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Original Paper

Intestinal Helminthiasis among School Children in Ilie, Osun State, Southwest, Nigeria

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ABSTRACT

A cross sectional study of intestinal helminthiasis among school pupils was undertaken in three primary schools in Ilie in Olorunda Local Government Area of Osun state in order to determine the prevalence and intensity of helminthic infections. The relationship between intestinal helminths and anthropometric indices and the factors that could favour the infection were also studied. Faecal samples from three hundred and four (304) randomly selected out of the four hundred and seven (407) school children in the study area were collected and analysed with the semi-quantitative Kato Katz technique and concentrated method. The intensity of infection was classified into light, moderate or high according to World Health Organisation (WHO) thresholds. The overall prevalence rate was 52.0% while five species of intestinal helminths were identified. *Ascaris lumbricoides* (36.2%) was the most common, followed by Hookworm (10.5%), *Schistosoma mansoni* (4%), *Strongyloides stercoralis* (0.7%) and *Hymenolepis nana* (0.7%). Multiple helminthic infection were recorded with *Ascaris* – Hookworm (6.58%) having the highest prevalence among the children. Female (56.6%) were more infected than male (46.4%) and the difference was statistically significant (P=0.0019). Seventeen percent (17%) of the children were below the third percentile for weight (wasted) while fourteen percent (14%) were below the third percentile for height (stunted). There was a relationship between intensity of infection and wasting since there were fewer underweight pupils (13%) with normal stool than those moderately infected (35%) (P<0.05). There was statistically significant association between type of latrine use and prevalence of infection; and also between water treatment and infection. Periodic surveillance of school children for intestinal helminthiasis should be part of the public health activities while periodic deworming programme should be done routinely as this would reduce intensity of intestinal worm infection among school children.

Keywords: **Anthropometric, Helminthiasis, Intensity, Kato-Katz, Prevalence**

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INTRODUCTION

Intestinal helminths are multicellular pathogens that infect vast number of human and animal hosts, causing widespread chronic disease and morbidity (Crompton and Nesheim, 2002). Poor people in developing countries endure the burden of disease caused by four common species of soil transmitted nematodes that inhabit the gastro-intestinal tract namely *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale* and *Necator americanus* (Crompton and Nesheim, 2002). Children and pregnant women are the main sufferers from these parasitic infections (WHO, 2003). The parasites are more common in rural areas in the developing countries of Asia, Africa and Central America and are often linked to poverty and other social problems such as poor sanitation and lack of clean water (WHO, 1998).

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They are of major hazard because of their high prevalent rate and their effect on both nutritional and immune status of the population (Latham, 1984). In sub-Saharan Africa, intestinal helminth infections are common and of major health concerns because factors that predispose man to the infections such as poverty, poor sanitation, ignorance and malnutrition prevail (Ijagbone and Olagunju, 2006). Furthermore, the habit of playing on sand resulted in very widespread parasitism with a variety of helminths, and eating habits that involve the consumption of raw vegetables, fish, crustaceans and meat allow the transmission of helminths infections (Montressor *et al*., 2002). The World Health Organization (WHO) estimates that more than one billion of the World's populations including at least 400 million school age children are chronically infected with soil-transmitted helminths (STH). Evidently, there is need for continuous evaluation of prevalence of intestinal infection among school children, since they seem most likely group at risk for constant infection.

The global prevalence and number of cases of intestinal helminths infection in school age children have been estimated to be Roundworm 35% (320million); Whipworm 25% (233million); Hookworm 26% (239million), others 14% (128million) (Partnership for Child Development, 1999). The severity of the disease caused by soil-transmitted nematodes has consistently been found to depend on the number of worms present per person (Crompton and Nesheim, 2002). In Nigeria, various studies have been carried out to estimate the status of soil transmitted helminth infections (Oyewole *et al*., 2007; Awolaja and Morenikeji, 2009; Osazuwa *et al*., 2011) but there is paucity of report on intestinal heminthiasis among school children in Ilie, Osun State. Therefore, this study set out to assess the occurrence and intensity of intestinal helminth infections among the school children in the study area in order to serve as a guide for health planners in the state in evaluating worm control programmes among school children.

MATERIALS AND METHODS

Study Area

The study area was Ilie, in Olorunda Local Government Area of Osun State, Nigeria. Ilie is about 20km from Igbona, the headquarter of the Local Government. It is located in the rain forest zone between latitude $4^{0}34^{1}$ and $4^{0}36^{1}$E and Longitude $7^{0}56^{1}$ and $7^{0}58^{1}$N with population of about 2,268 (National Population Commission, 1991). The area is rural and lack basic amenities such as good roads, standard hospitals and adequate facilities for refuse and sewage disposal. There is a big dam which serves as a source of water for bathing and other domestic activities. Members of the community are predominantly farmers though some engage in fishing and trading while some are civil servants. The community has three primary schools namely Community Primary School, Nawar-Ur-Deen Primary School and Saint James Primary School. There were 407 children in all the three primary schools in the area in which 304 randomly selected 138 males and 166 females, aged 5-18 years were enlisted for the study.

Study Design

The parasitological survey was preceded by a pre-survey contact during which permission was obtained from the zonal education department of the Olorunda Local Government. Verbal consent was also sought from the parents of the participating pupils through the Parent Teacher Association of each school. Questionnaires were administered on each subject so as to collect socio-demographic data including age, sex, type of latrines used, family size, source of drinking water and method of water treatment. These were done with the aid of their teachers. Anthropometric measurements of each school child such as height and weight were also taken using potable weighing balance and meter rule respectively. These were accurately measured to the nearest 0.1kg for weight and to the nearest 0.1cm for height. These measurements were compared to a standard population of the same age using Tanner's growth and weight charts to grade nutritional status according to height-for-age and weight-for-age (Tanner and Whitehouse, 1976). While pupil's age below third percentile for height defines "stunted growth", pupil's age below third percentile for weight describes "wasted" (Tanner and Whitehouse, 1976).

Sample Collection and Analysis

The pupils were educated on how to collect the fresh stool samples that was passed in the morning into the receptacle provided. Stool samples were collected from the pupils as soon as they arrived at the school premises. Samples were transportation to Parasitology laboratory of Ladoke Akintola University of Technology, Osogbo, which is about 20 km from the study area within 4 hours of passage in order to ensure proper identification of hookworm eggs (WHO, 2003).

The appearance of each faecal sample was carefully examined macroscopically for consistency, presence or absence of blood and mucus. Using x10 and x40 objective lenses, the faecal samples were then examined microscopically for parasites by direct smear saline method as recommended by WHO (2003). Negative samples were later subjected to concentration method. Based on WHO (2003) criterion for quantifying the number of eggs per gram(epg) of faeces, positive stool samples were further re-examined by single thick smear technique using a 41.7mg Kato-Katz template and the number of helminth eggs counted were multiplied by 24 in order to quantify the number of eggs per gram(epg) of faeces. To ensure consistency of the result and as a form of quality control, 20% of the slides randomly selected and read again (Andrade *et al.,* 2001).

Data Analysis

The data obtained were analysed using Duncan multiple range test and Chi-square statistical package. The differences were considered to be statistically significant when the *P*-value obtained was less than 0.05.

RESULTS

The single and multiple distribution patterns of the helminths are shown in Table1. Five different species of helminths were recorded in the survey namely *Ascaris lumbricoides*, Hookworm, *Schistosoma mansoni, Hymenolepis nana* and *Strongyloides stercoralis*. In all, 158 (52.0%) out of 304 stool samples collected were positive for one or two intestinal helminths. 128 (42.1%) of the students were infected with only one helminth while 30(9.9%) with two different helminths.

Table 1: Distribution of the Helminthes among the Study Group

Helminths	N=304	No of cases (%)
Single	*A. lumbricoides* *Hookworm* *S. mansoni* *H. nana* **Total**	**80 (26.3)** **12(4.0)** **4 (1.3)** **2(0.7)** **128 (42.1)**
Multiple	*A. lumbricoides + S. mansoni* *A. lumbricoides + Hookworm* *A. lumbricoides + S. stercoralis* **Total**	**8(2.6)** **20(6.6)** **2(0.7)** **30(9.9)**
Overall Total		**158(52.0)**

Table 2 shows the prevalence and intensity of helminth infection among school children in Ilie. The most common was *A. lumbricoides* 110 (36.2%), followed by Hookworm 32 (10.5%), then *S. mansoni* 12 (4%) while *S. stercoralis* and *H. nana* had the same frequency, 2 (0.7%) each. *Ascaris lumbricoides* had 35.5% and 10.5% light and moderate intensity respectively. Hookworm had light and moderate intensity of 9.9% and 0.7% moderate respectively and *S. mansoni* had intensity of 2.0% for both light and moderate intensity. The total prevalence of intestinal helminth infections by age and sex is shown in Table 3. Eighty percent (80%) of the subjects above 15years old had the highest prevalence rate, while those within 11-15years old (48.1%) had the least prevalence rate ($P<0.05$). Table 4 shows the relationship between the intensity of infections and the degree of malnutrition.

Table 2: Prevalence and Intensity of Helminths Infection among School Children in Ilie.

Helminths	N = 304 Number positive (%)	Infection level (%)			
		Negative	Light	Moderate	Heavy
Ascaris lumbricoides	110 (36.2)	164 (54)	107 (35.5)	23 (10.5)	0 (0)
Hookworm	32 (10.5)	272 (89.5)	30 (9.9)	2 (0.7)	0 (0)
Schistosoma mansoni	12 (4)	292(96.1)	6 (2.0)	6 (2.0)	0 (0)
Strongyloides stercoralis	2 (0.7)	*	*	*	*
Hymenolepis nana	2 (0.7)	*	*	*	*
Total	158 (52.0)				

**** Larva/Egg count could not be computed because threshold value is not available in WHO standard***

A. lumbricoides	**Hookworm**	***S. mansoni***
Light – 1-4,999epg	Light- 1-1,999epg	Light – 1-99epg
Moderate-5,000-49,999epg	Moderate-2,000-3,999epg	Moderate 100- 399epg
Heavy - > 50,000epg	Heavy - > 4,000epg	Heavy - > 400epg

Table 3: Prevalence of Intestinal Helminths Infections by Age and Sex

Age-Group (years)	Male		Female		Total		*P*-value = 0.0019
	No. Examined	No. Positive (%)	No. Examined	No. Positive (%)	No. Examined	No. Positive (%)	
≤5	8	5(62.5)	16	13(81.3)	24	18(75)	
6 – 10	48	26(54.2)	69	34(49.3)	117	60(51.3)	
11 – 15	80	31(38.8)	78	45(57.7)	158	76(48.1)	
> 15	2	2(100)	3	2(66.7)	5	4(80)	
Total	**138**	**64(46.4)**	**166**	**94(56.6)**	**304**	**158(52)**	

Table 4: Relationship between Intensity of Infections and Degree of Malnutrition

Parameter	Intensity of Infections			*Other Parasites	Stools from Normal Subjects (146) (%)	Total No Examined (304) (%)
	High	Moderate (34) (%)	Low (120) (%)			
<3rd centile of weight	0(0)	12 (35%)	26 (22%)	2(50%)	2 (13%)	53(17%)
<3rd centile of height	0(0)	10 (29%)	16 (7%)	1(25%)	1(17%)	41(14%)

The intestinal helminths that were not quantified using Kato Katz technique are referred to as other parasites. The parasites are Strongyloides stercoralis and Hymenolepis nana as regards the study

Table 5: Socio-Demographic Data of School Children in ilie

Parameter	Positive (%)	Negative (%)	Total (%)	P-value
Family size				
1 – 3	46(29)	73(50.0)	119(39.2)	
4 – 6	81(51.3)	59(40.4)	140(46.1)	
>6	31(19.6)	14(9.6)	45(14.8)	**0.0003**
Total	**158**	**146**	**304**	
Type of Toilet				
Water closet	2(1.3)	-	2(0.7)	
Pit latrine	91(57.6)	109(74.7)	200(65.8)	
Near by bush	65(41.1)	37(25.3)	102(33.6)	**0.0044**
Total	**158**	**146**	**304**	
Source of Drinking water				
Tap water	10(6.3)	4(2.7)	14(4.6)	
Well water	42(26.6)	76(52.1)	118(38.8)	
Bore hole	6(3.8)	1(0.7)	7(2.3)	
Stream water	72(45.6)	60(41.1)	132(43.4)	
Tap and other source	28(17.7)	5(3.4)	33(10.9)	**<0.0001**
Total	**158**	**146**	**304**	
Method of water treatment				
Boiling	**4(2.5)**	**7(4.8)**	**11(3.6)**	
Filtration	**-**	**-**	**-**	
Alum or other chemical	**21(13.3)**	**53(36.3)**	**74(24.3)**	
None	**133(84.2)**	**86(58.9)**	**219(72.0)**	**<0.0001**
Total	**158**	**146**	**304**	

Anthropometric measurements showed that among the 304 children examined, 53 (17%) were below the third percentile for weight (wasted) and 41 (14%) were below the third percentile of height (stunted). There is a relationship between intensity of infection and wasting since only 13% of the children with normal stool were underweight compared with moderately infected subjects (35%) (P<0.05).

The socio-demographic data of the study group is shown in Table 5. There was statistically significant association between family size and rate of helminthes infection (P=0.0003). The prevalence rate of intestinal helminths in term of family size was found to be (1-3) 29%, (4-6) 51.3% and (>6) 19.6% respectively. The highest prevalence rate was recorded among those using pit latrines (57.6%) and the majority of the school

children (43.4%) use stream water. Seventy two percent (72%) of the pupils drink water without any form of treatment and the prevalence of helminthiasis among them was 84.2%. There was a statistically significant association between water treatment method and prevalence of helminthiasis (P<0.0001).

DISCUSSION

Many studies have been done on the prevalence of intestinal helminth infection all over the world including West Africa and Nigeria in particular. But the only available date from this study locality was that of Ijagbone and Olagunju (2006). In this present study, the 52% overall prevalence of intestinal helminthes agreed with the (58.4%) reported in Ethiopia by Woldemichael and colleagues in 1990 and 54.7% documented in Delta state, Nigeria by Egwunyenga and Ataikiru (2005). Our figure was however high when compared with the studies of Adeyeba and Tijani (2002); Anantaphruti *et al.* (2004) and Uneke *et al.* (2007). However, this is considerably lower than over 65% prevalences documented in other studies (Haile *et al.,* 1994; Ibrahim *et al.*, 1999; Agbolade *et al.,* 2004; Ijagbone and Olagunju, 2006; Oyewole *et al.,* 2007). The difference in prevalence could be attributed to timing and seasonal differences of conducting the survey, environmental conditions and other geographical factors in the study areas. The high prevalence may also not be unconnected with poor sanitation, poor personal and environmental hygiene practices in the study area and among the school children.

The most prevalent among these helminthes is *A. lumbricoides* (36.2%), followed by hookworm infection (10.5%). This result is consistent with reports of Adeyeba and Akinlabi (2002) and Taiwo and Agbolade (2000) showing that intestinal helminthiasis caused by roundworms and hookworms is a common disease among school children in Nigeria. The highest prevalence and intensity of *A. lumbricoides* recorded in this study could indicate high level of unhygienic practices and the habit of defaecating indiscriminately in open place among school children which eventually contaminate the environment. Intestinal parasites have been reported to have deleterious effect on school children (Adeyeba and Akinlabi, 2002). Hadidjaja *et al*. (1998) observed that the presence of *A. lumbrioides* in school children is associated with nutritional status and cognitive development with a consequence of under-developed skills and learning ability. Although, the hookworm infection rate of 20.5% and 16.2% in studies respectively conducted by Ijagbone and Olagunju (2006) and Osazuwa *et al*. (2011) was higher than that observed in this study, most of the school children were bare-footed. The occurrence of *S. mansoni* eggs in faeces in this study agreed with a report in Kenya (Highton, 1974). The frequency may be attributed to a big dam in the study area which serves as a source of water for bathing, washing and other domestic activities for most of the school children thereby exposing them to infective cercaria of *Schistosoma* species. Information obtained from the questionnaires also revealed that majority of the children was from poor families judging by the fact that only 0.7% have water closet toilet at home.

The prevalence of intestinal helminths infection was highest among the age group greater than 15 years old (80%), followed by age group 5 years old or less (75%). This finding is in agreement with previous data from a study conducted in Onicha, Ebonyi State, Nigeria (Uneke *et al.*, 2007). Even though gender is not a significant risk factor for prevalence of intestinal helminth infection (Wani *et al*., 2010), in this study female (56.6%) children were more infected than male (46.4%) and the difference was statistically significant (P=0.0019). It is however important to affirm that more female was enlisted in the study than males. Nevertheless, our results are in agreement with those of Odikamnoro and Ikeh (2004) but contrary to reports of Ukpai and Ugwu (2003) and Ijagbone and Olagunju (2006). The prevalence rate was decreasing with increasing age group possibly due to change in attitude, habits and more awareness regarding personal hygiene among the older school children.

This present investigation also shows that the weight and height of the pupils was adversely affected by the parasitic infections. There was a presentation of low weight and shoddy height among the children. In addition, light infection characterised by low number of eggs counted was more common among them, indicating chronic infections (WHO 2003). Stortzfieus *et al*. (1997) have concluded that light intensity infections are related to loss of less than 2mg of haemoglobin per gram of faeces among African school children infected with *Necator americanus*. Therefore, the need to take appropriate control measures becomes pertinent.

Since intestinal helminthiasis is linked to socio-economic in most African countries and its deleterious effects on the educational performance of school children, comprehensive investigation of intestinal helminth infection should not be limited to the children alone but also extend to their parents and other communities within the local government area for effective control. Mass deworming of school children with anti-helminthic drugs such as albendazole, or combination therapy with praziquantel should be regularly administered at least twice in a year. This would reduce the prevalence and intensity of infections drastically. Good personal hygiene must be encouraged by the teachers and adequate budget for provision of basic infrastructures should be made by government the study area. Also, portable water should be provided and improved sewage disposal should be put in place. These measures will not only increase the effectiveness of parasite control but also protect children from having other diseases associated with dirty environment such as cholera and typhoid fever.

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