ISSN:
Print - 2277 - 0593
Online - 2315 - 7461

Journal of Natural Science, Engineering and Technology

INTESTINAL HELMINTHS PREVALENCE IN PRIMARY SCHOOL CHILDREN AFTER DEWORMING IN ABEOKUTA, SOUTHWESTERN NIGERIA

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ABSTRACT

Periodic deworming of school children with antihelminthic drugs is frequently employed by government agencies to reduce morbidity due to intestinal helminths in rural settings. Such an exercise was recently conducted in February 2012 by the Ogun State Ministry of Health for public school children in Abeokuta, Southwestern Nigeria. This cross-sectional study was carried out two months later to assess the impact of de-worming exercise. Four schools: Baptist Primary School, Bode-Ijaye, First Baptist Primary School, Ijaye, Moshood Abiola model school, Adatan and Itesi Methodist school, Adatan were randomly selected out of 25 schools and screened for intestinal helminth infection in May 2012, using stool microscopy. Questionnaires were also administered to investigate their knowledge, attitudes and practices associated with intestinal helminths transmission. Of the 216 school children examined for intestinal helminths, 55 (25.5%) had intestinal helminthiasis, with *Ascaris lumbricoides* infection having the highest prevalence of 30 (13.9%), followed by hookworm infection 16 (7.4%) and 3 (1.4%) for *Trichuris trichiuria*. Co-infection with *Ascaris*/hookworm, *Ascaris/Taenia* was also observed although at very low prevalence. Infections were significantly higher (p=0.021) in school children using pit latrines 32 (32.99%) than those using water closet system 22 (19.13%). The presence of infection two months after the exercise suggests a strong need for incorporation of pre deworming and post deworming assessment plans into subsequent deworming exercises in the state.

Key words: Deworming, intestinal helminths, school children, Abeokuta, Nigeria

INTRODUCTION

Intestinal helminthiasis is ranked first among children, aged 5 to 14 years old, in developing countries (World Bank, 1993). Studies have shown that intestinal worm infections significantly affect the cognitive development of school children and this may lead to poor academic performance, consequently affecting the productivity, quality of life and future of these children (Nokes *et al.,* 1992).

Nigeria is the leading country for high burden of intestinal helminthiasis due to ascariasis, trichuriasis and hookworm with estimated number of cases of 55 million, 34 million and 38 million respectively (DeSilva *et al*., 2003; Hotez and Kamath, 2009; Hotez *et al*, 2012). The absences of safe water and sanitation, poor socio-economic environment and poverty are factors facilitating the prevalence of the disease in Nigeria (Bethony *et al*., 2006). Within Nigeria, the prevalence and distribution of intestinal helminths varies

from place to place with *Ascaris lumbricoides* having the highest prevalence (Mafiana, 1995; Ekpo *et al.*, 2008).

School based deworming exercises are frequently used as intervention to reduce the prevalence of intestinal helminthiasis in school children (PCD, 1999; Montressor, *et al*., 2002). Periodic deworming is the recommended course of action in areas where infections are intensely transmitted and health resources are limited (Miguel and Kremer, 2003). However, these exercises in Nigeria are often conducted without pre and post assessment plans. As such the success of many deworming exercises carried out in Nigeria is not fully known or evaluated. Therefore, this study was undertaken to assess the recent deworming exercise in the Abeokuta, Ogun state, Nigeria and provide information on its success.

MATERIALS AND METHODS

Study area

The study was conducted in the southern district of Abeokuta, which is one of the 20 Local Government Areas in Ogun State, Nigeria. The LGA lies at Latitude: 7.1500000°N and Longitude: 3.3500000°E. It is predominantly populated by the Yoruba speaking tribes of Nigeria whose traditional occupations are Agriculture and commerce. Abeokuta south local government is highly urbanized, and it is the capital of the state. It lies in the rain forest vegetation belt of Nigeria and has a population of 593,100 people.

Selection of schools

Four public primary schools were randomly selected from 25 schools that have undergone the state deworming exercise. The schools are; Baptist Primary School (BODE), Bode-Ijaye, Latitude: 7.14755°N Longitude: 3.36146°E; First Baptist Primary School (IST BAPTIST), Ijaye, Latitude: 7.1833300°N and Longitude: 3.2666700° E; Moshood Abiola Model School (MAMS), Adatan, Latitude: 7.17134°N Longitude: 3.36503°E and Itesi Methodist School (IMSA), Adatan Latitude: 7.16943°N Longitude: 3.36220°E.

Collection and examination of faecal samples

A universal sample bottle that has a spoon inside was distributed to the pupils. Each bottle was marked with identification number. Pupils were instructed to scoop and put into the universal bottle freshly voided faeces. Faecal samples were taken to the laboratory immediately after collection for microscopy examination using saline wet mount method. One gram of faeces was examined with the number of helminths eggs counted for each pupil.

Questionnaire administration

Structured questionnaires were administered to the pupils in order to obtain their demographic information and to assess their level of knowledge, attitudes and practices associated with intestinal helminths transmission.

Statistical analysis

All quantitative data were entered into the computer and analysed using Statistical Package for Social Sciences (SPSS). Descriptive statistics were obtained for important variables. Differences were tested by chi-squared test.

Consent and ethical approval

The study protocol was approved by Abeokuta South Local Government Education Authority, and Ogun State Ministry of Health. Informed consent was obtained from each pupil after the aims and objectives

of the study were explained to them. The procedure for the faecal sample collection was also explained in detail to the pupils, after which they were given an informed consent form for their parents or guardians to complete for their wards who want to participate in this study. These forms were translated into the indigenous language (Yoruba) for easy understanding. Only pupils who returned completed informed consent forms were allowed to participate in this study.

RESULTS

Demographic information

A total of 262 school children from ages 4-15 years were enrolled for the study. There were 46 pupils from BODE, 44 pupils from 1ST BAPTIST, 70 pupil from MAMS, and 102 pupils from IMSA respectively (Table 1). Overall, there were 117 males and 145 females, with age group 10-12 years having the highest number, 114 (43.5%), of participants and age group 4-6 years with least of 31 (11.8%).

TABLE 1: Demographic information of school children

Demography	BODE N (%)	1ST BAPTIST N (%)	MAMS N (%)	IMSA N (%)	TOTAL N (%)
Male	18 (6.7)	19 (7.3)	34 (13.0)	46 (17.6)	117 (44.7)
Female	28 (10.7)	25 (9.5)	36 (13.7)	56 (21.4)	145 (53.3)
Total	46 (17.6)	44 (16.8)	70 (26.7)	102 (38.9)	262 (100.0)
Age Group					
4 – 6	4 (1.5)	10 (3.8)	6 (19.4)	11 (4.2)	31 (11.8)
7 – 9	20 (7.6)	11 (4.2)	24 (9.2)	21 (8.0)	76 (29.0)
10 – 12	12 (4.6)	23 (8.8)	32 (12.2)	47 (17.9)	114 (43.5)
13 – 15	10 (3.8)	0 (0.0)	8 (3.1)	23 (8.8)	41 (15.6)
TOTAL	46 (17.6)	44 (16.8)	70 (26.7)	102 (38.9)	262 (100.0)

Prevalence of intestinal helminth parasites among the school children

Out of 262 pupils enrolled for this study, only 216 pupils submitted their faecal samples. A total 55 (25.5%) of the 216 pupils examined were infected with one or more intestinal helminths. The intestinal helminthiasis diagnosed was *Ascaris lumbricoides*, hookworm, *Trichuris trichiura*, *Taenia* spp, and *Enterobius vermicularis*. There were cases of co-infections of Ascaris/hookworm and Ascaris/Taenia (Table 2).

TABLE 2: Prevalence of intestinal helminth parasites in different schools sampled after the deworming exercise

Intestinal helminth Parasite	BODE		1ST BAPTIST		MAMS		IMSA		TOTAL	
	NE	NI (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)
Ascaris lumbricoides	41	6(14.63)	37	6 (16.21)	55	6 (10.90)	83	12 (14.46)	216	30 (13.9)
Trichuris trichiura	41	1(2.44)	37	2 (5.40)	55	0 (0.0)	83	0 (0.0)	216	3 (1.4)
Hookworm	41	4(9.76)	37	4 (10.81)	55	4 (7.27)	83	4 (4.82)	216	16 (7.4)
Taenia species	41	2(4.87)	37	0 (0.0)	55	0 (0.0)	83	0 (0.0)	216	2 (0.9)
Enterobius vermicularis	41	1(2.4)	37	0 (0.0)	55	0 (0.0)	83	0 (0.0)	216	1 (0.5)
Ascaris/ hookworm	41	0(0.0)	37	0 (0.0)	55	1 (1.82)	83	1(1.20)	216	2 (0.9)
Ascaris/taenia	41	0(0.0)	37	0 (0.0)	55	0 (0.0)	83	1(1.20)	216	1 (0.5)
Any infection	41	14(34.14)	37	12 (32.4)	55	11(20.0)	83	18 (21.69)	216	55 (25.5)

Legend: NE- Number Examined, NI- Number Infected

Prevalence of helminth infections by age and sex in the schools

School children between the ages of 4 – 6 years in BODE and 1ST BAPTIST, had the highest prevalence of 66.7% and 40% respectively, while age group 10-12 years had the highest prevalence of 28.6% at MAMS and age group 13-15years (31.5%) at IMSA. Lowest prevalence of infections was recorded in school children between the ages of 10-12 years in BODE and 1ST BAPTIST while lowest prevalence of intestinal helminthiasis was recorded in age group 7-9years in MAMS and IMSA

Age group 4-6 years had the overall highest prevalence of 31.6%. This was followed by age group13-15 years with a prevalence of 31.10%. The lowest prevalence was recorded in age group 7-9 years with a prevalence of 18.8%.There was no significant difference (P>0.05) prevalence among the age groups (Table 3). Overall prevalence by sex showed that female (26.7%) was more infected than male (24.0%). However, infections was higher in males than in females in 1ST BAPTIST and MAMS but was higher in females than in males in BODE and IMSA. There was no significant difference (P>0.05) in the prevalence between sex. Table 4 shows the relationship between deworming and infection status after two months. The prevalence of helminth infection in those that were not dewormed was higher than those that were dewormed in all the schools except in 1ST BAPTIST.

TABLE 3: Prevalence of intestinal helminth infections by age group and sex in the schools

Category		BODE		1ST BAPTIST		MAMS		IMSA		Total	
		NE	NI (%)	NE	N (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)
Age	4-6	3	2(66.7)	5	2(40.0)	4	0(0.0)	7	2(28.6)	19	6(31.6)
	7-9	20	6(30.0)	9	3(33.3)	18	2(11.1)	17	1(5.9)	64	12(18.8)
	10-12	10	3(30.0)	23	7 (30.4)	28	8(28.6)	40	9(22.5)	101	27(26.7)
	13-15	8	3(37.5)	0	0(0.0)	5	1(20.0)	19	6(31.6)	32	10(31.1)
	Total	41	14(34.1)	37	12(32.4)	55	11(20.0	83	18(21.7)	216	55(25.5)
Sex	Male	16	3(18.8)	15	5(33.3)	26	7(26.9)	39	8 (20.5)	96	23(24.0)
	Female	25	11(44.0)	22	7(31.7)	29	4(13.7)	44	10 (22.7)	120	32(26.7)
	Total	41	14(34.1)	37	12(32.4)	55	11(20.0)	83	18(21.7)	216	55(25.5)

Legend: NE- Number Examined, NI- Number Infected

TABLE 4: Relationship between deworming and infection status among the school children

School	DEWORMED			
	YES		NO	
	NE	NI (%)	NE	NI (%)
BODE	38	12(31.6)	3	2 (66.7)
IST BAPTIST	35	12(34.3)	2	0 (0.0)
MAMS	49	9(18.4)	6	2(33.3)
IMSA	76	16(21.1)	7	2(28.6)
TOTAL	198	49(24.7)	18	6(33.3)

Legend: NE- Number Examined, NI- Number Infected

Attitude and practices associated with intestinal helminths transmission

The information obtained from the questionnaire administration on the knowledge, attitude and practices of the school children that are associated with intestinal helminths transmission is presented in Table 5. Overall percentage of children infected with intestinal helminths among those that wash their hands before eating (23.47%) is lesser than those that do not wash their hands before eating (31.48%). The prevalence of intestinal helminths among those that wash their hands with water only (23.74%) is higher than those that wash their hands with water and soap (21.74%). Prevalence of intestinal helminths in relation to the type of toilet facilities used reveals a significant high prevalence of intestinal helminths among school children that use the pit toilet (32.99%) than those that used the water closet (19.13%).

TABLE 5: Attitude and practices associated with intestinal helminths transmission

Questions	Responses	BODE		1ST BAPTIST		MAMS		IMSA		Total	
		N	NI (%)	N	NI (%)	N	NI (%)	N	NI (%)	N	NI(%)
Do you wash your hand before eating	Yes	34	10(29.4)	26	9(34.6)	45	8(19.5)	57	11(20.4)	162	38(23.47)
	No	7	4(57.1)	11	3(27.3)	10	3(30.0)	26	7(26.9)	54	17(31.48)
If yes what do you use	Water+ soap	9	3(33.3)	7	2(28.6)	4	0(0.0%)	3	0(0.0)	23	5(21.74)
	Water	25	7(28.0)	19	7(36.8)	41	8(19.5)	54	11(20.4)	139	33(23.74)
	Nil	7	4(57.1)	11	3(27.3)	10	3(30)	26	7(26.9)	54	17(31.48)
Type of toilet facility	Pit	28	9(32.1)	17	8(47.1)	23	9(39.1)	29	6(20.7)	97	32(32.99)
	Water closet	13	5(38.5)	20	4(20.0)	31	1(3.2)	51	12(80.0)	115	22(19.13)
	Nearby bush	0	0(0.0)	0	0(0.0)	1	1(100)	3	0(0.0)	4	1(25)
Washing hand after defecation	Yes	39	14(35.9)	36	24(66.7)	51	11(21.6)	78	17(21.8)	204	66(32.35)
	No	2	0(0.0)	1	1(100)	4	0(0.0)	5	1(20.0)	12	1(8.33)
Materials use	Water+soap	21	6(28.6)	24	6(25.0)	28	4(14.3)	31	7(22.6)	104	23(22.12)
	Water	20	8(40)	12	6(50.0)	24	7(29.2)	47	10(21.3)	103	31(30.10)
	Nil	0	0(0.0)	1	0(0.0)	3	0(0.0)	5	1(20.0)	9	1(11.11)

N-Number **NI-**Number infected

DISCUSSION

School based deworming exercise through the use of anti-helminthic drugs such Albendazole is a routine measure for the control of intestinal helminthiasis in school children. In Ogun state, such an exercise was carried out in the month of February, 2012 in all primary schools in Abeokuta South LGA. An assessment of the deworming exercise in four randomly selected schools showed an overall prevalence of 25.5% for intestinal helminthiasis two month after the exercise. Prevalence of intestinal helminths varied across the schools with *Ascaris lumbricoides* having the highest prevalence. These prevalence's had been previously shown in school children (Mafiana, 1995; Ekpo *et al.*, 2008). The highest prevalence of infection recorded in BODE, even though the school compound is neat, could be as a result of the environmental condition of the area in which the school is located and unhygienic conditions of houses in this area. These children are likely to get re-infection due to the unhygienic conditions of this area (Cooper, 2009). Worm infection is highly prevalent in a community where housing, sanitation, water supply, health care and edu-

cation are major problems (Halpenny *et. al.,* 2013). This area also usually experiences flood in the rainy season due to lack of or blocked drainage system and wetter areas were found to be associated with increased transmission of soil transmitted helminths (Brooker and Michael, 2000).

The high prevalence of *Ascaris lumbricoides, Trichuris trichiura* and hookworm observed in 1st BAPTIST after the deworming exercise could be as a result of the poor environmental sanitation of the school. Also, there was no toilet facility and the pupils defaecate on the ground near the school's dumping site. This makes it easier for pupils to be exposed to helminths eggs in soil, facilitating the transmission of *Ascaris lumbricoides* and *Trichuris trichiura* through accidental ingestion of the eggs while hookworms larva actively penetrate the skin (Brooker, *et al.*, 2006). School based deworming exercises need to be supplemented with provision of good water sources and sanitation in public schools as a means of controlling re-infection of intestinal helminth transmission in school areas.

There was no significant difference with respect to sex which suggests that both sexes were exposed to the same environmental conditions that could predispose them to re-infections. This was supported by the earlier findings (Mafiana, 1995; Sam-Wobo *et al*., 2012). We selected children in the age group 4-15years for this study because they are found on the average to harbour the heaviest infections of *Ascaris lumbricoides* and *Trichuris trichiura,* a pattern that has been reported worldwide (Bundy, 1988; Asaolu *et al*., 1992). The highest prevalence of infection recorded in age group 4-6years may be due to various activities of this age group including playing with soil and unhygienic eating habits. Children in this age group are particularly vulnerable to these parasites because of their high mobility and lower standards of hygiene (Montressor, *et al*., 2002).

There is no provision of water for the school children to wash their hands before eating and after defecation. As a result, some of the school children that wash their hands before eating and after defecation at home had infection, since they play and eat without washing their hands in school. The result from the study also shows that there is a relationship between poor hygiene practice and prevalence of helminth infection; this is evident in the fact that prevalence of intestinal helminths among children with poor hygiene practices was higher than those with good hygiene practice after deworming. Health education and sanitation were reported by Asaolu and Ofoezie (2003), as the two important components of primary healthcare systems, recognized for communicable disease prevention and control. It is recognized that where these control measures have been implemented in a sustainable way, transmission of intestinal helminths have reduced dramatically (World Health Assembly, 2001; Muth *et al*., 2003). Moreover, repeated treatment ensures that even if rapid re-infection occurs, intensity is maintained below the level associated with morbidity (Savioli, *et al*., 1992).

It is difficult to attribute the presence of infection two months after the deworming exercise to re-infection only as not all the pupils were dewormed in the exercise. Therefore, infection among dewormed children could be due to re-infection or poor cure rate of the anti-helminthic drug used. Anti-helminthic drug resistance and ineffective cure have been shown to be some of the reasons for persistent infection in deworming

exercises observed in recent trials with single dose treatment (Vercruysse *et. al*., 2011). Where re-infection had occurred, this could be due to the lack of appropriate health education, absence of sanitation and safe water sources for dewormed children to prevent re-infection as observed in this study. A recent systematic review and meta-analysis have shown that rapid re-infection in deworming exercise is common and may be due to lack of health education and environmental sanitation to compliment the exercise (Jia *et al*., 2012).

CONCLUSION

School based deworming alone without the provision of health education to school children and teachers to help reduce transmission and re-infection is not sustainable. Therefore, there is need for inclusion of appropriate health education, environmental sanitation, and personal hygiene into deworming campaigns. Moreover, the use of pre and post deworming assessment activities is necessary for evaluation of the success of such exercise.

ACKNOWLEDGEMENTS

The authors are grateful to the Head Teachers, staff and pupils of the four primary schools for their cooperation. We are also grateful to Engr. F.O. A. Alaran and Mr. Joseph Ogiogwa for their technical support. We are indebted to Abeokuta South Local Government Education Authority for permission to use their schools.

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