Original article

Pattern of intestinal helminth infections among school children in an urban community in Ibadan, Nigeria

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Abstract

Despite a substantial reduction in the incidence and prevalence of parasitic diseases in the industrialized world, they continue to be an important public health problem in many developing African countries, including Nigeria. However, estimates of the prevalence of such infections among school age children, who bear the greatest health burden due to these diseases, are hard to come by. The objective of this study was therefore to determine the prevalence and type of intestinal helminth infections among primary school pupils. The study was cross-sectional in design. The participants included 266 pupils recruited from three government primary schools in the Mokola area of Ibadan, Nigeria. The pupils were interviewed and their stool samples examined for eggs of common helminths. The mean age of the pupils was 9.8 ± 2.6 years, and 128 (48.1%) were males. Nineteen pupils (7.1%) had intestinal helminth infestations. Ascaris lumbricoides was found in 17 pupils (6.4%) and was the most prevalent helminth among the children, while Trichuris trichiura was found in only two subjects (0.8%). Previous infestations and the use of public toilets were found to be significantly associated with current infections ($P < 0.05$). This study demonstrated that the prevalence of intestinal infections was low among the pupils studied, and that Ascaris infection was the commonest infestation.

Keywords: prevalence, intestinal helminths, school children

INTRODUCTION

Parasitic diseases are universal. Although there has been a substantial reduction in the incidence and prevalence of parasitic diseases in the industrialized world, they continue to be an important public health problem in many developing African countries, including Nigeria. Intestinal helminth infections are important causes of morbidity and mortality in these countries, and are among the world's most common infectious diseases. The World Health Organization (WHO) estimated that there were a billion cases of ascariasis due to Ascaris lumbricoides, and 500 million cases of Trichuris trichuria infection worldwide[1].

Intestinal nematode infections are most often seen as common, chronic infections in children. They cause relatively mild sickness but are associated with significant impairments of physical and mental developmental, resulting in anemia, wasting, stunted growth and lowered educational achievement[2]. School-age children in developing countries bear the greatest health burden due to these infections[3].

Intestinal parasites are endemic in Nigeria because of the poor environmental conditions in most communities. Improper disposal of waste, gross environmental pollution with agrochemicals and industrial wastes, plus the steady contamination of surface and underground water are all contributory factors[4]. Poorly planned housing and patterns of human habitation also contribute to environmental de-

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cline, as urbanization in developing countries usually entails unplanned, uncontrolled and constant migration of people from rural areas to urban centers, in search of employment opportunities. Socio-cultural and agricultural practices combine with factors such as ecosystem degradation to create conditions which favor the transmission and maintenance of many human diseases, especially parasitic ones[5]. Intestinal parasites thrive in polluted environments such as refuse heaps, gutters and sewage units found in and around human dwellings[6]. The living conditions of people in crowded or unhealthy conditions also facilitate the spread of various helminth infections[7].

Although many studies have suggested a high prevalence and intensity of infections in many communities in Ibadan Nigeria, these studies were carried out more than 10 years ago[8-10]. Current estimates of the prevalence and type of intestinal helminth infections among school-age children, who bear the greatest health burden due to these diseases, are hard to find. This study was therefore carried out to estimate the prevalence and type of helminth infections among school-age children.

MATERIALS AND METHODS

The study was carried out in the Mokola area of Ibadan, located within the Ibadan North Local Government Area of Oyo State. Mokola is a suburban area, which was upgraded 2 years ago by the Federal Government, resulting in an improved standard of living and social amenities including tarred access roads, bore-hole water, good drainage, and public toilets, situated at the only market in the locality. Housing conditions were also improved and most houses were in good habitable shape, and plastered with cement. All three primary schools located in the area-Cherubim and Seraphim (C & S) New Eden Primary School, Ibadan Municipal Government Primary School I, II, III, and St. Brigit's Boys and Girls Primary School-were selected for this study.

The number of pupils required for the study was estimated based on a previous report[11]. A stratified random sampling method was used to select participants. Pupils were classified according to their educational level (class 1 to class 6). A number of participants from each level and each class were then selected, based on the proportion of the population of the class and the required sample size. Pupils were then selected from each class using simple random sampling techniques. Preliminary visits were made to the selected schools; permission to conduct the study was sought from the headmasters and the pupils, and their teachers were informed about the aims and implications of the study.

Data were collected using an interviewer-administered questionnaire. Information on demographic characteristics, availability of toilet facilities at place of residence, defecation practices, use of footwear when outdoors, deworming status and general health was obtained. Fecal samples were also collected for microscopic examination: stool cartons and informed consent forms were distributed to the selected pupils, and identification numbers (ID) were written on the containers. The cartons and forms were taken home by the pupils for their parents to see. If the parents agreed to sign the form, their ward returned with a freshly passed stool sample the next morning. The feces were labeled with the pupils´ID numbers, and were immediately taken to the laboratory for processing.

Feces were examined for helminth eggs using direct wet preparations. Small quantities of the feces were emulsified in normal saline with Lugol's iodine solution, using an applicator stick. A sample was placed on a glass microscope slide, with a few drops of normal saline and covered with a cover slip. This was then examined directly under a microscope at x10 magnification. The presence or absence of helminth eggs was recorded. A follow-up exercise was conducted later after health counseling for pupils and teachers, and antihelminthic drug treatment of pupils found to be infected. Data entry and analysis were carried out using SPSS version 11.0. Descriptive and inferential statistical tests were used. The significance of the differences between frequency distributions was tested using chi-square analyses. *P*-values less than 0.05 were considered statisticaly significant.

RESULTS

A total of 266 out of 287 pupils selected provided proper stool samples and correctly completed questionnaires, giving a participation rate of 93%. Table 1 shows the socio-demographic characteristics of the pupils: 128 (48.1%) were males and 138 (51.9%) were females and their ages ranged from 5 to 16 years. The mean age of the children was 9.8±2.6 years. Regarding the professional/occupational status of the pupils´parents, 131 (49.2%) were

petty traders, laborers, or employed in other unskilled jobs, 75 (28.2%) worked as junior clerks, mechanics, tailors, electricians, soldiers, etc. Only 6 (2.3%) of the parents were full-time housewives, students or unemployed.

Two species of intestinal helminths were identified with an overall prevalence of 7.1% (Table 2). The predominant parasite was A. lumbricoides, which was found in 17 (6.4%) of the pupils, followed by T. trichiura, which was present in two pupils (0.8%). Of those infested with helminths, 89.5% had Ascaris while 10.5% had Trichuris infestations.

Eighty-three (37.6%) of the children reported that they wore shoes regularly, while 53.4% wore them occasionally, and 6.0% wore shoes only when going out for important functions. The difference in the prevalence of infections between those that wore shoes and those that did not was not statistically significant ($P > 0.05$). Two hundred and one (75.6%) of the children regularly washed their hands before and after meals, while only 17 (6.1%) washed their hands after going to the toilet or after cleaning up their siblings after defecation. Ninety-eight children (36.8%) reported that they picked up food from the floor to eat, while 168 (63.2%) did not (Table 3). One hundred and seventy-one (64.3%) pupils reported that they had previously passed out worms, and 60.6% said the worms were in their feces, while others were either from mouths or noses. One hundred and thirty-three (50.0%) of the pupils were living in apartments with two rooms, 24.4% were living in one room apartments with their parents or guardians, while only 8.6% reported that they were living with their families in detached houses. Analyses of the effects of socio-economic factors showed that intestinal helminth infections were not associated with family size, type of house, or parent ś occupation ($P > 0.05$).

Two hundred and thirty-four (88.0%) pupils had access to toilet facilities in their homes, consisting of either a water closet (51.9%) or a pit latrine (26.1%). Sixteen (6.8%) of them were found to be infected with intestinal helminths. Thirty-two (12%) had no access to toilets; they defecated in open fields or used nylon bags, which they then disposed of in open gutters or dunghills. A higher prevalence of infections was associated with the availability and use of pit latrines ($P < 0.05$) (Table 4).

Table 1: Socio-demographic characteristics of study participants

S/N	Characteristics	Category	Frequency	Percent
1	Age in years	5-8	81	30.5
		9-12	153	57.5
		13-16	32	12.0
		TOTAL	266	100
2	Sex	Male	128	48.1
		Female	138	51.9
		TOTAL	266	100
3	Class of education	Primary I	38	14.3
		Primary II	32	12.0
		Primary III	46	17.3
		Primary IV	53	19.9
		Primary V	45	16.9
		Primary VI	52	19.5
		TOTAL	266	100
4	Parent occupation	7	26	
		Upper Social Class II	26	9.8
		Upper Social Class III	75	28.2
		Lower Social Class IV	21	7.9
		Lower Social Class V	131	49.2
		Lower Social Class VI	6	2.3
		TOTAL	266	100

Table 2: Prevalence and type of helminth infections among sampled population and infested pupils

Helminth	Total sampled pop. (%) (n=266)	Infested pop. (%) (n=19)
Ascaris lumbricoides	17 (6.4)	17 (89.5)
Trichuris trichiura	2 (0.8)	2 (10.5)
Any helminth	19 (7.1)	17 (100)

Table 3: Distribution of responses to personal hygiene/preventive behavior among sampled pupils.

Variables	Positive responses n (%)
Regularly wear shoes at home and outside	83 (37.6%)
Usually wash hands before & after eating	201 (75.6%)
Usually wash hands after toileting	17 (6.1%)
Picks things from the floor to eat	98 (36.8%)
Have been treated for worms in the last year	96 (36%)
Ever passed out worms either from the mouth, nose or feces	171 (64.3%)

Table 4: Characteristics/Risk behaviors of pupils and their association with intestinal helminth infections.

Risk factors	Intestinal helminthes				
	No n (%)	Yes n (%)	Total n (%)	χ^2	P-value
Sex					
Male	117 (91.4)	11(8.6)	128 (100)		
Female	130 (94.2)	8 (5.8)	138 (100)	0.783	0.38
Have access to toilet					
Yes	218 (93.2)	16 (6.8)	234 (100)		
No	29 (90.6)	3 (9.4)	32 (100)	0.273	0.60
Toilet type					
Water closet	129 (93.5)	9 (6.5)	138 (100)		
Pit latrine	109 (93.2)	8 (6.8)	117 (100)	5.17	0.036
Open space/bucket					
/nylon bags	7 (80)	2 (20)	9 (100)		
Hand washing habit					
Regularly	188 (935)	13 (6.5)	201 (100)	0.585	0.45
Not regularly	59 (90.8)	6 (9.2)	65 (100)		
Pick up food from the floor to eat					
Yes	94 (95.9)	4 (4.1)	98 (100)		
No	153 (91.1)	15 (8.9)	168 (100)	2.19	0.139

DISCUSSION

Studies on estimated disease burdens show that, globally, 39 million disability-adjusted life years (DALYs) are lost due to intestinal helminthiasis. This model also estimated that 70% of the total burden of these diseases was due to soil-borne helminth infections, which could be prevented in areas with high-prevalence by treating school-age children[10]. Knowledge of the patterns of distribution and extent of intestinal helminth infections in any given community is thus a prerequisite for planning and evaluating intervention programs.

The present study assessed the prevalence of helminth infections and the associated local risk factors, including socio-economic background, environmental conditions and personal hygiene practices, among primary school pupils in the city of Ibadan. The study was carried out in a suburban community where facilities had been recently upgraded by the government, with improved standards of living and social amenities, including tarred access roads, bore-hole water, good drainage and public toilets. The overall prevalence of helminth infections was found to be lower (7.1%) than that seen in similar studies performed in other urban/urban-slum areas within Ibadan[8,12]. The dominance of A. lumbricoides found in this research confirms the results of previous similar studies of school children reported by Oduntan (1974), Ejezie (1981), Holland et al (1989), and Egwunyenga and Ataikiru (2007)[13-16]. Only two cases of Trichuris infection were found.

The low intensity of infection observed in the present study was in contrast to persistently high intensities reported from rural areas[10], and could be due to the fact that these children were living in an urban area with improved environmental and sanitary facilities. Moreover, the current study showed no significant difference in prevalence of intestinal helminth infestations between male and female pupils ($P > 0.05$). This suggests that there was no correlation between sex and intestinal helminth infestations, which is in agreement with the results of a similar study of school children conducted in a village, Ilewo-Orile, in Ogun State, Nigeria[17].

This study found no significant difference in the wearing of shoes by infected children compared to those who were not infected ($P > 0.05$). This is in contrast to what was reported by Girum (2005) in Ethiopia[18]. This difference may be due to the absence of Strongyloides and hookworm infections in the current study, as these are the helminth species that burrow through or pierce the skin of their host (preferably the foot sole) during contact with infected soil. Also, the study found that 16 (6.8%) of the pupils infested with intestinal helminths had access to toilet facilities, with a higher prevalence of infection being associated with the availability and use of pit latrines ($P < 0.05$). The use of pit latrines might enforce close contact between a larger area of the body and the fecal material, possibly resulting in an increased risk of oral transmission of parasites, compared with water closet users. The quality and usage of the latrines might also be a contributory factor. The same observation was reported in eastern Ethopia, by Girum (2005)[18].

Only 17 (6.1%) children washed their hands after using the toilet or cleaning up their siblings after defecation. This suggests a lack of understanding of the purpose of hand-washing in helping to prevent infection with worms via the fecal/oral transmission route. However, it is possible that providing information on this would not be enough to change their behavior, considering the generally high levels of knowledge of basic hygiene already demonstrated by the pupils in this study. Eighty-three (37.6%) wore shoes regularly, 201 (75.6%) regularly washed their hands before and after meals, while 168 (63.2%) did not pick food off the floor to eat. These represent good hygiene practices on the part of the pupils, which may contribute to the low prevalence of infection observed.

Finally, in this study, intestinal helminth infection was not associated with socio-economic factors such as family size, type of house, or parent's occupation ($P > 0.05$). This is in agreement with the associated risk factors reported in children in an urban slum in eastern Ethiopia[18], where intestinal helminth infection was independent of family size, ethnicity or address of the children. It is, however, in contrast to studies conducted in Panama[19], which reported a significant association, and also in India[20], where large family size was found to be

significantly associated with infection. These discrepancies were explained by Adekunle et al (1986)[9], who reported on these inconsistent associations.

In conclusion, this study demonstrated a low prevalence of intestinal helminth infections among schoolchildren, with Ascaris infection being the commonest infestation. The pattern of risk behaviors among pupils, however, suggests the need for health education and promotion interventions as a primary preventive strategy to further protect the pupils from helminth infestations.

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