



RESEARCH PAPER

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Study of heavy metals in River Dor at Sarai Saleh Khyber Pakhtunkhwa, Pakistan

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Abstract

The current study was conducted to explore the quantity of toxic metals such as Pb, Cd, Zn, Cr, Cu and Mn in River Dor at Sarai Saleh Khyber Pakhtunkhwa, Pakistan. Three sampling sites were selected for detection of heavy metals. Results obtained from the present study comprise Cu 1.05-1.27, Cd 0.06-1.39, Pd 0.06-1.29 and Cr 0.03-0.16. These heavy metals were beyond the permissible range. The remaining two heavy metals Zn 1.15-1.81 and Mn 0.04-0.07 were found within the permissible limits. The concentration of exceeded heavy metals might be a risk factor for many diseases. This site of the River Indus is not suitable for agricultural activities and cattle's use because of high concentration of toxic metals availability. To avoid this health hazard pollution, both Government and public support is necessary.

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Introduction

Heavy metal contamination of aquatic system has attracted the attention of several investigators both in the developed and developing countries. Industrial effluents and domestic waste/sewage constitute largest sources of heavy metal which contribute to the steadily increasing metallic contaminant in aquatic and terrestrial environment in most part of the world thereby causing adverse effects on aquatic biota and human health (Wang, 2002; Dautremepuits *et al.*, 2004). Usually in unaffected environments, the concentration of most of the metals is very low and is mostly derived from the mineralogy and the weathering (Karbassi *et al.*, 2008).

These elements have attracted particular consideration in the recent two decades and within the framework of environmental investigation. Pollution of the natural environment by trace elements is a worldwide problem. These metals are indestructible because of their resistance to decomposition in natural condition (Khan, 2011). A survey was carried out by Usman *et al.* (2017a) to find out the concentration of heavy metals in Jhanjira Upper site of the River Kabul KP, Pakistan. The results obtained from the current study were in the range of Zn 1.11-1.97 ppm; Cu 1.05-1.63 ppm; Cd 0.11-0.89 ppm; Pb 0.07-1.07 ppm; Cr 0.01-0.11 ppm and Mn 0.02-0.28 ppm respectively. Analysis of heavy metals was determined by Usman *et al.* (2017b) to explore the amount of heavy metals in River Kabul at Khairabad water KP Pakistan.

The heavy metals recorded were Zn 1.5-1.59 ppm; Cu 1.15-1.94 ppm; Cd 0.02-0.05 ppm; Pb 0.15-0.73 ppm; Cr 0.01-0.02 ppm and Mn 0.07-0.21 ppm respectively. Assessment of heavy metals were carried out by Usman *et al.* (2017c) to examine the concentration of health hazard toxic metals in River Kabul at Khazana Suger Mill Peshawar KP, Pakistan. Heavy metals concentration obtained from the present study was Zn 1.13-201 ppm; Cu 0.55-0.9 ppm; Cd 0.02-1.22 ppm; pb 1.231.84 ppm; Cr 0.21-1.2 ppm and Mn 0.02-0.05 ppm respectively. Usman *et al.* (2017e) work on River Kabul at Cantt area Nowshera to evaluate heavy metals. The metals which were

recorded in the present study were Zn 1.13-1.85 ppm; Cu 1.02-1.21 ppm; Cd 0.03-1.32 ppm; pb 0.04-1.23 ppm; Cr 0.010.16 ppm and Mn 0.00-0.00 ppm respectively. In a research study demonstrated by Usman *et al.* (2018) to estimate the amount of heavy metals in the water of River Kabul at Jehangira Lower KP, Pakistan. The highest concentration of the heavy metals was found Cu 0.2-1.66, Cd 0.06-0.96, Pd 0.02-1.1, Cr 0.01-0.06 while the lowest concentration was found Mn 0.11-0.23 and zinc 1.13-2.37 respectively.

Another study was conducted by Masood *et al.* (2014) to find out heavy metals profile of *Barilius bendelisis*, plant (spirogyra), and water samples of the Shnebaye stream. The recorded level of the values of these heavy metals in plant (spirogyra) and soil were Cd>Ni>Cu>Zn and Cd>Ni>Cu>Zn respectively, while the values of selected heavy metals in surface, middle and startup water of stream were as follows; Ni>Cu>Cd>Zn (surface water), Ni>Cu>Cd>Zn (mid water) and Ni>Cu>Cd>Zn (startup water), respectively. The aim of the current research work was to study of heavy metals in River Dor at Sarai Saleh Khyber Pakhtunkhwa, Pakistan

Materials and methods

Study Area

Sarai Saleh is very imported spot of the River Dor located in Hazara Division Kyber Pakhtunkhwa Pakistan. This site of the river consisting low water bodies. In this point of the River is very narrow and speed of the water is also very slow. Over here almost Cyprinidae fish fauna are existing. This zone of the River Dor is very suitable for other invertebrates and vertebrates fauna. This area is very suitable for wild life conservation. Among the vertebrates wild life fauna Jackal, wolf, Porcupine, Gray partridge, Black Partridge are very popular.



Fig. 1. Map of River Dor at Sarai Saleh site KP, Pakistan.

Sampling of Water

Water samples were stored in clean and dry plastic bottles with screw caps and labeled. The freshly collected samples were analyzed for Heavy metals analysis at GC University Faisalabad lab by using atomic absorption

Method for preparation of stock solution

The stock solution was prepared as 1000 ppm = 1000mg/l. Then 100 ppm solution was prepared from stock solution using serial dilution equation of $C_1V_1 = C_2V_2$

Determination of heavy metals in water

The water samples were first filtered with the help of filter paper and then taken in 250ml of glass bottles and subjected to the atomic absorption spectrophotometer (Zn, Cu, Cd, Mn, Cr, Pb) at GC University Faisalabad lab.

Results and discussions

The main aim of the present investigation was to find out the concentration of heavy metals in River Dor at Sarai Saleh Khyber Pakhtunkhwa, Pakistan. For this purpose three sampling sites were selected for detection of heavy metals. Results obtained from the present study comprise Cu 1.05-1.27, Cd 0.06-1.39, Pd 0.06-1.29 and Cr 0.03-0.16. These heavy metals were beyond the permissible range. The remaining two heavy metals Zn 1.15-1.81 and Mn 0.04-0.07 were found within the permissible limits.

The amount of exceeded heavy metals might be a risk factor for many diseases. According to Nazir *et al.* (2015). Heavy metals are bioaccumulated and biotransferred both by natural and anthropogenic sources. Results showed that concentrations of cadmium, chromium, iron and lead in water were recorded above the permissible limits set by WHO while zinc and copper were recorded below the permissible limits and no concentration of nickel was recorded in water samples. Another study was carried out by Ullah *et al.* (2016) to estimate 96hr LC₅₀ value of Cadmium sulphate for the fish, *Labeo rohita*. The results showed that the median lethal concentration (LC₅₀) of Lead Nitrate for the fish, *Labeo rohita* is 24mg/l.

The susceptibility of *Labeo rohita* to the lethal effect of Cadmium sulphate was dependent on duration as well as on concentration. The mortality of the fishes is directly proportional to the concentration. Usman *et al.* (2017e) work on River Kabul at Cantt area Nowshera to evaluate heavy metals. The metals which were recorded in the present study were Zn 1.13-1.85 ppm; Cu 1.02-1.21 ppm; Cd 0.03-1.32 ppm; pb 0.04-1.23 ppm; Cr 0.010-0.16 ppm and Mn 0.00-0.00 ppm respectively. A survey was carried out by Usman *et al.* (2017f) to find out the concentration of heavy metals in Jhanjira Upper site of the River Kabul KP, Pakistan. The results obtained from the current study were in the range of Zn 1.11-1.97 ppm; Cu 1.05-1.63 ppm; Cd 0.11-0.89 ppm; Pb 0.07-1.07 ppm; Cr 0.01-0.11 ppm and Mn 0.02-0.28 ppm respectively. Analysis of heavy metals was determined by Usman *et al.* (2017g) to explore the amount of heavy metals in River Kabul at Khairabad water KP Pakistan. The heavy metals recorded were Zn 1.5-1.59 ppm; Cu 1.15-1.94 ppm; Cd 0.02-0.05 ppm; Pb 0.15-0.73 ppm; Cr 0.01-0.02 ppm and Mn 0.07-0.21 ppm respectively.

Table 1. Concentration of heavy metals (ppm) in River Dor at Sarai Saleh site KP, Pakistan.

S.No	Metals	U.S	M.P	D.S	Permissible limits
1	Zn	1.15	1.81	1.34	5.0 mg/l
2	Cu	1.05	1.27	1.07	0.05 mg/l
3	Cd	0.06	1.39	0.15	0.05 mg/l
4	Pb	0.06	1.29	0.07	0.05 mg/l
5	Cr	0.03	0.16	0.06	0.05 mg/l
6	Mn	0.04	0.07	0.05	50-70 mg/l

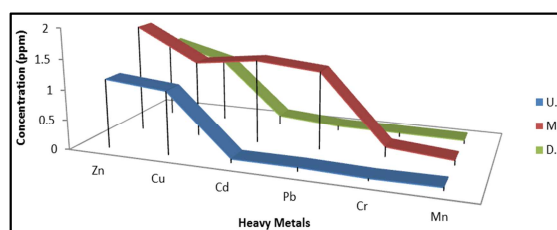


Fig. 2. Concentration of heavy metals (ppm) in River Dor at Sarai Saleh site KP, Pakistan. U.S (Up stream); M.P (Mid point); D.S (Down stream).

Conclusion

The main goal of the current survey was to find out heavy metals concentration in River Dor at Sarai Saleh site Khyber Pakhtunkhwa Pakistan.

The study revealed that maximum heavy metals crossing the permissible limits which are not good for health.

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References

- Dautremepuits C, Paris-Palacios S, Betouille S, Vernet G.** 2004. Modulation in hepatic and head kidney parameters of carp (*Cyprinus carpio* L.) induced by copper and chitosan. *Comparative Biochemistry and Physiology Part C Toxicology and Pharmacology* **137**, 325-33.
- Karbassi AR, Monavari SM, Nabi Bidhendi GR, Nouri J, Nematpour K.** 2008. Metal pollution assessment of sediment and water in the Shur River. *Environ. Monitor. Assess* **147(1-3)**, 107-116.
- Khan AT.** 2011. Trace elements in the Drinking water and their possible health effects in Aligarh city. *Ind. J. Wat. Res. Prot.* 2011; **3**, 522-530.
- Masood Z, Ullah A, Firdous N, Muntaha ST, Manzoor L, Naz S, Zaman S, Ahmad W, Ullah H, Rehman HU.** 2014. Heavy Metals Detection of a Carp Species, *Barilius bendelisis* (family cyprinidae) Collected from the Shnebaye Stream of District Karak, Khyber Pakhtunkhwa Province, Pakistan. *Int. J. Pharm. Sci. Rev. Res* **28(2)**, 216-219.
- Nazir R, Khan M, Masab M, Rehman HU, Rauf NU, shahab S, Ameer S, Sajed M, Ullah M, 1, Rafeeq M, Shaheen Z.** 2015. Accumulation of Heavy Metals (Ni, Cu, Cd, Cr, Pb, Zn, Fe) in the soil, water and plants and analysis of physico-chemical parameters of soil and water Collected from Tanda Dam Kohat. *J. Pharm. Sci. & Res.* Vol. **7(3)**, 89-97.
- Ullah A, Rehman HU, Saeed W, Quraish MF, Ullah Z, Haroon, Rehman RU, Awais S, Raqeebullah., Ahmad W, Saeed K.** 2016. Determination of 96-hr LC50 value of cadmium for a fish, *Labeo rohita*. *Journal of Entomology and Zoology Studies* **4(5)**, 380-382.
- Usman K, Rehman HU, Khudadad HS, Pervaiz K, Ali SZUA, Maqsood MJ, Jawad SM, Nazir R, Ihtesham Y.** 2017c. Evaluation of heavy metals in River Kabul at Khazana Sugar Mill Peshawar Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* **5(6)**, 2417-2419.
- Usman K, Rehman HU, Khudadad HS, Pervaiz K, Ali SZUA, Maqsood MJ, Jawad SM, Din AU, Ihtesham Y.** 2018. Investigation of heavy metals in River Kabul at Jehangira lower Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studie* **6(1)**, 100-102.
- Usman K, Rehman HU, Khudadad S, Pervaiz K, Ahmad N, Bilal M, Hussain ST, Jawad SM, Khan M, Akbar MU.** 2017a. Heavy metals analysis in River Kabul at Jhangira Upper Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* **5(6)**, 2485-2487.
- Usman K, Rehman HU, Khudadad S, Pervaiz K, Ahmad N, Bilal M, Hussain St, Jawad SM, Khan M, Ali M.** 2017d. Estimation of heavy metals in River Kabul at Cantt area Nowshera Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* **5(6)**, 2275-2277.
- Usman K, Rehman HU, Khudadad S, Pervaiz K, Ahmad N, Bilal M, Hussain ST, Jawad SM, Khan M, Akbar MU.** 2017f. Heavy metals analysis in River Kabul at Jhangira Upper Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* **5(6)**, 2485-2487.
- Usman K, Rehman HU, Khudadad S, Pervaiz K, Ali SZUA, Maqsood mJ, Jawad SM, Din AU, Ihtesham Y.** 2017b. Measurement of heavy metals in River Kabul at Khairabad Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* **5(6)**, 2263-2265.

Usman K, Rehman HU, Khudadad S, Pervaiz K, Ali SZUA, Maqsood mJ, Jawad SM, Din AU, Ihtesham Y. 2017g. Measurement of heavy metals in River Kabul at Khairabad Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* **5(6)**, 2263-2265.

UsmanK, Rehman HU, Khudadad S, Pervaiz K, Ahmad N, Bilal M, Hussain St, Jawad SM, Khan M, Ali M. 2017e. Estimation of heavy metals in River Kabul at Cantt area Nowshera Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* **5(6)**, 2275-2277.

Wang WX. 2002. Interaction of trace metals and different marine food chains. *Marine Ecology Progress Series* **243**, 295-309.