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Microbiological Analyses of Drinking Water from Some *Wash Boreholes* in Maiduguri and Jere Metropolis, Borno State, Nigeria

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Abstract: *Water is crucial constituent in the continuance of all forms of life, and generally living organisms can live only for short time without it. Infectivity through water is, therefore, one of the primary concerns for safe and sound water supply therefore, microbiological analyses of drinking water from some wash boreholes in Maiduguri and Jere metropolis were conducted using Total Heterotrophic Bacteria (THB) count and Total Coliform Counts (TCC) the result showed bacterial load ranging from 3 x 10^2 in Mairi Kuwait to 1.2 x 10^2 in House of Assembly Quarters and Mairi Kuwait olala respectively, in which some are within the range of World Health Organization standard (Heterotrophic plate count levels in potable water should be < 500 colony forming unit per millilitre) while few appeared not within the range. Total coliform count (TCC) conducted showed presence in 3 samples Mairi Ustaz 1.0x10^2, Fori, Kakawo 0.50 x10^2 and Mairi Kuwait 0.50 x 10^2 which is a sign of poor source of portable drinking water and perhaps possible source of contamination near the borehole.*

Keywords*: Water, Coliform, Bacteria, Heterotrophic, Borehole*

Introduction

Water is crucial constituent in the continuance of all forms of life, and generally living organisms can live only for short time without it (Shittu *et al.,* 2018). Basis and portability of water reveal on the health conditions of society as microbiological contamination of water is the source of disease occurrence in a lot of society particularly in a lot of underdeveloped countries(Karbasdehi *et al.,* 2017).The infection of disease through water is, therefore, one of the primary concerns for secure water supply (Ahmed *et al.,* 2014). In a lot of underdeveloped countries, availability of potable water becomes a problem when supply is interrupted frequently and shortages become the order of the day (Popoola *et al.,* 2007). The potential of drinking water to transmit microbial infectious agent to great number of people causing

subsequent disease is well documented in a lot of countries at all levels of economic development. The number of occurrence that have been reported throughout the world demonstrates that infection of infectious agent by drinking water remains a significant results in disease (Addo *et al.,* 2019). However, estimate of disease based solely on detected occurrence is likely to underestimate the problem. A significant proportion of water-borne illnesses are likely to go undetected by the communicable diseases surveillance reporting systems. The symptoms of gastrointestinal disease(nausea, diarrhoea, vomiting and abdominal pain) are usually mild and generally last a few days to a week and only a small percentage of those affected will visit a health facility (Addo *et al.,* 2019). Each year greater than 2 million persons, mostly minors less than 5 years of age, die of diarrhoea disease. For minors in this age group, diarrhoea disease accounted for 17% of all death from 2000 to 2013 (WHO, 2015), ranking third among results in death, after neonatal results in an acute respiratory infections (WHO, 2015). Various water borne bacteria can results in significant illness, disease most often results from ingestion of contaminated water or seafood, with gastrointestinal entry of infectious agent or their products. The skin and soft tissue are also common entry point for water borne bacteria. Microorganisms that results in cholera, severe diarrhoea, and other disease are often present in huge numbers in infected human faeces. If drinking water is contaminated with these dangerous microbes, the illnesses can results and these illnesses can spread easily to others (Popoola *et al.,* 2007). Typhoid fever remains a great socio-economic problem in underdeveloped countries, Nigeria inclusive. Perforation of intestines is associated with high mortality with wound infection occurring in 50 — 75% of survivors. Controlling wound sepsis or wound infection with various complications also affected mortality and unsecured drinking water had been the major source of this infection (Adekunle *et al.,* 2004). Water is vital to our existence in life and its importance in our daily life makes it imperative that thorough microbiological and physicochemical examinations be conducted on water. Potable water is the water that is free from disease producing microorganisms and chemical substances that are dangerous to health (Shittu *et al.,* 2008).

Methodology

Sampling Locations

Samples for this study were collected from 17 different society and from two different local government areas namely; Maiduguri and Jere LGAs respectively, localities include; Mairi behind Ngab oil, Mairi Kuwait, Fori, Kakawo, Galtimari, Mairi Kuwait Olala, Fori Modu Birkila, Fori Bazanna, Mairi Ustaz. Pompomari, Bolori, House of Assemly Quarters, Pinnacle, Barwee.

Sample collection

The water sample were aseptically collected using sterile water container and transported to the lab for further analysis

Serial dilution

1ml of the water samples were individually added to 9 ml of diluents and thorough shaking, further 10-fold serial dilutions were made by transferring 1 ml of the initial sample to freshly prepared normal saline diluents to a range of 10-4 dilutions (Monica, 2006).

Total Heterotrophic Bacteria (THB)

Total Heterotrophic Bacteria was conducted according to Monica (2006), 0.1ml of the diluents at different concentrations were then spread evenly on the surface of the media using a sterile spreader and incubated for 24 hours at 37.2°C colonies were counted and the mean expressed as cfu/ml/ for the samples

Cfu/ml was calculated using $= \frac{number\ of\ colonies}{dilution\ factor\ X\ volume\ plated}$

The colonies formed were further sub cultured on Eosin Methylene Blue (EMB) agar, Salmonella Shigella agar, Thiosulphate Citrate Bile Salt (TCBS) and Blood agar for identification of different bacteria in the water sample

Total Coliform Counts (TCC)

The water samples were cultured on MacConkey agar for 24 hours at 37°C colonies formed were counted (Cheesbrough, 2006).

Microgen tests

Microgen Rapid test was used to confirm bacterial isolates - Microgen™ GNA-ID System for E. coli, Salmonella

Results and Discussion

The results of the microbiological analysis are presented in Tables 1-3. The microbial counts for Heterotrophic bacteria were observed to be high in mairi Kuwait and Mairi Ustaz with bacterial load of 3 x 10^2 in each case.

Table 1 showing Total Heterotrophic Bacteria Count (THBC)

S/NO	Sample	Total Heterotrophic Bacteria Count
1	Mairi behind Ngab oil	2 x10^2
2 .	Mairi Kuwait	3 x 10^2
3.	Fori, Kakawo	2 x10^2
4.	Galtimari	2 x10^2

5.	Mairi Kuwait Olala	1.2 x10^2
6.	Fori Modu Birkila	2.2 x10^2
7.	Fori Bazanna	1.2 x10^2
8.	Mairi Ustaz.	3 x10^2
9.	Pompomari Housing Estate	2.2 x10^2
10.	Bolori layin taya	1.2 x10^2
11.	House of Assembly Quarters	1.2 x10^2

Total Heterotrophic Bacterial count of water samples collected from part of Maiduguri and Jere were analysed and the result showed bacterial load ranging from 3 x 10^2 in Mairi Kuwait to 1.2 x 10^2 in House of Assembly Quarters and Mairi Kuwait olala respectively, according to World Health Organization standard, Heterotrophic plate count levels in potable water should be < 500 colony forming unit per milliliter (WHO, 2019). Count time and again > 500 cfu/ml would indicate a general decline in water quality, in this regard, most of the water analysed are within the range except for Mairi Ustaz and Mairi Kuwait.

Table 2 showing Total Coliform Count (TCC)

S/NO	Sample	Total ColiformCount
1 .	Mairi Kuwait	0.50 x 10^2
2.	Fori, Kakawo	0.50 x10^2
5.	Mairi Ustaz	1.0x10^2

Total coliform count (TCC) conducted showed presence in 3 samples Mairi Ustaz 1.0x10^2, Fori, Kakawo 0.50 x10^2 and Mairi Kuwait 0.50 x 10^2 . TCC according to WHO (2003) should be zero in portable drinking water, this may be because Coliform bacteria are also indicators of contamination with faecal source and it is a measure of degree of pollution and sanitary quality of water. Contamination may be as a result of a layer of bacteria (biofilm) within the well or plumbing system. It is therefore essential to affect strong prevention measures to save ground and surface water system in the location. Sufficient monitoring and inspection of these water sources should be carried out and management of water should be compulsory.

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