PREVALENCE OF HELMINTHIASIS AMONG SCHOOL CHILDREN IN SOME RURAL COMMUNITIES OF ABIA STATE, NIGERIA

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ABSTRACT

Soil transmitted helminths (STHs) are known to be endemic in developing tropical countries. A study on the prevalence and risk factors associated with STHs infections among children in three selected primary schools in Ukwa East Local Government Area of Abia State was undertaken between February and July, 2012. The stool samples collected from 338 children aged 5 – 13 years in the three primary schools were analyzed using direct normal saline and formal-ether concentration technique for the presence of STHs. Closed ended pre-tested questionnaire was used for collection of data on socio-demographic and personal health habits associated with STHs. Three different helminths were observed. These included Ascaris lumbricoides (8.2%), hookworm (5.1%) and Trichuris trichiura (3.9%). Multiple infections were however observed in individuals. Of the 338 stool samples examined, 256 were infected giving a prevalence of 75.7%. The prevalence of STHs was significantly higher in males than females in age group 5 – 7 years. A. lumbricoides was the most encountered parasites in the study, while Central Primary School, Obohia recorded the highest prevalence (90.2%) of infection in the three schools sampled. The month of July (peak of the rainy season) recorded the highest prevalence rate (92.9%). Those who defecated in bushes and other unhygienic places had the highest infection of 89.9%, while those that had water closet had the least infection of 40.5%. Those that used wells and streams as main source of water had an infection of 96.9%. Inadequate basic social amenities have contributed to the spread of parasite in the area. Government should make available the much needed amenities to the populace to alleviate the spread of the diseases in the study area and should also create public awareness on the dangers of the disease.

Keywords: Soil transmitted helminths, *Ascaris lumbricoides*, *Trichuris trichiura*, *Necator americanus, Ancylostoma duodenale*, Infection, Prevalence, Environment

INTRODUCTION

Soil transmitted helminths (STHs) infections also known as geohelminths are among the most prevalent of chronic human infections worldwide. Of particular public health importance are roundworms (*Ascaris lumbricoides*), whipworms (*Trichuris trichiura*) and hookworms (*Necator americanus* and *Ancylostoma duodenale*). These infections are most prevalent in tropical and subtropical regions of the developing world where adequate water and sanitation are lacking, with recent estimates suggesting that *A. lumbricoides* infected 807 –

1,121 million people, *T. trichiura* 604 – 795 million and hookworms 576 – 740 million people in 2011 (WHO, 2011). The greatest numbers of infections occur in sub-Saharan Africa, East Asia, China, India and South America. STHs are a group of parasitic helminths causing infection in humans through contact with parasite eggs or larvae that thrive in the warm and moist soil of the world's tropical and subtropical countries. As adult worms, these helminths live for years in the human gastrointestinal tract (Bethony *et al*., 2006). It is estimated that between 25 and 35 percent of school aged children are infected with one or more of these major worm species (de Silva *et al.,* 2003). Chronic and intense STH infections can contribute to malnutrition, iron-deficiency anemia, compromised immune response and adversely affect physical and mental growth in childhood (Stephenson *et al.,* 2000; Hotez *et al*., 2004). The high prevalence of STH in tropical countries including Nigeria, is closely linked with poverty, poor environmental hygiene, improper waste disposal, inadequate water supply, gross environmental pollution and the constant pollution of the air and water bodies (Ukpai and Ugwu, 2003; Mba and Amadi, 2001; Kalu *et al*., 2013). There have been several reports from various parts of Nigeria on STH, including those of which recognized them as important health problems especially among growing school age children (Egwunyenga and Ataikiru, 2005; Asaolu *et al*., 2002). In recognition of the global health importance of STHs infections, World Health Organization (WHO) recommends a baseline survey in school age children to determine the prevalence and intensity of infections which will be useful in the diagnosis, planning and implementation of effective control programmes (Bethony *et al*., 2006). Understanding where at risk populations is fundamental for appropriate effective control strategies which are mostly focused on school age population (Albonico *et al*., 2007). Due to paucity of information on the prevalence of STHs among school age children in rural areas of Ukwa East Local Government, this study was undertaken. The study area is a remote rural community where health and environmental facilities and structure are poor, inadequate as well lacking. This baseline survey is aimed at providing a basis for development of control programmes at national, state and local levels.

MATERIALS AND METHODS

Ethics Statement: Ethical clearance was obtained from the Ministry of Health, Abia State, Nigeria and the Local Government Public Health Unit before the commencement of the study. Written informed consents were obtained from school Head teachers. Informed consents were given by parents and guardians of the children prior to the study. The parents/guardians were properly enlightened on the aims, objectives, benefits and protocols of study, and the need for voluntary participation and the right to stop participation at any time.

Study Area: The study was conducted in Ukwa East Local Government Area of Abia State, South Eastern Nigeria. The various communities in Ukwa East LGA include Akwete, Okotoko, Ohuru, Obohia, Ohambele, Obeaku, Ikwuo-rieator West, Azumini, and Akirika nta. The headquarters is at Akwete. Ukwa East is a heavy rainforest region and is located between latitude $4^{0}57^{1}$N and longitude $7^{0}29^{1}$E (Uwanuruochi and Nwachukwu, 2012). The total population of the study area is 58,139 (NPC, 2006). The climate is tropical and an average daily maximum and minimum temperature of 28^{0}C and 24^{0}C respectively. Ukwa East has an average rainfall of about 2400 mm and has two seasons in the year. The rainy season which is between March – October and the dry season which is between November – February. The average humidity is 90% (Uwanuruochi and Nwachukwu, 2012). The study area consists of low-lying land with ultisol-type soils of the coastal plains. These geographical features together with economic and socio cultural factors favour the survival, transmission as well as spread of STHs in the area. Inhabitants of the area are mostly farmers and petty traders. There are twelve Health Centres with one General Hospital at the headquarters. There are fifteen state owned primary schools with a population of 2045 pupils in Basic 1 – 6 in the study area (945 males and 1055 females) (ASUBEB, 2012).

Selection of Schools/Study Population: The schools selected for the study were done based on a random sampling technique. Pupils of 2011/2012 academic session formed the targeted population. Three primary schools were used for the study. They included Community Primary School, Ohambele, Central Primary School, Obohia and Central Primary school, Obeaku. The total population in the three schools studied was 525 pupils (213 males and 312 females) 144 pupils were randomly selected from each school based on the willingness of the pupil to participate in the study. An average of 24 pupils from each class (Basic 1 to 6) formed the proposed sampled population in the three schools. When a pupil was absent a replacement was done with a preceding pupil. The sampled subjects were 432 pupils (203 males and 229 females) between the ages of 5 to 13 years. During the study period 338 pupils (139 male's and 199 females) responded to the questionnaire and also brought their stool samples for analysis. The study was carried out between February to July 2012.

Collection and Method of Sample Analysis: Stool samples were collected between the months of February to July 2012. The months of February and March fell in the dry season, while April to July was the rainy season. Each of the selected pupils was given a well labeled screw capped bottles, applicator sticks and tissue paper, and properly taught with models on collection procedures. Two methods of parasitological stool analysis were used; direct normal saline wet mount and formalin-ether concentration were adopted (Cheesbrough, 1998). The number of pupils infected and the type of STH infection observed was recorded. A cross-sectional survey was conducted from February to July 2012 using structured questionnaire to obtain information on factors associated with helminthiasis such as sanitary facilities, hygiene, source of drinking water and demographics of the household (Kolsky and Bluementhal, 1995).

Data Analysis: Data collected from the study were analyzed using percentages. Differences in the STH prevalence between sexes were tested using the t-test and among ages and primary schools using one way analysis of variance (ANOVA). Responses from the questionnaire were tested using Chi square (χ^2). All the analyses were done using the Statistical Package for Social Sciences (SPSS) version 16.

RESULTS

Prevalence of STH in the Different Schools Sampled: Out of the 338 children examined, 113 were from each of the primary schools except for central primary school, Obohia were 112 pupils were sampled. Central Primary School, Obohia had the highest prevalence for *A. lumbricoides* (53.5%) and Hookworm (36.6%), while the highest prevalence for *T. trichiura* (29.4%) was recorded in Central Primary School, Ohambele. There was significant difference between the prevalence of infections among the schools sampled ($p<0.05$) (Table 1).

Sex, Age and STH Prevalence: Above seventy five percent (75.7%) of the pupils sampled were infected with STH. The prevalence was huger in males (82.0%) than in females (71.4%). The prevalence of STH among sampled pupils decreased with increasing age being more predominant among the ages 5 – 7 years (85.2%) than for the ages 11 – 13 years (64.6%). Single infections were more prevalent in the 8 – 10 years age group, while double infection wee more in the 5 – 7 years age category. Multiple infections were prominent in the 11 – 13 years age category. Among the STH that contributed to the single infections, *A. lumbricoides* ranked highest, while *T. trichiura* were the least encountered STH. Furthermore, among the STH that contributed to the double infections, *A. lumbricoides* + hookworm ranked highest, while hookworm + *T. trichiura* were the least recovered worms. Above sixty percent (60.9%) of the sampled pupils had multiple infections. There were significant differences between the sex, age and STH prevalence among the pupils sampled ($p<0.05$) (Table 2).

Table 1: Prevalence of helminths in children in relation to primary schools in Ukwa East Local Government Area, Abia State, Nigeria

Locations	Number Examined	Number Positive	*A. lumbricoides*	Hookworm	*T. trichiura*
Community Primary School, Ohambele	113(33.4)[a]	68(60.2)[c]	25(36.8)[c]	23(33.8)[c]	20(29.4)[a]
Central Primary School, Obohia	112(33.1)[a]	101(90.2)[a]	54(53.5)[a]	37(36.6)[a]	10(9.9)[c]
Central Primary School, Obeaku	113(33.4)[a]	87(77.0)[b]	45(51.7)[b]	28(32.2)[b]	14(16.1)[b]
Total	338(100)	256(75.7)	124(48.4)	88(34.4)	44(17.2)

Number in parenthesis is the percentage infection, Different letters on the same column represents significantly different prevalence at P<0.05

Table 2: Sex, age and parasite related prevalence of STH infections among children 5 – 13 years old in Ukwa East Local Government Area, Abia State, Nigeria

Characteristics	Number examined	Number infected	P-value
Prevalence by Sex	338(100)	256(75.7)	<0.05
Male	139(41.1)	114(82.0)	
Female	199(58.9)	142(71.4)	
Prevalence by Age			
Overall			
5-7 years	122	104(85.2)	<0.05
8-10 years	120	90(75.0)	
11-13 years	96	62(64.6)	
Single infection			<0.05
5-7 years	122	18(14.8)	
8-10 years	120	20(16.7)	
11-13 years	96	6(6.3)	
Double infections			<0.05
5-7 years	122	23(18.9)	
8-10 years	120	17(14.2)	
11-13 years	96	16(16.7)	
Multiple infections			<0.05
5-7 years	122	48(39.3)	
8-10 years	120	30(25.0)	
11-13 years	96	78(81.3)	
Prevalence by Parasite			
Single infection			<0.05
Ascaris	338	21(8.2)	
Hookworm	338	13(5.1)	
Trichuris	338	10(3.9)	
Double infection			<0.05
***Ascaris +* Hookworm**	338	24(9.4)	
Ascaris + Trichuris	338	18(7.0)	
Hookworm *+ Trichuris*	338	14(5.5)	
Multiple infection			
Ascaris* + Hookworm + *Trichuris	338	156(60.9)	
STH Overall Infections			<0.05
Single infection	338	44(13.0)	
Double infections	338	56(16.6)	
Multiple infections	338	156(46.2)	

Number in parenthesis is the percentage infection

Factors Associated with STH Infections: The percentage infection with STH among primary school pupils decreases with increasing level of mothers' education, the highest prevalence recorded among pupils whose mothers were illiterates (82.1%). Equally, the percentage infection with STH among primary school pupils increased with increasing family size, the highest prevalence observed among pupils with family size of more than six persons (84.0%). Pupils whose source of portable water were from well rivers and streams had higher STH prevalence (96.9%) than those using pipe borne water (69.7%). Above eight nine percent (89.9%) of the pupil reported using bushes as the main form of sewage disposal and 99.3% of the respondents had their waste disposal site less than 20 metres from their homes. 77.8% of the children reported of not using antihelminthic drugs, while 59.1% reported using unorthodox antihelminthic drugs. The frequency of deworming indicated that 81.7% of the pupil did not take any antihelminthic drug in the past six months.

Monthly and Seasonal Distribution of STH: There was a gradual increase in the prevalence of STH infections from February to July 2012. July recorded the highest prevalence, while February had the lowest prevalence for all the parasites observed. There were significant differences between monthly prevalence of *A. lumbricoides*, hookworm and *T. trichiura* ($p<0.05$). Seasonality was observed in the prevalence of STH, with more helminths recovered in the wet season (86.6%) than in the dry season (54.8%) (Table 4).

DISCUSSION

This study showed that STH infections are prevalent in the study area (75.7%). High prevalence of STHs among school age pupil has been consistently reported in other studies (Asaolu *et al*., 1992; Mafiana *et al*., 1998; Taiwo and Agbolade, 2000; Nock *et al*., 2003; Ukpai and Ugwu, 2003; Egwunyenga and Ataikiru, 2005; Ohaeri and Odukaesieme, 2011; Edelduok *et al.,* 2013). In this study, soil transmitted helminths namely *A. lumbricoides*, *T. trichiura* and hookworm were identified from the stool samples. The transmission of STH is related to climate, with adequate moisture and warm temperature essential for larval development in the soil (de Silva *et al*., 2003). Equally, important factors that aid the transmission in the study area are poverty, inadequate water supplies and poor sanitary conditions. The study further reconfirmed the triad patterns of *Ascaris* + hookworm + *Trichuris* infections common in rural communities in Nigeria and Africa (de Silva *et al*., 2003). Out of all the intestinal helminths observed, *A. lumbricoides* had the highest prevalence. Similar findings were made by Adeyeba and Akinlabi (2002) among school children in a rural community of southwesten Nigeria. They separately reported that *A. lumbricoides* was the predominant parasite observed among school children. *Trichuris* has been reported to be more prevalent in rural than urban areas due to the presence of environmental factors that favours their multiplication. The prevalence of hookworm infection in this study was consistent with results obtained among school age pupils in Aba, Abia State, Nigeria and Igboeze North, Enugu State, Nigeria (Amadi *et al*., 1999; Edelduok *et al*., 2013), respectively. Hookworm infection transmission has been found to be highly seasonal and occur mostly during the rainy season when their eggs hatch and make quick penetration into the host skin (Amadi *et al*., 1999; Ogomaka *et al.,* 2012). This study was however carried out mostly during the rainy season and similar trends were observed. Sex related prevalence showed that males were slightly more infected than the females. A similar finding had been reported by Ogomaka *et al.* (2012) among school age pupils in Owerri West, Imo State, Nigeria. The peak of the infections was observed within the age group 5 – 7 years which gradually decline towards 11 years and above. As the children get older, they become more selective in their choice of food and activities thereby reducing infection risks through proper health habits. Co-infection was reported in the study as it was common for a pupil to be chronically infected with the three worms.

Table 3: Factors associated with STH infection among children age 5 – 13 years in Ukwa East Local Government Area, Abia State, Nigeria

Characteristics	Total responses	Positive = 256	Negative = 82
Mother's education			
Illiterate	106	87(82.1)	19(17.9)
Completed Primary School	118	93(78.8)	25(21.2)
Completed Secondary School	85	60(70.6)	25(29.4)
Completed Tertiary School	29	16(55.2)	13(44.8)
Family size			
Less than six persons	126	78(61.9)	48(38.1)
More than six persons	212	178(84.0)	34(16.0)
Source of drinkable water			
Pipe-borne	98	43(69.7)	23(30.3)
Borehole	113	90(52.8)	59(47.2)
Well, Rivers, others	127	123(96.9)	4(3.1)
Form of sewage			
Water closet	84	34(40.5)	50(59.5)
Latrine	125	106(65.5)	19(34.5)
Others	129	116(89.9)	13(10.1)
Use a general toilet			
Yes	271	160(59.0)	111(41.0)
No	67	46(68.7)	21(31.3)
Distance of Habitation to waste disposal site			
≤100 metres away	87	27(31.0)	60(69.0)
≤50 metres away	112	91(81.2)	21(18.8)
≤20 metres away	139	138(99.3)	1(0.7)
Use Antihelminthic drugs			
Yes	203	79(38.9)	124(61.1)
No	135	105(77.8)	30(22.2)
Duration of Antihelminthic drugs			
≥One year ago	165	113(68.5)	52(31.5)
≤Six months ago	109	89(81.7)	20(18.3)
≤Three months ago	64	16(25)	48(75)
Take unorthodox antihelminthic drugs			
Yes	269	159(59.1)	110(40.9)
No	69	46(66.7)	23(33.3)

Number in parenthesis is the percentage infection

Such children were reported to be malnourished, had stunted growth, had intellectual retardation and cognitive and educational deficits (Bethony *et al*., 2006). Infection rate in relation to source of water in the study area is attributable mostly to streams and rivers which were the main sources of water by the populace. Lack of access to clean water in the study area was a major factor associated with STHs since water is necessary for primary health habit of washing, cleaning, drinking and cooking.

The habit of indiscriminate defecation in bushes contributed to the spread of the infections in the area. Educational status of mothers indirectly affects the health status of the children as mothers were the most closest to growing children. It is not impossible that illiterate mothers were ignorant of the proper way of taking care of their children. The unawareness of the potency of antihelminthics as reported agrees with the report of Hotez (2007). The use of unorthodox means of controlling the infection was rather worsening the situation as most of the herbs used were unhygienically prepared

Table 4: Monthly and seasonal prevalence of helminths infection in primary school children in Ukwa East Local Government Area, Abia State, Nigeria

Months	Parasites	Number examined	Number infected	Monthly prevalence (%)	Seasonal prevalence (%)
February	*Ascaris*	58	16(27.6)	48.3	**Dry**
	Trichuris	58	4(6.9)		54.8
	Hookworm	58	8(13.8)		
March	*Ascaris*	57	10(17.5)	61.4	
	Trichuris	57	1(1.8)		
	Hookworm	57	24(42.1)		
April	*Ascaris*	56	15(26.8)	78.6	**Wet**
	Trichuris	56	10(17.9)		86.6
	Hookworm	56	19(33.9)		
May	*Ascaris*	56	17(30.4)	85.7	
	Trichuris	56	13(23.2)		
	Hookworm	56	18(32.1)		
June	*Ascaris*	55	25(45.5)	89.1	
	Trichuris	55	7(12.7)		
	Hookworm	55	17(30.9)		
July	*Ascaris*	56	28(50.0)	92.9	
	Trichuris	56	6(10.7)		
	Hookworm	56	18(32.1)		

Number in parenthesis is the percentage infection

with contaminated water. Central Primary school, Obohia recorded the highest prevalence rate of 90.2%. The location is a rural community with inadequate sewage and refuses disposal and where the majority of the inhabitants defecate in nearby bushes. The main sources of water in the area are the rivers, streams and wells that are mostly contaminated. This together increases the rate of infection in the area. The transmission of helminthiasis is often associated with poverty, poor environmental sanitation and contamination of the environment with human waste among other things.

Conclusion: The prevalence level of STHs infection in the study area is alarming and calls for urgent attention. Hence the need for urgent intervention and control measures. The study has provided a baseline data for further investigation.

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