BACTERIOLOGICAL EXAMINATION OF SELECTED WELL WATERS IN ILORIN.

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Abstract

This study essentially involves the bacteriological examination of some randomly selected water wells within Ilorin Metropolis. The wells were observed to contain higher than World Health Organization recommended numbers of coliform. Total bacterial count ranges from 148 x 10^2 – 5 x 10^1 CFU while the total coliform ranges from 108 x10^2 – 12 x10^1. PH value is between 6.9 and 7.6. The likely sources of pollution as well as the possible implications are discussed. Recommendations to remedy the situation are also offered.

Introduction

Ilorin is considered to be one of the fastest cities in Nigeria with a population of well over 500, 000 people. As a result of the increasing population, water supply from the two municipal water works (Asa and Agba water works) has become inadequate for the parts of the city served by water supply infrastructures, while the newly developed areas are not serviced at all.

In the face of this reality, residents are being forced to augment the water supplied from the public water works with alternative private sources such as boreholes as hand dug wells. However, due to the relatively high cost of drilling boreholes, hand dug wells are more prevalent as alternative sources of domestic water supply. Thus, the necessity to determine the suitability of such well waters is imperative.

The earliest understanding of ground water environment is that, it is a sterile environment. However, over a century of research have proved otherwise. Madsen and Ghiorse (1993) explained the suitability of groundwater habitats for microbial growth and compared the groundwater environment to other aquatic habitats (lakes, rivers, wetlands etc) where microbes are abundant.

Chapelle (1993) related microbial activities in groundwater to subsurface geochemistry, while Gerbal et al (1975), were of the opinion that the movement and survival of virus and bacterial in groundwater is influenced by a complex interplay of environmental factors.

Nonetheless, Harrigan et al (1976) found that water dwelling micro-organisms are mainly of three kinds-the natural aquatic bacteria, soil dwelling bacteria and organisms that inhabit the intestine of man and other mammals. .

However, the Bacteria inhabiting the intestine of man and other warm blooded animals (mammals) have been observed to possess both physiologic and morphologic similarities with pathogenic bacteria. Thus, a relatively high concentration of these faecal indicator bacteria in any environment is assumed to increases the likelihood of pathogens being present as well (CDC, 1994)

According to Hutchinson and Ridgeway (1975), the water cycle is an obvious mode of transmission of enteric diseases. Bacteriological pollution in water is potentially dangerous to health because of possible outbreaks of typhoid, dysentery or cholera epidemics. The Link between contaminated water and some diseases (particularly gastro-enterittis and some helminthic diseases)is a long standing one(Okuofu et al,1990).

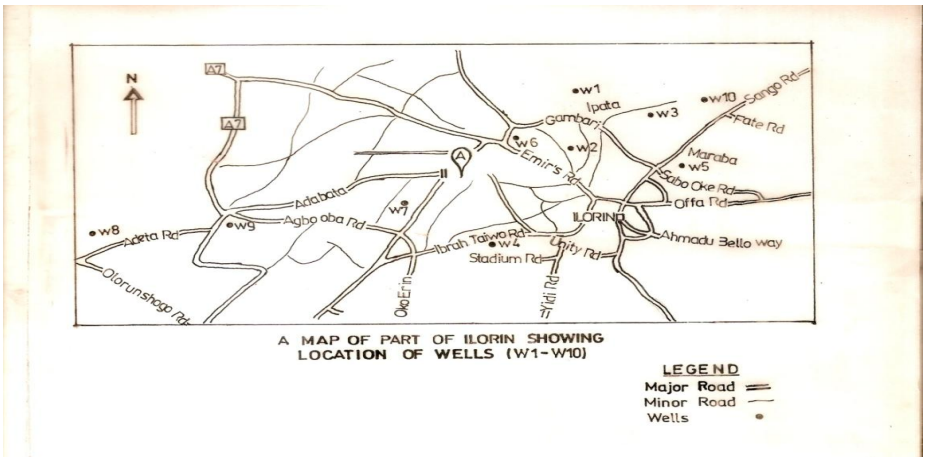
The World Health Organization (1976) reported that about 1.5 billion people worldwide drink filthy water. This number is thought to be increasing by about 20 million people each year. Consequently it has become pertinent to intensify the monitoring and protection of alternative water sources.

The purpose of this study is to examine the sanitary quality of 10 randomly selected water wells within Ilorin metropolis, using bacteria as indicator organism.

Materials and Methods

A total of ten well water samples were collected from ten different areas within Ilorin Metropolis namely Adeta, Kuntu, Opomalu, Ita- Ajia, Ipata, Taiwo, Moraba, Aduralere, Baboko, and Sango (Fig 1)

Map of Ilorin Showing Location of Sampled Wells



Samples of water for bacteriological investigation were collected in clear sterile 100ml glass stopper bottles. The neck and top of the bottles were covered with aluminum foil to prevent any external contamination.

The water samples were carefully collected from the wells using the drawing buckets used by the local people.

Ph Determination

The PH of water samples was determined on the spot using a HACH colour comparator disc and a PH paper. Two cells of the comparator were filled to 5ml mark each with water samples. Then, 6 drops of appropriate indicator (Bromothymol) were added to the right hand cell only. An indicative disc was then revolved until the nearest colour match was obtained.

For PH paper, the papers were dropped into the water with the colour comparator. The nearest colour matches were then recorded.

Estimation of Total Bacteria

After serial dilution and thorough mixing of the samples, they were plated on nutrient agar by pour plate technique. The plates were then incubated in inverted position at 37^{o}C for 24 hours and 48 hours respectively. After both 24 and 48 hours of incubation, colonies were counted with the aid of colony counter.

Coliform Test

Water samples were streaked over the surface of Epsin methlene blue (EMB) agar and incubated, at 37oC for 24 hrs, colonies appearing blue- black with metallic sheen were regarded as coliform bacteria and taken to be E coli while those that appear pinkish with tendency to coalease were taken for Enterobacter Aerogenes.

TABLE 1: SOURCES OF WELL WATER, THEIR USES AND THE SANITARY CONDITIONS OF EACH WELL

Sampling Area	Uses	Sanitary Conditions
Ipata	Washing, drinking and cooking	Dirty surrounding animal excrement
Opomalu	Drinking and cooking	Road side well, near a gutter
Aduralere	Washing, Irrigation of farmlands	Not far from latrines
Maraba	Cooking and drinking	Inside the garage
Ita-Ajia	Drinking	Inside the compound swampy area
Baboko	Drinking and cooking	Not covered (exposed)
Adeta	Drinking and irrigation	Dirty area and busy
Kuntu	Drinking and cooking	Gutter nearby
Taiwo	Washing etc	Not far from refuse dump
Sango	Drinking	Neat (inside a workshop)

TABLE 2: PH VALUE OF WATER FROM DIFFERENT WELL

Sampling Area	PH
Ipata	7.1
Opomalu	7.0
Aduralere	7.4
Maraba	7.2
Ita-Ajia	7.0
Baboko	7.0
Adeta	7.6
Kuntu	7.2
Taiwo	7.1
Sango	6.9

TABLE 3: TOTAL BACTERIAL AND COLIFORM COUNTS FROM DIFFERENT WELLS

Well Sampling	**Total bacterial count (Cfu per ml of Water)**	**Total Coliform Counts (Cfu Per ml of water)**
Ipata	148×10^2	108×10^2
Opomalu	104×10^2	94×10^2
Aduralere	60×10^2	40×10^2
Taiwo	94×10^2	55×10^2
Maraba	92×10^2	70×10^2
Ita-Ajia	20×10^1	20×10^1
Baboko	54×10^1	53×10^1
Adeta	37×10^1	20×10^1
Kuntu	21×10^1	12×10^1
Sango	5 x 10	Not detected

Results and Discussion

A total of ten wells were sampled in the course of this study. Out of the ten wells that were sampled eight serve sources of drinking and cooking water to people in the different localities.

Table (2) presents the PH values of all the water samples. The PH values range from 6.9 recorded at Sango to 7.6 which was obtained at Babako. This range, however, falls perfectly within the WHO recommendation for drinking water (PH6-PH8). Nonetheless, this fairly neutral PH range must have played a pivotal role in the survival of bacteria in all the tested water samples. This is because bacteria are known to thrive best under fairly neutral PH condition.

Table (3) shows both the total bacteria and total coliform count of water samples per ml from the different wells.

The highest occurrences of bacteria were obtained from Ipata (148 x 10^2 CFU) and Maraba (104 x10^2 CFU) respectively. While the lowest were recorded at Sango (5 x 10^1 CFU) and Ita Ajia (20 x 10^1 CFU)

The highest occurrences of coliform were observed at Ipata (108 x 10^2 CFU), Maraba (70 x 10^2 CFU) and Opomalu (94 x10^2 CFU)The constituent coliform bacteria are mostly Esherichia, coli, Klebsiella sp and Enterobacter Aerogenes

The bacteriological quality of all the water wells are in tandem with the sanitary conditions around the wells. The wells that are located in dirty surroundings such as near latrine, refuse dump or gutter show relatively higher bacteria and coliform count. Results as shown in table (3) suggest that 90% of the sampled wells do not fall within the recommended safe limit for drinking water i.e 100ml of water should not contain mere than one coliform (WHO, 1976)

The different type of bacteria identified from all the samples suggest that pollution is from more than one source. S. Aureus, P. Aeruginosa which are normal fauna on the skin, may have gained entrance into the wells through washing near the wells, while the coliform bacteria, which are intestinal bacteria, could have gained entrance through activities such as indiscriminate defecation near the wells. Contamination could also have occurred due to the percolation of leach ate from nearby refuse dumps, seepages from polluted run- offs or via the pit latrines.

It is pertinent to note that the few bacteria found at Sango are most likely the natural bacteria fauna and not evidence of pollution. The absence of coliform bacteria suggests a contamination free well and a possible pathogen- free situation.

Conclusion

The use of 90% of the waters from the wells studied for domestic purpose in their present conditions is hazardous. Consequently, to redress this undesirable situation, there is an urgent need to provide a reliable alternative potable water supply sources to the affected communities. Otherwise, the design of the wells should be improved to meet sanitary requirements.

Considering the potential negative effects associated with the presence of pathogenic organisms in groundwater, and its attendant consequences on the socio- economic well being of a nation, all hands must be on deck to prevent faecal contamination of groundwater. In order to achieve this, both private and public efforts must be harnessed.

Private individuals must be enlightened and sensitized about the need for an uncompromising proper and sanitation conscious mode of disposing both domestic and faecal waste so as to prevent leakages and seepages that could contaminate the ground water system. It has been suggested that water wells must be located at least 100ft away from potential sources of microbial contamination (Septic tanks, cesspools, refuse dumps, pit latrines etc) and not downhill to these sources (NCE, 1998). In the same vain drinking water wells should be subjected to periodic microbial and physiochemical analyses to ascertain their continuing portability.

Ultimately, government efforts should be geared towards the provision of waste disposal infrastructures such as sanitary landfills, incinerators and waste recycling facilities. Government should also put in place the necessary rules and legislations to regulate, standardize, and monitor water supply sources to ensure public health safety.

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