Emerging Trends in Chemical Engineering
Vol: 12 , Issue: 03 , Year: 2025, ISSN: 2349-4786

Evaluation and Study of The chemical Pollution Ratio of Dams Water in Najaf Governorate and The surrounding Environments

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REVIEW ARTICLE

Article received date: June 12, 2025
Article accepted date: July 17, 2025
Published Date: August 05, 2025

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Abstract
The importance of water and the urgent need for a clean environment free from pollutants has drawn our attention and focused in this study on estimating and evaluating ionic pollutants of elements (iron, chromium, lead, manganese) in the water of dams in Najaf Governorate and the surrounding areas. The study included four dams, namely ((Al-Mushkhab Dam, Al-Hindiya Dam, Shatt Al-Kufa, and Umm Abbasiyat Dam)) to determine the percentage of pollution with the elements in these water areas. Dam water is generally significantly affected by surface water from neighboring lands, which seeps through the soil into drainage channels and groundwater. Oxygen is also scarce in drainage water. Salinity is one of the most important quality specifications for water for all uses, and it plays a direct role in determining the quality and abundance of living organisms in the aquatic environment. Furthermore, it has a direct impact on the ability of benthic organisms and algae to absorb certain elements. It is also affected by pollution carried by high winds from time to time, which increases the level of pollution. Due to the widespread presence of heavy ions in dam water and their direct impact on determining the concentrations of heavy metal ions, this study aims to assess the environmental pollution rate of dam water and determine its negative effects and direct impact on the surrounding environment. Four samples of water from the dams selected for the study were collected and the heavy metals in all of these samples were analyzed. The laboratory results obtained indicate that there is pollution in the water of the four dams. The primary cause of this pollution is sewage outlets that flow near these stations, which have serious negative environmental impacts on the water, as well as polluted air and dust carrying pollutants that flow into the dams and are carried by the wind.

Keywords: pollutant, dams, water, impurity, drainage channels, groundwater

INTRODUCTION

Many of these minerals are essential for the health of humans, animals, and plants, and some play a role in vital processes at certain concentrations, such as copper. Others, such as copper and selenium, have not been discovered to have any vital role. These elements have highly toxic properties and are not tolerated or broken down by microorganisms. Their effects are cumulative, and they ultimately reach humans through the food chain, where they settle in various body tissues, such as the blood, liver, kidneys, and other organs. There are many definitions of the concept of pollution. Some define pollution as any substance or energy introduced by humans, directly or indirectly, into the aquatic environment, which has harmful effects on aquatic life, poses a threat to human health, hinders fishing activities, and alters water quality. Pollution is generally defined as anything present in the wrong quantities or concentrations in the wrong place or at the wrong time. It is said to be present when it affects human health or kills other organisms. [1-3] Pollution can also be defined as the disruption of the natural balance of the environment in a way that affects the lives of other organisms. Water pollution is also defined as the disruption of water functions and changes in its chemical, biological, or bacteriological properties, whether in surface water or groundwater. It is defined as a change in the characteristics and properties of water that may negatively affect the health of humans or other living organisms. In other words, water pollution occurs when any unfamiliar substance reaches the water, leading to harmful results that negatively impact other elements of the environment. When these heavy metals reach water bodies, either through soil erosion, dust, airborne precipitation, sewage and industrial waste, or various agricultural and municipal activities, they are either dissolved in the water, bound to zooplankton and phytoplankton, or bound to bottom sediments. Herein lies the environmental and health danger of these elements, as they can reach all levels of the food chain in the water, from plankton, swimming organisms, and benthic organisms, in addition to various aquatic plants. They can also move between water components and layers through the influence of water current movement, bottom emission phenomena, spring and autumn water circulation, or through the influence of high winds and air movement after the end of the life cycle of organisms or the death of some of them, due to various factors. Thus, the cycle is repeated and they accumulate again among the water components, reaching humans, the ultimate recipient of the products of aquatic systems. [4-8]

Experimental Part

Four samples of dam water were collected in plastic containers washed with distilled water. The containers were then filled thoroughly with the samples, which were then filled directly with the water from the four studied dams : ((Al-Mushkhab Dam, Al-Hindiya Dam, Shatt Al-Kufa, and Umm Abbasiyat Dam)) to determine ions ((Cr , Fe , Pb , Mn)) ., The names of the dams were written on the containers for the purpose of identification, with a letter indicating the type of water to be tested and the location of the sample. Additional information was also collected about each dam, including its location, the technology used, and the year of its opening. The samples were then transferred to the laboratory for testing, where they were analyzed within 12 hours of the time of collection. Heavy element ions were measured in the studied samples using a Shimadzu (Flame Atomic Absorption Spectrophotometer))., Table (1) shows the data for all the samples selected in the study. [9-12]

Heavy Elements Measurement

Heavy elements dissolved in water (cadmium and lead) using an Atomic Absorption Spectrometer (AAS)

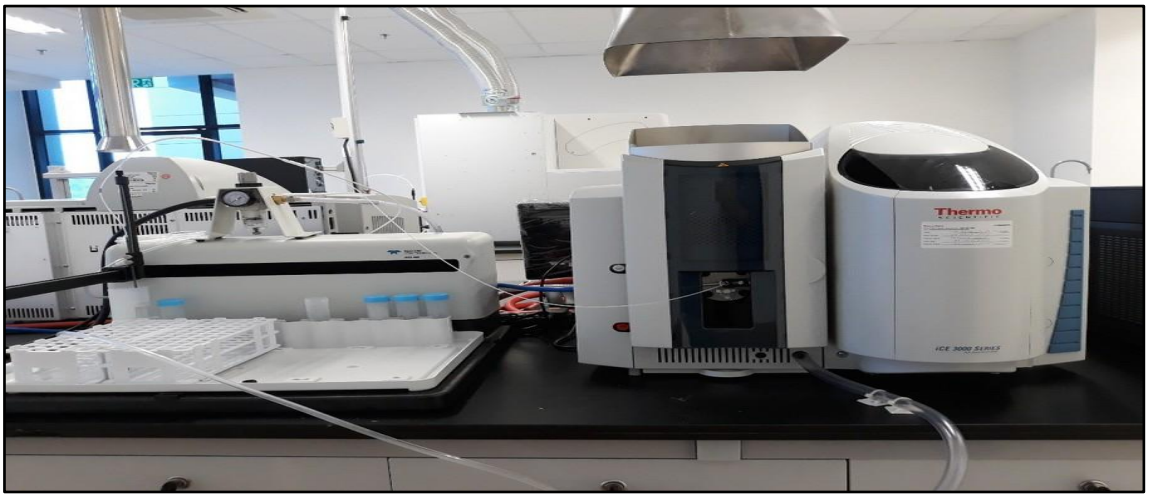

Photo. 2: Flame Atomic Absorption Spectrometer

Results and Discussion

Determination of Heavy Metals Concentrations in Selected Samples

The concentrations of heavy elements (Cr ,Fe , Mn, Pb) were estimated to use a flam atomic absorption spectrometer at wavelengths)[(266, 248, 252 , 242) nm] respectively in the water of dams in Najaf Governorate and the surrounding areas in four dams: ((Al-Mushkhab Dam, Al-Hindiya Dam, Shatt Al-Kufa, and Umm Abbasiyat Dam))., The main cause of water pollution is the discharge of untreated or untreated wastewater into rivers and water bodies. These pollutants include micro and heavy metals, pesticides, and other chemicals, which can accumulate in living organisms to the point of poisoning the final consumer. Sources of pollution include accidental leakage or spillage of chemicals, as well as human activities such as seepage, surface runoff, and atmospheric deposition of chemicals used in agriculture or industry. Materials stored or dumped on or in the soil, as well as transported or packaged pollutants and demolition operations, can lead to soil and water pollution, even within residential areas. [13-18] Wind speed and movement can also cause pollution to spread to dams and surrounding areas. Improper, inadequate, or inappropriate waste disposal practices can lead to various forms of pollution. These pollutants can enter water through surface runoff or seep into groundwater from the soil. These pollutants vary in their tendency to remain in the water held in the soil, seep into groundwater through leaching processes within the soil, or evaporate or evaporate into the atmosphere, returning to the soil and becoming firmly bound within the soil. Furthermore, mineral pollutants typically tend to settle downward or are taken up by living organisms, either dissolved or suspended in the water system. [19-23]

The concentration of these elements depends on temperature, salinity, pH, and the surface area of organic and mineral materials present in the river. Heavy elements are present in aquatic environments either dissolved, in suspended matter, in bottom sediments, or within

the crystalline structure of the minerals that make upriver sediments. However, measuring their concentrations in water over long periods does not provide accurate indicators of pollution due to the variability of water discharges and the instability of pollution sources. Therefore, the focus is on sediments, as sediment particles less than 2 microns in size contain high concentrations of heavy elements due to their high content of clay minerals, which have a high adsorption capacity for these elements in the sedimentary environment, table (1), figures (1-4). [24-29]

Table. 1: Valuation of Concentrations of Heavy Metals in Selected Water Dams by Flam Atomic Absorption Spectrometry

Water Dams	**Concentration of Heavy Metals (ppm)**			
	Pb	**Cr**	**Mn**	**Fe**
Water Dams - 1 : (Shatt Al-Kufa)	8.97	7.43	7.82	7.14
Water Dams - 2 : (Umm Abbasiyat Dam)	6.68	6.19	5.11	6.31
Water Dams - 3 : (Al-Mushkhab Dam)	6.83	4.22	4.79	5.75
Water Dams - 4 : (Al-Hindiya Dam)	7.54	5.24	7.67	6.58

From Results in table (1), we noted that Dams-1 (Shatt Al-Kufa) has higher concentration of heavy metals from all elements, then Al-Hindiya Dam, figures (1-4)

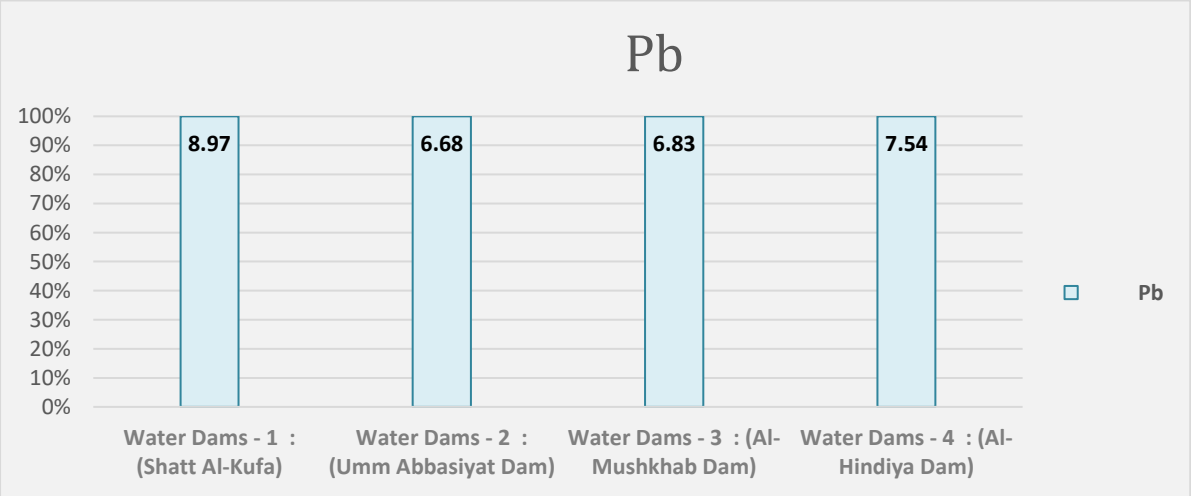

Figure. 1: Concentration of (Pb) in Dams

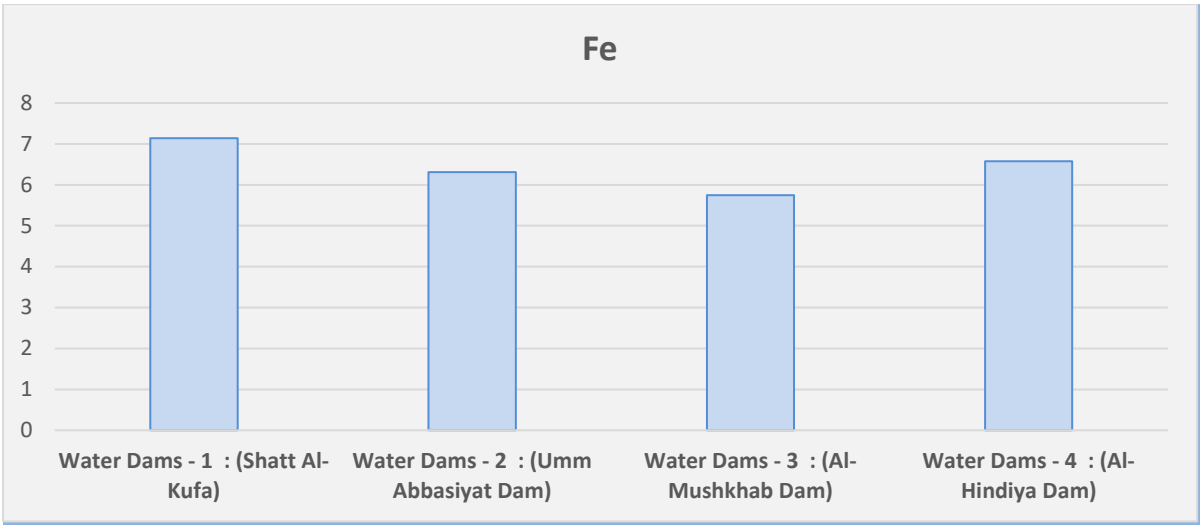

Figure. 2: Concentration of (Fe) in Dams

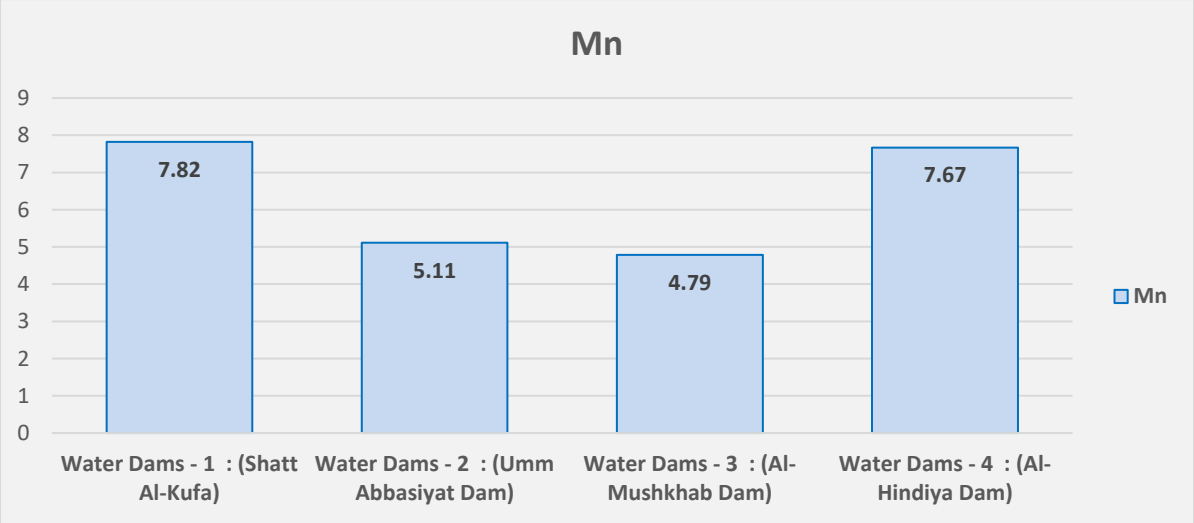

Figure. 3: Concentration of (Mn) in Dams

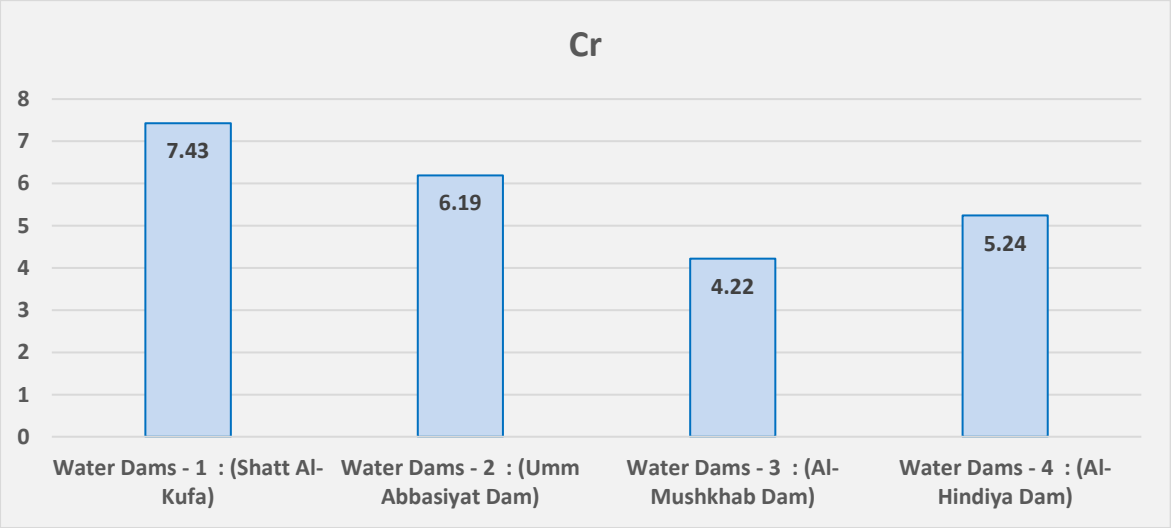

Figure. 4: Concentration of (Cr) in Dams

Electrical conductivity

The electrical conductivity of water samples was measured directly in the laboratory using a Sence Eco 300 EC conductivity meter. The results were expressed as (ds m) and (1:1) (ds m). The electrical conductivity of sample filtration with water was estimated to be using a conductivity meter the electrical conductivity value of the water in the study stations ranged from [7.34 to 5.46 (ds m)]. The highest value was recorded in the water dams in (August 2024), and the lowest value was recorded in the same dams during (March 2025). The results indicated a decrease in the electrical conductivity values of the stations compared to the two seasons, and all recorded values less than 8 (ds m) in all months (Table 2). The reason for the decrease in the electrical conductivity of these stations is due to the lack of pollutants flowing into the water dams. [30-33] This increase is attributed to the station due to the decline in discharge. We found from the results of our study that the conductivity values of the Kufa River water increased. We attributed this to the discharge of sewage into the river environment, which increases the heavy ions in the water and thus increases the conductivity. Data in table (2) and figures (5- 7):

Table. 2: Results of Electrical Conductivity and (pH) of Selected Dams

Water Dams	**Conductivity (dsm^{-1}) in (August -Month)**	**Conductivity (dsm^{-1}) in (March -Month)**	**pH**
Water Dams-1: (Shatt Al-Kufa)	7.34	5.46	7.84
Water Dams-2:(Umm Abbasiyat Dam)	6.15	4.15	7.47
Water Dams-3:(Al-Mushkhab Dam)	5.65	4.32	7.59
Water Dams-4 (Al-Hindiya Dam)	7.12	4.27	7.64

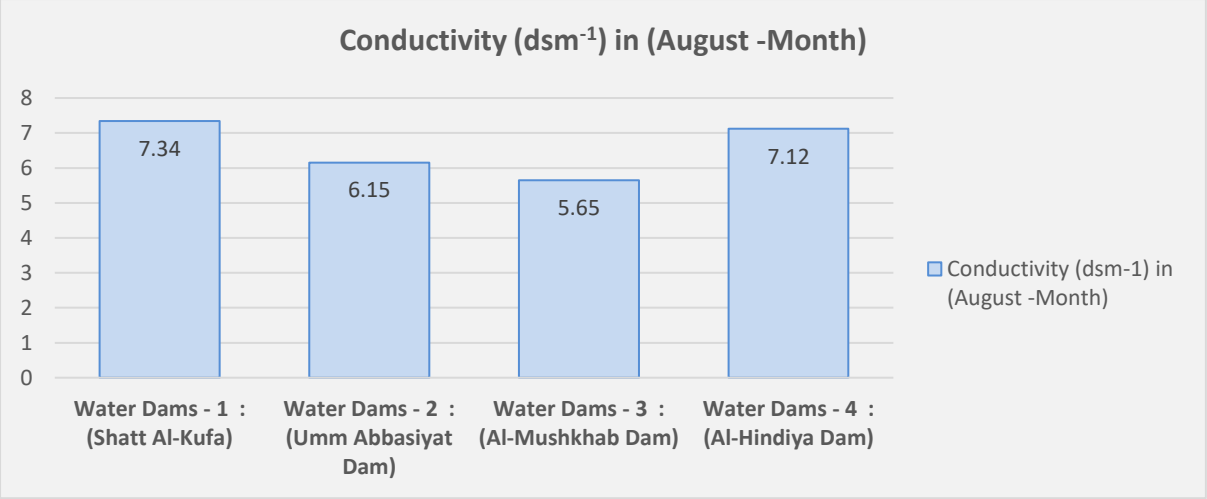

Figure. 5: Electrical Conductivity of Samples (Water Dams) in August-Month

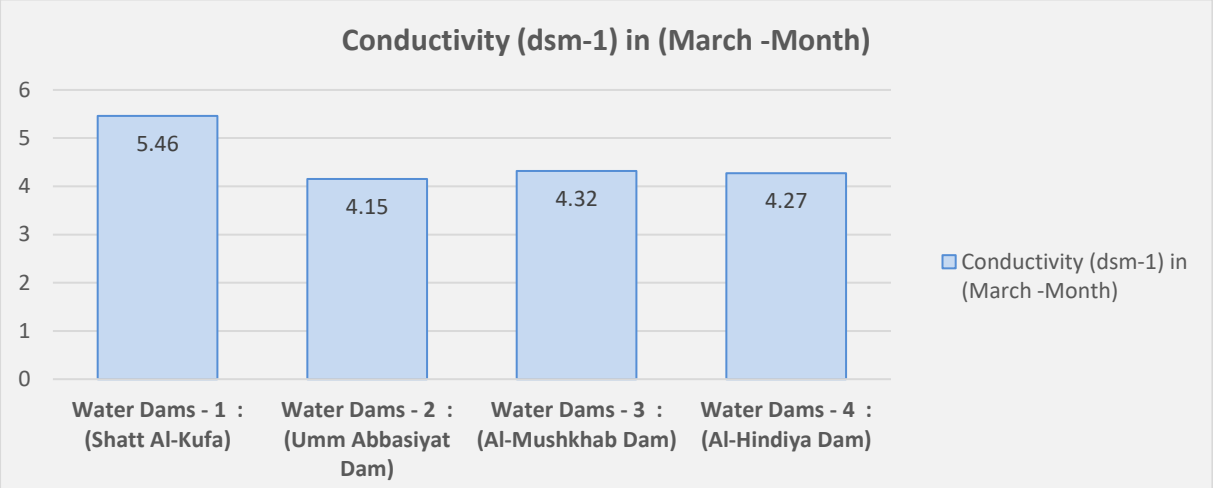

Figure. 6: Electrical Conductivity of Samples (Water Dams) in March-Month

pH -Measurements

The pH of the water was measured in the laboratory using a pH meter after calibrating it with standard solutions (solution buffer). For the samples, the degree of soil interaction was estimated by the four-sample extract with water (1:1). The reaction rate of the water at all study stations was characterized as neutral to slightly basic. The results showed that the water was within the alkaline trend, a characteristic that characterizes Iraqi water, as indicated by many researchers. The values for the river water samples from the selected dams ranged from (7.47 to 7. 84) for Dams, respectively (Table 2). These values fall within the permissible limits for irrigation and drinking according to the classifications of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO), as well as Iraqi specifications. [34-37] , The reason for the high alkalinity is attributed to the presence of bicarbonates and calcium in the water, and to the dominance of basic ions. Water alkalinity is affected by various factors, including carbon dioxide concentration and microbiological activity. The reason for the decrease in some months is due to the depletion of free carbon

dioxide by living organisms, and the accompanying decomposition of bicarbonates, and the decrease in flow velocity due to water scarcity on the other hand. [38-40]

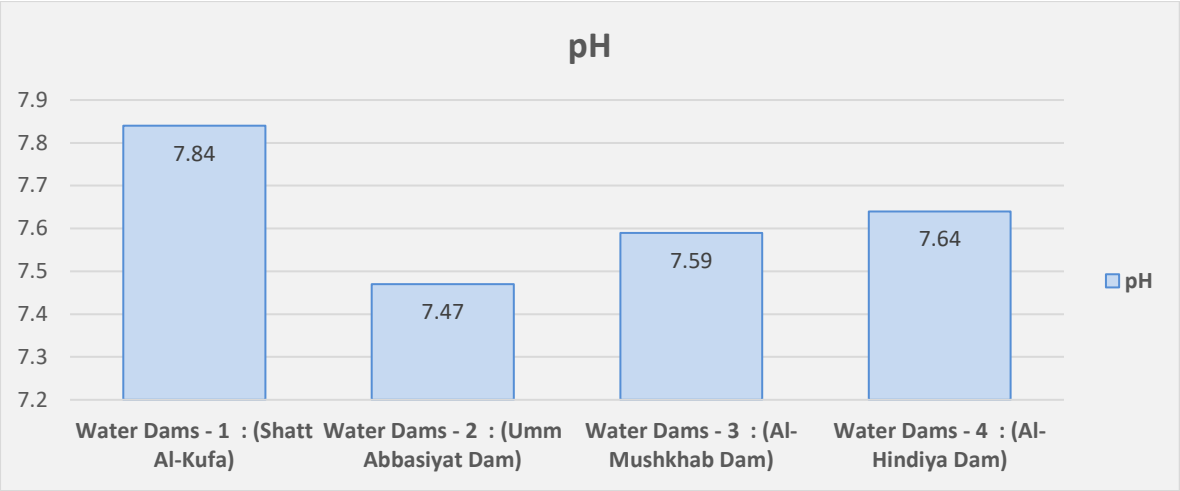

Figure. 6: pH of Samples (Water Dams)

CONCLUSIONS

The subject of pollution and its effects on water dams has occupied a wide space among environmental sciences, both ancient and modern. Humans are one of the biological factors influencing the aquatic environment through various activities, which in various aspects lead to the pollution of the aquatic environment with numerous pollutants. Therefore, international organizations have become increasingly interested in limiting the excessive use of these pollutants and attempting to eliminate them. Environmental scientists have defined water pollution as an increase in the values of chemical, physical, or biological properties at a concentration that makes water harmful to humans, living organisms, or property. Pollution of the aquatic environment with heavy metals has become a significant problem worldwide, as most of them have toxic effects on living organisms (some of which are harmful even at low concentrations). They represent dangerous environmental pollutants because they are non-degradable, so they remain suspended or partially dissolved in the water.

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