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Measurement of heavy metals in River Kabul at Khairabad Khyber Pakhtunkhwa, Pakistan

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Abstract
The present investigation examined the heavy metals concentration of River Kabul at Khairabad water. The samples were divided into groups namely: Upstream, Mid-Point and Downstream. These samples were analyzed for heavy metals using Atomic Absorption Spectrophotometer. The mean concentration computed for borehole water samples 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. In the present investigation Cu and Pb were above the permissible limits while the remaining heavy metals were in limits. The present study recommends that the water should be treated for both heavy metals before consumption.

Keywords: River, Kabul, Khairabad, Heavy Metals, discharge. Pollution

1. Introduction
Developing countries are facing the problem of water pollution due to rapid spread of industrialization and civilization. These industries produce large amount of polluted products especially heavy metals that are constantly drained untreated into nearby rivers [1]. The impact of heavy metals on water ecosystem has turned out to be a global concern [1-2]. Among other organic and inorganic pollutants our aquatic systems may extensively be contaminated with heavy metals [2, 3]. 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 [4, 5]. The aim of the research work was to find out the measurement of heavy metals in River Kabul at Khairabad Khyber Pakhtunkhwa, Pakistan.

2. Materials and Methods
2.1 Study Area
Khairabad is also considering very important and attractive places for tourists throughout the Pakistan. It is consider one of the important places in the Khyber Pakhtunkhwa Pakistan. In this area well furnish hotels and recreation places are available for the tourists. There is lot of greenery in this spot. Literacy ratio of this area is moderate. Summer season of this area are moderate. This area consisting of a variety of flora and fauna. In this area very important medicinally important plants are found. The invertebrate's fauna of this area are also famous. This area is very suitable for wildlife conservation point of view. Peoples living near by the bank of river Kabul hunting of fishes especially in the months of Jun and July.

Fig 1: Khairabad sampling station Khyber Pakhtunkhwa, Pakistan.

The three red dots shown sampling spots away 100 m from each other.

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 [6, 7].

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 givs direct results of heavy metals on computerized system [6, 7].

3. Results and Discussion
The results of the current study were in the ranges of 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. The present investigation reviled that Cu and Pb were found exceed the standard level. Furthermore, the local community plays a vital role to keep this site safe from pollution. Besides all these, the automobiles also badly affected on the river by washing their vehicles on the bank of the river. So environmental protection should want to stop such types of activities to keep the river from further contamination.

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

S. No.	Metals	U.S	M.P	D.S	Permissible limits
1	Zn	1.5	1.59	1.28	5.0 mg/l
2	Cu	1.15	1.94	1.28	0.05 mg/l
3	Cd	0.02	0.05	0.03	0.05 mg/l
4	Pb	0.15	0.73	0.24	0.05 mg/l
5	Cr	0.01	0.02	0.01	0.05 mg/l
6	Mn	0.07	0.21	0.12	50-70 mg/l

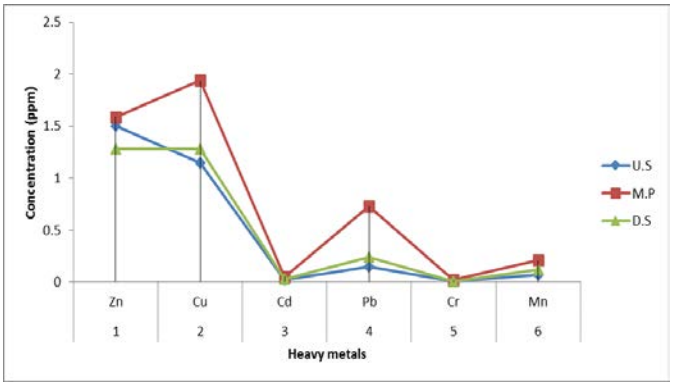

Fig 3: Concentration of heavy metals (ppm) in River Kabul at Khairabad site KP, Pakistan. U.S (Up stream); M.P (Mid point); D.S (Downstream).

According to Hassan *et al.* River Toi Kohat water is not suitable for flora and fauna. From River Toi toxic pollutant were examined in various concentration like 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. Furthermore, River Toi Kohat is effected by domesticated sewages [6]. A detailed survey was conducted by Usman el al. to explore the concentration of heavy metals in the water of River Kabul Khyber Pakhtunkhwa, Pakistan. The purpose of the study was to find out heavy metals (Pb, Cd, Zn, Mn, Cu and Cr) in the River Kabul. With the help of Atomic Absorption Spectrophotometer all the selected heavy metals were analyzed. All the metals i.e. Pb, Cd, Zn, Cu and Cr were above the slandered level except Mn. The evaluated 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 [7]. The results of the both study areas shows variation. In the present study the results were obtainedZn 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. Hence Cu and Pb were above the permissible limits while the remaining heavy metals were in limits but in the previous study only Mn was found below the permissible limits. There was a variation in the both study results.

4. Conclusion
We can conclude from the obtained results that this site of the river Kabul is not too much contaminated by the heavy metals. The main source of the pollution was found domesticated discharge and automobiles vehicles. The Government wants to take some step to stop this river site from further pollution. Fishes are also badly affected due to heavy metals. Therefore, from the present investigation we can say that the water quality of this site was not too much affected.

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