

Health risks associated with heavy metals in the drinking water of Swat, Northern Pakistan

Kifayatullah Khan^{1,2}; Yonglong Lu²; Hizbullah Khan¹; Shahida Zakir¹; Ihsanullah³; Sardar Khan¹; Akbar Ali Khan¹; Luo Wei² and Tieyu Wang²

¹*Department of Environmental Sciences, University of Peshawar*

²*State Key Laboratory of Urban and Regional Ecology, Research Centre for Eco-environmental Sciences, Chinese Academy of Sciences, Beijing, China*

³*Nuclear Institute for Food and Agriculture (NIFA), Tarnab, Peshawar*
mr_khann84@yahoo.com

Abstract

The concentrations of heavy metals such as cadmium (Cd), chromium (Cr), copper (Cu), manganese (Mn), nickel (Ni), lead (Pb) and zinc (Zn) were investigated in drinking water sources (surface and groundwater) collected from Swat valley, Khyber Pakhtunkhwa, Pakistan. The potential health risk of heavy metals to the local population and their possible source apportionment were also studied. Heavy metal concentrations were analysed by using atomic absorption spectrometer and compared with permissible limits set by Pakistan Environmental Protection Agency (Pak-EPA) and World Health Organization (WHO). The concentrations of Cd, Cr, Ni and Pb were higher than their respective permissible limits, while Cu, Mn and Zn concentrations were observed within their respective limits set by Pak-EPA and WHO. Health risk indicators such as chronic daily intake (CDI) and health risk index (HRI) were calculated for adults and children separately. CDIs and HRIs of heavy metals were found in the order of Cr > Mn > Ni > Zn > Cd > Cu > Pb and Cd > Ni > Mn > Cr > Cu > Pb > Zn, respectively. HRIs of selected heavy metals in the drinking water were less than 1, indicating no health risk to the local people. Multivariate and univariate statistical analyses showed that geologic and anthropogenic activities were the possible sources of water contamination with heavy metals in the study area.