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## Investigation of heavy metals in River Kabul at Jehangira lower Khyber Pakhtunkhwa, Pakistan

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**Abstract**

The aim of the present study was to estimate the amount of heavy metals in the water of River Kabul at Jehangira Lower Khyber Pakhtunkhwa, Pakistan. Water sampling was carried out in different interval of time for detection of heavy metals at PCSIR laboratories Peshawar. 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. The highest concentration of the heavy metals found may effect on may aspect of life. This high range of heavy metals is very toxic to all living organisms including human being. The results of the heavy metals investigation revealed that the condition of water is not fitting for aquatic life and human utilization due to addition of public and manufacturing contamination. This problem needed to be resolved directly with both community and Private Corporation.

**Keywords:** River, Kabul, Lower Jehangira, pollutants, Heavy Metals, waste

**1. Introduction**

They are also regarded as trace elements <sup>[1]</sup>. Many factors enhances their detrimental effect and may involve the age of particular species, sex of an individual, concentration of dose, route of exposure as well as various biological and physiological adaptations perform an essential part <sup>[2]</sup>. On account of their high level of toxicity chromium, lead, mercury, arsenic and cadmium, rank among the priority metals that are of great health significance. These metallic elements are viewed as systemic toxicants that are known to incite numerous organ damages, even at lower levels of exposure <sup>[3]</sup>. Heavy metals influence cellular organelles and various enzymes involved in metabolic process, detoxification, and damage repair <sup>[4]</sup>. Metal ions also damages DNA molecule and nuclear proteins that may possibly lead to carcinogenesis or apoptosis <sup>[5]</sup>. Heavy metals are environmentally present everywhere, readily get dissolved in water and are the major persistent element in the aquatic ecosystem. The major component of most aquatic habitats is fish and they are considered as bio-indicator of heavy metal levels in aquatic environment <sup>[6, 7]</sup>. The fresh water ecosystem occupies an extremely small area in comparison to marine ecosystem. Fresh water resources now a day's degraded at a very large scale, due to water pollution <sup>[8]</sup>. The aim of the research work was the investigation of heavy metals in River Kabul at Jehangira Lower Khyber Pakhtunkhwa, Pakistan

**2. Materials and Methods****2.1 Study Area**

Jehangira Lower is a town in the Khyber-Pakhtunkhwa province in north-western Pakistan. It is situated on the banks of River Kabul before its convergence with Indus River near Attock. The river divides Jehangira into two union councils and districts. Eastern Jehangira is under Swabi district while western Jehangira is under the administration of Nowshera District. Wide boundaries of Jehangira town touch the mountains of Khawri behind Jehangira Railway station in the west. The southern shore of Indus river sets the border with (Attock district) Punjab, Pakistan. Tordhair town and AlaDher Village on the east and village Mian-Esa and Jalbai are located in the North of Jehangira. The climate of Jehangira town is similar to Islamabad but some time more humid due to the streams of Kabul and Indus Rivers. In the summer days, chain of Rocky Mountains and desolate area in the northwest brings hot dusty winds in the area,



**Fig 1:** Effluent discharges of Lower Jehangira KP, Pakistan.

## 2.2 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 PCSIR Peshawar by using sophisticated instruments especially atomic absorption [9-10].

## 2.3 Method for preparation of stock solution

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

## 2.4 Determination of heavy metals in water

The water samples were first filtered with the help of filter paper and then taken in 250 ml of glass bottles and subjected to the atomic absorption spectrophotometer (Zn, Cu, Cd, Mn, Cr, Pb) (Model: Z-2000; Hitachi, Tokyo, Japan) which gives direct results of heavy metals on computerized system [9-10].

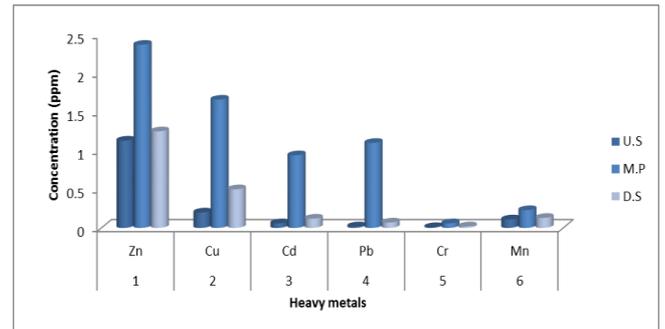
## 3. Results and Discussion

The recorded concentration of heavy metals was found as 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. The output of the heavy metals results shows that water of this site is containing lot of heavy metals. These metals creates serious issues when enter to our bodied by various sources like fish consumption. This site of the river Kabul is highly polluted by waste like garbage and polythene bags. The polythene bags are too much dangerous because they non-digestible. A research study was conducted by Usman *et al.* on River Kabul Khyber Pakhtunkhwa, Pakistan. The aim of the research was to explore the existence of heavy metals in the water of River Kabul. For this purpose various heavy metals were selected. These selected heavy metals were Pb, Cd, Zn, Mn, Cu and Cr. These heavy metals were find out by using atomic absorption spectrophotometer. The heavy metals which were examined were in the range of Pb 0.06-4.41 ppm; Zn 4.11-7.11 ppm; Cd 0.42-1.46 ppm; Cu 1.07-3.86 ppm; Mn 0.06-2.11 ppm and Cr 0.05-2.11 ppm [9]. A survey was done by Hassan *et al.* (2012) in River ToiKohat to explore heavy metals. For this survey 3 sites were selected for water sampling. The heavy metals analyzed during this study were: lead (0.33, 0.40 and 0.55 mg/L), zinc (0.34, 0.60 and 0.53 mg/L), cadmium (0.03, 0.08 and 0.13 mg/L), arsenic (0.29, 0.63 and 0.51 mg/L), copper (0.04, 0.04 and 0.03 mg/L) and nickel (0.00, 0.01 and 0.01 mg/L), respectively. From this study it can be concluded that River Toi water is not suitable of both agriculture and aquatic life [10]. The present investigation was conducted on River Kabul at Jehangira Lower Khyber Pakhtunkhwa Pakistan. From the current research the results were analyzed which comprising 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. The current results show variation in the concentrations of heavy metals after comparison. The variation may be due to climatic factor or due to the industrial zone.

**Table 1:** Concentration of heavy metals (ppm) in River Kabul at Jehangira Lower site KP, Pakistan.

S. No.	Metals	U.S	M.P	D.S	Permissible limits
1	Zn	1.13	2.37	1.25	5.0 mg/l
2	Cu	0.2	1.66	0.5	0.05 mg/l
3	Cd	0.06	0.94	0.12	0.05 mg/l
4	Pb	0.02	1.1	0.07	0.05 mg/l
5	Cr	0.01	0.06	0.02	0.05 mg/l
6	Mn	0.11	0.23	0.13	50-70 mg/l



**Fig 2:** Concentration of heavy metals (ppm) in River Kabul at Jehangira Lower site KP, Pakistan. U.S (Upstream); M.P (Mid-point); D.S (Downstream).

## 4. Conclusion

From the present survey, it can be concluded that River Kabul at Jehangira site is too much polluted due to anthropogenic activities and automobile. This site is also affected by the animals excreta. Furthermore, the boats are also affected on river Kabul at Jehangira Lower.

## 5. Acknowledgement

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