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BACTERIOLOGICAL QUALITY ASSESSMENT OF WATER HAWKED IN SOME PARTS OF MUBI METROPOLIS, ADAMAWA STATE, NIGERIA

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Abstract: Investigation of bacteriological quality of drinking water hawked around five different areas in some parts of Mubi town in Adamawa state, Nigeria was conducted, using most probable number (MPN) technique and standard plate count methods. Two samples were collected from each site (one at the source and the other from hawkers at the point of delivery to house holds) which was repeated weekly for a period of one month. Mesophilic counts for the samples at the point of collection had values> 10^3 cfu/ml. whereas only two samples (Shuware and Lokuwa at the point of delivery) showed values = 10^3 cfu/ml. However, neither at the source nor at the point of delivery showed MPN values within acceptable range of <1O/IOOml. Therefore, the findings recommend improvement in sanitary quality at the source and enlighten the hawkers on measures that reduce microbial contamination during handling.
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1. Introduction

Water makes life possible on earth for all living organisms. It is next to air in importance for human existence. The importance of water to life on earth particularly human becomes clearer when one considers its role, or usefulness in various aspects of human endeavours. Even though a lot of resources are being spent for the supply of clean and potable drinking water all over the world, achievement of this aim is still facing serious plight in Nigeria.

Currently, the emergence and proliferation of water vendors using carts with multiple jerry cans in Mubi town is an issue of concern in public health sectors especially with the common incidence of enteric diseases like typhoid fever, cholera and dysentery. In recent months, there has been an out break of cholera like disease in Mubi town where 70 — 80 people were reported to have died. This inspired this study to investigate more on microbiological quality of water hawked within this part of Adamawa state.

Idakwo and Abu (2004) reported that a wide variety of microorganisms pathogenic to human beings are transmitted through contaminated water. According to WHO (l982) some 300,000 people die every day from water related diseases like typhoid and paratyphoid fevers, cholera, bacillary dysentery and gastroenteritis.

Therefore, in order to substantiate the nation's effort to provide and ensure the provision of safe drinking water, this study was conducted with the aim of ascertaining the bacteriological quality of water supplied in jerry cans by vendors in some parts of Mubi town and to recommend some possible measures of ensuring its portability.

2.0 Materials and Methods

2.1 Sampling Sites: A survey was conducted on areas having plights of water scarcity in Mubi town. Emphases were made to places that served as commercial and/or public water sources, and these places were identified. Site where hawkers collect and sell water in jerry cans were chosen for the sampling. The sites are, Arahan Kunu, Lokuwa, Kolere, Shuware and Wuro Patuji.

2.2 Sample Collection: Sample collections were carried out in two forms. One from the main source (reservoir) and the other directly from the jerry cans of the hawkers at the point of delivery to a house hold. This was repeated four times a month on weekly basis. For each sampling sites, samples were collected in a sterile *250m1* capacity dark brown glass sampling bottle (Cheesebrough, 2000) in each case. All samples were transported to the laboratory and kept under refrigeration for analyses.

2.3 Detection and Enumeration of Coliforms: This was carried out according to the method described by Harold (1998). Each sample was inoculated into 3 sets of tubes as follows:

First, l0ml into a tube containing 40m1 of lactose broth, usually designated as double strength lactose broth (DSLB) with Durham tubes, then 1.0ml of the 20m1 of lactose broth, usually designated as single strength lactose broth (SSLB) with durham tubes, and then O.lml inoculated into three tubes each containing 20m1 of lactose broth, usually designated

as single strength lactose broth (SSLB) with durham tubes. The tubes were incubated at 35^{0}C for 24 — 48 hrs. Following incubation tubes showing gas production were counted and compared with MPN table adapted from APHA (1998) for the determination of most probable number (MPN) of coliforms per 100mls of water.

A loopful of broth from gas positive tubes was seeded on to eosin methylene blue (EMB Antec UK) agar plate and incubated at *35°C* for 24 hours. The plates were observed after 24 hours for the presence of bluish black colonies with green metallic sheen which confirmed the presence of Coliform bacteria.

2.4 Standard plate count

This was carried out according to FAO (1979). In this method; 1ml of sample was transferred into a test tube containing 9.0ml of sterile distilled water and the tube labeled 1: 10. From this tube 1.0ml was transferred after agitation into another tube containing 9.0 ml of sterile distilled water and labeled 1: 100. This was also agitated and the procedure was repeated up to 1: 1000. Using sterile pipette 1.0ml of inoculum was transferred from dilution tubes into appropriately labeled duplicate Petri dishes. This was followed by pouring a cooled molten nutrient agar (oxoid). The dishes were gently rocked, allowed to solidify and incubated at 37^{o}C for 24hours. After 24 hours incubation, plates containing 30 -300 colonies were counted and the number obtained multiplied by the reciprocal of the dilution factor to get the actual number of organisms. The results were finally expressed in colony forming unit per ml (cfu/ml) of the sample.

Table 1: Mean Count of The Bacterial Load obtained from different water sources

Sampling Site	**Mean Mesophilic Count (cfulml)**	
	Water source	Jerry Cans
Arahan Kunu	3.00 x 10^4	4.20 x 10^5
Wuro Patuji	2.91 x 10^3	3. 23 x 10^4
Kolere	2.00 x 10^3	2.25 x 10^4
Shuware	2.22 x 10^3	3.11 x 10^3
Lokuwa	1.00 x 10^3	3.67 x 10^3

Key: S= Source and J= Jericans. E.g AS= Arahan kunu source, AS= Arahan kunu jericans.

2.5 Biochemical characterization of *E. coli*

Indole Test: Three loopfuls of the material from colonies formed were inoculated into a bijou bottle containing 3 ml of sterile trypton water and incubated at 37^{0}C for 48 hours. This was followed by the addition of 0.5 ml of Kovac's reagent. Appearance of red ring on the surface of the medium is positive for indole production which was confirmed for *E. coli* (Cheesebrough, 2000).

2.6 Methyl red test:

Tube of methyl red - Voges Proskauer (MRVP) broth was inoculated with three loopfuls from the suspected colony of *E. Coli* and incubated at 37^{o}C for 3 days. This was followed by the addition of few drops of methyl red indicator. Appearance of red colour confirmed acid fermentation (positive for *E. coli*) (Cheesebrough, 2000).

3. Results

Arahan kunu, Wuro patuji, Kolere, Shuware and Lokuwa wards obtained their drinking water from commercial water source hawked by truck pushes. Sixty percent (60 %) of these supplies had bacterial count of 1 0 cfu/ml and about 40 % had bacterial count of = 10^4 cfu/ml. The MPN value ranged between 21— 120 per 100ml with lowest at Lokuwa water source (Table 1) corresponding to the lowest mesophilic count. *E. Coli* was detected in 80% of the samples.

Table 2: Most Probable Number of Coliforms Present In Water Samples From The Various Sampling Location in Mubi

Numbers of gas positive tubes				**MPN index per 100ml**
Sample	3 of 10 ml each	3 of 1 ml each	3 of 0.lml each	
AS	3	1	0	43
AJ	3	1	2	120
WS	3	1	0	43
WJ	3	1	1	75
KS	2	2	1	28
KJ	3	0	0	39
SS	2	2	1	28
SJ	3	0	1	39
LS	2	2	0	21
LJ	3	0	1	39

4. Discussion

The result for bacteriological assessment of water hawked in the selected areas of Mubi town indicated contamination at both the source (reservoir) and the point of delivery to the consumers. The counts at the sampling sites are however higher at the point of delivery to the consumers than at the source. This suggests that the increase in microbial load might be as a result of poor handling of the water or the use of unclean containers (Jerry cans). This result agrees with the work of Muktar et al., (2007) who reported that 90 % of water hawked in some selected areas in Kano had bacterial count of 10^4 cfu/ml and MPN values ranged between 9 and > 180 per 100ml. This result is also in conformity with the work of Muktar and Oyeyi (2005), who reported that some of the raw water sources from some open wells in Kano had Coliforms of up to 15 MPN/l00ml.

Furthermore, the result obtained from the standard plate count shows conspicuously that people living around these areas of study namely: Arahan kunu, Wuro patuji, Kolere, Shuware, and Lokuwa are exposed to risk of contracting infection by the organisms isolated, which might lead to an outbreak of gastroenteritis and other enteric diseases.

The distribution of such important commodity (water) in the hands of illiterate members of the society who are habitually dirty and always unhygienic may be responsible for the introduction of microbes into the water, because most of the hawkers don't wash their jerry can thoroughly and regularly.
The entire study area has been known with long history of prominent water scarcity. The inability of the government to provide potable drinking water had contributed immensely to the water scarcity, creating more public health problems. People depend heavily on truck pushers who sell water some of which were obtained from doubtful sources.

5. Conclusion and Recommendations

In conclusion, people living in the study areas are at high risk since the work has shown that there is contamination of water sold by hawkers in the areas by feacal Coliform *(E. Coli)*. Hence the following recommendations are suggested.

i. Regulatory agencies (both governmental and non governmental) should intensify their efforts towards providing clean and portable water to the public.
ii. Water hawkers should maintain personal hygiene and should always use clean and leak proof containers for their business.

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