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Prevalence and Predictors of Helminthic Infections among Pupils in a Public Primary School in a North-Central City of Nigeria

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KEYWORDS

Ascaris, prevalence, predictors, Ilorin, helminths

ABSTRACT

Background

The prevalence and intensity of helminthiasis are highest in children aged 5-15 years where it accounts for 12% of the total disease burden and 20 % of disability adjusted life years (DALYs) lost among this age group. This study therefore, aims to determine the prevalence and predictors of helminthiasis among pupils in a public primary school in a metropolitan city in north-central Nigeria.

Methodology

A descriptive cross-sectional study was carried out between June and November 2010 among pupils registered for the academic year in Okelele Community Ilorin, Nigeria, using a multi- stage sampling technique in 3-stages to recruit 300 participants. A semi-structured, interviewer-administered questionnaire was used to collect quantitative data from respondents and their stool samples were also collected for microscopic examination.

Findings

The prevalence of helminthiasis was relatively high (32.0%) with a peak prevalence in the 9-12 years old age group. No statistically significant associations were found between prevalence of ascariasis and age, sex, maternal educational backgrounds and maternal occupational status ($p > 0.05$). Similarly, no statistically significant associations were found between prevalence of ascariasis and hygiene habits of pupils ($p > 0.05$).

Conclusion

Soil-transmitted helminthic infections are still pervasive among school- age children. Implementation of school health service programme will go a long way to improving the environmental, personal and food hygiene habits of pupils thereby reducing helminthic infections among school children.

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INTRODUCTION

Helminthiasis is a disease caused by infestation with intestinal worms. These worms include the roundworm (Ascaris lumbricoides), the pinworm (Enterobius vermicularis), the whipworm (Trichuris trichiura), and the anthropophilic hookworm (Necator americanus and Ancyclostoma duodenale). The infection has a varied global geographical distribution with highest prevalence in the hot humid climate. Helminthic infection is highly endemic in tropical and subtropical areas of sub-Saharan Africa, Asia and Latin America. Globally, an estimated 3.5 billion people harbour one form of helminth or the other.[1] About 300 million people with heavy helminthic infections suffer from severe morbidity that results in more than 150,000 deaths annually.[2] The disease is known to be associated with low socio-economic condition, poor environmental sanitation and poor personal hygiene.[3] Three main helminthic infections, namely ascariasis, trichuriasis and hookworm infestation cause the commonest clinical disorders in man.[4] The gastro-intestinal tract of a child living in poverty in a less developed country is likely to be parasitized with at least one, and in many cases, all the three helminthic infections.

In Africa, prevalence rates recorded from previous studies among primary school children have shown divergent pattern, ranging from 12.9% in Nairobi, Kenya[5], 53% in Guinea6 to 83.4 % in Ethiopia.7 Various studies on helminthiasis among school children in Nigeria have demonstrated diverse prevalence rate as well. Prevalence rate of 3.2% was reported in Vom (Plateau State)[8] 25% in Niger Delta,[9] and 72% in Iragbiji, Osun State.[10] The prevalence and intensity of helminthiasis are highest in children aged 5-15 years. School-age children are particularly at risk of becoming symptomatic of the disease. Studies have revealed that helminthic infection accounts for 12% of the total disease burden and 20 % of disability adjusted life years (DALYs) lost among children aged 5-14 years in low income countries.[11]

Helminthic infection has serious public health impact on the quality of life of people especially school-age children causing iron deficiency anaemia, protein-energy malnutrition and growth retardation, in addition to other physical and mental health problems.[12] Growth in helminthic-infected children is compromised through a variety of mechanisms including reduced food intake due to malabsorption and or reduced appetite. The infection in schoolchildren causes impairments of cognitive and educational abilities.[13]

The high prevalence of helminthiasis among school-age children and its adverse effects on cognitive and educational achievement calls for concern.[14] Hence, the World Health Organization (WHO) recommends a baseline survey among schoolchildren to determine the prevalence and intensity of helminthic infections in order to develop effective treatment strategies and case management options.[15] In most communities in Nigeria such previous baseline survey on helminthiasis have not been done among this susceptible age group. This study, therefore, aimed to determine the prevalence and predictors of soil-transmitted helminthic infections among public primary schoolchildren in a north-central city of Nigeria.

SUBJECTS AND METHOD

This descriptive cross-sectional study conducted between June and November 2010 among pupils registered for the academic year in a public primary school in Okelele Community Ilorin, north-central Nigeria. Data was generated from the selected primary school pupils through administration of semi-structured interviewer-administered questionnaire. Stool samples were also collected from the selected pupils for microscopic examination. The questionnaire sought information on socio-demographic characteristics, knowledge and perception of primary school pupils regarding helminthic infection.

There are 5 zones of public primary schools in

Ilorin East LGA namely Zango, Akerebiata, Magaji-Are, Oke-oyi and Okelele zones. Four public primary schools comprising Okelele primary schools A& B and Dada primary schools A & B, are in Okelele zone with a total population of 6,584 pupils. As at the time of the study (June to November 2010), none of the existing primary school had school health programme in place. Pupils who enrolled for 2009 / 2010 academic session and agreed to participate and were physically present in the schools on the day of the survey were included in the study.

All pupils who declined to participate as well as those pupils who failed to produce stool sample on the day of the survey were excluded from the study but were allowed to benefit from the mass deworming exercise. All pupils in the selected school later benefited from mass deworming at the end of the study.

Using the Fischer's formula,[16] a minimum sample size of 268 was arrived at but a total of 300 pupils were selected for the study using a multi-stage sampling technique in 3 stages. The instrument and material used for data collection were questionnaire and sterile specimen bottles (into which stool samples were collected for microscopic examination.)

A pretested semi-structured and interviewer-administered questionnaire was used. Information obtained from relevant literature and other studies was used to develop the questionnaire. The questionnaire sought information on socio-demographic characteristics, knowledge and habits of primary school pupils with respect to intestinal helminthiasis.

Ethical approval was obtained from the Department of Epidemiology & Community Health, University of Ilorin. Informed consent was also obtained from the parents of the pupils through the Parent / Teachers Association.

Letters were also sent to the parents of each pupil detailing the purpose of the study. Parents were allowed to decide whether or not their wards should participate in the study.

About a finger's breath stool sample was collected into sterile universal specimen bottles from each pupil partaking in the study following the informed consent from their respective parents. The stool sample was subsequently transported to the Department of Medical Microbiology and Parasitology Laboratory of the University of Ilorin Teaching Hospital, Ilorin, Kwara State where saline and iodine stool preparations were made on sterile slides.

Examinations of stool preparations for the presence or absence of eggs or larvae of helminthes were done under the light microscope with magnification objective lens x10 and x 40. Six research assistants were recruited and trained for two days for the purpose of data collection.

They administered the questionnaire to the pupils. Sterile specimen bottles were given to the selected pupils with instruction to put a finger's breath stool sample into them a day before the survey. Stool samples collected on the morning of the survey were transported to the laboratory where they were processed and examined microscopically for the presence or absence of helminthes.

The questionnaires were sorted, coded and checked for errors and completeness. Properly completed questionnaires were analyzed using EPI- INFO version 3.5.1 software package. Chi square test was used to determine the statistical difference in observation where necessary.

The level of significance was set at p-value of <0.05. Of the 300 questionnaires administered,

291 responses were completed and eligible for final analysis, giving a response rate of 97%.

RESULTS

Slightly more than half 150 (51.5%) respondents were males and the ages of the respondents ranged from 5 to 15 years with a mean age of 10.05 ± 2.07years. Majority of the respondents were in the 9- 12 years age group (67.4%) followed by those in the 5-8 years age range(22.7%). Table I.

Table I: Socio-demographic Variables of Respondents

Socio demographic Variables	n=291	Frequency (%)
Age distribution		
	5-8	66 (22.7)
	9-12	196 (67.4)
	13-16	29 (9.9)
Sex distribution		
	Female	141 (48.5)
	Male	150 (51.5)
Religion		
	Christian	36 (12.4)
	Islam	255 (87.6)
Tribe		
	Hausa	6 (2.1)
	Ibo	4 (1.4)
	Nupe	12 (4.1)
	Yoruba	269 (92.1)
Mothers education		117 (40.2)
	None	
	Primary	29 (9.9)
	Secondary	98 (33.7)
	Tertiary	47 (16.2)
Mothers occupation		
	Unemployed	62 (21.3)
	Not skilled	53 (18.2)
	Civil Servant	57 (19.6)
	Professional	119 (40.9)
Fathers education		
	None	86 (29.6)
	Primary	23 (7.9)
	Secondary	75 (25.8)
	Tertiary	107 (36.8)
Fathers occupation		
	Unemployed	21 (7.2)
	Not skilled	50 (17.2)
	Civil Servant	114 (39.2)
	Professional	106 (36.5)

Only 93 of the 291 stool specimen taken for microscopic examination, had ova of ascaris giving a prevalence rate of 32%. A higher proportion (32.7%) of the 9-12 years age group had ova of ascaris in their stool specimens, Although, it was not statistically significant (P = 0.65). More females than males harbour ova of

ascaris in their stool samples . Whereas 33.3% of females had ova in stool only 30.5% of males did. This observation was, however, not statistically significant(P = 0.35). Table II.

A greater proportion (36.7%) of respondents whose mothers had secondary education had ova of ascaris in their stool specimens. This was followed by respondents whose mothers had no formal education (30.8%), tertiary education (29.5%) and primary education (24.1%). There is

no statistically significant association between maternal educational status and prevalence of ascariasis (P = 0.57). Table II.

Table II: **Demographic variables and prevalence of Ascaris infection among respondents.** **N= 291**

Variables	Ova of *Ascaris lumbricoides* in stool		Chi squared	P-value
	Present (%)	Absent (%)		
Age-group				
5-8	45(71.4)	21(28.6)		
9-12	132(67.3)	64(32.7)	0.8526	0.6529
13-16	21(72.4)	8 (27.6)		
Sex				
Male	98(69.5)	43(30.5)	0.2690	0.3474
Female	100(66.7)	50(33.3)		
Maternal literacy				
None	83 (69.2)	37 (30.8)		
Primary	22 (75.9)	7 (24.1)		
Secondary	62 (63.3)	36 (36.7)	2.0314	0.5659
Tertiary	31 (70.5)	13 (29.5)		
Maternal occupation				
Unemployed	43 (69.4)	19 (30.6)		
Not skilled	35 (66.0)	18 (34.0)	0.6900	0.8748
Civil servant	41 (71.9)	16 (28.1)		
professional	79 (66.4)	40 (33.6)		
Defeacation site			0.3500	0.8388
Open bush	64 (70.3)	27(29.7)		
Pit latrine	87 (67.4)	42 (32.6)		
Water Carriage	47 (66.2)	24 (33.8)		
Source of drinking			0.572	0.1262
water	84 (66.1)	43 (33.9)		
Borehole	63 (70.2)	31 (29.8)	2.990	0.3938
Pipe borne	2 (33.3)	4 (66.7)		
Stream	49 (76.6)	15 (23.4)		
Well				

Less than 40% of all the respondents' mothers in all the various occupatioal groups harbour ova of ascaris in their stool samples. There is no stattistically significant association between maternal occupational status and prevalence of ascariasis (P = 0.8948). Table 2. Respectively, 27 (29.7%), 42 (32.6%) and 24 (33.8%) of the infected pupils defaecated in the bush, pit latrine and water carriage system. However, there was no significant relationship between the sites of defecation and the prevalence of Ascariasis (p = 0.8388).

The mean hygiene habit score was 5.8 ± 1.9 points. Slightly higher proportion of male respondents (88.0%) than their female counterparts (87.2%) imbibed good habit. This diffence is however, not statistically significant (P = 0.84) table 3. The highest proportions (17.7%) of respondents with poor hygiene habit were those with unemployed mothers. Maternal occupation appeared to have a significantly positive influence on the personal hygiene habit imbibed by respondents (P = 0.049). Table III.

Table III: Socio-demographic distribution of respondents and their hygiene habit of respondents. **N = 291**

Variables	Habit Score		Chi squared	p-value
	Bad Habit	Good Habit		
Sex				
Male	18 (12.0)	132 (88.0)	0.0393	0.8428
Female	18 (12.8)	123 (87.2)		
Mother's Occupation				
Unemployed	11(17.7)	51(82.3)	7.8300	**0.0496**
Not Skilled	3(5.7)	50(94.3)		
Civil Servant	3 (5.3)	54 (94.7)		
Professional	9 (7.6)	110 (92.4)		
Tribe				
Non Yoruba	8 (36.4)	14 (63.6)	9.2700	**0.0066**
Yoruba	28 (12.6)	241(87.4)		

Table IV: Behavioural risk factors and prevalence of helminthiasis. **N= 291**

Variables	Presence of Ascaris ova in stool specimen		Chi Squared	P- value
	No	Yes		
Hand washing after defecation			0.527	0.768
Never	18(69.2)	8(30.8)		
Sometimes	83 (70.3)	35 (29.7)		
Always	96 (66.2)	49 (33.8)		
Washing of fruit before eating it			0.496	0.780
Never	31 (70.5)	13(29.5)		
Sometimes	84(69.4)	37 (30.6)		
Always	83 (65.9)	43 (34.1)		
Hand washing before eating			0.928	0.629
Never	8 (72.7)	3 (27.3)		
Sometimes	82 (65.0)	44 (35.0)		
Always	108(70.1)	46 (29.9)		

The prevalence of ascaris in infected children in relation to their behavioural risk factors is as shown in Table 4. Of the 93 infected pupils, 49 (33.8%) consistently and 35 (29.7%) occasionally washed hands after defaecation while 8(30.8%) would not wash hands after defaecation. The observed difference was, however, not statistically significant (p = 0.768).

Respectively, 43 (34.1%) and 37 (30.6%) of the 93 infected pupils regularly and irregularly washed fruits before eating while 13 (29.5%) did not do so at all (table 6). The prevalence of infection, however, was not statistically significant among the different categories (P= 0.780).

Regarding hand washing before eating, 46 (29.9%), 44 (35.0%) and 3 (27.3%) of the 93 infected pupils regularly, irregularly and seldom washed hands before eating respectively. However, the observed distribution was not statistically significant (P = 0.629). Table IV.

DISCUSSION

In this study only 93 out of the 291 respondents had ova of Ascaris lumbricoides in their stool sample giving a prevalence rate of 32.0%. The prevalence of Ascariasis observed in this study (32.0%) was similar to the one recorded (33.8%) by Saka et al[17] in the same area, and that observed (33.2%)[18] in Ile -Ife, Osun, state. The result was also consistent with the findings of Adekunle et al[19] who reported high prevalence rates of A. lumbricoides in a study carried out on intestinal parasites and nutritional status of Nigerian children in Ibadan. These similarities in the observed prevalence rates above may be adduced to the fact that the studies were done in the south-western parts of Nigeria that are under the same geographic and environmental influences. The consistency of findings reflected that the burden of helminthic infection is still pervasive in Nigeria and hence a concerted effort is required to curb the menace.

Parasitic distribution is not homogenous but rather varies in relation to geographical areas as observed in previous studies. This can explain the sharp contrast between the prevalence of Ascariasis in this study and those of Onicha (86.0%)[20] and Iragbiji (46.0%)[21] in Osun State of Nigeria. The result also differs from the findings of Egwunyenga et al[22] who reported Ascaris infection rate of 48.4% in a study of STH among school children in Ethiope LGA of Delta State, Nigeria. Similarly, Ugbomoiko et al reported a high prevalence of Ascariasis (60.0%)[23] in Ilobu, Osun state in a study on socio-environmental factors and ascariasis infection among school-age children. Similarly high prevalence rates of Ascaris infection have been reported in Africa; 65.8% in Mozambique,[24] and in the south-east Asian region: 68.8% in Karachi[25] and 65.8% in Malaysia.[26]

Only Ascaris lumbricoides was isolated from the stool samples of respondents in this study. This contrasts sharply with the findings in many previous studies where poly parasitism was the rule.[14,27] In those studies, the most commonly isolated STHs were A. lumbricoides, T. trichiuria and hookworm.[20,21] In a study done by Gulnaz et al28 to determine the distribution of intestinal parasites among Turkish children living in a rural area, A. lumbricoides ova were not isolated. Rather, E. vermicularis, Blastocyst hominis and Giardia intestinalis were found. However, in a similar study done in the same area by Ulukanligil et al.[14] A. lumbricoides was the most prevalent specie among the intestinal helminthes isolated.

Even though, it is not statistically significant (p > 0.05), the conventional age-dependent convexity in prevalence of helminthiasis was observed in this study. Whereas the highest prevalence was found in the 9-12 years old age-group in this study, the 4-6 years old age-group and the 5-9 years old age group in the Onicha20 and Ilobu[23] studies carried the highest prevalence rates respectively. In the Onicha study several other soil transmitted helminthes were isolated from the stool samples of respondents .This might account for the high prevalence rate observed among the 4-6 year olds.

The higher prevalence observed in females (33.3%) than males (30.5%) in this study was not statistically significant (p > 0.05). This was similar to the findings of Wagbatsoma et al[29] in Benin, Nigeria, where intestinal worm infection rate was higher in females than males though, not significant statistically. Nkengazong et al[30] also reported a higher prevalence rate of ascariassis in females than males in Cameroun. These were in contrast with the findings of Amuta et al[24] in Benue, Chigozie et al[20] in Onicha and Dakul[25] et al in Plateau where more males than females were infected. Equal prevalence rates were reported for both male and female in the findings of Ahmad et al31 in District Bagh, Kashmir, and in the Mozambique study.[27] It is not apparent if the prevalence of STH infection among children is gender dependent.

In previous studies, significant association had been found between low maternal educational level and prevalence and intensity of helminthic infection.[32,33] In this study, there was no statistically significant association between maternal educational status and prevalence of Ascariasis (P = 0.57). Luis et al[34] in Mexico found higher risk of intestinal parasitism in children whose mothers had low educational status (OR=6.0, CI= 1.6 22.6). Also, in Ilobu study[23], maternal educational background had influence on prevalence of Ascariasis. Hamdan et al[35] in his Saudi study found that low maternal educational status increased the likelihood of intestinal parasitic infection in respondents.

There was no statistically significant association between maternal occupational status and prevalence of Ascariasis in the respondents in this study (p= 0.875). This was in keeping with the findings of Gulnaz et al but not consistent with findings from many previous studies. Luis et al[34] in Mexico reported an increased risk of intestinal parasitism in children of unemployed mothers (OR= 6.0, 95 % CI= 1.6- 22.6). Similarly, Hamdan et al[35] in Saudi-Arabia found higher rates of Ascariasis in children whose mothers were unemployed. Gulnaz et al found[36] no significant relationship between maternal occupation or educational backgrounds and prevalence of helminthiasis.

In otherwords, maternal unemployement had been significantly associated with high prevalence of intestinal helmnthes in previous studies.[37,38] In this study, high proportion of respondents whose mothers were not employed imbibed poor hygiene habit. This can explain why high prevalence of intestinal helminthic infections is usually observed among children whose mothers were either unemployed or less skilled.

It is a well established fact that helminthic infection is due mainly to contact with feacal matter and is therefore related to the standard of personal and environmental hygiene in the community. In this study, no significant relationship was found between the sites of defecation. This is not in consonance with the finding of Ilechukwu et al[39] in their study on behavioural risk factors for intestinal helminthiasis among nursery and primary school children in Enugu, south eastern Nigeria, where a significant association between the sites of defecation and the prevalence of helminthic infection was established. Similarly, this study found no significant relationship between the different hand washing habits of pupils after defeacation or before eating and prevalence of helminthic infection. This is contrary to the findings of Ilechukwu et al in which a significant association was found between hand washing after defeaction and prevalence of heminthic infection,[39] The difference in findings may not be unconnected with the difference in age group of subjects involved in both studies. It may also be due to the difference in geographic and socio-cultural backgrounds of the subjects that partook in the studies.

CONCLUSION

Soil-transmitted helminthic infections are still pervasive among Nigerian school children. Re-invigoration of school health service programme will go a long way to improving the environmental, personal, and food hygiene habits of the pupils and consequently lead to a decline in prevalence of helminthic infections among school children.

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