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PARASITIC SURVEY OF DRINKING WATER SOURCES IN OHAUKWU LOCAL GOVERNMENT AREA, EBONYI STATE, NIGERIA

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ABSTRACT

A survey of parasites was carried out on the different drinking water sources in Ohaukwu Local government area of Ebonyi State. A total of 36 water samples collected from (Ezzamgbo, Ngbo and Effium) the three towns in Ohaukwu Local Government area of Ebonyi State were examined. 11 samples were from the rivers, 5 samples were from the wells, 3 samples were from Rain water (tank), 5 samples were from ponds, 1 sample was from the spring, 6 samples were from the bore holes and 5 water samples were from streams. All the drinking water sources harbour one or more cyst or oocysts of the parasites. The observation was made possible by the calcium carbonate flocculation method and by simple microscopy. The parasites observed include, *Giardia lamblia* (G. intestinals) cyst 50% (18/36), *cryptosporidium* oocyst 38.8% (14/36) and *Entaemoeba histolytica* cyst 27.7% (10/36). The highest number of *Giardia lamblia* cyst *and Cryptosporidium* oocyst were observed in rivers. The prevalence rate of the parasites differed due to the difference sources of water. The inhabitants of the studied area, should stop defecating near their drinking water sources to reduce the rate at which these parasites contaminates water. They should also boil their drinking water before drinking it, to reduce its effects on humans, as well treat their waters effectively to ensure the safety and hygienic quality of the water.

Key words: Drinking water, Parasites, Ebonyi, Nigeria.

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INTRODUCTION

Water is considered as one of the nutrients, although it yields no calories yet it enters into structural composition of cell and it is an essential components of diet [1]. According to WHO more than 80 disease of humans are water-borne. In developing countries, 60 percent population has no access to pure drinking water. Water borne disease occur worldwide, and out breaks caused by the contamination of community water system have the potential to cause disease in large number of consumers [2]. A number of outbreaks have been associated with drinking and recreational water worldwide including USA [2]. Water plays a crucial role in the origin and maintenance of every life as it is a content of all living beings including the minutest living cell. It is the most abundant liquid on earth, covering about 71% of the earth's surface [3].

Water is useful to man in drinking. Agriculture irrigation, fishery, Electricity, recreation/sports (swimming) etc. Historically, the availability of water supply has been a major determinant in the sitting of villages, toward and cities [4]. Enough supply of clean water is very essential for the health and survival of man in all his habitation. Hence, the quest for the adequate supply of clean water for drinking and for other purposes. Drinking enough water is essential for physical and emotional well-being of the body. Clean water is necessary for prevention of diseases associated with unclean water. It serves as a transport medium to both plants and animals. Water is also necessary for removal of waste water products like urine urea etc. through sweat, tears, urination etc. water is useful and considered the most important in the rearing of animals or livestocks. In fish farming it is very important.

Average human being is about 70% water. And one can only survive for days without water [5]. The consumption of contaminated water has been implicated and proven to be a

major source of *Giardia lamblia*, *Cryptosporidium parvum*, *Entamoeba histolytica* ,*isospora bell*, *Microporidia* species, infections in various outbreak/ epidermic.

MATERIALS AND METHODS

Ohaukwu L.G.A is made up of towns which are: Ezzamgbo, Ngbo and Effium. Many activities go on in and around these drinking water sources such as washing, bathing as well as fishing activities. Cattle rearers lead their cattle to the water during this process those cattles drop their dung in the water. Human beings also defecate around the waters too. There are some vegetation around the water sources such as shrubs, bamboo, cassava plant and trees etc.

SAMPLES DESCRIPTION

Thirty-three samples of water were collected from different drinking water sources in Ohaukwu. Twelve samples were collected in each trip .In Ezzamgbo, sample were collected from Ndiaguazu Stream, Akadoro River, Nkpuvuru Stream, Onuafor Stream, Ngedege Well, Amaike River, Ndiokpuru Pond. In Ngbo, sample was from Amaogu Spring, Orieja Borehole and Inyimagu Borehole, while in Effium, samples were collected from Rain water (tank) in Umuezeoka, Effium high school, and Nweke-ndiagu. The samples were collected in a sterilized 1 litre screw capped bottles from the different drinking water sources. The samples were collected in three trips, between 6am – 12pm. The first, second and third trips were made on 14th Nov, 28th Nov and 1st Dec 2011.The Reagents were also bought from Abakpa market.

Collection of Water Sample

A total of 36 water sample were collected from, Pond, River, Stream, Spring, Rain, Well and Borehole water in a clean and sterilized bottles. The samples were labelled with name, date of collection, nature of source of water, the site of collection and were transported to the laboratory for further analysis.

METHOD

Water samples were collected in sterilized containers. The samples were viewed with the unaided eyes and the observations were made, fresh drops of the samples were examined under the microscope and observations were also made. Calcium Carbonate Flocculation method was used as discussed by Vesey G *et al* [6]. In this method, each one-litter water sample was treated with 20mls of calcium chloride solution, 20mls of sodium bicarbonate solution; 20mls of sodium hydroxide was also added to each sample to raise the pH of the solution to 10. The solution were mixed thoroughly and allowed to settle for two hours at room temperature and the formed sediments were settled.

The calcium carbonate crystals were formed and precipitation absorbed, pushed the particles in the water to the bottom of the beakers/vessels, given a denser stable precipitate. The supernatant fluid was discarded with care and the sediments were dissolved by adding 40mls of 10% w/v sulphuric acid. The dissolved sediments were centrifuged at 300 rpm, for 15 minutes. The supernatant fluids were discarded, the pellet were transferred to 50ml centrifuge at 3000g for 15 minutes. The sediments were used to prepared smears on grease-free slide. Two smeared slides were prepared for each samples and one was stained with lugol's iodine while the acid fast stain was applied on the other using Ziehl Nelson technique. The stain slides were covered with cover slides. The slides were mounted one after the other and viewed under the microscope using 10x and 40x objectives.

RESULTS

A total of 36 samples were collected from the 12 sample sites and examined. In this study, *Giardia lamblia* cysts were observed to be 50% (18/36), *Entamoeba histolytica* cyst were 27.7% (10/36), *Cryptosporidium parvum* were 38.8% (14/36).

According to the the result of the study, the rivers harboured the highest number of parasites, followed by the stream, the pond and the wells. While the borholes and rain water harboured the least number of parasites.

Table 1. Showing the summary of the results of the various drinking water sites examined and the number of times each parasite was identified

Sample label	Drinking water Site	Sample type	*G.lamblia*	*E. histolytica*	*C. parvum*
A	Amaogwu	River	5	-	2
B	Orieja	Borehole	-	1	-
C	Ndiokpuru	Pond	2	3	1
D	Amaogu	Spring	-	-	-
E	Ndiaguazu	Stream	-	1	-
F	Nkpuvuru	Stream	-	-	-

G	Umuezeoka, Effium high school	Rain water (tank) from	1	1	2
H	Nweke-ndiagu	Well	1	1	2
I	Amaike	River	3	-	3
J	Inyimagu	Borehole	2	1	-
K	Onuafor	Stream	3	1	2
L	Ngedege	Well	1	1	1
	Total	36	18	10	14

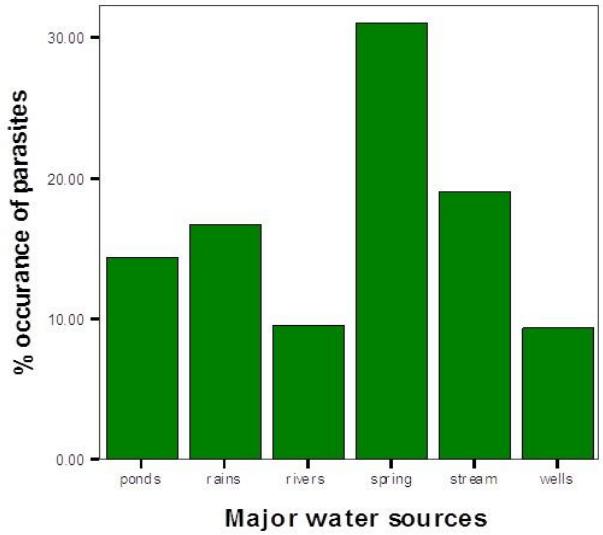
The table below shows the various drinking water sites examined and the number of times each parasite was identified. This result reveals a high rate of occurrence of parasites in almost all the sample sites examined.

Table 2. Showing the summary of the rate of occurrence of parasites in different water sources in the area.

Major (water) sources	Total number of samples	*Giardia lamblia*	*Entaemoeba histlytica.*	*Cryptosporidium parvum.*	Total no of parasites	Percentage occurrence of parasites %
Boreholes	6	2(33.3%)	2(33.3)	-	4	9.5%
Wells	5	2(40%)	2(40%)	3(60)	6	14.3%
Ponds	5	2(40%)	3(60%)	1(20)	7	16.7%
Rain (Tank)	3	1(33.3%)	1(33.3)	2(66.6)	4	9.5%
Rivers	11	8(72.7%)	-	5(45.5)	13	31.0%
Spring	1	-	-	3(60)	-	19.0%
Stream	5	3(60%)	2(40%)	(27.7%)	8	-
Total	36	18(50%)	10(38.8%)	14(27.7%)	42	100%

The table above showed that river water contained the highest number of parasite, followed by streams; pond and wells while boreholes and rain water from the tank had the least number of parasites.

Figure 1. Bar chart showing the percentage occurrence of parasites in the drinking water sources



The bar chart shows a high percentage occurrence of the six parasites observed in Rivers (31.0%), streams (19.0%), ponds (16.0%), wells (14.3%), boreholes and rain water which had the lowest percentage occurrence of (9.5%) respectively.

Plate 1. The Activities Akadoro Drinking Water Source

Plate 2. Rain Water From Tank In Effium: Front View

Plate 3. Rain Water From Tank In Effium: Side View

DISCUSSION

A total (36) thirty-six water samples were collected from (12) twelve sample sites and examined from the three towns of Ohaukwu L.G.A of Ebonyi State. The study reveals that *Giardia lamblia* cyst, *Cryptosporidium parvum*, *Entameba histolytica* were found in the River, Stream, Pond, Well, Borehole and Rain water from the tank. They occur in their oocystic and cystic forms. Only one water source was free of detectable parasites throughout the study. Parasites were detected more in rivers compare to other water sources.

According to the result of the survey, the percentage of all the parasites detected in River samples were as high as 72.7% while the percentage of *C. parvum* in the same sample were 45.5%. The high prevalence rate of both the *Giardia* cyst and *Cryptosporidium* oocyst in the river might be as a result of unsanitary attitude of people who defecate near the rivers and activities of farm animals like goat and cattle which harbour the parasites and this could result in the outbreak of *Giardiasis*. It could also be due to different environmental and geographical distribution of the country and locality.

The study is similar them to findings of clinical studies conducted, that had shown the presence of these two parasites in the human population. *Giardia* and *Cryptosporidium* were known to be the root cause of gastroenteritis and were also considered as the two of the leading causes of water borne disease in the United States as reported by Furness *et al*. [7] Similar studies, conducted in srilanka also confirms the findings [8,9]. Entamoeba cyst, were also recovered from the water sources. Therefore *Entamoeba histolytica*, *Giardia lamblia* and *Cryptosporidium parvum* are three of the major causes of parasitic induced diarrhea disease [10] and the most common cause of infection worldwide [11,12]. Apart from identification of these parasites in the water samples, it was also observed that most of the water samples contained dirts and debris, coloured particles and other things which contributed in a great deal by contaminating and polluting water and the same way makes it unsafe for human consumption.

CONCLUSION

All the drinking water sources surveyed were found to harboured one or more parasites. Although cysts/oocysts are small and hard to be detected. The calcium carbonate flocculation method was able to dissolve all the particles around the cysts/oocysts and manifest them for observation under the microscope. Water borne diseases can have a significant impact on the economy, locally as well as nationally. People who are infected are usually confronted with related costs, such as costs for medical treatment and medication, costs for transport, special food and by the loss of manpower, many families may even sell their land to pay for treatment. Therefore preventing water borne contamination through provision of safe and adequate drinking water is vital to the public health, due to the fact that access to safe drinking water is required cornerstone of public health.

RECOMMENDATIONS

The transmission of all these water borne parasites, found in the drinking water samples in Ohaukwu Local Government areas is possible. To avoid the outbreak of these diseases, the inhabitants of the studied areas should avoid faecally contamination of food and water. They should stop using human excreta as fertilizer which may lead to contamination of vegetables, water etc. There should be proper disposal of human faeces through proper drainage system rather than defecating near the rivers and streams, the cattle should also not be allowed to go near the drinking water sources.

Drinking water should be boiled and allowed to cool before drinking. There should also be proper water treatment. Finally the Government of the surveyed area should provide and distributes more purified water through pipe lines to all the towns in the surveyed areas to avoid deaths as a result of epidermis.

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