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## Analysis of heavy metals in river Kabul at Sardaryab Khyber Pakhtunkhwa, Pakistan

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### Abstract

The present study was conducted to analyse of heavy metals such as Zn, Cu, Cd, Pb, Cr and Mn in River Kabul at Sardaryab Khyber Pakhtunkhwa, Pakistan. Mainly sampling of water was carried out from three locations of the River Kabul at Shah Alam tributary. All the collected samples of water were subjected to the heavy metal detection digital computerize machine (Atomic Absorption Spectrophotometer). The heavy metals analyzed in the present research were in the range of Zn 1.14-1.86 ppm; Cu 1.03-1.22 ppm; Cd 0.12-0.89 ppm; Pb 0.08-1.08 ppm; Cr 0.02-0.12 ppm and Mn 0.03-0.29 ppm respectively. Heavy metals which were above the permissible limits were Pb, Cd and Cu while the remaining heavy metals remain below the permissible limits.

**Keywords:** River, Kabul, Sardaryab, Charsadda, Heavy Metals, anthropogenic

### 1. Introduction

After decades of rapid urbanisation, population growth and industrialization, developing countries are now home to many of the world's most critical air, water and solid waste problems. Earlier studies have identified the rise in the pollution of particular heavy metals in freshwater systems around the world, particularly in rivers. The pollution has mainly been caused by industrial processes and industrial waste, typically from rubber and oil palm mills [1]. Apart from that, the main source of heavy metal pollution also comes in the form of deforestation, domestic or animal farming sewage, sand mining and agriculture [2]. The heavy metal contamination of aquatic ecosystems above the natural background load has drawn the attention of many researchers. Heavy metals may accumulate in aquatic species, enter the food chain and cause serious harm to human health when the contamination content and exposure are significant. Heavy Metal Levels in Fish Tissue from the Kelantan River [3-6]. Consequently, they have been listed by the US Environmental Agency (USEPA) based on their potential for human exposure and health risk [7]. The general symptoms of humans related to metal [e.g., Cd, Pb, As, Hg, Zn, Cu and aluminium (Al)] poisoning include vomiting, convulsions, paralysis, ataxia, hemoglobinuria, gastrointestinal disorder, diarrhoea, stomatitis, tremor, depression and pneumonia [8]. The aim of the research work was to find out the analysis of heavy metals in River Kabul at Sardaryab Khyber Pakhtunkhwa, Pakistan.

### 2. Materials and Methods

#### 2.1 Study Area

Sardaryab is a local tourist and picnic spot near Peshawar, Pakistan. It is situated in the Charsadda District and located on the banks of the Kabul River some 20 Kilometers north in Peshawar. Fishes of the Sardaryab are very popular. This picnic spot comprising a variety of Ichthyofauna and aquatic flora. There are lots of boats available every time for the tourist's entertainment. At summer season, the majority of tourists move toward this recreation place.

#### 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].

### 2.3 Method for preparation of stock solution

The stock solution was prepared as 1000 ppm = 1000 mg/l. Than 100 ppm solution was prepared from stock solution using serial dilution equation of  $C_1V_1 = C_2V_2$  [9].

### 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 a computerized system [9].

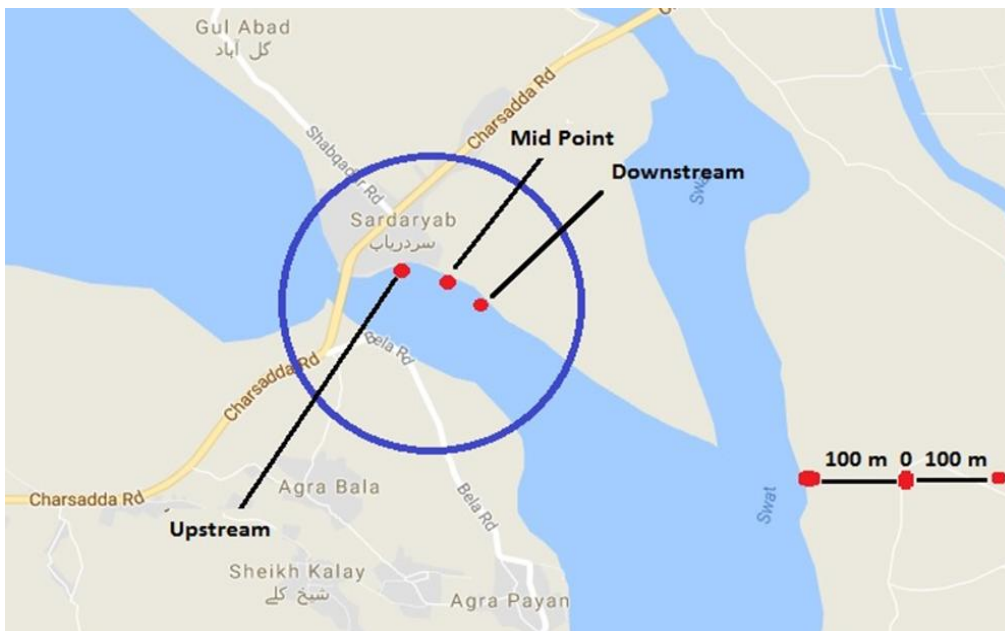


Fig 1: Sardaryab sampling station Khyber Pakhtunkhwa, Pakistan.

### 3. Results and Discussion

Results obtained from the present study was in the range of Zn 1.14-1.86 ppm; Cu 1.03-1.22 ppm; Cd 0.12-0.89 ppm; Pb 0.08-1.08 ppm; Cr 0.02-0.12 ppm and Mn 0.03-0.29 ppm respectively. The heavy metals which were found beyond the recommended standard level were Pb, Cd and Cu while the remaining heavy metals remain below the permissible limits. Hassan *et al.* conducted a study in River ToiKohat to find out the existence of pollutant metals such as lead, zinc, cadmium, arsenic, copper and nickel. For this investigation 3 different sampling sites were selected. During 6 months study the heavy metals recoded were lead (0.33, 0.40 and 0.55 mg/L), zinc (0.34, 0.60 and 0.53 mg/L), cadmiu m (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). The research work conducted on River ToiKohat revealed that aquatic flora and fauna are badly affected by the anthropogenic pollution [10]. The concentration of heavy metals Pb, Cd, Zn, Mn, Cu and Cr) were evaluated by Khalid *et al.* (2017) in the River Kabul Khyber Pakhtunkhwa, Pakistan. During this study, Mn was the only metal which was found below the lethal range. While the remaining 5 metals Pb, Cd, Zn, Cu and Cr were above the standard level recommended by WHO. The heavy metals were examined by Atomic Absorption Spectrophotometer. The amount of recorded heavy metals were 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 respectively [11]. The heavy metals examined during the current survey were Zn 1.14-1.86 ppm; Cu 1.03-1.22 ppm; Cd 0.12-0.89 ppm; Pb 0.08-1.08 ppm; Cr 0.02-0.12 ppm and Mn 0.03-0.29 ppm respectively. This site is badly affected by the tourism load, especially at the months of Jun and July. Every year a lot of tourists enter to Sardaryab picnic spot for entertainments. Diseases are also spread by the migration diseases victim tourists. The River Kabul is badly contaminated at this site by the garbage's thrown into the

water by tourists. Besides all these contamination factors, there are some other resources through which this site is also affected like washing of vehicles in the bank of the river. The fuel of the vehicle contains Tetraethyl lead, which enters to the water. Furthermore, this site is affected by some tourists by using powder and dynamites for fishing which are illegal ethical.

Table 1: Concentration of heavy metals (ppm) in River Kabul Sardaryab site KP, Pakistan.

S. No.	Metals	U.S	M.P	D.S	Permissible limits
1	Zn	1.14	1.86	1.34	5.0 mg/l
2	Cu	1.03	1.22	1.04	0.05 mg/l
3	Cd	0.12	0.89	0.18	0.05 mg/l
4	Pb	0.08	1.08	1.09	0.05 mg/l
5	Cr	0.02	0.12	0.03	0.05 mg/l
6	Mn	0.03	0.29	0.07	50-70 mg/l

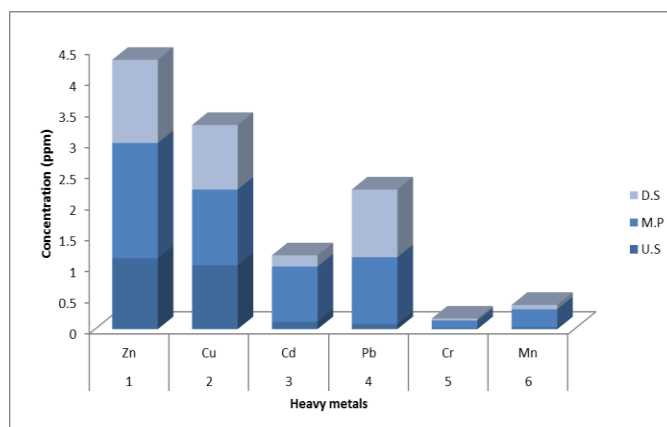


Fig 2: Concentration of heavy metals (ppm) in River Kabul at Sardaryab site KP, Pakistan. U.S (Up stream); M.P (Mid point); D.S (Down stream).

#### 4. Conclusion

In the present investigation, the results were found in the range of Zn 1.14-1.86 ppm; Cu 1.03-1.22 ppm; Cd 0.12-0.89 ppm; Pb 0.08-1.08 ppm; Cr 0.02-0.12 ppm and Mn 0.03-0.29 ppm. From the obtained results one can conclude that the area of Sardaryab was badly affected by the tourism activities and automobile fuels as well.

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