

Prevalence of Intestinal Protozoa among Primary School-Aged Children in Selected Communities in Yenagoa Metropolis, Bayelsa State

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ABSTRACT

The prevalence of intestinal protozoa among primary school-aged children in five communities in Yenagoa Metropolis, Bayelsa State was investigated. Faecal samples were collected from 300 presumably healthy primary school-aged children from the five selected communities within Yenagoa Metropolis. Laboratory analysis was carried out on the faecal samples using zinc sulphate floatation method and formol-ether concentration technique. Demographic data of age, sex and nature of school attended (public or private), were recorded at the point of sample collection. Out of the 300 children investigated, 61 (20.3%) were positive for one type of intestinal protozoa or the other. Etegw Community recorded the highest prevalence (30%), followed by Okutukutu (25%), Agudama (18.3%), Opolo (16.7%) while Azikoro Community recorded the least prevalence (11.7%). Among the intestinal protozoa identified, *Entamoeba histolytica* recorded the highest prevalence (57.4%), followed by *Giardia lamblia* (24.6%), *Entamoeba coli* (13.1%) and *Toxoplasma gondii* (4.9%). The age range prevalence for intestinal protozoa recorded 24%, 22.4%, 22% and 10% for 13-15 years, 10-12 years, 7-9 years and 4-6 years respectively. More male children (23.6%) were infected compared to the females (17.5%). The laboratory analysis further revealed that prevalence was more among children that attend public school (24.7%) than those in private schools (14.6%). Increased personal hygiene, sanitation, provision of toilet facilities, provision of good drinking water, reduction of contact with flooded areas and health education in schools will reduce the prevalence of these intestinal protozoa in the study area.

KEYWORDS: Prevalence, Intestinal protozoa, Yenagoa, Bayelsa State.

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INTRODUCTION

Intestinal protozoa are parasitic protozoa which infect the gastrointestinal tract. These parasites are known to flourish in areas characterized by warm temperature, high relative humidity, poor environmental conditions and crowded housing. The rate of infection is highest among children living in sub-Saharan Africa, followed by Asia, Latin America and the Caribbean (Okeke – Osisiogu et al., 2018).

Available records showed that an estimated 65,000 species of protozoa occur on land and in water with more than 100,000 species adopting either a parasitic or symbiotic mode of interaction (Udensi et al., 2005). Infection with intestinal protozoa are among the major causes of morbidity and mortality worldwide especially in developing countries

where the mortality rate owing to infectious diarrhea could be as high as 56% (Okike-Osisiogu et al., 2018). *Entamoeba histolytica* is ranked third among parasitic causes of death worldwide, being second to malaria as protozoan cause of death, affecting approximately 50 million people each year and causing an estimated 40 – 100 thousand deaths annually (Olubunmi, 2013). It is also reported that Giardiasis due to *Giardia lamblia* impedes the labour force and output of the individual and the community at large (Orji, et al., 2018). The risk factors associated with the transmission of intestinal protozoa include consumption of contaminated foods or water, lack of portable water, poor hygiene, lack of awareness, poor sanitary conditions and contact with

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contaminated objects/surfaces (LeBari & Jennis, 2021; Orji et al., 2018).

The most common intestinal protozoa include: *Giardia lamblia*, *Toxoplasma gondii*, *Entamoeba histolytica* and *Cryptosporidium parvum* (LeBari & Jennis, 2021). In Nigeria and especially in parts of the Niger Delta region, open defecation and sewage are regularly discharged into surrounding water bodies thereby promoting the proliferation and transmission of the infective stages of these parasites (Udensi et al., 2005). The symptoms of these infections on individuals include; abdominal pain, bloody stool, loss of appetite, ulcer, colitis, diarrhea, weight and loss (LeBari & Jennis, 2021).

The prevalence of these intestinal protozoa infection differs from one region to another and largely depends also on the methods of diagnosis adopted and the number of stool samples examined (Mayta et al., 2000). Several concentration techniques such as zinc sulphate floatation, centrifugal floatation, formol-ether concentration are used in the diagnosis of intestinal parasites while conventional methods used in the detection of these parasites include the direct wet mount and the iodine mount. However, the conventional methods lack sensitivity in detection of parasites in the stool specimens (Parameshwarappa et al., 2012).

Even though several researches have been made to determine the prevalence of intestinal protozoa in various regions of Nigeria (LeBari and Jennis, 2021; LeBari and Elele, 2013; Akinboye et al., 2015), there is no published evidence presently on the prevalence of intestinal protozoa among primary school-age children in Etegwe, Okutukutu, Agudama, Opolo and Azikoro communities in Yenagoa, Bayelsa State, Nigeria. This study will therefore, provide a published evidence to guide intestinal protozoa control programme officers, researchers and policy makers in the study area.

MATERIALS AND METHODS

This study was carried out among primary school-aged children in five communities within Yenagoa metropolis. Yenagoa lies between latitude 4°55'29" N and longitude 6°5'51" N. It is the headquarters of Yenagoa Local Government Area of Bayelsa State in Nigeria, with a population of 352,285 (N.P.C, 2006) and has an area of 1,698km² (656sqm). The major occupation of the people includes trading, fishing, farming and civil servants. The city lies on a low and swampy area, hence most of the communities within the city are prone to perennial flooding.

Study Population

Sixty (60) primary school-aged children comprising of males and females were randomly selected from each of Etegwe, Okutukutu, Agudama, Opolo and Azikoro communities making a total of three hundred (300) primary school-aged children (140 males and 160 females).

Sample Collection

Well labeled sterile bottles (1each) were given to sixty (60) presumptively healthy primary school-aged children in each of the five communities for collection of their stool samples with the help/permission of their parents/guardians. At the time of collection, the age, sex, nature of school attended (private or public) and the nature of the stool (soft, watery, semi-soft and firm) were recorded for each child on a recording format. The retrieved stool samples were immediately taken to the laboratory for parasitological analysis.

Stool Analysis

The stool samples were examined macroscopically and microscopically.

Macroscopy

The stool samples were carefully examined for odour, colour, texture and consistency (soft, watery, semi-soft and formed).

Microscopic examination of stools

The stool samples were examined using Zinc sulphate floatation method and formol-ether concentration technique described by Cheesbrough, (2010).

Zinc sulphate floatation method

165grams of zinc sulphate salt was dissolved in 500ml of distilled water and was mixed thoroughly. About 2grams of faecal sample was introduced into a test-tube containing zinc sulphate solution and was emulsified using a sterile spatula. The test tube was kept in a completely vertical position. More zinc sulphate solution was added to the test-tube, using a pipette until the test tube was filled to the brim. A clean (grease-free) cover slip was gently placed in the test-tube. The test-tube was left to stand for 30 – 45 minutes in order to give time for cysts, eggs and larvae to float. The cover slip was lifted carefully from the test tube by a straight pull upwards at the expiration of the time. The cover slip was placed downward on a microscope slide and viewed under x4, x10 and x40 objective lenses.

Formol-ether concentration technique: Using an applicator stick, about 1g of the faecal sample was mixed thoroughly in a test tube containing 4ml of 10% formol water and was sieved through two layers of gauze into a centrifuge tube containing another 4ml of formol water. 3ml of diethyl ether was then added and mixed thoroughly. The mixture was centrifuged for one minute at 3000rpm. The sediments were transferred onto a microscope slide after discarding the supernatant. Cysts of parasites were observed and identified using x10 and x40 magnifications of the microscope.

ETHICAL CLEARANCE

The ethical clearance for this work was approved by the Bayelsa State Ministry of Health. Consent of

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parents/guardians and participants were also sought before samples were collected.

RESULTS

Prevalence of intestinal protozoa in relation to communities

Name of community	No. examined	No. infected (%)
Etegewe	60	18 (30)
Okutukutu	60	15 (25)
Agudama	60	11 (18.3)
Opolo	60	10 (16.7)
Azikoro	60	7 (11.7)
Total	300	61 (20.3)

The laboratory analysis of the stool samples revealed that a total of 61 (20.3%) out the 300 primary school-aged children in the five communities were infected with one intestinal protozoa or the other. The parasites were more prevalent among school-aged pupils in Etegewe community (30%). Also, 15 (25%), 11 (18.3%), 10 (16.7%) and 7 (11.7%) primary school-aged children were infected in Okutukutu, Agudama, Opolo and Azikoro communities respectively (Table 1)

Prevalence in relation to species of intestinal protozoa

Species of intestinal parasite	Prevalence (%)
<i>Entamoeba histolytica</i>	35 (57.4)
<i>Giardia lamblia</i>	15 (24.6)
<i>Entamoeba coli</i>	8 (13.1)
<i>Toxoplasma gondii</i>	3 (4.9)
Total	61 (100)

The results of the examination of the faecal samples further revealed the presence of three genera of protozoa (*Entamoeba*, *Giardia* and *Toxoplasma*). *Entamoeba histolytica* was most prevalence among the identified intestinal protozoa (57.4%), followed by *Giardia lamblia* (24.6%), *Entamoeba coli* (13.1%) and *Toxoplasma gondii* (4.9%) (Table 2).

Prevalence in relation to demographic factors of age and sex

Variables	No. examined	No. infected (%)
Age		
4 – 6	50	5 (10)
7 – 9	100	22 (22)
10 – 12	125	28 (22.4)
13 – 15	25	6 (24)
Sex	Male	
	140	33 (23.6)
	Female	
	160	28 (17.5)

The laboratory analysis of the stool samples further showed that out of 300 primary school-aged pupils (140 males, 160 females), 33 (23.6%) and 28 (17.5%) were infected with one form of intestinal protozoa or the other for males and females respectively. Also, pupils within the age of 13 -15 years were most infected (24%), followed by 10 – 12 years (22.4%), 7 – 9 years (22%) and 4 – 6 years (10%) (Table 3).

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Prevalence in relation to nature of school attended

Nature of school	No. examined	No. infected (%)
Public	170	42 (24.7)
Private	130	19 (14.6%)
Total	300	61 (20.3)

The laboratory analysis of the stool samples revealed further that, out of the 170 pupils in public primary schools examined, 42 (24.7%) were infected with one species of intestinal protozoa or the other. From the 130 pupils in private schools, 19 (14.6%) were also infected with one species of gastrointestinal protozoa or the other (table 4).

DISCUSSION OF FINDINGS

The study examined the prevalence of intestinal protozoa among primary school-aged children in selected communities in Yenagoa metropolis between March 2022 and August, 2022. Intestinal protozoa are among the common and neglected public health problem in Nigeria.

The study recorded an overall prevalence of 20.3% among the 300 primary school-aged children from the five (5) communities. The 20.3% recorded in this study is slightly lower than the 22% recorded by LeBari and Jennis (2021) among students of Isaac Jasper Boro College of Education, Sagbama, Bayelsa State. It is greatly lower than the 44.2% reported by Gboeloh and Elele (2013) among abattoir workers in Port Harcourt. It is again lower than the 43.3% reported by Ejinaka et al. (2019) among students from a tertiary institution in Jos, Nigeria. It's further at variance with the 63.5% and 40.0% reported by Kpurkpur et al., (2016) among rural and urban school children respectively in Benue State, Nigeria. The 20.3% recorded in this study could be related to the fact that only few children among the respondents were exposed to risk factors such as contact with/or consumption of contaminated water and poor sanitary conditions.

Among the intestinal protozoa identified in this study, *Entamoeba histolytica* recorded the highest prevalence (57.4%). This is lower than the 62% reported by LeBari and Jennis (2021) among students of Isaac Jasper Boro College of Education, Sagbama, and higher than the 20.6% reported by Utume et al., (2015). *Giardia lamblia* recorded a prevalence of 24.6% in this study. This is at variance with the 11.7% reported by Gboeloh and Jennis (2021) and the 0.5% reported by Okike-Osisiogu et al., (2018). The 24.6% recorded in this study may be owing to the fact that some of the children were exposed to cyst of *G. lamblia*. It could also be owing to the fact that *G. lamblia* is known to infect children below the age of 11 compared to adults. *Entamoeba coli* recorded a prevalence of 13.1%. This is lower compared to the 18.3%

reported by LeBari and Jennis (2021). The 13.1% recorded in this study may be attributed to contact

with faecally contaminated food or drinks (Gboeloh & Elele, 2016). *Toxoplasma gondii* recorded the least prevalence in this study (4.9%). The low prevalence of *T. gondii* recorded in this study may be due to the fact that only few children had contact with cyst of the parasite. It could also be due to the fact that the parasite is naturally low in prevalence compared to other intestinal protozoa in the study area.

Community based prevalence revealed that the intestinal protozoa were more prevalent among children in Etegwe Community (30%), followed by Okutukutu Community (25%), Agudama Community (18%), Opolo Community (16.7%), while children from Azikoro Community recorded the least prevalence (11.7%).

The 30% prevalence which is highest in this study agrees with the 30.3% reported by Gboeloh et al., (2019) among students of Rivers State College of Health Science and Technology, Port Harcourt, Rivers State. The slightly high prevalence (30%) among children from Etegwe community may be due to the fact that Etegwe community is prone to perennial flooding due to the Epie creek that overflows during the rainy season, circulates its debris including faecal waste to its environs. Children within 13 – 15 years recorded the highest prevalence (24%). This is greatly lower than the 45% reported by LeBari and Jennis (2021). It is also at variance with 33.2% reported by Gboeloh and Wokoma (2009), among primary school children in Khana Local Government Area of Rivers State. The 24% prevalence in this study might be due to poor sanitary conditions, lack of awareness, drinking of contaminated water and eating of contaminated food. Age ranges 10 – 12 years, 7 – 9 years and 4 – 6 years had prevalence of 22.4%, 22% and 10% respectively. This is lower than the 37.3%, 28.3% and 25.0% reported by LeBari and Jennis (2021) among age ranges 16 – 20 years, 21 – 25 years and 31 – 35 years respectively. The prevalence could be related to consumption of contaminated food and water, poor sanitation and lack of awareness.

Sex-related prevalence recorded a higher percentage among males (23.6%) than females (17.5%). The 23.6% recorded in this study is lower than the 34.5% recorded by Eze et al., (2016) among community school children in Khana Local Government Area of Rivers State. It is further lower than the 57.6% reported by Abah and Aremu (2016). The 17.5% recorded among female children in this study is lower than

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the 42.4% reported by Abah and Aremu (2016) and the 35.4% reported by Eze et al., (2016). The 23.6% prevalence recorded in this study could be attributed to contact with contaminated food, drink and water. Also, it could be due to the fact that male children tend to be more active than females, hence could be more exposed to the risk factors compared to the females.

Children attending public schools recorded a higher prevalence (24.7%) compared to those in private schools (14.6%). The 24.7% recorded in this study is lower than the 63.5% and 40.4% reported by Kpurkpur et al., (2016) among rural and urban school children respectively in Benue State, Nigeria.

The higher prevalence among children in public schools could be due to the fact that most public schools lack good sanitary/toilet facilities, and even when they are present, they lack proper hygiene compared to the private schools.

CONCLUSION

The result of the study revealed that intestinal protozoa are present among primary school-aged children in Okutukutu, Agudama, Opolo, Etegwe and Azikoro communities in Yenagoa Local Government Area of Bayelsa State, Nigeria. *Entamoeba histolytica* was more prevalent among the intestinal protozoa identified in the study (57.4%), while *Toxoplasma gondii* was the least prevalent among the intestinal protozoa identified in the study (4.9%). The 20.3% overall prevalence recorded in this study is attributed to consumption of faecally contaminated food/water, poor sanitation and hygiene and lack of awareness.

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