

ABSTRACT

Lake Victoria is increasingly threatened by anthropogenic pollution, with implications for water quality, fisheries, and public health. This study examined the relationship between physicochemical parameters and heavy metal concentrations [lead (Pb), cadmium (Cd), zinc (Zn), copper (Cu), iron (Fe), chromium (Cr)] in Lake Victoria. During the dry season, water samples were collected from six sites in Siaya County, and physicochemical parameters were measured *in situ*. Heavy metals were analyzed using atomic absorption spectrophotometry, and data were subjected to Kruskal–Wallis tests, Dunn’s post hoc analysis, and Spearman’s rank correlations in R. Results revealed that most physicochemical parameters were within WHO limits, although conductivity and salinity varied significantly ($p < 0.05$) across sites. Fe was significantly ($p < 0.05$) higher in Kokach and Wichlum, while Cr levels were lowest ($p < 0.05$) in Kokach. Positive correlation between Fe and both temperature ($r = 0.77$) and dissolved solids ($r = 0.77$) was observed, while Cd was negatively correlated with conductivity ($r = -0.97$). Other associations were weak and not statistically significant. In conclusion, there is a strong association between physicochemical parameters and heavy metal concentrations in Lake Victoria, indicating that monitoring these selected physicochemical variables can serve for predicting heavy metal dynamics. Regular monitoring and integrated catchment management are therefore recommended to safeguard the lake’s ecological integrity. Further studies incorporating seasonal variation are necessary.