less valuable than general drinking water, due to the efficiency of the treatment unit and its effectiveness in the process of prevention.

Finally, nitrates are the common form of inorganic nitrogen in the aquatic environment [17] was much less than the permissible limit [7- 8- 9- 10]. especially with regard to the results of RO water. The reason is due to the efficiency of filters through which water passes, as well as to the sedimentation and filtering processes that take place on the water at RO stations before they reach consumers.

The results showed that all readings of reverse osmosis water and most factors are less than the permissible limits globally and in Iraq, and the reason for this is that filtered water is a type of pure water that has undergone strict purification processes to strip it of pollutants and from natural minerals as well, where many scientists say that this water is not Best for human consumption, as it lacks all natural minerals that are often beneficial.

CONCLUSIONS

- 1 It was concluded that most of the results of the study were within the limits permitted by Iraq and the world.
- 2 All public drinking water results were higher than RO drinking water results.
- 3 Most of the readings for RO drinking water were well below the permissible limits.

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