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Prevalence of Some Parasitic Protozoan Species along Kumbotso and Wudil River, Kano Nigeria

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ABSTRACT

Over the past few decades, pathogenic enteric protozoa have been increasingly implicated in compromising the health of millions of people, mostly in developing countries. The aim of the study is to determine the prevalence of parasitic protozoan species along Kumbotso and Wudil River in Kano, Nigeria. Four (4) water samples were collected from four different points of the river namely; Challawa, Kumbotso, Tamburawa and Wudil. The water samples were left to stay undisturbed for 24 hours at room temperature and the supernatant were examined microscopically, as a 0.9% saline smear, for parasite cysts and trophozoites. Samples were stained with Lugol's iodine for easy identification. The result showed that 4 different species of parasitic protozoans were found namely; Entamoeba histolytica, Cryptosporidium sp, Giardia sp and Blastocystis sp. Entamoeba histolytica has the highest number of occurrence with 54 appearances which accounted for 48.2%, followed by Cryptosporidium sp 27 (24.1%), Giardia sp 20 (17.9%) and least number was obtained by Blastocystis sp 11 (9.8%). It is concluded that the contamination from municipal sewage, industrial effluent as well as animal and human feces influence the distribution and prevalence of parasitic protozoa in fresh water.

Keywords: *Kano, parasite, prevalence, protozoans, river*

INTRODUCTION

Over the past few decades, pathogenic enteric protozoa have been increasingly implicated in compromising the health of millions of people, mostly in developing countries. These protozoa contribute significantly to the staggering case load of diarrheal disease morbidity encountered in these regions and are also significant concerns in industrialized countries despite improved sanitation [1]. Protozoa are eukaryotic cells distributed worldwide in nature and are receiving increasing attention as human and animal pathogens and potential vehicles for the transmission of bacteria in the environment. Unfortunately, one of two persons in the world is affected by water borne or food borne parasites [2]. The protozoa are among the most common parasitic pathogens present in environmental samples. They have multi-stage life cycles, consisting of an active trophozoite stage and a resistant stage (oocysts or cyst) excreted in feces that is capable of infecting new hosts [3]. There are about 15,000 species of protozoa [4] on Earth. However, it is divided into 4 classes depending on their methods of locomotion. Mastigophora (flagellates); move by using one or more flagella. Sarcodina (amoebae) have extensions of the cytoplasm called pseudopodia assisting phagocytosis and motion in the organisms. Ciliophora (ciliates) move by means of cilia. Sporozoa (Apicomplexa) have no locomotion [5].

Protozoan parasites are identified as the second most frequent etiological causes of the mortality among children under five years old. Globally they are responsible for 1.7 billion cases of diarrhea, which leads to 842,000 deaths per year [6,7]. Parasitic diseases transmitted through water by protozoa caused epidemic and endemic diseases in both developed and developing countries [8]. However, the former have better hygiene conditions so parasitic protozoa are commonly not considered as a reason of these diseases [9]. The latter, where population consume both treated and untreated water, have the high rates of protozoan diseases in spite of having achieved their water during recent years, there appears to be an increasing number of cases without breaks of water borne or water-washed parasitic diseases worldwide [10]. The reason for this seems to be crumbling or poorly maintained

community sanitary and water supply systems [11, 12].

Parasitic protozoa that are transmitted through water and those that cause human infections are *Toxoplasma gondii*, *Entamoeba histolytica*, *Cyclo-sporacayetanensis*, *Isospora belli*, *Blastocystis hominis*, *Balantidium coli*, *Acanthamoeba* spp., *Sarcocystis* spp. and *Naegleria* spp. However, the most common water-related parasitic infections are cryptosporidiosis and giardiasis [13, 14]. *Giardia* and *Cryptosporidium* are zoonotic agents that are more often identified during outbreaks caused by contaminated drinking water. The majority of giardiasis outbreaks (71%) occur in systems with surface water, while the majority of cryptosporidiosis outbreaks (53%) ensue in the ground water system [8]. These enteric protozoan parasites are important causes of diarrheal disease [10,12], especially among children in developing countries[15]. Cysts of *Giardia* and oocysts of *Cryptosporidium* can penetrate through the water treatment system because of their small size (1–17 m) and may cause outbreaks and epidemics after consumption of purified drinking water [16]. The aim of the study is to determine the prevalence of parasitic protozoan species along Kumbotso and Wudil River in Kano, Nigeria.

Materials and Methods

Study Sites

Wudil Local Government Area is geographically located in the south-eastern part of Kano state along Maiduguri – Kano way with a distance of about 41 Kilometer from the State capital. It is located at Latitude 110 49' 0" N and Longitude 80 51' 0" E. It covers an area of about 362 Km2 of land and population of about 185,189 according to 2006 census [17]. Wudil Local Government shares common boundaries with Warawa (North), Dawakin-kudu (West), Garko (South) and Gaya Local Government (East). Kumbotso Local Government Area has an area of 158 km² and total population of two hundred and ninety four thousand, three hundred and ninety one (294,391) residents with population density of 2,197.47 inhabitant/ km2 [17]. According to National population commission 2006, the populations are expected to reach to 374,200 by the year 2011. It is located at an elevation of 450 meters above sea level. Its coordinates on a map are 11° 53'17" N latitudinally and 8° 30'10"E longitudinally [18].

Sample Collection

Four (4) water samples were collected from four different points of the river namely; Challawa, Kumbotso, Tamburawa and Wudil. The water samples (250 ml) were collected in sterile bottles, transported to Biology in the Department of Biological Sciences Kano State University of Science and Technology Wudil. The water samples were left to stay undisturbed for 24 hours at room temperature for parasitological analysis [19].

Table1. *Samples collection points*

S/N	Collection Point	No. of Samples
1	Challawa	4
2	Kumbotso	4
3	Tamburawa	4
4	Wudil	4
	Total	**16**

Identification of Parasitic Protozoan

After allowing the water to stay undisturbed for 24 hours, the supernatant was sucked and removed [20]. Sediments of each sample were examined microscopically, as a 0.9% saline smear, for parasite cysts and trophozoites [21]. Samples were stained with Lugol's iodine for easy identification [22].

Results

Number of Parasitic Protozoans

The number of protozoan parasites obtained from each collection points is presented in Table 2. The results showed that the highest number of protozoan parasite was obtained at Kumbotso with total number of 36 parasites, followed by Challawa with 31 parasites, and then Wudil with 25 parasites and least was found at Tamburawa with total of 17 parasites.

Table2. *Number of protozoan parasites obtained from each collection points*

	Collection points			
Parasite	**Challawa (n)**	**Kumbotso (n)**	**Tamburawa (n)**	**Wudil (n)**
Entamoeba histolytica	15	19	8	12
Crystosporidium sp	9	8	4	6
Blastocystis sp	3	4	2	2
Giardia sp	5	7	3	5
Total	**31**	**36**	**17**	**25**

Prevalence of Parasitic Protozoan

The prevalence of protozoan parasite in the various collection points along Kumbotso and Wudil River is presented in Table 2. The result showed that Entamoeba histolytica has the highest number of occurrence with 54 appearances which accounted for 48.2%, followed by Crystosporidium sp 27 (24.1%), Giardia sp 20 (17.9%) and least number was obtained by Blastocystis sp 11 (9.8%).

S/N	Parasite	Frequency (n)	Prevalence (%)
1	*Entamoeba histolytica*	54	48.2
2	*Crystosporidium* sp	27	24.1
3	*Blastocystis* sp	11	9.8
4	*Giardia* sp	20	17.9
	Total	**112**	**100**

DISCUSSION

The protozoa are among the most common parasitic pathogens present in environmental samples. In the present study it was found that Entamoeba histolytica cysts were predominant in all the water samples examined. Infections with E. histolytica occur worldwide, and it has been suggested that 12% of the world's population is infected with this organism. In the presence study, considerable number of Cryptosporidium and Giardia was also found. G. lamblia is the most commonly isolated intestinal parasite throughout the world and is especially prevalent in children in developing countries [23]. The mean prevalence rate for Cryptosporidium infection is between 1 and 3% in Europe and North America but is considerably higher in under developed continents, ranging from 5% in Asia to approximately 10% in Africa [24]. Several studies were conducted on the prevalence of parasitic protozoan in fresh water body; Khouja in Tunisia [19] and Bakir in Ankara [22]. The finding of this study revealed the presence of 4 parasitic protozoans namely; Entamoeba histolytica, Crystosporidium sp, Giardia lamblia and Blastocystis sp in the study area. This finding was in consistent with the study of Ziae [25] from Mazandaran and Ayaz from Pakistan. The presence of parasitic protozoan in the study area is due to the water source for the river. The major water source for the river is surface water, which could be more easily contaminated with parasitic protozoa from animals and human. In addition to that, nearness of the water distributary system to the sewage system may also be accounted for the presence of parasitic protozoans.

According to the result of this study, highest number of parasitic protozoans was found Kumbotso and Challawa areas. This is as result of the contamination of the river water with industrial sewage in the area as there are large numbers of industries around the area. In addition to, Kumbotso and Challawa are located near Kano metropolis were large quantity of sewage are disposed on daily basis. Fewer number of parasitic protozoan around Wudil River may be due proximity to industrial area and possibility of self-purification of water as it flow through a long distance. Fletcher et al. [9] reviewed that Giardia sp, Cryptosporidium spp., and Entamoeba spp. were the most commonly reported protozoa associated with enteric infections and were associated mainly with food- and waterborne outbreaks. These enteric protozoa are isolated frequently from diarrheal patients in developing regions such as Asia and Sub-Saharan Africa [9].

CONCLUSION

Based on the finding of this study, 4 protozoan parasites were detected along Kumbotso and Wudil Rivers. The species include; Entamoeba histolytica, Giardia sp, Cryptosporidium sp, and Blastocystis sp. with Entamoeba histolytica being the most dominant species. Contamination from municipal sewage, industrial effluent as well as animal and human feces influence the distribution and prevalence of parasitic protozoa in fresh water. There is need for improving water supply and sewerage systems to prevent or minimize the risk of spreading protozoan parasites. Measures should also be focused on the hygienic behavior of people to avoid defecation.

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