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Appraisal of access to safe drinking water in southwest Nigeria

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The importance of developing effective water supply services is universally recognised as a basis for improving the overall health of the population. This study ascertained the quality of water supplied by a water treatment scheme in southwest Nigeria. One hundred and twelve samples were collected during the wet and dry seasons. Tests on physico-chemical and bacteriological parameters were conducted. Statistical analysis of variance was carried out on the results of the test. The effectiveness of the treatment processes on the parameters considered showed that the aeration, sedimentation and filtration processes were 70.13% effective in colour removal; sedimentation and filtration processes were 94.78% effective in turbidity removal; sedimentation and filtration process were 28.84% effective in the removal of total suspended solids (TSS) and 9.88% effective in the removal of total solids (TS); the disinfection and filtration processes were 100% effective in bacterial and coliform removal. The treatment system was found to be 71.38% effective in pollutant removal.

Keywords: raw water, sedimentation, settled water, water quality, water supply

Introduction

In Nigeria, one of the key elements of the Millennium Development Goals is the provision of water in every home by the year 2015. At the global level, the target is to reduce poverty levels through adequate provision of potable water. There appears to be a multiplicity of challenges associated with the supply of fresh water to the cities and towns in the western region of Nigeria (Adeniji-Oloukoi, Urmilla, and Vadi 2013; Aderogba 1994; 2005).

The history of water pollution dates back to the nineteenth century when cholera outbreaks and other waterborne diseases occurred in Europe as a result of gross organic pollution of river water with raw human waste. A similar outbreak was reported in 1997 in Milwaukee, USA (Keller and Botkin 1997). However, the worst cholera outbreak, which led to the death of thousands of people, was experienced in Nigeria in 1971 (World Health Organisation 2012).

Inadequate access to safe drinking water constitutes a serious problem in Nigeria because only about half of Nigeria's population of above 167 million have access to improved water sources (Onabolu *et al*. 2011). Nigerians use a combination of alternative water sources. While many people spend substantial amounts of money buying water from vendors, most people have invested in boreholes, wells and storage tanks. On the other hand, some engage in rain water harvesting, while others depend on free or subsidised water owing to the commitment of the citizens to paying taxes. However, many people do not have access to piped water, whereas for those who have access to pipe-borne water, it is mostly irregular due to ageing infrastructure and deterioration of the available water schemes (Adekalu, Osunbitan, and Ojo 2002).

The task of producing and supplying safe drinking water to consumers at all times constitutes a major challenge to water managers and operators. This task is often compounded in tropical countries like Nigeria where strong climatic seasonal variations prevail. This variation can affect the quality of catchment water, efficiency of water treatment, water supply pattern (whether it is continuous or intermittent) and the quality of water in the water distribution system (Etchie *et al*. 2014).

Nigeria is endowed with natural water resources, but a salient issue is the conformity of the resources in their pure form to WHO and Nigerian drinking water standards for both industrial and domestic use. Therefore, it is necessary to assess the water treatment schemes in order to safeguard public health, the environment and ultimately satisfy the human need in the country. The objective of this study was to evaluate the efficiency of each of the components of the treatment plant of Ogun State Water Corporation at Arakanga Water Works in Abeokuta, southwest Nigeria and determine the reliability of the final treated water for human consumption in accordance with WHO and Nigerian drinking water standards.

Methodology

Study area

The Arakanga Main Scheme of Ogun State Water Corporation remains the main source of municipal water supply for the people of Abeokuta city of Ogun State, southwest Nigeria. The scheme was commissioned in 1988, with a designed capacity of 162 million litres per day (MLD). The maximum capacity attained since inception had been 48.6 MLD.

The source of the scheme's raw water is the Ogun River; while the final treated water is lifted via high-lift pumps to a reservoir situated on Asaran Hill in Abeokuta for onward distribution to consumers within Abeokuta metropolis.

The scheme has an intake structure with four low-lift pumps and the aerator structure is a concrete cascade in two parallel units. The scheme has four reinforced concrete