

Health risk assessments of heavy metals in soil from the vicinity of a kaolin milling plant in Alkaleri Bauchi State, Nigeria

A O Abdullahi¹, O N Maitera², A B Mohammed¹ and A U Maigari¹

¹Gombe State University, Nigeria

²Modibbo Adama University of Technology, Yola, Nigeria

This study concerns the health risk assessments of soil from the vicinity of a kaolin milling plant in Alkaleri, Bauchi State. The aim of the study is to determine the concentration of elements and the health risk assessments of heavy metals in the soil in the kaolin milling plant. Soil samples were collected from 12 sampling points from the vicinity of the milling plant using hand auger at the depth of 0-15cm. The elemental analysis of the soil samples were carried out using neutron activation analysis (NAA). Pb and Zn was determined using atomic absorption spectrophotometer after digestion with mixture of HCl and HNO₃ in 1:3 ratios. The results showed that the concentration of heavy metals in mg/kg were As=0.581±0.49, Cd=0.445±0.74, Cr=59.64±40.12, Co=2.84±1.08, Cu=6.78±13.9, Mn=138.6±27.9, Pb=11.36±2.98, V=28.54±4.96, and Zn=95.42±32.24. The health risk assessment was carried out using the method developed by the United States Environmental Protection Agency. The health risk assessment showed the daily exposure doses of heavy metals are in the order of Zn>Mn>Cr >V>Pb>Cu>Co>As>Cd for the three pathways. The exposure pathways trend decreases in the order ingestion > dermal > inhalation. The hazard index (HI) of heavy metals in soil for non-carcinogenic effect is in the order Cr>Co>V>Pb>As>Mn>Cd>Zn>Cu, the HI is far less than one, which is the safe value. The cancer risk index (RI) of the metals for carcinogenic effect in the soil from the vicinity of the kaolin milling plant through the inhalation pathway is in the order Cr>Co>As>Cd, also within the safe value of 10⁻⁶-10⁻⁴. These indicate that the soil in the vicinity of the kaolin milling plant do not pose major adverse health effect.