Republic of Iraq
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Assessment of Some Reverse Osmosis and Tap Water Stations in Al-Muthanna Governorate-Iraq

A Thesis Submitted to the Counical of collage of Science /Al-Muthanna University as Partial Fulfillment of the Requirements for the Degree of Master of Science in Biology

By

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Abstract

The objective of the current study is to evaluate three categories of drinking water, namely Commercial Reverse Osmosis (ROc), Home Reverse Osmosis (ROh), and Tap water (TW), in terms of their impact on human health. A total of 600 samples were collected for analysis in this study. These samples were categorized into three groups: 100 water samples, 100 blood samples from individuals using Home Reverse Osmosis (ROh) and 100 water samples, 100 blood samples from individuals using Commercial Reverse Osmosis (ROc) and 100 water samples, 100 blood samples from individuals using Tap drinking water (TW) in Al-Muthana governorate. The objective of this study was to compare the obtained results with the standards set by the World Health Organization (WHO) and the criteria established by the Iraqi authorities.

The study includes the measurement of some physical Parameters such as (Turbidity, Electrical conductivity, Total dissolved solids, Total suspended solid) and some chemical Parameters (pH, Total hardness, Calcium hardness, Sodium, Potassium, Calcium , Phosphates, Nitrites, Nitrates). Indicators of bacterial contamination were also studied, which includes (Total bacterial count), and blood samples analysis such as blood urea, Serum calicium, Serum elyctrolytes is conducted to find out their effects on human health during the study period(from December 2022 to June 2023).

The findings indicated that the pH values observed fell within the range of (6.2 to 9.2). The turbidity values observed in this study varied from(0 to 9.7) NTU. The electrical conductivity values exhibited a range of (20 to 1980) µS/cm. The total dissolved solids values spanned from (14 to 1950) mg/l, while the total hardness values ranged from (75 to 1100) mg.CaCo3/l. Sodium values varied between (2.4 and 1450) mg/l, potassium values ranged from (0 to 17.5) mg/l, and calcium values exhibited a range of (19.9 to 1613) mg/l.

In terms of nutritional levels, the study found that phosphate concentrations ranged from(0.02 to 0.63) mg/l, nitrite concentrations ranged from (0.005 to 0.066) mg/l, and nitrate concentrations ranged from (1.5 to 29.6) mg/l.

As for the bacterial examination, the total number of total bacterial count ranges between (4000-17000 CFU/ml). The results of the environmental properties of the study for a period of seven months,

As for the results of the blood samples the current study recorded the Urea ranged between (13-234mg/l), and Serum Calcium values ranged between (3.8-10.6) mg/l , and Serum Sodium values ranged between (110-165 mmol/l), and Serum Potassium values ranged between (2.3-6.9 mmol/l).

The current study showed that the physical and chemical parameters for ROc , ROh drinking water showed that is no exceeded permissible limits for parameters (electrical conductivity, turbidity, TDS, TH, , Na+, K+, Ca++) , and low concentrations of chemical parameters ($NO2^{-}$,$NO3^{-}$, PO4-3) for Tap, ROc , ROh drinking water .

The results of the statistical analysis showed that the pH values in ROh (mean: 7.81), ROc (mean: 7.54), and TW (mean: 7.37) were compared, and significant differences were observed (P value ≤ 0.001) and that there is a significant effect on the TH, as there was a significant increase in TW at a rate of (441.24 mg.CaCo3/l) comparison to ROh, which amounted to (284.35 mg.CaCo3/l),and there is increase K+ in TW with mean (7.35 mg/1) in comparison with ROh and ROc with mean (1.99 mg/1) and (0.95 mg/1) respectively with significant differences (P value ≤ 0.001),and the Ca++in TW with mean (306.92 mg/l) in comparing ROh and ROc with mean (202.79 mg/l) and (104.17 mg/l) respectively with significant differences (P value ≤ 0.001) There is a positive correlation between ions blood Ca^{++} and ions water K^{+} , and a moderately positive correlation between ions blood Na^{+} and ions water Ca^{++}