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The Study of Heavy Metal Concentrations in Water for Selected Areas the North of Basra

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ABSTRACT
Then current study was conducted in the northern regions of Basra to show the pollution status of life and the extent to which it is affected by various pollutants, including heavy elements. The study period was extended from september 2021 to june 2022 to determine the proportions of some metals in the water during of the two seasons (dry and wet) (zinc, copper, lead, nickel, cadmium, iron). The dry season results revealed that the highest rate of elements (zinc-copper-lead-nickel-cadmium-iron) was recorded (62.95--70.11 31.97-40.21-22.27 -262.08µg/l), while the lowest rate It was recorded (47.94-37.11-29.26 -15.85 - 20.05 -174.01 µg/L) respectively, while during the wet season the highest rate was recorded for (Zinc - Copper - Lead - Nickel - Cadmium - Iron) (70.86 - 77.31 - 41.83 - 48.93 - 25.07 - 251.42 µg/L) respectively, while the lowest rate was recorded (59.05 - 41.04 - 28.43 - 39.45 - 17.31 - 182.06 µg/L) respectively.

Keywords: water pollution, heavy metals.

I. INTRODUCTION

Heavy metal pollution in the aquatic environment has sparked international concern due to its abundance, persistence, and ecotoxicity (Ali *et al.,* 2016). Heavy metals are found in aquatic environments when these bodies of water are far from the source of pollution, in very low concentrations , but As a result, concentrations may rise of rapid population expansion and various human activities (Osma *et al.*, 2013). In aquatic settings heavy metals are frequently resistant to decomposition and can bioaccumulate, potentially leading to the rapid degradation ecosystems, as well as human health (Liu*, et al.,* 2016). There were many sources of heavy metals in the aquatic environment in various concentrations, and they can be separated into two major sources:

Resources from nature : The weathering processes of natural mineral rocks, soil washing operations, forest fires, natural disasters, and agricultural lands, as well as storms, have a role in adding a percentage of heavy elements to the environment (Tsakovski *et al.,* 2012).

Human resources, such as the manufacture of fertilizers, textiles, batteries, dyes, the which encompasses all human-caused sources, such as industrial waste use of agricultural pesticides, the products of oil refineries, and others. Household waste plays a major role in adding quantities of heavy elements to the ocean Song *et al.*,2010)

II. MATERIALS AND PROCEDURES

Six Water samples were collected taken derived from study area in plastic bottles and transferred to the laboratory, where 100 ml of the sample was taken and (5 ml) of acid was added to it, The concentrated nitric acid was heated to near dehydration, then 5 ml of nitric acid concentrate was added to it once more to ensure that the sample is correct was completely digested, then allowed to cool and transferred to special polyethylene containers after diluting it to a certain volume with distilled water free of ions. Thus the sample is prepared for measurement with a spectrometer. Flame atomic absorption (F.A.A.S.) in grams per liter (APHA, 1995).

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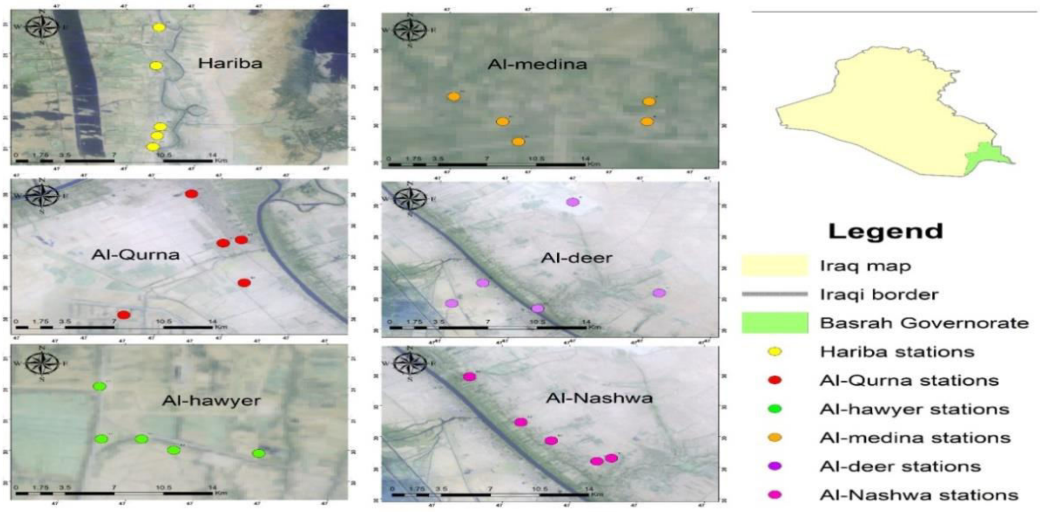
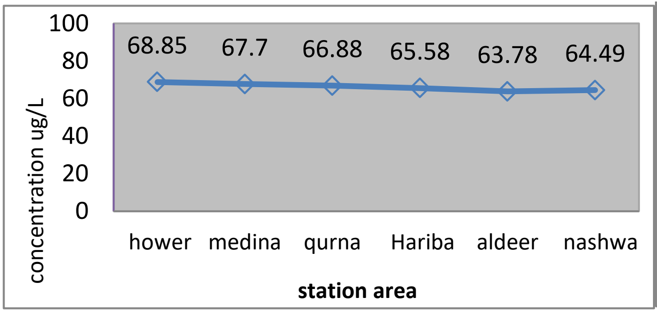


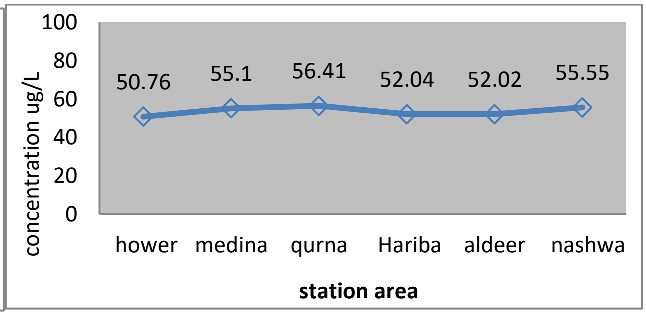
A map showing the sampling areas

III. RESULTS

The results of the study for the dry season showed that the highest rate of zinc was recorded in the Qurna region (62.95 g/l) in the fifth station, and the least expensive rate It was recorded in the Al-Hawyer region (47.94 g/l) in the fourth station, while the total concentration was (56.41 g/L). In the wet season, the highest rate of zinc was in the medina area (70.86 µg/l) in the first station as well as the lowest in the aldeer area (59.05 µg/l) in the fifth station (with a total concentration of(68.85 µg/l). and there are significant differences. In all stations during the study area at P≤ 0.05

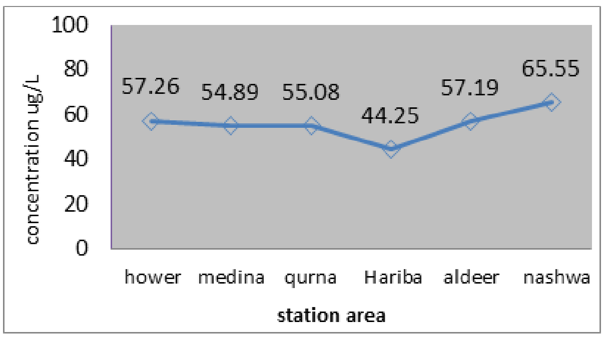


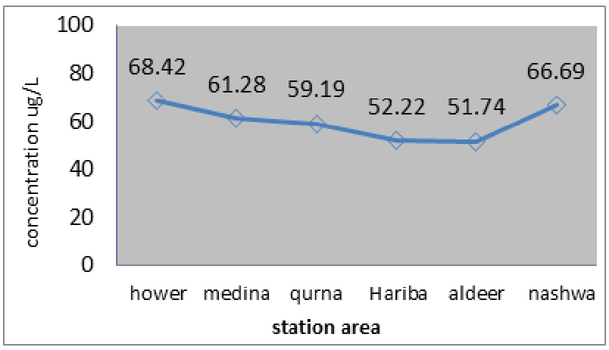
Zinc element in dry separation water samples



Zinc element in wet separation water samples

The outcomes of the dry season revealed that the highest rate of copper was recorded in Al Nashwa area (70.11 µg/L) in the first station, the lowest rate was recorded the Hariba area (37.11 µg/l) in the fourth station, with a total concentration of (65.55 µg/l). In the wet season, the highest rate of copper was in the Al-Nashwa area (77.31 µg/l) in the fifth station, and the lowest rate in the aldeer area (41.04 µg/l) in the fifth station with a total concentration (68.42 µg/l) and there are significant differences in All stations during the study area at P≤0.05





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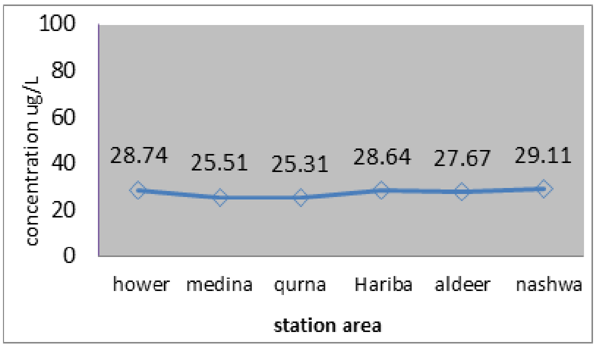
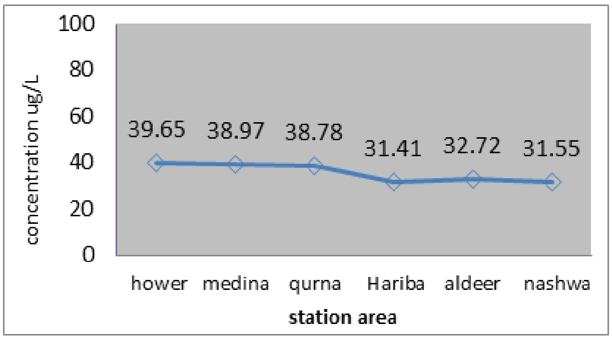
Copper rate in dry separation water samples **Copper rate in wet separation water samples**

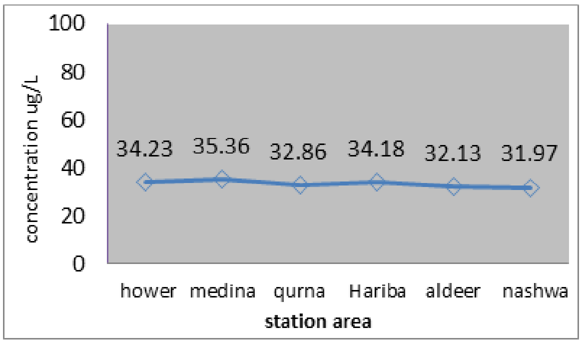
The results of the dry season revealed that the highest rate of lead was recorded the Hariba region (31.97 µg/L) the third station, while the least expensive rate was in the Qurna region (20.05 µg/l) in the third station, with a total concentration of (29.11 µg/l). During the wet season, the highest rate of lead was in Al Haweer region (41.83 µg/L) in the second station, and the lowest in the Hariba region (28.43 µg/L) in the fourth station with a total concentration (39.65 µg/L) and there were significant differences in all stations during the study area at P≤0.05

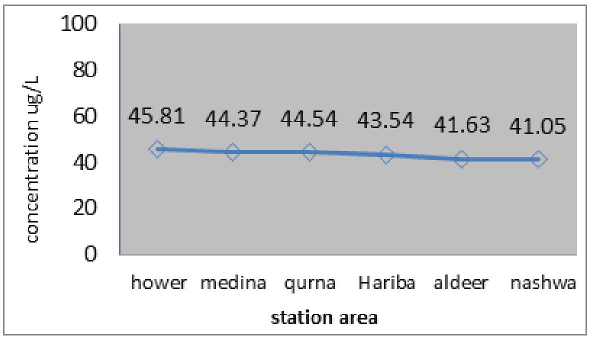




Lead element in dry separation water samples **Lead element in wet separation water samples**

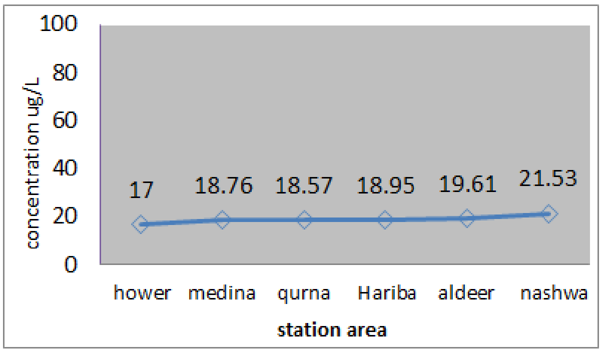
results for the dry season showed that the highest rate of nickel was recorded in the city area (40.21 µg/L) the fifth station, and the least expensive rate was recorded in the aldeer area (29.26 µg/l) in the first station, whereas the total concentration was (35.36 µg/l) During the wet season, the highest rate of nickel was in the Qurna region (48.93 µg/L) in the fourth station, and the lowest rate in the nashwa region (39.45 µg/L) in the second station with a total concentration of 45.81 µg/L) and there were significant differences in All stations during the study area at P≤0.05.



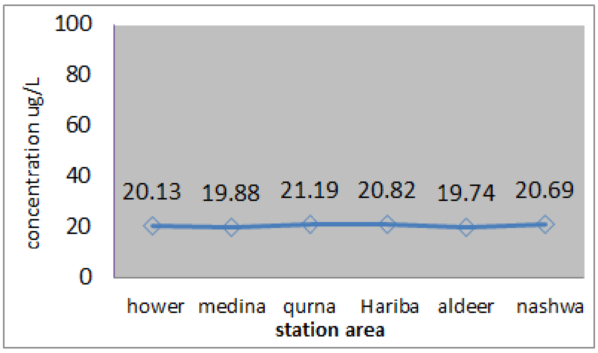


Nickel element in wet separation water samples **Nickel element in wet separation water samples**

The dry season's results revealed that the highest rate of cadmium was recorded in the Nashwa region (22.27 µg/L) in the second station and the lowest in the Al-Hawer region (15.85 µg/l) in the first station, whereas the total concentration reached (21.53 µg/L) either During the wet season, the highest rate of cadmium was in the NASHWA region (25.07 µg/L) in the second station, and the least expensive was in the Al-Hawyer region (17.31 µg/L) with a total concentration of (21.19 µg/L) and there were significant differences in all stations within the region. Study at P≤0.05.

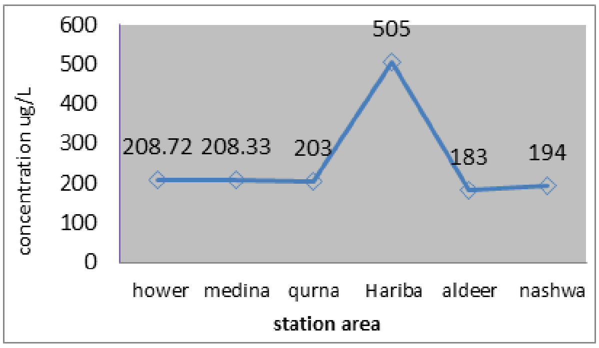


Cadmium in water samples dry separation

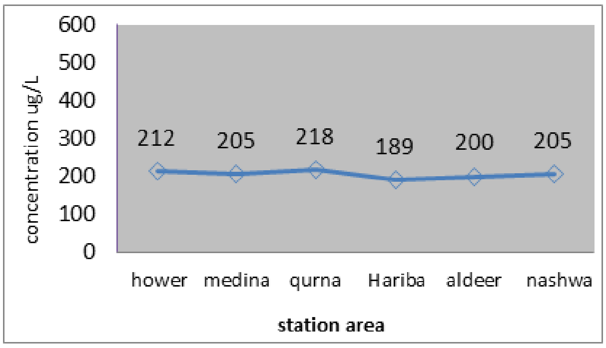


Cadmium element in water samples wet separation

The results of the dry season revealed that the highest rate of iron was recorded in Al-hower area (262.08 µg/L) in the first station, and the lowest rate in the Hariba region (174.01 (µg/l) in the second station, while the total concentration reached (505.29 µg/l). During the wet season, the highest iron rate was reached in the Qurna region (251.42 µg/L) in the fourth station, the lowest in the Hariba region (182.06 µg/L) in the second station with a total concentration (218.08 µg/L) and there are significant differences in all stations during the study area at P≤0.05



Iron element in wet separation water samples



Iron element in dry separation water samples

IV. DISCUSSION

The results of the study for zinc in water demonstrated that the highest rate was recorded during the rainy season with a concentration of (68.85 ug/l) and the lowest rate was recorded in the dry season (50.76 ug/l). Because of air precipitation and acid rain, which contain high levels of this element, in addition to the increase in human and industrial flows rich in pollutants, which are thrown directly into the riverbed and oil spills in rivers, and in a study conducted by(Gokalp & Mohammed, 2019) in the city of Dohuk, Iraq and found that the percentage of zinc contamination is lower than in the current study.

As for the copper element, the outcomes of the current study in water demonstrated that the highest rate of copper was recorded in the wet season (68.42 ug/l) and the lowest rate was recorded in the dry season (44.25 ug/l). He attributed this to the washing of land resulting from the rains and torrential rains that occurred in the southern regions of Iraq, eventually reaching the rivers through sewage and small rivers. These results are consistent with those of (Al-Qaruni, 2011).

As for nickel and lead, they both recorded the highest rates in the wet season (45.81-93.65 ug/l) and the lowest rates in the wet season (31.97-25.31 ug/l). pollution areas near the study area, as well as waste dumping in the waters surrounding the study area, in addition to oil pollution and oil spills into the water. When comparing the current results of nickel and lead to some previous studies, as shown in the table, we find that there is a discrepancy in the concentration ratios of both elements in the previous studies comparedto With our current study.

As for the results of cadmium in the water, it showed values in contrast to the rest of the elements, where the highest rate was recorded in the dry season (21.53 ug/l) and the lowest in the wet season (19.74 ug/l). The reason for the high rate of cadmium in the dry is the high temperature and, consequently, an increase in evaporation rates, which leads to an increase in their concentrations. In addition, an increase in agricultural activity in the summer leads to an increase in the flows of salt and agricultural fertilizers. (Alcom, 2002). When comparing the current results with some previous studies, it was found that the percentage of cadmium concentration in water is higher than its concentration in some previous studies.

As for iron, The study's findings revealed that highest rate of iron was recorded in the dry season (505.29) µg/l) and the lowest rate recorded in the wet season (189.87 µg/l) due to the high temperatures and the increase in evaporation and the accompanying decrease in the water level which led This causes a rise in the concentration of these elements in the aquatic environment (Al-Qaruni, 2011).

The table shows a comparison between the concentration values of the elements in the current study with some previous studies

Station area	**zinc**	**copper**	**Lead**	**Nickel**	**cadmium**	**iron**	**Source**
Shatt Al-Arab River	-	43.9-87.1	34.8-102	25.6-59.7	2.18-5.77	-	**AlShmailawi& Atia ,2021**
at Al-Delmaj Marsh, Al-Kut Province, Iraq	1.61-2.339	0.228-0.571	3.10-3.90	1.419-1.767	0.12-0.18	7.166-9.313	**Al-Hemidawi *et al.*, 2020**
Thi-Qar province, southern Iraq	-	-	2.97	0.56	0.06	-	**Al-Atbee *et al.*, 2020**
Duhok city, Iraq	0.051-0.92	-	0.0274	0.14	0.0064	0.003-2.2	**Gokalp & Mohammed, 2019**
Marshes of Chabayish	-	-	**2.97**	-	**0.06**	-	**2018, Al-Atabi**
Tigris river/IRaq	49	2-40.10	**8.60-403**	7.30-80.20	**4.50**	-	**Al Obaidy *et al.*, 2015**
Beni Hassan-Al-irag Table	-	**0.09**	**2.45**	-	**0.51**	**2.78**	**Sharifi, 2014**
River, Diyala, Iraq	2.80-9	**62**	**218-330**	86-108	**8-12**	**127-218**	**Al Obaidy *et al.*, 2014**
Euphrates River - Iraq	-	-	**0.021**	-	**6.46**	**79.04**	**Al-Ghanimi , 2011**
North of basra	50.76-68.85	44.25-68.85	25.31-39.65	31.97-45.81	19.74-21.53	189.87-505.29	**The current study**

V. CONCLUSIONS

1- The concentrations of heavy metals were within the permissible values for another study in the region.
2- The use of water quality and pollution indicators is a comprehensive tool for assessing quality and pollution levels.

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