STUDY OF MICROBIOLOGICAL QUALITY OF DRINKING WATER IN ELOBEID CITY, NORTH KORDOFAN STATE, SUDAN

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ABSTRACT

This study conducted in El-Obied City, North Kordofan State to study microbiological quality of drinking water. The study comprised of 54 samples of water selected from houses, animal carts (karo), tankers, gerbas and main source of water which includes bara basin and El-khazan (surface water) in El-Obied. The sample divided over these sources following a process of stratified sampling combined with simple random samples with probability proportional to size of sample over the selected blocks where selection was at random in each stage. Bacteriological testing of water was done using standard bacteriological procedures. Two Samples of water were collected from the main sources of water in the City for Bacteriological, analysis and 52 samples collected from blocks. The data were analyzed by SPSS & Microsoft Excel Software. The study showed that the 31 samples of Drinking water contained feacal E.coli distributed as 12 samples from houses, 6 Samples from tankers and Gerbas and 13 samples from animal carts (Karo), while 23 Samples of water were without pollution.

The study showed that two samples taken from main sources of water supply were free from bacteriological contamination.

KEYWORDS: *Drinking Water, Bacteriological Parameters, E. Coli*

INTRODUCTION

A supply of water is critical to the survival of life as we know it. People, animals and plants need water to drink. The basic functions of society require water: cleaning for public health, consumption for industrial processes, and cooling for electrical generation (Weiner and Matthews, 2003).

Africa had the minimal water supply access of any area on the planet toward the start of the decade. The complete populace with access to an improved water supply in 2000 was 62%, while that for improved sanitation was 60%, (WHO-UNICEF, 2000). Thus, the number of people without access to safe water and sanitation is 300 million and 313 million respectively, Access to safe water in rural Africa is only 47%. As of 2008, the latest year for which data are available from the UNICEF/WHO"s Joint Monitoring Program (JMP), Sub-Saharan Africa accounted for over a third of the 822 million people without access to improved water supply. The region as a whole is lagging behind in progress towards the MDG target, with 60% of the population using improved sources of drinking-water despite an increase of 11 percentage points since 1990, (ADBG, 2003).

Water related ailments brought about by inadequate safe water supplies combined with poor sanitation and cleanliness cause 3.4 million deaths every year, generally among youngsters. Regardless of proceeding with endeavors by governments, common society and the worldwide network, over a billion people despite everything don't approach improved water sources (UNICEF, 2008).

The arrangement of a sufficient stock of safe water is one of the eight segments of essential medicinal services distinguished by the International Conference on Primary Health Care in Alma-Ata in 1978 (WHO, 1997). A great part of the evil wellbeing which influences mankind, particularly in the creating nations can be followed to absence of protected and healthy water supply (Park's, 2015).

The poor water and sanitation situation was, and has been, a principal cause of disease among Africans, particularly infants and children, who suffer from one of the six main water-related diseases including diarrhea ,intestinal worms, cholera and guinea worm. Vulnerable groups, mainly women and children, have been the most affected as they travel long distances to fetch water, often of questionable quality, and spend an inordinate amount of time and energy at the expense of family other activities, education, and productive work, (ADBG,2003).

MATERIAL AND METHODS

Study Design
Descriptive cross-sectional study.

Study area
El-obeid City is the biggest City in the North Kordofan State. El-obied is one of the most important cities in North Kordofan and the capital of the North Kordofan State. Its area have been estimated as 81 km square and the distance from Khartoum is about 560 km. The population of the City is estimated as 440483 persons. There are 38000 houses, 40000 families in the City.

Study population
Water supplies

Inclusion criteria
Water distribution to household by animal's carts (karo) especially the far household, as well as water from tankers and gerbas, samples from housing and distribution network.

Exclusion criteria
Water from intake and surface water (haffirs).

Sampling
Sample Size
Sample size was selected according to (WHO) guidelines for water sampling measurement, which recommend to take one sample per 10,000 population, plus 10 additional samples, (WHO, 1997).

Number of population: 440483
Sample size: 44 sample + 10
Accordingly, a sample of **54** samples were obtained.

Sampling technique
El-Obied, City was divided into four equal quarters (Clusters). The different types of blocks are considered as strata where 13 samples was selected from each quarter of El-Obeid City by using a process of simple random sample, and 2 samples were selected from water distribution network, so the total number of samples selected is **54** samples from all blocks.

Data collection methods and tools
Samples Collection
Water samples for biological, testing were collected in the sterilized bottle. The outside of the tap sterilized by flame, and then water allowed running for two minutes to wash out any organism in the pipe. The bottle then filled with water and closed immediately. A total of water samples of each in tightly sealed sterile bottles packed in cool box then submitted to ministry of health laboratory in El-Obied in the same day for analysis.

Bacteriological testing of water
The bacteriological examination of water used to affirm whether a water supply has been faecally sullied. The following tests were used:

- Presumptive Test.
- Confirmative Test.
- E.coli test (completed test).
- Membrane filtration technique.

Data processing & analysis:

After taking samples, data analyzed using Statistical Package for Social Sciences (SPSS) and presented in tables and figures.

Ethical consideration:

Ethical permission for this study was obtained prior to collection of data. The researcher was contact and received approval from the appropriate management authority.

RESULTS AND DISCUSSION

This cross sectional study was carried out in El-Obied City to study of microbiological quality of drinking water in El-obeid City, North kordofan State.

The study showed that about 57% of samples of drinking water containing faecal- E.Coli (**fig.1**), these findings are in contrast with WHO guidelines which indicate that E.Coli must not be detectable in any 100-ml sample of water for drinking (WHO, 1997). Thus those samples were considered as unsafe water because it contains bacteria which indicating faecal pollution, because of the risk that enteric pathogens may be present (WHO, 1996).
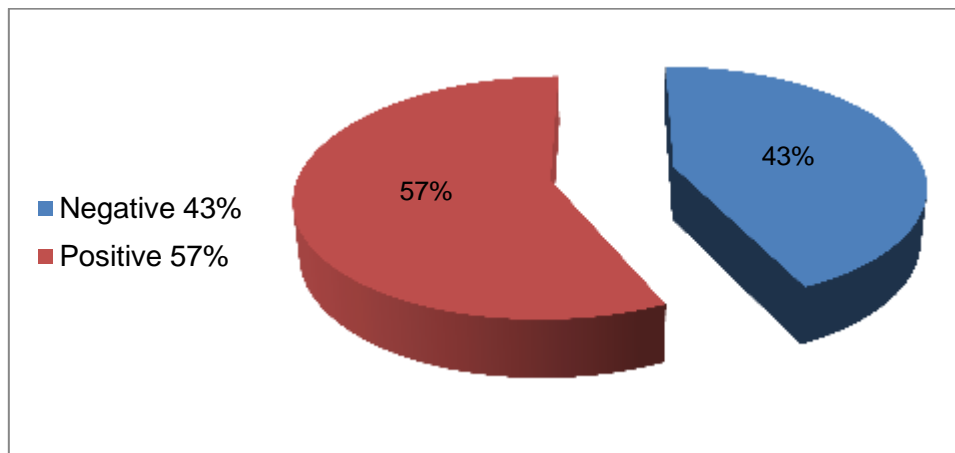

■ Negative 43%
■ Positive 57%

Figure (1): The distribution of faecal E.coli among samples in EL-Obied City. n=54

While this study showed that there were 60% samples from houses contain E.coli , 50% from tanker and Gerba contain E.coli and 81% animal cart samples contain E.coli (**fig.2**), this percentage refer to a high pollution of water in this sources, which is corresponding with, WHO guideline which indicate that, all water intended for drinking E. coli or thermotolerant coliform bacteria must not detected in any 100-ml sample, in treated water entering the distribution system E. coli or thermotolerant coliform bacteria and total coliform bacteria must not detected in any 100-ml sample, and treated water in the distribution system. In the case of large supplies, where sufficient samples were examined, bacteria must not be present in 95% of samples taken throughout any 12-month period (WHO, 1997).
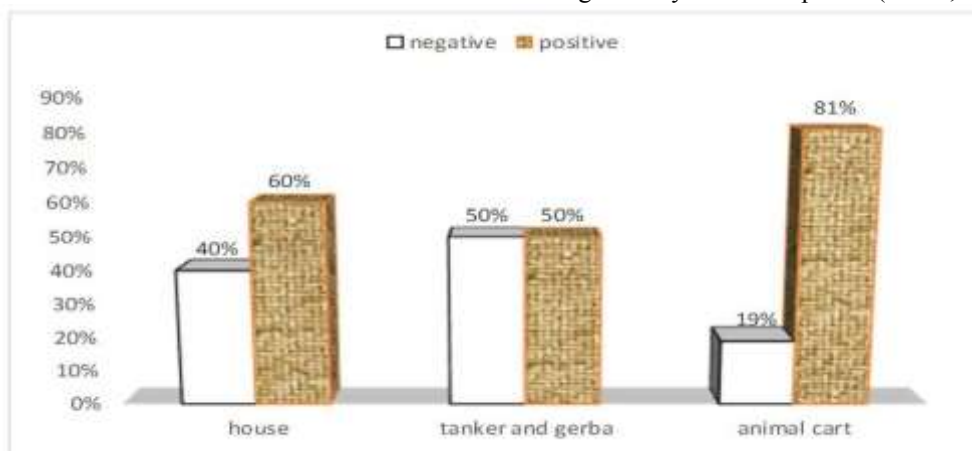

Figure (2): The distribution of faecal E.coli among samples by source in EL-Obied City. n=52

The study showed that the water sample taken from the main source of water coming from Bara basin (ground water) was free from contamination and also the sample taken from main source of Khazan (surface water) after treatment was free from contamination. Whereas the samples from main sources in El-Obied were free from contamination (**table.1**), and this indicates that the contamination that occurs in samples tested may be due to leakages in the distribution system or bad handling and storage methods, WHO guideline, which indicate that, there are a number of health concerns associated with water supplied to consumers by water vendors. These include access to adequate volumes and concern regarding inadequate treatment or transport in inappropriate containers, which can result in contamination. Where the source of water is uncertain or the quality of the water is unknown (WHO, 2011).

Table (1) the result of E.coli for samples from main sources Bara basin and El.khazan (surface water) – in EL-Obied city. n=54

Sources	Positive%	Negative%
Bara basin	0.00%	100%
El-khazan	0.00%	100%

CONCLUSIONS

The study concluded that most samples taken from houses, animal carts (Karo), Tankers and Gerbas were polluted with feacal E.coli, and samples taken from main sources were free from contamination, as shown in the result of water analysis, which indicate the safety of water from main sources, and pollution of it after handling and storage. The study recommend encourage all venders who transfer water by Tankers, Gerbas and animal carts to take water from safe sources of drinking water, clean and paint storage water equipment regularly to avoid any contamination.

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