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ASYMPTOMATIC INTESTINAL PROTOZOA IN SCHOOL AGE CHILDREN IN PATEGI, PATEGI LGA OF KWARA STATE, NIGERIA.

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Abstract

Introduction: Intestinal protozoan infection is one of the principal diseases contributing to human illness and suffering in tropical countries with significant morbidity and mortality effect on children. The prevalence of intestinal asymptomatic protozoan infection was assessed (November, 2012 through May, 2013) among school age children in Pategi, Pategi Local Government area of Kwara State, Nigeria.
Materials and methods: Four public primary schools with nursery, prebasic and basic sections were used for the study. The age range was from 1 to 15 years old. Seven hundred and forty eight (748) stool specimens were collected and examined for protozoan cysts using the direct wet preparation and formol-ether concentration methods.
Results: One hundred and ninety seven (26.3%) of the samples were positive for intestinal protozoan parasite. The distribution of the parasites was *E. histolytica/dispar* (75.1), *E. coli* (18.8) and *G. lamblia* (6.1%). *Balantidium coli* cyst was not detected in the stool samples of the pupils. Highest prevalence of *E. histolytica* was observed among Gboke primary school (35.0%), closely followed by Nyamkpan (31.7%) and Sudan Interior Mission (SIM) (5.9%). Though males (28.0%) were more infected than female (24.7%), the difference was not statistically significant ($P>0.05$) except for *G. lamblia* infection ($P<0.05$).
Conclusion: The public health implication of asymptomatic carriage in cysts of intestinal protozoan among the children with poor personal hygiene was discussed. The use of mass chemotherapy and integrated measures of parasitic control would be of utmost importance in reducing the level of symptomatic infections among children.

Key words: Asymptomatic, amoebiasis, giardiasis, rural area, children.

Authors' Contributions: AA carried out the design and coordinated the study and also prepared the manuscript, participated in most of the experiments and prepared the manuscript. SB participated in field work, laboratory and manuscript preparation. AAA supervised the study. All authors have read and approved the content of the manuscript.

Introduction

Over half of the world's population living in areas with low socioeconomic and sanitary standard conditions are infested with intestinal protozoa and helminthes (Adedoja, 2010). In most cases, the infection occurred as asymptomatic (Smyth, 1999). Intestinal protozoa that infect human include *Entamoeba histolytica/dispar, Giardia lamblia, Balantidium coli, Entamoeba coli, E. hartmani, E. gingivalis, E. moshkovskii, Chilomastrix mesnili, Enteromonas hominis* and *Trichomonas hominis*. The last seven protozoans mentioned above are non-pathogenic to human but may be often found in stool specimens. *Balantidium coli* are common only where pigs are reared and pork meat consumed. *E. histolytica* and *Giardia lamblia* are confirmed human pathogens. *E. histolytica* is responsible for two most common forms of diseases; amoebic colitis or amoebic dysentery and the invasive type amoebic liver abscess. Although amoebiasis is very common occurring worldwide and infecting 10-12% of the world's population, a vast majority are entirely free of symptoms (Dialogue on diarrhea, 1986). It is estimated that only 10% of those infected have clinical symptoms, which occur with invasive amoebiasis thought to affect 48 million people annually (Kreidl et al., 1999). Of all the symptomatic patients with amoebiasis only 80-98%, presents with amoebic colitis while the remaining 02-20% present with extra-intestinal disease, most commonly as liver abscess (Kreidl et al., 1999). Another important cause of chronic diarrhea that severely affects children that may also occur as asymptomatic is *Giardia lamblia*. These diseases are water borne and are still considered a major public health problem in developing countries of the world. Symptomatic effects of these infections may lead to death, impairs the physical, mental and intellectual development of children and adult, thereby exerting tremendous impact on productivity and hence the economy of the individual and the community. Worldwide distribution showed that 450 million persons are infected every year, with an incidence of 50 million, and 100,000 death tolls (Nokes and Bundy, 1994; Smyth, 1999).

Amoebiasis and giardiasis are widespread in distribution, occurring in all parts of the world. Both of them are endemic in many parts of tropical and subtropical Africa, Asia, Mexico, South America, and China. They are common in areas with low socioeconomic and sanitary standards; and are transmitted by faecal-oral route with infective cysts being ingested in food, water, or from hands contaminated with faeces. In Nigeria, amoebiasis is prevalent and widespread (Ajero et al., 2008). The two species of *Entamoeba* that are human pathogen; *E. histolytica* and *E. dispar* are difficult to differentiate microscopically, they are presently been differentiated using molecular methods.
These protozoan parasites have been reported from various parts of Nigeria (Adeyeba and Akinlabi, 2002; Ogbe and Isichei, 2002; Ukpai and Ugwu, 2003), which recognized them as important health problems especially among young children (Agbolade et al., 2004). The high prevalence of intestinal protozoa infections is closely linked with among others; poor health education, poverty, and lack of commitment of government or policy makers in making policies that will ensure proper environmental hygiene. Immune compromised patients, children and pregnant women are mostly vulnerable to *Entamoeba histolytica* infection (Montresor, 1998). In spite of many reports of amoebiasis and giardiasis in various parts of Nigeria, no report as emanated on these parasites from children in rural communities in North Central of Nigeria. Previous studies were either institution based or urban study. It is in the view of this that the study was carried out to determine the prevalence of amoebiasis among school age children in Pategi Kwara State, North Central of Nigeria. The outcome of the study would help in formulating control programs that can improve the health status of children, their home environment and personal hygiene.

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Methods

The study area and population

Pategi is located in Pategi Local Government Area of Kwara State, Nigeria. It is the capital of Pategi Local Government. According to the national population census record of Pategi was 110,852 people (NPC, 2006). The town stands on higher level and the soil can be described as well drained, moderately leached and with moderate humus content (Kwara State Today, 1990). Major occupations include farming (rice farming), fishing and petty trading. The town has a general hospital owned by state government and many private clinics. Most of the pupils go to school on barefoot and in dirty clothes. Generally, there is poor environmental and drainage system, unhygienic methods of disposing sewage, absence of good water supply, indiscriminate defaecation as well as very low standard of personal hygiene in the studied area and among school children. The study was carried out from November 2012 through May 2013.

Permission for the study was obtained from the Kwara State Ministry of Health Ethical Committee, Nigeria (MOH/KS/777/41) and from the Local Government Primary School Board as well as from the parents. Also, permission was obtained from heads of the sampled school, teachers, and the children were informed and consents obtained as to the project and objective of the study.

Study subjects and sampling technique

The study subjects were recruited among pupils of four primary schools in Pategi with age range of 1 to 15 years. Children were recruited from four randomly sampled primary schools. These are Sudan Interior Mission (SIM), Central, Nyamkpan and Gboke primary schools. Random sampling method was used to collect specimens from the children.

The inclusion criteria for the study are: children aged 1-15 years; parents or guardians gave written consent; there was no history of recent episode of diarrhea or watery stooling and children lived in the study area for at least one year. Before samples were collected, demographic data such as sex, age, and name of subject were recorded. The age of each child was determined based on the school records, and the weight and height were measured. Containers for faecal samples bearing the pupil's name and code number were given and careful explanation on proper collection was given to all the pupils. The samples were collected the following day. All the faecal samples were examined macroscopically for constituency, presence of mucous and blood. The faecal samples were processed, examined and cysts identified according to methods previously described WHO (1991), and Cheesbrough (2005), using wet mount and formol-ether concentration methods. Dobell's iodine was added in drops to stain observed cysts for easy identification. The stool samples collected were examined in batches. Prevalence of intestinal protozoa infection by sex, age groups and schools were compared using $\chi 2$ tests. Two sided p values < 0.05 indicated statistical significance.

Results

All the stool specimens were semi-formed not blood stained and some with mucous. The overall prevalence of intestinal protozoa parasites by sex is shown in table 1. Among 748 children examined 380 were females and 368 were males. The overall prevalence of intestinal protozoa infection was (26.3%). High prevalence of infection of *Entamoeba histolytica* (175.1%) was observed followed by *E. coli* (18.8%) and least prevalence of *G. lamblia* (6.1%). Higher prevalence of infection of parasites was found in male subjects (28.0%) than in females (24.7%). The difference in the prevalence by sex in all the protozoa was not statistically significant ($p>0.05$) except in *G. lamblia* infection ($P<0.05$). Table 2 shows the prevalence of intestinal protozoa in the subjects by age groups. *E histolytica* has higher prevalence 60.1% among subjects of age group 6-10 years. This was followed by age group 11-15 years (39.2%). *E. coli* had higher prevalence of (70.3%) among age group 6-10 years. This was followed by age group 11-15 years (27.0%). *G. lamblia has* higher prevalence (58.3%) among age group 6-10 years, followed by age group 11-15 years (41.7%). No infection of *G. lamblia* was observed in lower age group 1-5 years but few infections of *E. histolytica* (0.7%), *E. coli* (2.7%) were observed ($P>0.05$). The prevalence of intestinal protozoa among children stratified by schools studied is shown in Table 3. A high prevalence of *E. histolytica* was observed in all schools; the highest was in Gboke (35.0%); followed by prevalence of (31.7%) in Nyamkpan, least prevalence in Sudan Interior Mission (SIM) primary school (5.9%). Pupils harbouring *E. coli*, prevalence was more in SIM (6.6%), closely followed by Nyamkpan (4.8%) and least in Gboke (3.0%). Among pupils with cysts of *G. lamblia*, three schools; Gboke, Nyamkpan and SIM primary schools had same prevalence (1.7%), while Central primary school had slightly lower prevalence (1.2%).

Table 1: Overall prevalence of intestinal protzoa investigated stratified by sex among the children

Parasites	Number positive N=197	Female n=380 (%)	Male n=368 (%)	P=value	Chi sqr
E. histolytica	148 (75.1)	71 (18.7)	77 (20.9)	0.739	0.111
E. coli	37(18.8)	17(4.5)	20 (5.4)	0.685	0.165
G. lamblia	12(6.1)	6 (1.6)	6(1.6)	0.955	0.003
Total	197 (6.3)	94(24.7)	103(28.0)		

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Table 2: Overall prevalence of parasitic diseases investigated, stratified by age group of the subjects

Age group (yrs)	**Freq n=748**	***E. histolytica/dispar* ()%***	***E. coli* (%)***	***G. lamblia* ()%***
1-5	4	1 (0.7)	1 (2.7)	0 (0.0)
6-10	477	89(60.1)	26 (70.3)	7 (58.3)
11-15	267	58 (39.2)	10 (27.0)	5 (41.7)
Total		**148 (75.1)****	**37 (18.8)****	**12 (6.1)****
P value		0.582	0.105	0.885
Chi sqr		1.082	4.498	0.244

Key: ***Percentage within positivity ** **N=197

Discussion

This study revealed a prevalence of intestinal protozoan parasites among primary school pupils in Pategi, Pategi Local Government area of Kwara State. Out of 748 children involved in the study 179(26.3%) were positive for intestinal protozoa parasites with male children slightly more infected (28.0%) than female children (24.7%). This prevalence (26.3) was lower than 59.9% obtained among pupils of rural community of Moro LGA of the same State by Babatunde and his colleagues (Babatunde et al., 2013). Various prevalence rates of intestinal protozoa infection had been published by different researchers. The rates vary for the different locations, Country/States, the age group of subject surveyed and rural/urban community. The prevalence of 20.9% for *E. histolytica* among male children in this study is quite higher than those obtained by other researchers outside Nigeria such as a prevalence of 5.3% was recorded in India (Rine et al., 2013). In Ishiagor of Abia State and Port Harcort, Rivers State, Nigeria, prevalence rates of 3.1% and 11.0 % were recorded among children respectively (Nyenke et al., 2008; Obiukwu et al., 2008). The high prevalence of amoebiasis and giardiasis recorded in this study can be attributed to poor environmental or drainage system, unhygienic methods of disposing sewage, absence of good water supply, indiscriminate defaecation as well as very low standard of personal hygiene in the study area and among school children because transmission is mainly by faeco-oral route. School children usually share biscuits, sweets, and others among their mates with unwashed dirty hands thus spreading cysts of these parasites.

Table 3: Prevalence of intestinal protozoa among children stratified by schools

School	**No examined**	***E. histolytica/dispar* (%)**	***E. coli* (%)***	***G. lambia* (%)***	**Total**
Gboke	60	21(35.0)	5(3.0)	1(1.7)	27 (45.0)
Central	168	37 (22.0)	2 (3.3)	2 (1.2)	41 (24.4)
Nyamkpan	230	73(31.7)	11(4.8)	4(1.7)	88 (38.3)
SIM	290	17(5.9)	19(6.6)	5 (1.7)	41 (14.1)
Total	748	148 (19.8)	37 (4.9)	12(1.7)	197 (26.3)
P value		0.000	0.345	0.971	
Chi sqr		65.411	3.322	0.237	

*Percentage within school

The prevalence of *Entamoeba histolytica* and *E.coli* by sex showed no statistical difference and it is supported by the report of Taiwo and Agbolade (2000), who maintained that both sex have the same chance of contracting the disease. In as much as boys are usually exposed during games and so do girls in most of their games (Barbosa-Sabanero, 2004). Also cultural and religious factors come into play here as males are given unrestricted freedom for play time thereby exposing them to the soil that harbors the infective cysts, while females are not given such liberties.

Among the three age category represented in this study, the highest prevalence of *E.histolytica* was recorded among those within 6-10 years old (60.1%) and 11-15 years old (39.2%). whereas the least was among those within 1-5 years old. The reason for the low occurrence of intestinal protozoa in under 1- 5 years children may be attributed to their humoral resistance due to the induced production of secretory immunoglobulin A (IgA) that can diminish the adhesion between protozoa trophozoites epithelial cells, hence reducing new infection (Haque et al., 2002). Also, the lack of antitrophozoite IgG and the acquired resistance due to intestinal IgA against the carbohydrate recognition domain of protozoa glactase N-Acetyl D-galactosamine lecitin is responsible for the partial immunity enjoyed by the under fives (Arfaa, 1984). The high prevalence rate of *E. histolytica* recorded among children between age group 6-10 and 11-15 shows a common pattern of behavior and susceptibility to infection. So also is the same for *G. lamblia* prevalence in the same age groups. They play a lot on the sand with little or no care, and they are not old enough to understand the advantages of general cleanliness or personal hygiene.

There was a striking difference in the distribution of the infection within the different schools sampled. This could be attributed to the sanitary condition of the pupils and toilet facilities provided by the schools. Children from Gboke and Nyamkpan schools recorded higher infection rates compared to children from Central and SIM. Most of the children attending Gboke and Nyamkpan are not from well-to-do families and it was evident in their mode of dressing. Most children were without shoes but slippers, lack periodic medical

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examination and are poorly nourished. They also have poor sanitary practices using pit and open air toilets. Children from the other schools do not only use pit latrines but medical, sanitary and nutritional attentions are minimal.

Another very important outcome of this study is that asymptomatic carriage of these intestinal protozoan parasites would be sources of infections to other susceptible pupils in the community. This is because they would be shedding the cysts of the parasites each time they defeacate. Thus this asymptomatic carrier state has public health implication. In addition, the fact that generally cysts of protozoan parasites can survive for longer period in environments than the vegetative forms make the cysts transmissible to others feasible (WHO, 1980). A drop in immune status of these asymptomatic children due to stress or sickness their asymptomatic status may be reverted to full disease state.

Conclusion

In the survey of four (4) primary schools, 748 school children were examined. One hundred and ninety seven 197(26.3%) pupils were found to be infected. *Entamoeba histolytica* had an overall prevalence of 75.1% and also accounted for 20.9% of the male infected population.

Recommendation

WHO (1987) report showed that ignorance and lack of adequate hygiene contribute immensely to intestinal parasite infection; including intestinal protozoa transmission. Therefore, health education is a way for mobilizing the populace on the dangers associated with public and private insanitary conditions. Indiscriminate stooling should be discouraged, provision of toilet facilities instead of bush defaecation helps in reducing the spread of the infection. Generally, this work has shown that an average primary school pupil in this area (and probably elsewhere in the country) is harboring parasitic infections, most of which are preventable through planned and carefully organized health education programmes. A high prevalence of parasitic disease particularly among children is an index of not only their communities' low level of health, but also of inadequate health education.

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