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Contamination of Heavy metals in River Shah Alam Peshawar: (A tributary of River Kabul) Khyber Pakhtunkhwa Pakistan

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Abstract
The present survey was carried out to find out the amount of heavy metals in the River Kabul Shah Alam tributary, Peshawar. The selected heavy metals were (Zn, Cu, Cd, Pb, Cr and Mn) were analyzed by Atomic Absorption Spectrophotometer. The concentration of the heavy metals were Zn 1.2-2.0 ppm; Cu 0.17-1.48 ppm; Cd 0.2-0.69 ppm; Pb 1.01-1.23 ppm; Cr 0.04-2.01 ppm and Mn 0.01-0.82 ppm respectively. In this analysis only Cu, Cd, Pb and Cr found above the permissible limits. From this research it can be concluded that almost tanneries waste were added to this station.

Keywords: River, Kabul, Shah Alam, Peshawar, Heavy Metals, analysis, ppm.

1. Introduction
Trace elements are chemical elements that are required in a very minute amount for the proper growth, development and human physiology. They are called heavy metals because their densities greater than 5g/cm^3 [provide reference]. However, these essential trace elements become poisonous when their concentration becomes extreme [1]. 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 [2]. Therefore, monitoring these metals is utmost necessary for safety assessment of the environment and human health in particular. Biologically or chemically these metals cannot be degraded, and thus may either accumulate locally or be transported over long distance [3]. Pollution of the environment by heavy metals is very prominent in areas of mining sites and reduces increasing distance away from these sites. Another contribution of anthropogenic metals of terrestrial origin is from industrial development and other activities such as agriculture, metallurgy and transport [4, 5]. From mining activities, ground water is most vigorously polluted. The aim of the current research work was to find out the contamination of heavy metals in River Shah Alam Peshawar: (A tributary of River Kabul) Khyber Pakhtunkhwa Pakistan.

2. Materials and Methods
Study Area
River Shah Alam is a tributary of River Kabul Khyber Pakhtunkhwa, Pakistan. Sampling was carried out from three sites away from one another 100 meter as shown in the (Fig. 1). This River is contaminated by various resources like domesticated sewage, Industrial discharges, Ganda Erab and Budni Nalla. Besides all these contaminating factors River Naguman sewages discharge into the River Sha Alam.

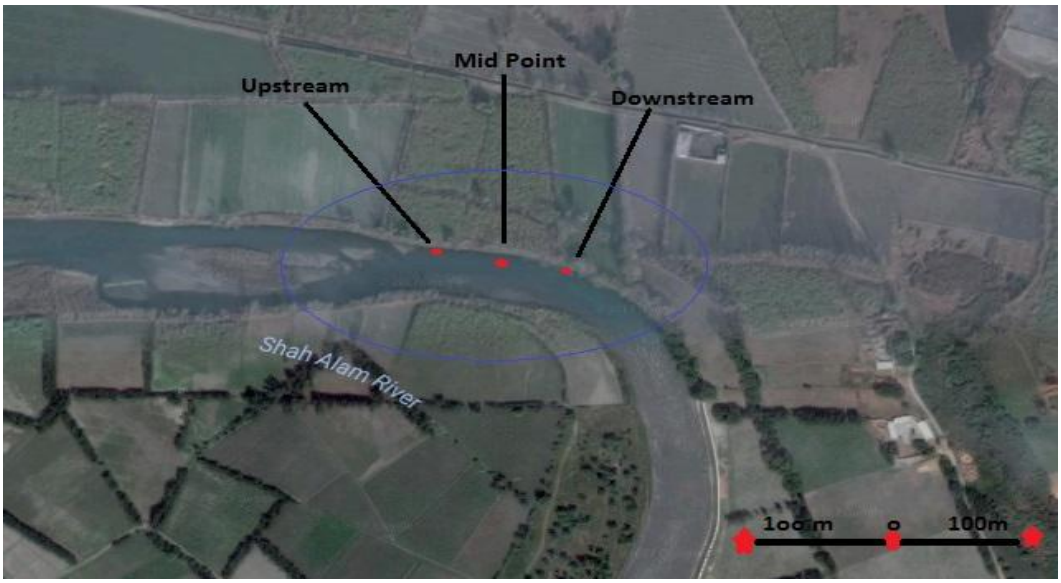

Fig 1: Shah Alam River sampling station Khyber Pakhtunkhwa, Pakistan.

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 PCSIR Peshawar by using sophisticated instruments especially atomic absorption [provide reference].

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 $C_1V_1 = C_2V_2$ [provide reference].

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.

Statistical analysis section is missing

3. Results and Discussion

Heavy metals analyzed in the present research were Zn 1.2-2.0 ppm; Cu 0.17-1.48 ppm; Cd 0.2-0.69 ppm; Pb 1.01-1.23 ppm; Cr 0.04-2.01 ppm and Mn 0.01-0.82 ppm respectively. In this analysis only Cu, Cd, Pb and Cr were exceed the standard level recommended by WHO (1993) [6]. The WHO permissible limits for heavy metals are Zn 5.0 mg/l; Cu 0.05 mg/l; Cd 0.05 mg/l; Pb 0.05 mg/l; Cr 0.05 mg/l and Mn 50-70 mg/l respectively. The present investigation revealed that River Shah Alam Peshawar is badly affected by the various domesticated and industrials influents discharges. Ultimately all these toxic pollutants change water chemistry as results all aquatic organisms are affected severely. This pollution also affected on the population of Ichthyo fauna. Another brief investigation was done by Usman *et al.* (2017) to determine trace metals concentration in River KP, Pakistan. The main goal of the research was to calculate the amount of trace metals. The trace metals were Pb, Cd, Zn, Mn, Cu and Cr respectively. Atomic Absorption spectrophotometer was used for heavy metals analyzing. For this investigation 6 heavy metals were selected. The heavy metals which were detected *et al.* were in the proportion 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 [7]. River Toi Kohat is one of the small River where lot of domesticated and automobile waste discharge every day. To find the main pollutant in this River Toi Kohat Hassan *et al.* (2012) conducted a survey. Duration of the survey was 6 months. From the River Toi Kohat 3 main sites were selected to find out heavy metals concentration. Heavy metals analyzed in this research 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) [8]. The results of present study were different from the previous studies results. In the current study the amount of the heavy metals were Zn 1.2-2.0 ppm; Cu 0.17-1.48 ppm; Cd 0.2-0.69 ppm; Pb 1.01-1.23 ppm; Cr 0.04-2.01 ppm and Mn 0.01-0.82 ppm respectively. In this examination only Cu, Cd, Pb and Cr found to exceed the standard level. The River Shah Alam site was found badly affected by the toxic pollutants. In all the collected samples heavy metals were detected which prove that all the resources like domesticated or industrials influents are too much threaten for the River Shah Alam aquatic environment.

Table 1. Concentration of heavy metals (ppm) in River Kabul at Shah Alam Peshawar site KP, Pakistan.

S. No.	Metals	U.S	M.P	D.S	Permissible limits
1	Zn	1.2	2.00	1.8	5.0 mg/l
2	Cu	0.17	1.48	0.46	0.05 mg/l
3	Cd	0.2	0.69	0.34	0.05 mg/l
4	Pb	1.01	1.23	1.03	0.05 mg/l
5	Cr	0.04	2.01	0.06	0.05 mg/l
6	Mn	0.01	0.82	0.03	50-70 mg/l

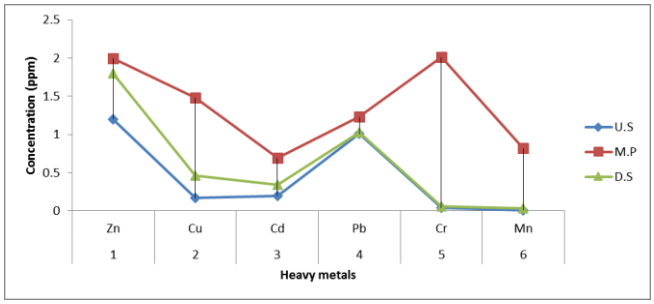

Fig 2: Concentration of heavy metals (ppm) in River Kabul at Shah Alam Peshawar site KP, Pakistan. U.S (Upstream); M.P (Mid-point); D.S (Downstream).

4. Conclusion

From the present results, it can be concluded that River Shah Alam was badly affected by Industrials and domesticated pollutants. In the future, it may create serious health related problems. The present study recommended that both civic and Governments should take action against these contamination resources in time.

5. Acknowledgements

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