

# Heavy Metals analysis in Koche River and Associated Impacts on the Adjacent Community, Tatek Industrial Zone, Ethiopia

Mathewos Temesgen<sup>1</sup>, Tegenu Alemu<sup>2</sup>

<sup>1</sup>Department of Biology, Ambo University, Ethiopia

<sup>2</sup>Burayu City Administration, Office of inspection, Burayu, Ethiopia

Corresponding Authors Email: [mathewos\\_temesgen@yahoo.com](mailto:mathewos_temesgen@yahoo.com)

Received 30 June 2021; revised 16 July 2021; accepted 22 August 2021

**Abstract**— This study was determining the levels of some heavy metals in Koche River and the associated impacts on the adjacent community, Tatek Industrial Zone, Ethiopia. Water samples were taken from 12 sampling sites. Questionnaire survey, focus group discussion, key informant interview and secondary data sources were also used to collect additional data. The heavy metals were determined using flame AAS. Heavy metals detected from all sampling sites were Cr, Fe, Cu, Zn and Mn. The concentration of Cr, Fe, Mn and Cu were found above the maximum permissible limit of WHO (1984) for drinking and irrigation water at most of the sampling sites. Wastewaters discharging from the industries are the major polluting sources (96.1%) of the river water. Respiratory diseases were the most common diseases affecting the people in the area (56.6%) followed by dermatitis/skin diseases (31.6%). This calls for an effective management at the pollution source and continuous monitoring of the river quality is very imperative to minimize its impacts on the society.

**Keywords**— Heavy metals, Industrial wastes, Koche River, Tatek Industrial Zone, Wastewater treatment

## I. INTRODUCTION

The fast pace of industrialization, galloping demand for energy and reckless exploitation of natural resources during the last century are the key reasons for aggravating the problem of environmental pollution, which is now set to pose a serious threat to biodiversity and ecosystem processes (1). A variety of toxic organic and inorganic pollutants are discharged into water bodies from urban areas, which further pollutes the soil and sediments. Heavy metals are one of the most hazardous pollutants that are affecting our environment (2). They are among the most harmful water pollutants due to their non-biodegradability, long biological half-life, and their potential to accumulate in aquatic ecosystems (3, 4). Among these, lead, mercury, chromium, arsenic and cadmium are highly toxic to humans and animals (5). These heavy metals are highly affecting the ecosystem and human health worldwide (3). Toxicity level of heavy metals depends on the type of metal, its biological role, and the type of organisms that are exposed to it. Their multiple industrial, domestic, agricultural, medical and technological applications have led to their wide distribution in the environment; and raising concerns over their potential effects on human health and environment (6).

Rapid acceleration of industrial growth and discharging of contaminated effluents without adequate treatment into the aquatic environment is exerting negative impacts to the environment throughout the world (7). Industrial wastewaters which are associated with automobile manufacturing, purification of metals, electroplating, galvanizing, coating, paint, electronics, pharmaceutical, chemicals and battery manufacturing are the most common sources of heavy metal pollution. Arsenic, cadmium, copper, chromium, lead, mercury, nickel and zinc are normally found in heavy metal contaminated wastewaters (1).

In Ethiopia, many researchers conducted on wastewater discharging from different factories of the country, which shows high impacts on environments such as water, soil, plants and aquatic animals though inhalation as a dust or fume, vaporization and ingestion through food and drink on human health, affect soil fertility, plant growth and nutrient uptake (8). Dietary exposure to heavy metals, namely Chromium (Cr), cadmium (Cd), lead (Pb), zinc (Zn), copper (Cu) and others have been identified as a risk to human health, which resulted from industrial emission and becoming disastrous to the health of the society living around industries (9). It causes asthma and allergies, lung cancer, eye disease and cardiovascular problems and etc. (10). In recent years, there has been an increasing ecological and national public health concern associated with environmental contamination by these metals (11).

- [59] Kifle, S. (2008). Industrial waste and urban communities in Addis Ababa: the case of AkakiKaliti and KolfeKeranio Sub Cities. MSc. Submitted to Addis Ababa University, Ethiopia.
- [60] Benjamin, C. (2014). The Effect of PAH'S, POP'S and Heavy Metals on Coastal Zooplankton (Copepods, Crab Zoea, Shrimp Megalopes). Capstone.Nova Southeastern University. Retrieved from NSUWork., (40).
- [61] Sharma, R.K., Agrawal, M., Marshall, D. (2007). Heavy metal contamination of soil and Vegetables in suburban areas of Varanasi, India, *Ecotoxicology and Environmental Safety*, 66:258–266.
- [62] Karadede, A.H. (2007). Heavy Metal concentration in water Sediments, fish and some benthic organisms from Tigris River, Turkey, *Environmental Monitoring and Assessment*, 131(1-3):323-337.
- [63] Abul, S. (2010). Environmental and Health impact of Solid Waste Disposal at Mangwaneni Dumpsite in Manzini, Swaziland, *Journal of Sustainable Development in Africa*, 12(7): 23-31
- [64] Bekele, M. (2008). Determination of heavy metals concentration in the sediment cores, water hyacinths and water of Aba Samuel Lake. M.Sc. thesis.Submitted to Addis Ababa University, Ethiopia.
- [65] WHO. (2007). Children's Health and the Environment WHO Training Package for the Health Sector, World Health Organization.
- [66] Jan, A.T., Ali, A., Haq, Q. (2011). Glutathione as an antioxidant in inorganic mercury induced nephrotoxicity,*Journal of Postgraduate Medicine*, 57(1):72-75.
- [67] Arif, A., Malik, M.F., Liaqat, S., Aslam, A., Mumtaz, K., Afzal, A., Mahmood, D., Nisa, K., Khurshid, F., Arif, F., Khalid, M.S.Z., Javed, R. (2020). Water pollution and industries, *Pure Applied Biology*, 9(4): 2214-2224
- [68] UNESCO (2009)."Water-resource Management and International Relations in Central Asia", IHP VII, Technical Document in Hydrology, Beijing: UNESCO, No. 2, pp.53-67.