

Original Article

Prevalence of gastrointestinal parasitic helminths among school-aged children from two selected primary schools in Mubi-north L.G.A., Adamawa State, Nigeria.

Musa Y. Tula,¹ Richard Elisha,² Usman U. Wafari,³ Zulkifli M. Usman⁴

¹Department of Biological Science Technology, Federal Polytechnic Mubi, Adamawa State, Nigeria.

²Department of Biomedical and Pharmaceutical Technology, Federal Polytechnic Mubi, Adamawa State.

³Department of Food Science Technology, Federal Polytechnic Mubi, Adamawa State.

⁴Department of Science Laboratory Technology, Modibbo Adama University, Yola, Adamawa State.

Correspondences to: **Musa Yakubu Tula**, Department of Biological Science Technology, Federal Polytechnic Mubi, Adamawa State, Nigeria.

Email: birtyty@gmail.com

Phone: +2349138341934

ABSTRACT

Background: Infections involving parasitic helminths constitute a major health challenge especially as it affects children from rural and sub-urban communities of developing countries. It is also reported to be an influential cause of morbidity in children of school age who harbour the peak burden and the damaging effect of the worm invasion. **Objectives:** This was a cross-sectional institutional-based study aimed at investigating the prevalence of gastrointestinal parasitic helminths from two selected primary schools in Mubi-North LGA, Adamawa State. **Methodology:** Faecal samples were collected from 150 pupils of Staff Primary School, Federal Polytechnic Mubi, and Mubi I Primary School Lokuwa and were examined for eggs/larvae of intestinal helminths using direct smear and formal ether concentration methods. **Results:** The results showed an overall prevalence of 22.0% consisting of four species of helminthic parasites which includes *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Taenia solium*, and *Schistosoma mansoni*. Staff Primary School had the highest occurrence of *S. mansoni* (5.3%), while Mubi I Primary School had the highest occurrence of *A. duodenale* (10.7%), *A. lumbricoides* (8.0%), and *T. solium* (5.3%). On the overall, *Ancylostoma duodenale* (10.0%) was the most predominant parasite, while the least was *T. solium* (3.3%). The result of the odd ratio and chi-square (OR=1.263, CI=0.582-2.742, P=0.554) showed that pupils in Mubi I Primary School are 1.263 times more likely to be infected with gastrointestinal helminths than pupils of Staff Primary School, Federal Polytechnic Mubi, but with no statistical difference. The relationship between gender and infection with gastrointestinal helminthic parasites (OR=1.017, 95% CI=0.456-2.269, P=0.967) showed that females stand a higher chance of being infected with gastrointestinal helminths than their male counterparts, but the difference is not significant. The highest prevalence of *A. lumbricoides* and *S. mansoni* was observed among males, while the highest prevalence of *Ancylostoma duodenale* and *T. Solium* was observed among females. The age group 8-10 years had the highest prevalence of gastrointestinal parasites, but with no statistical difference from other age brackets (P=0.514). **Conclusion:** Despite low prevalence, there is, the need for urgent development of high-quality preventive and control measures that is compliant with the endemic or highly prevalent communities.

Keywords: *gastrointestinal, helminths, parasites, children, primary school*

Introduction

Parasites that reside in the intestinal tracts of humans and other animals are known as gastrointestinal parasites. They are largely categorized into two main groups namely the protozoan and helminths.¹

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Parasitic helminths of medical importance include nematodes (*Ascaris lumbricoides*, hookworms), cestodes (*Taenia solium*) and trematodes (*Schistosoma mansoni*). These parasites are majorly transmitted either by means of skin penetration or through intake of the infective stage of the parasites² and they usually thrive in environments that portrayed any or all but not limited to these factors; poor sanitation, warm temperature, dampness, unclean water and congested housings.^{3,4}

The World Health Organization estimated that about 24% of the world's population is infected with intestinal helminths.⁵ Of these, school-age children account for not less than 400 million who are chronically infected.⁶

A recent survey estimated that more than one billion people globally were infected with *A. lumbricoides*, 800 million with hookworm, and 200 million with Schistosomes.^{7,8} Studies have also recorded that the global prevalence of intestinal parasitic infections is maximum in children, especially those living in sub-Saharan Africa, followed by Asia, Latin America, and the Caribbean.^{4,9}

In sub-Saharan Africa, especially Nigeria, the widespread nature of intestinal helminth infections constitutes public health significance due to the high rate of morbidity and sometimes mortality.^{8,10} This is because the factors that promote the dissemination and transmission of helminthic parasites abound especially in rural and suburban communities including urban slums.^{11,12,13} The problem is further compounded due to the habitual attitude of children; especially in regards to playing with sand and eating randomly without observing rules of hygiene.⁸ The consequences of parasitic helminthic infections in children are harmful and disturbing and are known to have damaging effects on the growth, health, survival, vigour, and working operations of school children.^{8,14}

Given the foregoing, there is a need for urgent development of high-quality preventive and control measures malleable for endemic or highly prevalent communities. This can only be achieved when the reference data on the occurrence of parasitic infections in a particular area is known. Therefore, this study was aimed at determining the prevalence of gastrointestinal helminthic parasites from two

selected primary schools in the Mubi-North Local Government Area of Adamawa State.

Materials and Method

Study Design

This was a cross-sectional study that was carried out between June to August 2018 in which 150 (75 from each school) consenting primary school pupils from two selected primary schools in Mubi-North Local Government Area were randomly recruited and their stool samples were taken and analysed for the presence of gastrointestinal helminthic parasites.

Study area

The study area comprises two selected primary schools; staff primary school, Federal Polytechnic Mubi, and Mubi I Primary School Lokuwa. These schools are situated in the Mubi-North Local Government Area of Adamawa State. Mubi I Primary school is located in Lokuwa within the coordinate 10°16'37.7" N 13°16'59" E while Staff Primary School is located within the Federal Polytechnic Mubi premises in the coordinates 10°16'47.8" N 13°17'23.6" E

Ethical Approval

Ethical approval was obtained from the management of the respective schools. Consent was also sought and obtained from parents after due consultations with their wards.

Collection of Stool Samples

One hundred and fifty (150) Stool samples (75 from each school) comprising 55 and 95 male and female pupils were randomly collected from the selected schools. Each pupil was supplied with clean paper, wraps of tissue paper, and a clean labeled screw-capped plastic stool sampling bottle containing an applicator stick. All consenting pupils were taught how to collect their early morning stool using the applicator stick. All the sampling bottles were retrieved from the pupils as they resumed in the morning for their routine classes. Each faecal sample was immediately treated with 2ml of 10% formalin before being taken to the Microbiology Laboratory of Federal Polytechnic Mubi for analysis.

Faecal Sample Analysis

Direct wet mount or smear method

A drop of stool sample was applied to a small area on a clean grease-free slide to which 1 to 2 drops of saline or iodine were added with a pipette. It was mixed with an applicator stick and was carefully covered with a clean coverslip to avoid air bubbles and over floatation. The mount was observed using x10 and x40 magnifying objective lenses.¹⁵

Formal-ether concentration technique

In this method, an aliquot of 1g faeces was measured and suspended in 10ml of 10% formaldehyde solution and mixed with a glass rod. The suspension was passed through a funnel to remove debris into a centrifuge tube, 3 ml of diethyl ether was added and the suspension was mixed thoroughly. The tubes were centrifuged at 4000rpm for three minutes, after which the tubes were decanted, leaving only sediment. Using a Pasteur pipette, a drop of the sediment on a clean grease-free slide was examined using x10 and x40 objectives lenses. The eggs and larvae were identified using a parasitological manual and Atlas of Medical Helminthology.^{16,17}

Statistical Analyses

Data were presented in tables in percentages. Odd ratio (OR) and chi-square were used to determine infection rate based on school location and the suitability of gender as a risk factor for infection with gastrointestinal parasites. Duncan Multiple Range Test (DMRT) and least significant difference (LSD) was used to determine the level of significance between age groups. All statistical analyses were carried out using SPSS version 17.0. A significant difference was taken at p-value of less than 0.05, (p<0.05).

Results

Results from Table 1 show the prevalence of helminthic parasites among 150 pupils from two primary schools in Mubi. Out of the 150 participants, 33(22.0%) had four species of

helminthic parasites which includes; *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Taenia solium*, and *Schistosoma mansoni*. Staff Primary School had the highest occurrence of *S. mansoni* (5.3%), while Mubi I Primary School, Federal Polytechnic Mubi had the highest prevalence of *A. duodenale* (10.7%), *A. lumbricoides* (8.0%), and *T. solium* (5.3%). Overall, *A. duodenale* (10.0%) was the most predominant parasite, while the least was *Taenia solium* (3.3%). The result of the odd ratio and chi-square (OR=1.263, CI=0.582-2.742, P=0.554) showed that pupils in Mubi I Primary School are 1.263 times more likely to be infected with gastrointestinal helminths than pupils of Staff Primary School, Federal Polytechnic Mubi, but with no statistical difference.

Table 2 shows the prevalence of gastrointestinal parasites based on gender. The highest prevalence of *A. lumbricoides* and *S. mansoni* was observed among males, while the highest prevalence of *A. duodenale* and *T. Solium* was observed among females. The relationship between gender and infection with gastrointestinal helminthic parasites (OR =1.017, 95% CI = 0.456-2.269, P=0.967) showed that females stand a 10.17% chance of being infected with gastrointestinal helminths than their male counterparts, but the difference is not significant.

The age-related prevalence shows that the age group 8-10 years had the highest prevalence of gastrointestinal parasites, but with no statistical difference from those of 5-7 and 11-13years (P=0.514). However, the highest prevalence of *A. lumbricoides* and *T. solium* were recorded in the age group 5-7years, while *A. duodenale* and *S. mansoni* were much more predominant in the age group 8-10 years (Table 3).

Table 1: Prevalence of gastrointestinal helminths from two primary schools

School	no tested	<i>A. lumbricoides</i>	<i>A. duodenale</i>	<i>T. solium</i>	<i>S. mansoni</i>	Total	Odd ratio	95% CI	X ²
A	75	3(4.0)	7(9.3)	1(1.3)	4(5.3)	15(20.0) ^a	1.236	0.582-2.742	0.967
B	75	4(8.0)	8(10.7)	4(5.3)	2(2.7)	18(24.0) ^a			
Total	150	7(4.7)	15(10.0)	5(3.3)	6(4.0)	33(22.0)			

Legend: A = staff primary school, Federal Polytechnic Mubi; B = Mubi I primary school Lokuwa.

^a = parameters with the same superscript denote not statistically different (P=0.554)

Table 2: Prevalence of gastrointestinal helminths based on gender

Parasites	No positive (%)	Male (n=55) ^a	Female (n=95) ^a
<i>A. lumbricoides</i>	7(4.7)	4(7.3)	3(3.2)
<i>A. duodenale</i>	15(10.0)	4(7.3)	11(11.6)
<i>T. solium</i>	5(3.3)	1(1.8)	4(4.2)
<i>S. mansoni</i>	6(4.0)	3(5.5)	3(3.2)
Total	33(22.0)	12(21.8)	21(22.1)
Odd ratio	1.017		
95% CI	0.456-2.269		
X²	0.967		

^a = parameters with the same superscript denote not statistically different (P=0.967)

Table 3: Prevalence of gastrointestinal helminths based on age group

Parasites	Age group (n=50 each)		
	5-7 ^a	8-10 ^a	11-13 ^a
<i>Ascaris lumbricoides</i>	4(8.0)	1(2.0)	2(4.0)
<i>Ancylostoma duodenale</i>	4(8.0)	9(18.0)	2(4.0)
<i>Taenia solium</i>	2(4.0)	1(2.0)	2(4.0)
<i>Schistosoma mansoni</i>	1(2.0)	4(8.0)	1(2.0)
Total	11(22.0)	15(30.0)	7(14.0)

^a = parameters with the same superscript denote not statistically different (P=0.514)

Discussion

In sub-Saharan Africa, infections with intestinal helminth are on the rise and constitute major health concerns because elements that predispose humans to infections abound.

In comparison to the finding of our study, a lower prevalence of gastrointestinal helminths was also reported in Nigeria. These include 27.7%¹⁸ and 26.6%¹⁴ reported in Rivers and the Cross-River States respectively.

The low prevalence of 22.0% of gastrointestinal parasites observed in this study was contrary to previous studies where higher prevalence rates were reported in the various States of Nigeria. These include 92.4%¹⁹ and 80.0%²⁰ in Delta State, 82.6%²¹ in Abia State, 76.2%²² reported in Abuja and 67.1%¹⁷ in Katsina. Others include 59.1%²³, 53.5%²⁴, 52.5%²⁴, 48.1%²⁵, and 45.3%² reported in Akwa Ibom, Imo, Enugu, Anambra, and the Kebbi States respectively.

However, the 22.0% prevalence rate of gastrointestinal parasites observed in our study is quite higher than the 9.1% prevalence rate reported in Numan, Adamawa State²⁶. It was also higher than 11.0%²⁷, 16.9%²⁸, and 9.1%²⁹ reported in Lagos, South-eastern Nigeria, and Bauchi State respectively. The differences observed in the reported prevalence of gastrointestinal helminths in this study and the comparative may be attributed to differences in environmental and geographical locations, sanitary conditions, local endemicity, overcrowding, level of awareness on the mode of transmission, personal hygiene, the season of sampling, study population type and the type of method used for the detection of the parasites.^{2,6,27}

The preponderance of *A. duodenale* in this study followed by *A. lumbricoides* agreed with previous studies in Edo State⁶, Anambra State²⁵, and Imo State²⁴. Although the prevalence of *A. duodenale*

(10.0%) in this study was the highest but was less than 23.5%³⁰ and 94.2%⁵ reported among school children in Rivers and Imo State respectively. The preponderance of *A. duodenale* among the study population could be attributed to the fact that Mubi is a peri-urban settlement; characterised by poor water supply and or poor sanitation facilities, which could be more favourable for *A. duodenale* than the other worms.⁶ More so, children within this type of settlement are characterised by indigent hygienic conditions or habits which include inconsistency in wearing protective shoes while playing or working within and outside school premises^{31,32}, and indiscriminate or open field defecation.^{14,31} These observations were consistent with earlier studies that reported that *A. duodenale* intestinal helminthiasis and other roundworms are frequent diseases notably among rural³³ and sub-urban¹⁷ communities in Nigeria. The relatively high prevalence of *A. duodenale* in this study, when compared to other parasites, might also be due to the climatic condition of the community at the time of sampling. In this study, samples were collected during the rainy season and studies have shown that *A. duodenale* transmission is often retarded during the dry season but is facilitated during the rainy season. This is because the eggs of *A. duodenale* are commonly distributed by rain which consequently increases the chances of its contact with humans.^{5,30} More to this, the detection of *A. duodenale* and *A. lumbricoides* as the most prevalent parasites observed in this study might be because the ova of these parasites are resistant to environmental pressure.¹⁵

The detection of *S. mansoni* in this study may suggest water contact activities and possibly inadequate use of protective shoes around or outside the school premises as previously observed.³²

The finding that pupils of Mubi I Primary School are more likely to be infected with gastrointestinal helminths comparable to Staff Primary School pupils may be attributed to differences in social strata of the pupils. Mubi I Primary School is a Public School attended mostly by the wards of the masses, while Staff Primary School is a private school located within the premises of the Federal Polytechnic Mubi attended mostly by the wards of the elites or the affluent. The differences in their school and home environment may have contributed immensely to the differences in the occurrence of

gastrointestinal helminths observed in the study populations. Moreover, it is a common practice for the elites or the affluent to send their wards to private lessons after regular school hours. Such wards usually receive closer parental attention. Thus, they are more preoccupied and less exposed to parasitic infections compared with their counterparts.³⁴ The lack of significant difference in the prevalence rate of gastrointestinal parasites among the two studied schools may suggest that the level of exposure to risk factors among the school pupils was relatively the same.

This study showed a marginally higher prevalence of gastrointestinal parasites in females 22.1% than in males 21.8%. This result may be influenced by the higher number of females than males in the study population. It could also be because females are more exposed to domestic sources of transmission (such as food preparation, fetching of water, waste disposal, etc) than males. These observations were consistent with studies previously reported.^{6,25} The higher number of females than males with intestinal parasites as seen in this study is comparable to previous studies in Enugu State⁴, Imo State¹, Lagos State²⁷, Anambra State²⁵, and Edo State⁶. In contrast to our findings, other studies showed that males are more predisposed to intestinal parasites than females.^{2,29} According to them, it is because males are more engaged in extracurricular and outdoor activities than females.^{2,35} The lack of significant difference in the prevalence of intestinal parasites between males and females as observed in this study is an indication that gender may not be a risk factor for infection with intestinal parasites in the study area. It also implies that both sexes are relatively exposed to the same or similar sources of infection or transmission. This allusion corroborates previously reported studies in Nigeria and other parts of the world.^{4,8,36,37,38}

The higher prevalence of *A. lumbricoides* and *S. mansoni* among male folks wasn't unexpected. This is because male children are more engaged in swimming, outdoor, and extracurricular activities than females which predisposed them more to sources of transmission of these parasites.²

The peak prevalence rate in this study was observed among the age group 8-10 years, followed by 5-7 years. This was contrary to a previous study that

reported that the age group 5-7 years had the highest prevalence rate followed by 8-10 years.² However, the result of prevalence concerning age groups in our study concurs with a previous study in Enugu State⁴ which showed that children of the age group 8-10 years had the highest prevalence rate. The age groups 5-7 and 8-10 years are younger children when compared with 11-13 years. Studies have shown that younger children are more susceptible to intestinal parasitic infection than older children. The reason for this may be because they are known for keeping indigent personal hygiene which significantly plays a role in intestinal parasitic infections.³⁹ In this study, pupils in the age bracket 11 - 13 years had the least prevalence rate. This agreed with a previous study in Kebbi State.² This suggests that this age bracket is less exposed to the risk factors that promote susceptibility to gastrointestinal parasite infections. This is enhanced by the increased level of personal hygiene in this age bracket. This observation is consistent with previous studies that reported that exposure to intestinal parasitic infections decreases as age increases.³⁹ Also, the lack of statistical difference between the age groups was in agreement with previous studies^{4,40} which revealed that infection with intestinal parasites is independent of age.

Although the prevalence of intestinal parasites in this study was low; however, the detection of four species of intestinal parasites in this study is of public health concern especially as it affects children. This is because intestinal parasitic infections in children have been linked with relatively high morbidity and mortality, especially in sub-Saharan African countries. Aside from this, infection with intestinal parasites has been associated with an increased risk for dietary anaemia, malnutrition, and stunted growth⁴¹ which is proven to cause persistent illnesses that can harmfully affect the children's health, cognitive behaviour, learning and educational development.²

Conclusion

This study recorded a low prevalence of gastrointestinal parasites among primary school children in our study area. Despite this, we recommend among others that good personal hygiene should be encouraged among this study group by both parents at home and teachers in schools. This will help further to reduce drastically the prevalence and menace of the intestinal parasite

within our communities, especially among school-age children.

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