

This study was carried out to determine the physico-chemical and bacteriological quality of water from various sources in Kithimani location and explores the effectiveness of common water treatment methods. Selected metals and non-metals ions were determined colorimetrically while turbidity was measured using a turbidimeter. pH, electrical conductivity, dissolved oxygen (DO) and temperature were measured using a portable universal multiline P4 WTW meter while total alkalinity was determined titrimetrically. The load of coliform bacteria contamination was determined by Millipore filtration method. Screening for the presence of pathogenic bacteria was carried out using standard methods.

The levels of the properties investigated were each compared with the recommended drinking water standards according to Kenya Bureau of Standards (KEBS) and World Health Organization (WHO). The most contaminated water source identified based on the faecal coliform colony count was subjected to mechanical filtration and solar irradiation and changes in their physico-chemical properties and bacteriological load determined. Among the physico-chemical properties investigated in selected water sources, levels of alkalinity (range; 5.0 -196.3 mg CaCO₃ L⁻¹), sulphates (range; 0.2 -124.3 mg LOI), chlorides (range; 0.0 -94.0 mg LOI) fluorides (range; 0.0 - 0.15 mg LOI) and zinc (range; 0.01- 0.3 mg LOI) did not exceed the upper limit for drinking water according to the KEBS and WHO standards. Manganese (range; 0.02 - 1.79 mg LOI) and copper (range; 0.0 - 2.2 mg LOI) concentration in water samples from most sources studied exceeded the maximum permissible concentration according to KEBS and WHO (0.1 mg LOI and 0.05 mg L⁻¹ respectively) for safe drinking water.

Levels of mean turbidity (0.78 and 0.65 NTU), color (0.0 mg pt LOI) and nitrates (7.99 and 7.01 mg LOI) in borehole and rainwater did not exceed the maximum permissible level for drinking water set by KEBS and WHO. *Vibrio cholerae* was detected in Athi and Kauthulini rivers only. *Shigella SP/J Salmonella SP/J Klebsiella sp., Streptococcus faecalis* and *Clostridium perfringens* were isolated from the samples of most water sources except in borehole and rainwater. The mean range for total coliforms and *Escherichia coli* for the water sources were 10 to 23,830 CFU per 100 mL and 10 to 3480 CFU per 100 mL respectively. which exceeded the maximum permissible limit of 0 CFU /100 mL for KEBS and WHO. There was no significant difference in colour (P = 0.723), sulphates (P = 0.999), temperature (P = 0.999) and conductivity (P = 0.058) among the water sources.

A significant difference in mean values of salinity, alkalinity, DO, turbidity, nitrate nitrogen, chlorides, calcium, zinc, copper and iron among water sources (P < 0.05) was noted. The results obtained after treatment revealed that solar irradiation killed most of the pathogenic bacteria after exposure for eight hours but had no impact on the physico-chemical properties except nitrates (from 24.5 to 8.0 mg LOI). Mechanical filtration reduced total coliforms and *E. coli* by 30 %. It also reduced the loads of Zn, Cu, Mn, Pb, Fe, nitrate nitrogen and turbidity of the water treated to an almost potable state. The study concludes that most water sources in Kithimani do not meet the potable water standards according to KEBS and WHO. The results showed no significant variation in overall bacteriological water quality during dry and wet seasons (between low and high rainfall months). Finally, water treatment using mechanical filtration system and solar disinfection was found to be very effective in reducing the bacterial load.