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PREVALENCE OF INTESTINAL PARASITES AMONG PRIMARY SCHOOL PUPILS OF SELECTED SCHOOLS IN BOSSO LOCAL GOVERNMENT AREA, NIGER STATE, NIGERIA

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ABSTRACT

The prevalence of intestinal parasitic infection among primary school children in Bosso Local Government Area, Niger State, Nigeria was investigated in this study. A total of 600 pupils from 10 primary schools comprising 300 males and 300 females were enrolled in the study. A structured questionnaire was administered to obtain information on the demographic data of children and risk factors for gastrointestinal parasitic infection. The stool was analysed using the formol-ether concentration technique. The overall prevalence was 45.2% (271/600); thirteen intestinal parasitic species were recovered; hookworm had the highest prevalence of 32.5% followed by *Entamoeba histolytica;* 30.3%, *Isospora belli*, *Giardia lamblia*, *Paragonimus* sp. and *Taenia* sp. had the least prevalence of 1.6% each. The age-specific prevalence was higher in the age group 5-7years (52.5%) and the least was in the 11-13years age group (38.0%). There was a statistically significant difference ($p<0.05$) in prevalence in different age groups. Males had a higher prevalence (49.7%) than females (40.7%) and the difference ($p<0.05$) was statistically significant. The odds ratio (OR) revealed an association between the sex of the pupils (OR=1.44), Use of stream water (OR=1.514), use of pit latrine (OR=1.196), and open field defaecation (OR=1.126), history of not deworming at all (OR=1.151) and the extent of acquiring intestinal infection. This study concludes that there is a high prevalence of intestinal parasites among school children in the Bosso Local Government Area and there is a need to step up efforts toward the control of these parasites through improved sanitation and public health education in the schools in particular and the community in general.

Keywords: *Prevalence, Gastrointestinal Parasites, School Pupils, Bosso Local Government.*

INTRODUCTION

Intestinal parasitic infections are widespread human infections worldwide, common especially in poor regions with significant mortality and morbidity in developing countries (1). These infections are mainly transmitted by ingestion of water, soil, or food contaminated with faeces containing cysts of protozoans or eggs/larvae of helminthes. Prevalence and profile of parasitic infection vary widely among continents and within countries or sub-regions (2).

Intestinal parasitic infection thrives among children aged 5-14 years due to the carefree attitude of the age group (3). There are over 50 parasitic species that parasitize humans; some are restricted to given geographical regions while many have a higher incidence in tropical areas. These infections cause iron deficiency, anaemia, growth retardation, intestinal obstruction, and physical and mental problems in children (4).

In Nigeria, various surveys have been conducted over the past decades on the prevalence of intestinal parasitic infections (1, 5). Research on the prevalence of intestinal parasites among primary and post-primary school children in five communities in Ilesa West Local Government Area, Osun States, Nigeria from January to July 2005 recorded a prevalence of 151(48.8%) (6). A total of 122(39.10%) children harboured *A. lumbricoides* while 29(9.29%) had *E. histolytica.* Research on the prevalence of intestinal helminth parasites among school children in Bida, Niger State, Nigeria revealed an overall prevalence of 40.9% (7). *Ascaris lumbricoides* had the highest prevalence at 31.9%. A survey among pupils in Umuezeaga autonomous community, Akokwo in Ideato North Local Government Area, Imo State Nigeria revealed that out of the 156 stool samples investigated, 100 (64.1%) were positive for intestinal parasites; 66(66.0%) were positive for hookworm, 60(60.0%) *Ascaris lumbricoides*, 37(28.5%) harboured *E. histolytica*, 24(18.5%) had *G. lamblia.* other parasites recovered were 17(13.2%) *T. trichiura* and 2(1.5%) Strongyloides *stercoralis.* 53(53%) of the samples recorded mixed infections (8). A survey of intestinal helminthes was conducted among primary school pupils in Ekwulumili community, Nnewi South Local Government Area, Anambra State, and recorded an overall prevalence of 10.18%; with *Ascaris lumbricoides* having a higher prevalence of 64.7% (9). From the foregoing, it could be inferred that intestinal

parasitic infection is a worldwide problem, particularly in developing countries.

The distribution and prevalence of various species of intestinal parasites vary from one region to another. Although several surveys have been conducted on the prevalence and intensity of intestinal parasites in Nigeria, there are several localities/communities where epidemiological information has not been established. This study was therefore conducted to enrich baseline data on the occurrence of gastro-intestinal parasites among school children in Bosso Local Government Area of Niger State.

MATERIALS AND METHODS

Study Area

The study was conducted in Bosso Local Government Area of Niger State, Nigeria which lies on latitude 09°27′30″N to 09°47′30″N and longitude 06°15′0″E to 06°40′0″E. It has a landmass of 1,606.1 square kilometers (1,606.1 sq. Km). The climate of Bosso Local Government Area is a true reflection of the climate of the middle belt, with rainfall starting from April and lasting till October. It has a mean annual temperature of 30.20°C and rainfall of 1,334mm (10).

Many rivers and streams transverse the area which serves as a major source of water to the populace in the rainy and dry season in the rural areas; in addition, there are boreholes sunk at various locations to complement the water supply, especially during the dry seasons. People living in the urban areas depend on epileptic pipe-borne (tap water), solar boreholes, and wells as their domestic water supply. The majority of the populace are farmers, some are civil servants and a few are traders.

Study Population and Selection of Schools

The study population comprised 600 primary school pupils between the ages of 5-13years; 60 pupils were selected from 10 randomly selected government primary schools which include; Beji, Bosso Central I, Bosso Central 2, Chanchaga, Garatu, Kampala, Kodo, Maikunkele, Shakwata and Shatta primary schools in Bosso Local Government Area, Niger State.

Ethical Consideration

Before the collection of samples, advocacy visits were made to the traditional rulers and local government education secretary as well as relevant authorities of the schools to obtain permission and cooperation of the people to conduct the study in the schools within the community.

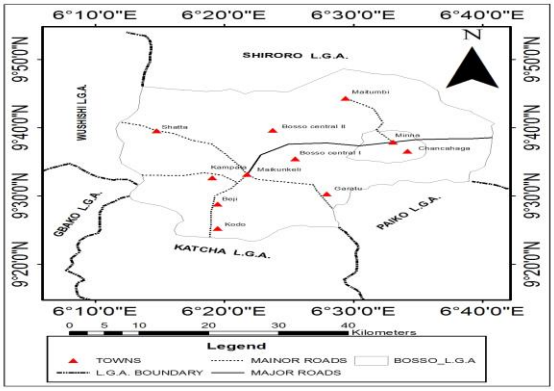

Figure 1: Map of Bosso Local Government Area

Administration of the Structured Questionnaire

A structured questionnaire was administered to the pupils to obtain information on demographic data and risk factors for acquiring gastrointestinal infections. Some of the information obtained includes the name of the school, sex, age, toilet type, and source of drinking water among others.

Collection of Samples and Laboratory Analysis

Six hundred universal sample bottles were distributed to 600 randomly selected pupils in all the ten primary schools in the study area for the collection of the stool samples. The pupils were instructed on how to collect their stool samples the following morning. The samples were collected and preserved in 10% formalin and examined using the formol-ether concentration technique as described by Chesbrough (11). The preparations were examined microscopically using X10 and X40 objectives to identify the eggs, cysts, and larvae of the parasites.

DATA ANALYSES

The data obtained in this study were analyzed statistically using chi-square (χ^2) to compare the differences in the prevalence of infection between schools, age groups, and sexes. Odds ratio (OR) was used to determine the association between risk factors and the prevalence of gastrointestinal infection among the school pupils.

RESULTS

A total of 600 pupils were examined for gastrointestinal parasites out of which 271 pupils representing 45.2% of the study population were infected (Table 1). The prevalence varied between primary schools in the study area. The highest prevalence of 51.7% was recorded in Bosso Central 2 Primary school followed by 50.0% in Kodo Primary School while the least prevalence of 38.3% was recorded at Chanchaga Primary School. The differences in prevalence among the schools were however not statistically significant ($p>0.05$) (Table 1).

Thirteen species of gastrointestinal parasites were recovered from the stools of the children; Hookworm recorded the highest prevalence of 32.5% followed by *Entamoeba histolytica at* 30.28% while

Giardia lamblia, *Taenia* spp, and *Paragonimus* spp each had a prevalence of 1.58%. Single parasitic infection was recorded in 83.03% of the study population while 16.24% harboured double parasites each and 0.7% had triple parasitic infections (Table 2).

Age-specific prevalence showed that the 5-7years age group had a higher prevalence of 52.5% while the 11-13 years had the least prevalence of 38.0%. The difference in prevalence in different age groups was not statistically significant (P>0.05) (Table 3).

Sex-specific prevalence revealed that males were more infected (49.7%) with the parasites compared to females (40.7%). There were statistically significant differences (p<0.05) in prevalence between males and females and there was an association (OR=1.44) between sex and prevalence of gastrointestinal parasitic infection (Table 4).

The responses of the pupils to the questionnaires and the result of statistical analysis showed associations between various epidemiological variables and the prevalence of gastrointestinal parasitic infection. An odds ratio greater than one revealed an association between the various risk factors and the prevalence of the disease. Responses on sources of water supply showed that those that use stream water had OR= 1.514 which means those that use stream water were 1.514 times more likely to come down with the disease. Based on the type of toilet facility used, those that use pit latrine (OR=1.196) and open field defaecation (OR=1.126) were more likely to come down with the disease as compared to those that use water closet toilet facility (OR=0.583). Those that have never been dewormed in the study population were 1.151 more likely to come down with the infection (Table 5).

Table 1: Prevalence of gastrointestinal parasites among primary school pupils in Bosso Local Government Area, Niger State

School	Total	Status		χ^2	P-value
		Positive (%)	Negative (%)		
Beji	60	27 (45.0)	33 (55.0)	4.502	0.875n.s
Bosso Central 1	60	29 (48.3)	31 (51.7)		
Bosso Central 2	60	31 (51.7)	29 (48.3)		
Chanchaga	60	23 (38.3)	37 (61.7)		
Garatu	60	25 (41.7)	35 (58.3)		
Kampala	60	25 (41.7)	35 (58.3)		
Kodo	60	30 (50.0)	30 (50.0)		
Maikunkele	60	28 (46.7)	32 (53.3)		
Shakwata	60	29 (48.3)	31 (51.7)		
Shatta	60	24 (40.0)	36 (60.0)		
Total	**600**	**271 (45.2)**	**329 (54.8)**		

Table 2: Mixed infection of intestinal parasites among school pupils in Bosso Local Government Area (N=600)

Parasite species	Frequency of occurrence	Percentage
Single infection		
Hookworm	81	29.89
Entamoeba histolytica	66	24.35
Ascaris lumbricoides	28	10.33
Strongyloides stercoralis	9	3.32
Schistosoma mansoni	9	3.32
Enterobius vermicularis	8	2.95
Trichuris trichiura	6	2.21
Hymenolepis nana	4	1.48
Isospora belli	5	1.85
Giardia lamblia	3	1.11
Taenia spp	2	0.74
Paragonimus spp.	4	1.48
Subtotal	**225**	**83.03**
Mixed parasite infection		
double parasites infection		
Ascaris lumbricoides + *Entamoeba histolytica*	3	1.11
A. lumbricoides + Hookworm	4	1.48
A. lumbricoides + *Entamoeba coli*	1	0.37
A. lumbricoides + *Schistosoma mansoni*	1	0.37
E. histolytica + *E. coli*	8	2.95
E. histolytica + Hookworm	11	4.06
E. histolytica + *Enterobius vermicularis*	1	0.37
E. histolytica + *Giardia lamblia*	1	0.37
E. histolytica + *Strongyloides stercoralis*	3	1.11
E. histolytica + *Taenia* spp.	1	0.37
E. coli +Hookworm	2	0.74
Hookworm+ *Paragonimus* spp	1	0.37
Hookworm + *S. mansoni*	3	1.11
Hookworm + *S. stercoralis*	2	0.74
Hookworm + *Taenia* spp	2	0.74
Subtotal	**44**	**16.24**
Triple parasite infections		
E. histolytica + *G. lamblia* + *H. nana*	1	0.37
E. histolytica + *E. vermicularis* + *S. stercolaris*	1	0.37
Subtotal	**2**	**0.74**
Total number of pupils infected	**271**	**100**

Table 3: Prevalence of gastrointestinal parasites concerning age group of pupils in Bosso Local Government Area

Age group	Total	No. Positive (%)	No. Negative (%)	P. value	Odds ratio
5-7	200	105(52.5)	95(47.5)	0.207	1.558
8-10	200	90(45.0)	110(55.0)		0.990
11-13	200	76(38.0)	124(62.0)		0.644
Total	**600**	**271(45.2)**	**329(54.8)**		

Table 4: Prevalence of gastrointestinal parasites concerning the sex of the pupils in Bosso Local Government Area

Sex	Total	Status		P-value	Odds ratio
		Positive (%)	Negative (%)		
Male	300	149 (49.7)	151 (50.3)	0.027*	1.440
Female	300	122 (40.7)	178 (59.3)		0.695
Total	**600**	**271 (45.2)**	**329 (54.8)**		

Table 5: Responses of pupils to questionnaires

Other risk factors	Total	Status		Odds ratio	C.I
		Positive (%)	Negative (%)		
Water source					
Tap	111	47(42.3)	64(57.7)	0.869	0.573-0.318
Borehole	339	144(42.5)	195(57.5)	0.779	0.563-1.078
Well	80	42(52.5)	38(47.5)	0.819	0.663-1.717
Stream	70	38(54.3)	32(45.7)	1.514	0.918-2.497
Toilet type					
Pit latrine	282	134(47.5)	148(52.5)	1.196	0.867-1.651
Water closet	99	34(34.3)	65(65.7)	0.583	0.371-0.914
Open field	219	103(47.0)	116(53.0)	1.126	0.806-1.572
Deworming					
Not at all	439	201(45.8)	238(54.2)	1.151	0.799-1.658
Yearly	90	39(43.3)	51(56.7)	0.924	0.588-1.451
3-6 months	71	30(42.3)	41(57.7)	0.874	0.530-1.443

DISCUSSION

The overall prevalence of gastrointestinal parasitic infection among primary school children in Bosso Local Government Area (LGA) was 45.2%. The prevalence was lower than 63.4% recorded in Dutsin-Ma LGA, Katsina State (12); a difference that could be due to the regular deworming of children by parents in the study area. The result was higher than 10.18% recorded among primary school pupils in Ekwulumili, Nnewi South Local Government Area, Anambra State (9) and 21.0% recorded among primary school pupils in Gokana and Khana LGAs, Rivers State (13). The high

prevalence of intestinal parasites among primary school children in Bosso LGA could be due to the favourable climate for the survival of the intestinal parasites; improper management and disposal of refuge and inadequate supply of clean water. Poor drainages, lack of personal health education, and use of dumpsites for open defaecation might have also contributed to the high prevalence (14, 15).

In addition, most of the schools in the LGA lack toilet facilities, and the few that had the facility were not properly managed, thereby exposing the children to open field defecation. The unavailability of potable water in most of the schools led the pupils to drink water from unhygienic sources thereby exposing them to the risk of acquiring the infection.

The species-specific infection showed that Hookworm had the highest prevalence followed by *E. histolytica* and *A. lumbricoides*. A high prevalence of hookworm was also recorded in Makurdi, Benue State (16), Akokwo, Imo State (8), and in some rural communities in Kogi State (15). Several studies have reported that hookworm larvae in African soils could remain viable up to a land surface temperature of 40^{o}C or higher (4, 17) unlike *Ascaris lumbricoides* and *Trichuris trichiura* eggs that cease to develop at 38^{o}C. The motility of infective hookworm larvae and accelerated development (3-100 days) in comparison to 10-30days and 28-84 days for *Trichuris* and *Ascaris* eggs can confer advantages as adult hookworms have longer lifespans (14).

The pupils in age group 5-7 years had the highest prevalence of gastrointestinal parasites which might be due to predisposition to the environment through contact with contaminated soils and eating indiscriminately with unwashed hands. The lowest prevalence recorded in the 11-13 years age group could be attributed to the fact that as children grow older, there is better awareness of personal hygiene practices which reduces the chances of the children getting infected. Similar observations were made among school children in Doi village, Plateau State (18), Mbaitoli village, Imo State (19), and some communities in Kogi State (15).

Sex-specific prevalence showed higher prevalence among males compared to females and the difference was statistically significant. This outcome could be because males are more engaged in extracurricular activities than their female counterparts. The lower prevalence among females may be due to cultural practices that require the

females to be indoors most of the time and involved in household chores whereas males are fond of moving around freely, therefore, becoming more exposed to the parasite (19).

The low prevalence of mixed infection recorded in this study may be attributed to the fact that the parasites that invade the host first circulate their antigen around the body of the host which may hinder the survival or reduce the chances of invasion by other parasites (20).

The responses of pupils to questionnaires on risk factors of intestinal parasitic infection revealed that the pupils that use rivers/streams as a source of water supply had a higher prevalence compared to those that use borehole and pipe-borne water. There was an association between the use of stream water by the pupils (OR=1.514) and the prevalence of intestinal infection. This may be due to the contamination of the water from rivers and streams with animal faeces where human and domestic/wild animals drink from the same source, especially during the dry season in local communities that exposes them to the infection.

Based on the type of toilet facility used by the pupils, there was an association between the use of pit latrines, open field defaecation, and the prevalence of intestinal parasitic infection in the study area. This attitude of open defecation due to poor personal sanitation might help flies and cockroaches to spread cysts and eggs of intestinal parasites picked from faeces (21).

It was also observed that lack of deworming was associated with the prevalence of intestinal parasitic infection because pupils that have never been dewormed were 1.151 more likely to come down with the infection as compared to those that were dewormed once or twice in a year. Positive cases recorded in those that were dewormed may be due to re-infection after treatment; the same observation was made in Doi village in Plateau State, Nigeria (18). Even though chemotherapy is the best way of reducing the worm burden; improved living standards, environmental sanitation, and agricultural and industrial hygiene can contribute to the success of chemotherapy (22).

CONCLUSION

The result of this study revealed a high prevalence of gastrointestinal parasitic infection among primary school pupils in the Bosso Local Government Area. Age and sex-specific prevalence showed that pupils of age group 5-7years and males had a higher prevalence of various intestinal parasites. Poor sanitation, lack of potable

water, poor personal hygiene, and lack of deworming were observed as the major risk factors that enhance the transmission of the infection. There is, therefore, a need to step up efforts toward the control of gastrointestinal parasitic infection.

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CONFLICT OF INTEREST

The authdeclareares no conflict of interest

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