

# How Safe is the Water Consumed in Different Parts of Nairobi, Kenya?

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**Abstract:** Water is very important in human beings because it plays a greater role, in that it keeps the body properly hydrated for brain and body cells functioning among others. In the rural areas water may be supplied through pipes or directly taken from the sources such as Rivers, Oasis and Lakes, while in the urban areas water is mainly supplied in polyethylene terephthalate (PET) plastic made bottles. Heavy metals are among the major products that may lead to water contamination, which should be maintained below the permissible level by the health organizations. This project dealt with the analysis of contaminants in different types of water brands that are consumed in Nairobi County in Kenya. Seven trusted brands of bottled drinking water were obtained from some Supermarkets in Nairobi city and analyzed for heavy metals, which includes; Sb, Cr, Mn, Pb, Cd, Cu and Zn and the residue levels of physico-chemical parameters including pH, Electrical Conductivity (EC) and Total Dissolved Solids (TDS) were also determined. The heavy metals were analysed using Atomic Absorption Spectrometer (AAS) Spectra AA-10, while the physico-chemical parameters were analysed using the standard methods for the examination of bottled drinking water. The results reviewed that; antimony levels were Below Detectable Limit (BDL) in all the samples, while copper concentration ranged between BDL and  $0.05 \pm 0.01$  mg/g in all the samples, which was in the range stipulated by World Health Organization (WHO) and Kenya Bureau of Standards (KEBS) of 0.1 mg/g and 2.00 mg/g respectively. Lead concentration residue levels on the other hand ranged between BDL and  $0.32 \pm 0.19$  mg/g in the seven samples. Cadmium residue levels were Below Detection Limit (BDL) in all the samples analysed in the two projects, while chromium ranged between BDL and  $0.66 \pm 0.03$  mg/g. The concentration of manganese was in the range of BDL and  $0.93 \pm 0.53$  mg/g, Zinc was not detected in all the samples. Lead, Chromium and Manganese residue levels were all within the limit set by WHO and KEBS in most of the samples, but some of their levels were higher than those standards in only few water samples. The pH values ranged between  $6.72 \pm 0.15$  and  $7.32 \pm 0.01$  in all the samples. These values were all within the standard set levels by the health organizations, which are in the range of 6.0 and 9.4. These organizations include, National Environment Management Authority (NEMA), KEBS and WHO. The TDS levels were in the range of  $26.80 \pm 0.50$  mg/l and  $100.70 \pm 0.08$  mg/l, which were well below the set standards set by NEMA, KEBS and WHO of 1,500 mg/l each. On the other hand, the EC was in the range of  $74.50 \pm 0.05$   $\mu$ S/cm and  $197.70 \pm 0.02$   $\mu$ S/cm, which was within the range set by NEMA, KEBS and WHO of 25-2,500  $\mu$ S/cm, 30-2,500  $\mu$ S/cm and 26-2,500  $\mu$ S/cm respectively. There is therefore, need for regular monitoring of pH values of bottled drinking water by the respective water bottlers.

**Key words:** Water, Brands, Contaminants, Pollution and AAS

## I. INTRODUCTION

In human life, water is a vital welfare significantly more than food. It has been reported that human being can die after one week without any liquids but can survive for couple of months without food<sup>1</sup>. Water plays a greater role in the body such as regulating body temperature through perspiration; it helps in physiological homeostasis and that it keeps the body properly hydrated among many other roles<sup>2</sup>. This therefore, calls for an increase and continuous drinking water supply. An increase in population need increased water supply, therefore, Nairobi County is among the most populated urban cities in Kenya in sub – Saharan countries. According to World Bank 2015 statistics is that at least 85% of the urban population has access to safe drinking water. However, this percentage is much lower than that of world average for urban population which is 96%<sup>3</sup>.

Due to the increasing economic and industrial activities within Nairobi city, her population has tremendously increased up to 47.5 million<sup>4</sup>, which in turn as triggered the supply of clean drinking water in portable bottles to counter the high demand from this populace. Most of these bottles are made of plastic thus raising concern over the levels of contaminants that may have been caused either during their manufacturing process or through piping by the bottlers company. Sb, Cd, Cr, Cu, Mn and Pb and their compounds are the common heavy metals that have been found to be the main contaminants in drinking water which can cause health complications and diseases if consumed at high levels<sup>5</sup>.

### 1.1: Statement of The Problem

The fact that drinking water is a rare asset in most places in the world, some individuals tend to use it without earlier information of its fitness to human utilization. For example, water may contain overwhelming high levels of metals contaminants including; antimony, copper, cadmium, Lead, and chromium. Impacts of substantial metals to human well-being are known from the past examinations. It is therefore very crucial to assess the levels of these contaminants in the water consumed in Nairobi County. There is also a need to evaluate the level of the selected heavy metals such as Zn, Cr, Cu, Mn, and Pb and compare them with the set standards permissible by different bodies locally and globally.