

PREVALENCE OF GASTROINTESTINAL PARASITIC INFECTION AMONG PRIMARY SCHOOL PUPILS IN LOKOJA, KOGI STATE, NIGERIA

*Ngwamah J.S., Kayode V.O., Saleh R. and Audu P.A.

Department of Zoology, Federal University Lokoja, PMB 1154, Lokoja, Kogi State, Nigeria

*Corresponding Author Email Address: sngwamahs@gmail.com

ABSTRACT

The study was evaluated to determine the present pervasiveness of gastrointestinal intestinal parasites among school-aged children in Lokoja, Kogi State, Nigeria. The study was carried out to relate the ambiguity among the different participants to gastrointestinal infections in relation to sexes, ages and their sociodemographic status. The investigation was carried out in 10 randomly selected primary schools (5 public and 5 private). Four hundred samples (comprises of 212 male and 188 female) were collected and examined for the presence of parasites. The ages of the participants ranged from 5-14 years, were examined microscopically by using direct smear methods. Out of the 400 participants inspected 149 (37.25%) were found positive for some gastrointestinal intestinal parasites. 10 species of intestinal parasites were came in contact with. Hookworm infection recorded the highest prevalence (10.50%) followed by *Fasciola hepatica* (6.00%). *Trichuris trichiura*, recorded the least prevalence (1%). In the four different age groups, pupils of group 10-12 proved to have higher prevalence than any other group investigated. The environmental factors are also considered as the major risk factors associated with infection intensity of gastrointestinal intestinal parasitic infections. The result showed water source, occupational status, toilet system used by the participants determine their health status in relation GIPs. The result showed high prevalence in individuals using river water (62.96%) for their domestic chores than any other source. The study indicated that intestinal parasites were prevalent in the study area, and for this reason, control measures, such as chemotherapy, provision of adequate sanitary facilities, portable drinking water, improved personal hygiene and health education should be the focus of community, government and non-governmental organizations.

Keywords: Stool, parasite, hygiene, Chemotherapy

INTRODUCTION

Gastrointestinal parasites (GIP) are parasites that are found majorly in the gastro-intestinal tract of vertebrates, commonly, protozoa and helminthes are the two utmost types of gastrointestinal parasites found in humans (Udensi *et al.*, 2015; Bakuza *et al.*, 2023). The acuteness of intestinal parasitic infections has a great impact on public, affecting approximately one-third of the world population causing high mortality rate mostly in children (WHO, 2017). The prevalence of gastrointestinal parasites is majorly related with individual personal hygiene, environmental sanitation, low access to clean water, socioeconomic status and occupational status of an individual (Njeru *et al.*, 2019; Eltantawy *et al.* 2021). Poverty is considered as the major risk factor the led to

Study Area

endemic nature of parasitic infections in the tropical Africa. It is related to unhygienic eating habit that encompasses poor drainage systems, fertilizing vegetable farms using human and animal faeces (Naveed, 2021; Tappe *et al.*, 2021) In fact epidemiological statistics on the endemic nature of different types of parasitic infections a necessary condition to develop perfect control measures. For this reason, the aim of this investigation was to assess the prevalence of intestinal parasitic infections and their risk factors that could lead to spreading of the different infections in the study area.

In developing countries, prevalence of gastrointestinal parasitic infection varies from one region to the other. The intensity of infections also varies from rural to urban cities and from locality to locality. There are variations in the prevalence of intestinal parasitic infections in different studies conducted within from different places within Nigeria as observed from so many research works. Opara *et al.* (2012) reported his findings that showed rural communities (40.0%) and urban community (63.5%) in a research conducted in eastern Nigeria, showed clear variation with 75.70% by Wusu and Onyeabor 2014, from their research conducted in Southern Nigeria, and also the report of Tyoalumum *et al.*, 2016 conducted in Benue State, Nigeria. The intensity of parasitic infections depends on season, climatic conditions, and sanitary behavior.

In Nigeria, a considerable amount of human and animal wastes are released into the environment on daily basis, which lead to high environmental contamination with pathogenic organisms which includes cysts, eggs and larvae of these parasites (Udensi *et al.*, 2015). High prevalence of infections associated with intestinal parasites can be attributed to poverty, poor environmental hygiene and inadequacies in medical services (Nexasana *et al.*, 2013; Odu *et al.*, 2011). Faecal contamination of food and water are the major routes of transmission of gastrointestinal parasite where they are transmitted to human via faecal-oral routes (Magaji *et al.*, 2021). Intestinal parasitic diseases were the leading cause of morbidity in many parts of Nigeria and are considered as one of the top five diseases in the country that is of public health concern (WHO, 2017). Intestinal parasites are the leading cause of diarrhea which is transmitted faeco-orally when we consume contaminated food and water (Omule *et al.*, 2016). Some of them are also contacted when walking bare footed on contaminated soil (e.g., hookworms), and working in contaminated water sources (schistosomiasis). The objective of this study is to determine the prevalence of intestinal parasitic infections, identifying the different species available and relate the prevalence to the age and gender of primary school aged pupils in Lokoja, Kogi State.

The study was conducted in both the public and private primary

schools in Lokoja, Kogi State. Lokoja lies about 7.8023° north of the equator and 6.7333° east of the Meridian. It is about 190 km Southwest of Abuja as the crow flies, and 390 km Northeast of Lagos by same measure. Residential districts are of varying density, and the city has various suburbs such as Felele, Adankolo, Otokiti and Ganaja. The town is situated in the tropical Wet and Dry

savanna climate zone of Nigeria, and temperature remains hot all year round. The highest temperature is usually recorded in the afternoon. Lokoja rose to fame due to its location at the confluence of the two great waterways in West Africa the Niger and Benue Rivers (CENSUS 2006).

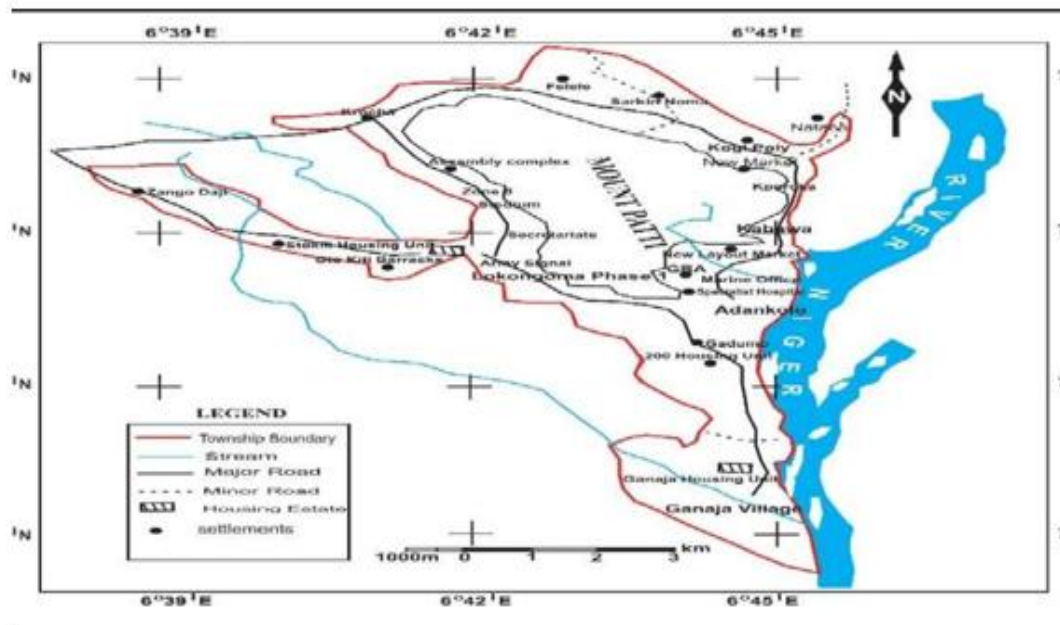


Figure 1: Map of Lokoja
 Source: (Alabi MO, 2019).

Study Population

The study was carried out in some randomly selected public and private primary schools in Lokoja, between November 2021-February 2022 and July-October 2022. Random selections of public and private schools were done by balloting. Ten schools were selected for both categories of school type. Twenty pupils were randomly sampled from each school. The children comprised of both sexes and different ages, ranging from 5 to 14 years that were selected at random. During sampling 1 and 2 was written on a piece of paper, stool samples were collected from those who chose 1. A total of 400 stool samples were collected from 10 private and 10 public schools.

Collection and Parasitological examination of stool sample

Plastic wide mouth bottles were given to 450 primary school students selected randomly from 10 public and 10 private schools. The students were given sample bottles, questionnaires and letters seeking the consent and co-operation of parents and returned the next day, with freshly stool samples. The name, age, sex and sociodemographic status were noted after the samples and the questionnaires were received and labeled. The stool samples were then transported to the department of Biological Sciences laboratory for diagnosis using direct smear method as indicated below:

One gram of the stool sample was mixed with the normal saline using a glass rod to get a thin smear. Large particles were removed

and then a cover slip was placed on the smeared slide. A drop of Lugols iodine was added to the edge of the cover slip so as to allow gradual diffusion into the saline mount. The slide was then examined under the light microscope for presence of parasites egg, cysts or larvae, using x 10 objective lens. Then x 40 objective lens was used for closer examination.

Statistical Analysis:

The data obtained in this study were subjected to one-way Anova, using SPSS version 2020 package. The prevalence of gastrointestinal parasites was calculated and expressed as percentage of n/N where n is the number of children infected and N is the total number of the children examined. Chi Square was also used to compare the infection rate among age, sex and different socioeconomic status.

RESULTS

The result of the current study shows that out of the 400 pupils examined, 149 (37.25%) were found harbouring intestinal parasites. Twelve (10) species of intestinal parasites were encountered. The prevalent percentage (%) of intestinal parasites in decreasing order was; hookworm 42(10.50%), *F. hepatica* 24(6.00%), *Ascaris lumbricoides* 18(4.50%), *Schistosoma mansoni* 16(4.00%), *B. coli* 10(2.50%), *S. stercoralis* 10(2.50%), *D. latum* 9(2.25%), *T. Sagina* 9(2.25%), *E. vermicularis* 7(1.75%), *Trichuris trichiura* 5(1.25%) as observed in Figure 1.

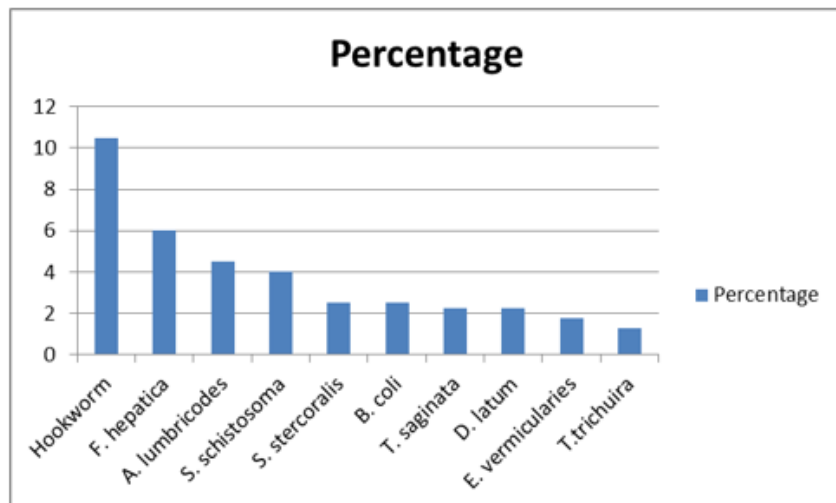


Figure 2: General Prevalence of Individual Parasites among School Aged Children in Lokoja

Distribution of gastrointestinal parasites among school-age children by Sex

The distribution of parasitic species among sex groups is given in table 1. The result showed hookworm as the most prevalent (10.50%) species of the gastrointestinal parasitic infection encountered during this current investigation. The prevalence among males and females, shows that gastrointestinal parasitic infections are more prevalent among males than their female counterpart. Hookworm 42(10.50%) Proved to be the most common gastrointestinal parasitic infection in the study area, following by *F. hepatica* 24 (6.00%). Males recorded higher prevalence of gastrointestinal parasites encountered during this

study than females. Percentage of infection in males (7.00%, 3.35%, 2.72%, 2.50%, 2.00%, 1.75%, 1.50%, 0.75%) for hookworm, *F. hepatica*, *S. mansoni*, *A. lumbricoides*, *B. coli*, *S. stercoralis*, *T. saginata*, *D. latum*, *E. vermicularies*, and *T. trichuira*, respectively, shows higher infection rate than their females counterpart percentages (3.50%, 2.50%, 2.00%, 1.25%, 0.50%, 0.50%, 0.50%, 0.50%, 0.25%, 0.00) for hookworm, *F. hepatica*, *A. lumbricoides*, *S. mansoni*, *S. stercoralis*, *T. saginata*, *D. latum*, *E. vermicularies*, *T. trichuira* and *B. coli* respectively. The result showed significance differences among male and female infections ($P < 0.05$) with males prove to have higher infection rates.

Table 1: Prevalence of gastrointestinal parasites among school age children in Lokoja by sex

Parasitic Species	Boys (%) N=102(25.50)	Girls (%) 47(11.75)	Total 149(37.25)	X ²	P.value
Hookworm	28(7.00)	14(3.50)	42(10.50)	11.342	18.307
<i>F. hepatica</i>	14(3.35)	10(2.50)	24(6.00)		
<i>A. lumbricoides</i>	10(2.50)	8(2.00)	18(4.50)		
<i>S. stercoralis</i>	8(2.00)	2(0.50)	10(2.50)		
<i>T. saginata</i>	7(1.75)	2(0.50)	9(2.25)		
<i>E. vermicularies</i>	5(1.25)	2(0.50)	7(1.75)		
<i>D. latum</i>	7(1.75)	2(0.50)	9(2.25)		
<i>B. coli</i>	10(2.50)	0(0.00)	10(2.50)		
<i>T. trichuira</i>	3(0.75)	1(0.25)	4(1.00)		
<i>Shistosoma spp.</i>	11(2.75)	5(1.25)	16(4.00)		
Total	102	47	149		

Distribution of gastrointestinal parasites among school-age children by Age

The study was carried out among the pupils of primary schools in Lokoja from age 4- >12 comprises of both male and female pupils. The overall prevalence of intestinal parasitic infections was 149(37.25%) of the 400 pupils examined. Among the four different age groups of pupils used for this study, the highest rate of parasitosis was seen in 10 - 12 years (13.00%) followed by 7 - 9years (10.75%). The age group up to 4 – 6 years was least

infected group (Table 2). Parasites identified in this study were *F. hepatica*, hookworm, *A. lumbricoides*, *S. stercoralis*, *T. sagina*, *E. vermicularies*, *T. trichuira*, *Shistosoma spp.*, *D. latum* and *B.coli*. Among all these parasites, hookworm, *F. hepatica*, *A. lumbricoides* and *S. mansoni* were the most common intestinal parasites in the study area.

Table 2: Distribution of Intestinal Parasites among School Aged Children in the Study Area by Age

	4- 6years (n=100)	7-9years (n=100)	10-12 years (n=100)	13-14years (n=100)	Total [n (400)(100%)
Hookworm	0	15	25	9	42(10.54)
<i>F. hepatica</i>	1	7	10	6	24(6.00)
<i>A. lumbricoides</i>	5	8	3	2	18(4.50)
<i>S. stercoralis</i>	4	4	2	0	10(2.50)
<i>T. saginata</i>	0	3	4	2	9(2.25)
<i>E. vermicularies</i>	5	2	0	0	7(1.5)
<i>D. latum</i>	3	1	5	1	10(1.75)
<i>T. trichuira</i>	2	1	1	0	4(1.00)
<i>Shistosoma spp</i>	0	1	7	7	15(3.75)
<i>B. coli</i>	2	1	5	2	10(3.75)
Total	22(5.5)	43(10.75)	52(13.00)	27(6.75)	149(37.25)

Prevalence of helminths in relation to environmental factors of Lokoja

Participants using river waters 34(62.12%) have higher infection with gastrointestinal parasites than any other participants. Next to this are those using uncovered well 43(57.33%). Partispants using bottled water showed less gastrointestinal parasitic infections than any other group.

There are higher odds of gastrointestinal parasitic infections in those under fishermen group 49(61.25%) than any other

occupational groups, followed by farmers 32(45.25 %). Civil servants proved to have less parasitic infections 31(25.83). In general the occupational groups showed statistical significance ($P < 0.05$) as demonstrated by table 3.

There are also higher odds of Gastrointestinal parasitic infections among those has the habit of open defecation (52.40%) followed by those buried [11(50.00%)] their faeces within their environment. Less rate of infection was observed in those participants using water system toilet 22(17.46%).

Table 3: Prevalence of helminths in relation to environmental factors of Lokoja

	Number (%)	% positive	%Negative	X ²	P. Value
Water source					
Covered well	200(50%)	56(28.00)	144(72.00)		
Uncovered well	75(18.75)	43(57.33)	32(42.76)		
Bohole	68(17.00)	13(19.12)	55(80.88)	1.79(1.15-3.41)	0.03*
River	54(13.50)	34(62.96)	20(37.04)		
Bottled water	87(21.75)	3(3.45)	84(96.55)		
Occupational					
Farmer	70(17.75)	32(45.71)	38(54.28)		
Fisherman	80(20.00)	49(61.25)	31(38.75)	0.39(0.18 - 1.02)	0.01*
Civil servants	120(30.00)	31(25.83)	89(74.16)		
Traders	130(32.50)	37(28.46)	103(71.53)		
Toilet System					
Flushing	126(31.50)	22(17.46)	102(82.53)		
Pit latrine	103(25.75)	31(30.10)	72(69.90)		
Bush buried	22(5.50)	11(50.00)	11(50.00)	0.38(0.73 - 0.89)	0.002*
Bush open space	149(52.23)	78(52.40)	71(47.65)		

DISCUSSION

The present investigation assessed the prevalence of gastrointestinal parasites among pupils (4-14 years) attending public and private schools within Lokoja. It is the first cross sectional study evaluate the prevalence of such infection in relation to the socio-demographic status of the participants in the study area. The result of this present study showed incidence rate of intestinal parasitic infection of 149/400 (37.25%). The intestinal helminthes prove to more prevalent in the study area as compared to intestinal protozoan. The only protozoan encountered during this investigation was only *B. coli* 10(3.75%). The findings of this specific investigation are contrary to the report of previous studies that reported more cases of protozoa than helminthic parasites (Abah and Arene 2006, Adeyeba, and Akinlabi, 2000). In this study, hookworm was positive in 42 participants out of 400 investigated. Globally, infection of hookworm is highly associated with poor sanitation level that has to do with open defecation and constant habit of working bare footed, open grazing and night soil (Naveed, 2021; Tappe, et al., 2021). The pupils of age 10 - 12 had the highest prevalence of 25 out of the 42 individuals infected with hookworm. This variation of the intestinal infections among the different groups considered, showed statistical significant ($p < 0.05$). This finding was similar to the result obtained by (Igbodika et al., 2014) in a research conducted in Anambra State of Nigeria but differs from the result obtained by Magaji et al., 2021, in his research conducted in Kagarko, Kaduna State. The higher prevalence in the pupils of age 10 - 12 could be due to their excessive play in the contaminated environment, walking bare footed and swimming in streams that might have been contaminated with human and animal faeces. In regards to the low case of prevalence observed in the younger groups might not be far away from much attention paid on them by their parents, as the younger ones are not always allowed out of sight of their of the parents. They were usually allowed to play within their house premises.

There was a significant difference in the infection rate between male and female, where male pupils has higher prevalence of 25.50 % (102 out of 400) than the female pupils with 11.75% (47 of the 400) samples tested, ($p < 0.05$). The result is similar to the one obtained by Adeyeba and Akinlabi (2002); Baldo et al., 2004; Bethony et al., (2006) who reported higher prevalence in males than females pupils. The difference could be attributed to those males spent most of their time playing outside the home, and also take most part of the game sports at school. Hookworm has the highest prevalence 42(10.54%) out of 400 participants investigated. Globally, infection of hookworm is highly associated with poor sanitation level that has to do with open defecation and constant habit of working bare footed (WHO, 2017). The higher prevalence of hookworm in this study is in line with the finding of (Magaji et al., 2021). The low prevalence rate of *E. vermicularis* may not be unconnected with the examination procedure adopted for this study, direct smear method. It is rarely seen in the stool. A specimen is best obtained by dabbing the stretched and washed perianal folds in the early morning cellophane tape and affixing the specimen onto a slide. Adaptive methods of the anal region are recommended for the recovery of enterobius ova (Wendt et al., 2019). It is only occasionally the eggs of *E. vermicularis* seen in the human faeces because they rarely excreted in the stool (Adeyeba, and Akinlabi). Previous reports suggest that the highest number of eggs can usually be found in the morning stool, soon after waking up and before bathing.

Disparity of parasitic infections with study subjects demographic attributes

Gastrointestinal infections were highly associated with subjects' age; the older pupils were more infected than younger ones. This observation is in contrast with the report of some researcher conducted in places. The report of research conducted by Ejinaka et al., 2019, in Jos showed younger ones prove to have higher infections than their elder counter parts. However, this finding is in agreement with the report of Mazigo et al., 2010, for his research conducted in Mwanza, Tanzania. In this research high variation of infections rate was observed in children 10-12 years age. The higher infections observed in the older children 10 - 14 years than the younger ones. This may be due to the fact that activities of the younger ones (4-6) are highly monitored by their parents than older ones. The older ones have more freedom to be roaming around which make them to be at high risk of infection with this diseases from highly contaminated they might have visited.

In this study pupils under 12 - 14 prove have higher *S. mansoni* infections than any other group considered. This could be attributed to their relatively high (fishing, swimming, rice farming) in the contaminated (Mueller et al., 2019).

In terms of water sources for day to day activities of the participants, there was significant difference ($P < 0.05$), infections rate with regard to water sources. Participants depending on river water (62.96%) prove to have high infection rate which is in disagreement with Deku et al. (2022) that reported no significant difference associated between sources of drinking water with gastrointestinal infections.

The study had shed light on the prevalence of gastrointestinal parasites among primary school pupils in Lokoja, Kogi state. Despite the low prevalence of intestinal parasites found in the study area, the public health concern should be considered, this is because intestinal parasitic infection hampers physical economic and mental development and leads to poor academic performance in school children. The most common intestinal parasite was Hookworm (10.54%). This finding is a pointer to the poor hygienic standard of the environment.

As most pupils are exposed by intestinal parasites, a prompt treatment program is suggested. Primary health care services should be put in place for the control of intestinal parasites. Health parsonels (Community health workers) should move from house to house and school to school to ensure that surrounding of residential areas and schools are kept clean and educating the pupils. Health education should be well taught, they should form part of the curriculum and pupils should be enlighten on the dangers of exposing themselves to parasites, and possibly avoid coming in contact with them. Indiscriminate defecation and inadequate disposal of human waste should be discouraged among school children. The Government, voluntary organization and private individuals should provide adequate social amenities like water, toilets etc. that will better the lives of children. Government should legislate against accumulation of refuse and indiscriminate defecation around the schools and other places.

For a better understanding of the problem of gastrointestinal parasites in Lokoja and Kogi at large, and for more reliable data to consolidate the results, further research is needed which should involve most of the schools in Kogi in general hence there is need

for public enlightenment to be intensified in the study area to further educate the students, teachers and also parents in the need of proper hygiene. This will help to completely eradicate intestinal parasitic infection among primary school pupils in the study area.

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