UNDERGROUND WATER RESOURCES OF ONITSHA METROPOLIS: HOW SAFE?

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Abstract
Borehole water sources at Onitsha, Anambra state were studied with respect to the level of pollution. A total of forty-two boreholes were visited during rainy and dry seasons of November, 2006 and September, 2007. A simple random sampling was employed. Forty-two water samples were tested for the period using standard methods of APHA, ASTM and NNPC. In comparison to WHO standard for drinking water, these groundwater sources were fit for human consumption though periodic monitoring, testing and analyses must be in place because of the environment where these boreholes are situated.

Introduction

In nearly every corner of the globe, man is making increasing demands upon his surroundings and thereby altering his own natural environment and that of the other organisms living with him. As a result of this increased quest of man, the demand for water, being an essential constituent for human environment has been on the increase. Man needs water for his physiological existence, just as every other living organism does and for many other purposes such as industrial water supply, irrigation, propagation of fish and other aquatic life, generation of power, washing etc.

The continuous increase in population, urbanization, industrial activities and modernization of agricultural practices in terms of the application of fertilizers, pesticides and other agrochemicals, natural disasters had persistently caused a large demand for water, generation of huge waste matters and unending land-use problems (Asiwaju-Bello and Akande,2001; Vrba, 1989). The cheap mode of disposal of huge refuse matters being generated domestically and industrially has, over the years, been reducing the potential sources of utilization of water for the growing population.

Both surface and groundwater sources are exposed to this danger of pollution. The surface waters are not always within reach of the people; this is why there is increasing sourcing of clean water from ground water sources such as boreholes. (Kassas,1978; Lehr,1973). The necessity for good quality water makes it important to monitor water contamination for the overall human safety. In Onitsha city, one of the fastest growing cities in the world with a population of over one million, the major source of drinking water is through the borehole. The situation is such that these ground-water sources can be sourced from just any spot irrespective of what the environment is

like and without pre-treatment facilities attached to it. More worrisome, is the increased rate at which "pure water" industries are springing up in Onitsha hence the need for this study. This study is to evaluate these groundwater sources in a bid to determine how fit they are for human consumption. Substandard water can lead to diseases such as typhoid fever, dysentery, cholera and certain types of gastrointestinal disturbances (WHO,1985).

Materials and Method

Water samples from boreholes were collected from different parts of the city during the rainy and dry seasons. Areas of concentration are the very busy spots where inhabitants, do frequent either for domestic use, packaging for "pure water" consumption or industrial use. A total of six sampling trips were made. The samplings were done in the morning hours each day of the sampling. Six replicate samples were collected per area (Fig.1).

For this study, a total of forty-two water samples were collected for chemical analyses. Six (6) each from the seven zones as depicted in the figure. Each sample for analysis was collected using a new sterilized 2-litre plastic container with screw cap.

The temperature and pH (using Bechman pH meter model 23A) were taken in situ. The samples were treated with 2ml concentrated HNO_3 to stabilize the oxidation state of the metals and Bulk Scientific Atomic Absorption/Emission spectrophotometer 200A was used for metal – ion determination. Total hardness was obtained by titrating with EDTA and Ammonium Chloride buffer; Chloride by Argentometric method; Nitrate and Sulphate by colorimetric and turbidimetric methods (APHA 1980, ASTM 1978 and NNPC, 1978). Ammonia was determined by a sensitive colorimetric method using Nessler's regent (Prati et al, 1971).

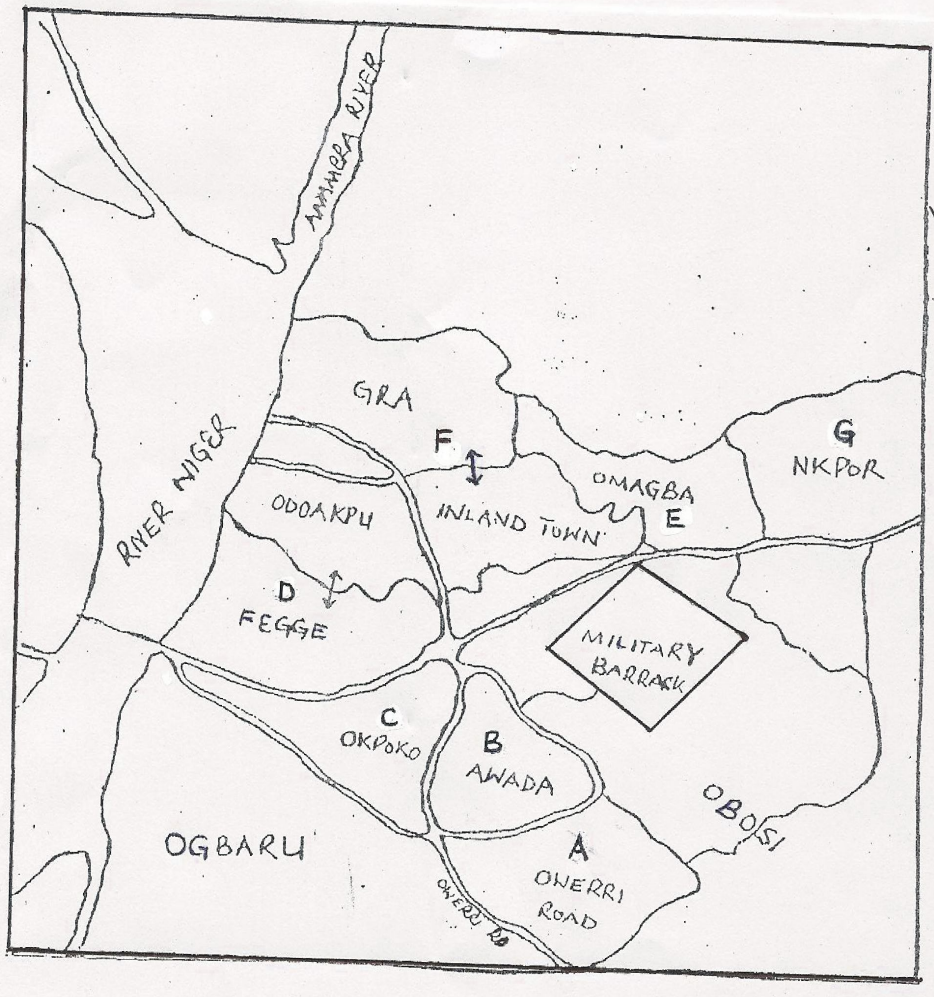

Fig. 1. Map of Onitsha metropolis with various zones sampled

Source : Town Planning Department, Onitsha South L.G.A., Onitsha.
Zone A – Owerri Road Axis
Zone B – Awada Axis
Zone C – Okpoko Area
Zone D – Feggé / Odoakpu Axis
Zone E – Omagba / Ozala Layout Axis
Zone F – GRA / Inland Town Axis
Zone G – Limca / Nkpor Axis

Table 2: Water quality standards.

Parameter	Excellent	Acceptable	Slightly polluted	Polluted	Heavily polluted
pH	6.5 – 80	6.0 – 8.4	5.0 – 9.0	3.9 – 10.1	3.9 – 7.0
Chloride (ppm)	50	150	300	620	620
1ron (ppm)	0.1	0.3	0.9	2.7	2.7

Source: Prati et al, 1971

Results and Discussion

The annual mean results of the chemical analyses are given in Table 1 for the period of November, 2006 of February 2007 representing the dry season and April to September 2007 representing the rainy season.

From the analyses, majority of the parameters tested for did not meet the WHO standards of 1993. Total hardness and nitrate concentrations was above the stipulated standard. The values for total hardness were high for both seasons with the highest recorded in zone A. These values falls between moderately hard and hard water classification according to Tchobanoglous and Schroeder ,1985. Implication being that too much soap will be needed for the water to lather.

The chloride content though lower than the stipulated standard was classified as slightly polluted (Prati et al, 1971).The nitrate content was above permissible level indicating bacteriological pollution.

The iron content, though lower than the WHO permissible limit, fell under the heavily polluted class by Prati et al (1971) classification. High iron content in water samples are undesirable as it may cause rust, colours on clothes and not suitable for domestic use. Apart from lead which was below detectable limit, other cations tested were below WHO permissible limits.

Conclusion and Recommendation

A total of 42 water samples were analysed from seven different zones of Onitsha metropolis. The boreholes analysed were the concentrated ones where the inhabitants frequently visit.

The results obtained showed that these waters were fit for human consumption and other domestic purposes. However there is need for caution. Onitsha being an ever expanding commercial city with increasing population and industries, is capable of generating increased wastes mostly industrial. And these wastes through seepage or leaching processes find itself in the underground formations (Okoye et al, 2006). As such periodical analysis should be carried out to ascertain the level of purity or pollution.

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