Physicochemical Properties and Heavy Metal Concentration of Groundwater in Owerri Metropolis, Nigeria

ABSTRACT

The present study was performed in order to assess the physicochemical parameters and heavy metal concentration of groundwater in Owerri municipal area. Water samples were collected in triplicates from thirteen different sites. Electric conductivity, pH, total dissolved solids, turbidity, biochemical oxygen demand, oxygen demand and chloride were determined by standard methods. Sulphate and nitrate were determined by UV- Spectrophotometric method whereas the heavy metals were evaluated using Atomic Absorption Spectrophotometer (AAS). The results of the study revealed that both the physicochemical and heavy metal parameters evaluated were within the limits recommended by WHO and SON. But arsenic concentration in one (Sample 6) out of the thirteen borehole sites had a pollution index above unity (1.11). The ground water samples assessed were suitable and portable for drinking and other domestic purposes except water from site 6 which was contaminated with arsenic.

KEY WORDS: Pollution index, contamination, Atomic Absorption Spectrophotometer, heavy metals, concentration.

1. INTRODUCTION

The water which is found underground in the cracks and spaces in soil, sand and rock is appropriately described as groundwater. Water flows in the aquifers at a speed which depends on the size of the spaces in the soil or rock and interconnectivity of these spaces. The depth of water table is also dependent on a number of factors such as the intensity of the rainfall, extent of melting process of snow and excessive pumping of groundwater supplies. Water from rain and melted snow can seep down or percolate into the cracks and crevices underneath the land’s surfaces thereby replenishing the groundwater supply. The water table is depleted by heavy pumping of groundwater supplies for drinking and other domestic purposes. Groundwater constitutes a very vital source of water for drinking, industrial and agricultural activities [1, 2]. Water is very important natural resources essential for sustenance of life and need to be available, accessible and affordable in its purest form. Pure water is said to be portable and safe for the purpose of drinking if it was able to comply with the physical, chemical and microbiological standards set by World Health Organisation [3]. Water quality therefore should not surpass the maximum limits quantified in the water quality guidelines [4].

Groundwater is contaminated from different sources. These consist of landfills, insanitary condition especially during borehole construction, septic tanks, leaky underground gas tanks, wading of runoff into wells, excessive use of pesticides and fertilizers. Sanitary condition at the surface within the immediate vicinity of the well affects the quality of groundwater. The pollutants readily sink into groundwater via aquifers when material above the aquifers is permeable therefore rendering the water unsafe and not portable for drinking. Heavy metals are constellations of metals and metalloids with atomic density greater than 4 g/cm³ or five times greater than water [5]. The population or levels of free metal ions in drinking water is indexes useful in determining the levels of pollutant and nutrient elements it contain [6].