

## Abstract

Groundwater from shallow wells is an important source of water for domestic and agricultural uses in Chuka Sub-County. However, most shallow wells in Chuka Sub-County are undocumented because approval is not required to sink a shallow well. Groundwater from these shallow wells is therefore susceptible to contamination by both geogenic and anthropogenic sources. This study was conducted to determine the quality of shallow wells water in Chuka Sub-County. Samples were collected from twenty shallow wells in Chuka Sub-County during the dry and wet seasons. The temperature, pH and conductivity were determined *in situ* using a conductivity meter. The concentration of cations in the water samples was determined using an Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) system. The concentration of chloride and nitrate ions in the water samples were determined using the argentometric and the spectrophotometric method, respectively. The concentration of sulphate ions was determined using a turbidimetric method while the concentration of phosphate ions was determined using a colorimetric method. The data obtained were subjected to ANOVA to test the significance differences using R-3.5.2. Mean comparison was achieved through LSD. The temperatures of the waters were significantly higher during the dry season. The pH of water in most shallow wells during the wet season was within the limits set by KEBS and WHO. However, shallow well water at Karandini (T15) was highly acidic (pH of 3.95) during the wet season. During the dry season, the shallow well waters were slightly acidic (4.42 - 6.44) except for the shallow wells at Ndagani market (T11), whose water was alkaline (pH = 8.75). The shallow wells water at site T11 had remarkably higher conductivities than the other shallow wells in the study area during both the wet (1150  $\mu\text{s}/\text{cm}$ ) and the dry (1208  $\mu\text{s}/\text{cm}$ ) seasons. The concentrations of macro-cations ( $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ ) were higher during the dry season. The concentrations of the trace and toxic cations differed significantly across sites and seasons but were within the limits set by KEBS and WHO. The concentrations of anions ( $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{Cl}^-$  and  $\text{PO}_4^{3-}$ ) were within the limits set by KEBS and WHO for portable water. Groundwater from most shallow wells in Chuka Sub-County is generally safe for domestic uses but regular monitoring for quality is recommended because, the concentration of nitrate in several wells during the dry season was within the range that causes chronic health effects including colorectal, ovarian, thyroid, kidney and bladder cancers.