Middle-East Journal of Scientific Research 4 (3): 211-215, 2009
ISSN 1990-9233
© IDOSI Publications, 2009

The Prevalence and Risk Factors of Geohelminth Infections among Primary School Children in Ebenebe Town, Anambra State, Nigeria

[1]M.C. Chukwuma, [2]I.M. Ekejindu, [1]N.R. Agbakoba, [3]D.A. Ezeagwuna, [3]I.C. Anaghalu and [4]D.C. Nwosu

[1]Department of Medical Laboratory Science, Faculty of Health Sciences & Technology, College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, P.M.B. 5001, Nnewi, Anambra State, Nigeria
[2]Department of Medical Microbiology and Parasitology, Faculty of Medicine, College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus
[3]Department of Medical Microbiology, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria
[4]Department of Medical Laboratory Sciences, College of Medicine and Health Sciences, Imo State University, Owerri, Imo State, Nigeria

Abstract: A study of the prevalence of parasitic geohelminth infection of primary school children aged 6-13 years was undertaken. Two hundred and twenty (220) soil samples from the school compound and 220 stool samples from pupils in 3 primary schools were examined using formol ether concentration technique. Overall results showed that 118(53.6%) soil and 193(87.7%) stool samples were positive. The recovery rates from stool samples were; eggs of *Ascaris* spp. 199(54.1%), Hookworm 100(45.5%), *Trichuris trichiura* 41(18%) and larvae of *Strongyloides stercoralis* 13(5.9%). Prevalence from soil samples showed 53(24.0%) of Ascaris eggs, 57(25.9%) of Hookworm eggs and 21(9.5%) of *Strongyloides stercoralis* larva. The wide and unrestricted spread of the infection is attributed to failure to wear footwears to school, lack of functional toilet facilities, geophagia and preference of the students to defecate in the bush leading to indiscriminate defecation in and around the school yard. Intervention by way of education on proper hygiene habits and regular de-worming exercise especially at the primary school level coupled with legislation against indiscriminate disposal of faeces and its endorsement is recommended.

Key words: Geohelminths · Stool samples · Children

INTRODUCTION

Geohelminths are soil transmitted parasites where immature stages (eggs) require a period of development or incubation in the soil before they become infective. The commonest and well known of such parasites are *Ascaris lumbricoides, Trichuris trichiura*, Hookworm and *Strongyloides stercoralis* [1]. The prevalence of infection with soil transmitted parasites is approximately one billion people world-wide with school children being the most heavily infected group. It is estimated that over one billon people are infected with *Ascaris lumbricoides*, 800 million with hookworm and 770 million with *Trichuris trichiura* [2].

A study of 286 randomly selected children aged 1-18 years in rural Guinea showed that 53% of children were infected by at least one type of soil-transmitted nematode [3]. In Nigeria, a 68.2% prevalence rate of intestinal helminthes from stool samples of children aged 0 -17 years was reported from Ibadan [4]. From primary school pupils in Buea district of Cameroon, a 59.1% prevalence rate of soil-transmitted nematode was reported [5]. An examination of 2,394 stool samples from Indonesia showed the prevalences of *Ascaris lumbricoides, Trichuris trichiura*, hookworms and *Strongyloides stercoralis* as 73.7%, 62.6%, 24.5%, 1.6%, respectively [6]. From Cameroon, *A. lumbricoides* was the most common geohelminth encountered (54.9%) followed by *T. trichiura* (33.8%) and hookworm infection (20.3%) [7].

Geohelminth is the second leading cause of mortality in children < 6 years of age in Africa [2]. The infection is promoted by poor hygienic habits such as indiscriminate disposal of human and animal faeces. This habit permits

Corresponding Author: Dr. Nneka R. Agbakoba, Department of Medical Laboratory Sciences, Faculty of Health Sciences and Tech., Nnamdi Azikiwe University, Nnewi Campus, P.M.B. 5001, NNEWI, Anambra State, Nigeria

contact of faeces and its accompanying microbial load including geohelminth eggs with soil. Other risk factors include lack of safe water source, overcrowding, poverty, geophagia, failure to wear foot wears, having pools of water/sewage around houses [8]. In Nigeria, a considerable amount of human and animal waste is discharged into the soil daily leading to the seeding of the soil with pathogenic organisms including geohelminth eggs and larvae [9]. Infection may be direct or indirect through secondary sources as food, water, vegetables and fruits since most geohelminth infections are acquired through the faecal-oral route. Observations in Zaria, Northern Nigeria showed that 70% of the soil samples collected in a school compound was contaminated with geohelminth eggs showing the level to which the soil can be contaminated with faeces [9].

The main objective of this investigation is to determine the prevalence and risk factors of geohelminth infections among school children in Ebenebe Town, Awka North Local Government Area of Anambra State, Nigeria.

MATERIALS AND METHODS

Study Area: The study area is Ebenebe in Awka North Local Government Area. It is a riverine area made up of eight villages and has a tropical climate with distinct wet and dry seasons. Ebenebe is a Community area with two private hospitals. Its inhabitants are generally farmers, fisherman and petty traders. Ebenebe has five public and three private schools. Three of the public schools lack functional toilet facilities. One has functional toilet facilities but most of the students especially boys defecate in the nearby bush. The fifth school does not have toilet facilities. Most of the children go to school bare footed. Information obtained from mothers showed that 70% of the children have never received anti-helminthic drugs in their life.

The environment is generally poor in hygiene and children and adults defecate in the open. It was gathered that geophagia is culturally accepted by mothers of children who were receiving breast milk and that after weaning, geophagia was neither discouraged nor encouraged by mothers.

Three Primary Schools out of the five public schools were randomly chosen for the study.

Collection and Examination of Soil Samples: Two hundred and twenty (220) soil samples were collected twice weekly from the compound of the three primary schools within the rainy season months of 2005. About 20g of the top soil (down to a depth of not more than 2cm) from the play ground, front and behind classrooms and toilet areas were scoped into clean polythene bags using clean spoon and taken to the Laboratory for analysis [9]. Five (5) gram of each sample was placed in a tube containing formol water. This was homogenized for one minute. The suspension was then strained through wet cheese cloth placed over funnel to remove coarse sand particles. Ether was added to the filtrate in a centrifuge tube and the mixture centrifuged at 2,300 rpm for 3 minutes. The supernatant was decanted and the sediment placed on a clean slide, covered with a cover slip and examined microscopically. The ova/larvae of parasites were identified with reference to Atlas of Parasitology [1].

Collection and Examination of Faecal Sample: Wide-mouth glass bottles were given to 220 randomly selected pupils in the selected schools. The pupils were asked to take the bottles home and return same the next morning to school with fresh stool samples. The name, age and sex of each pupil were noted after the samples has been collected and labeled. The samples were then transported to the laboratory for analysis. The stool samples were analyzed using the formol ether concentration technique [1] as follows;

Formol Ether Concentration Technique: With an applicator stick, 1g of the stool sample was emulsified in 4ml of 10% formol ether contained in a tube. Additional 4ml of 10% formol ether was added to the tube and homogenized. The emulsified faeces was sieved and collected in a tube. The suspension was transferred to a centrifuge tube into which 4ml of diethyl ether was added. The tube was stoppered and mixed for 1minute. The stopper was loosened and the tube centrifuged at 1000g for 1minute. After centrifuging, the faecal debris was lossened and decanted along with the ether abd formol water leaving the sediment at the bottom of the tube. The bottom of the tube was then tapped to re-suspend and mix the sediment. The sediment was placed on the slide, covered with cover slip and examined microscopically. The ova/larvae were identified using Atlas of Parasitology [1].

RESULTS

The overall prevalence of geohelminth eggs is 118 (53.6%) out of the 220 soil samples collected from the three schools. This is distributed as follows; eggs of *Ascaris* sp 53 (24.0%), eggs of hookworm 57 (25.1%) and larvae of S*trongyloides* 21 (9.54%). The distribution according to schools is shown in Table 1. The prevalence

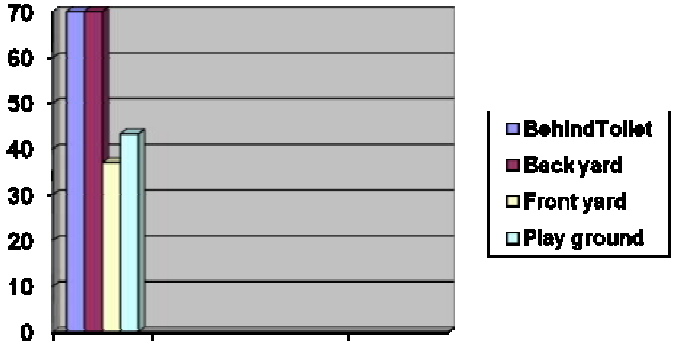

Fig. 1: Histogram showing the prevalence of eggs/larvae in soil sample with respect to sample sites

Table 1: The prevalence of geohelminths in soil samples from the three primary schools studied

School	No of samples examined	No (%) of samples positive	*Ascaris lumbricoides* No (%)	Hookworm No (%)	*S. stercoralis* No (%)
Umuji	80	42 (52.5)	15 (35.7)	20 (47.6)	6 (14.3)
Umuogbuefi	60	50 (83.3)	18 (36.0)	27 (54.0)	15 (30.0)
Obuno	80	26 (32.5)	22 (84.6)	10 (38.5)	0
Total	220	118(53.6)	53 (24.0)	57(25.9)	21(9.54)

Table 2: The prevalence of geohelminth eggs/larvae in stool samples of pupils examined from the three schools

Schools	No of sample examined	No (%) of samples positive	*Trichuris trichiura* No (%)	*Ascaris lumbricoides* No (%)	Hookworm No (%)	*S. stercoralis* No (%)
Umuji	80	70(87.5)	4 (5.7)	40 (57.1)	30 (42.9)	6 (8.6)
Umuogbuefi	80	78(97.5)	0	40 (51.3)	60 (76.9)	7 (8.9)
Obuno	60	45(75)	0	39 (86.7)	10 (22.2)	0
Total	220	193(87.70)	4(1.8)	119(54.1)	100(45.5)	13(5.9)

Table 3: Age distribution of the geohelminths among the children

Age (Years)	No of sample examined	*Ascaris lumbricoides* No. (%)	Hookworm No. (%)	*S. stercoralis* No. (%)	*Trichuris trichiura* No. (%)	Total
6-8	104	59(56.7)	60(58.0)	10(9.6)	0	129
9-12	116	65(97.5)	40(34.5)	7(6.0)	4(3.4)	116

Table 4: Sex distribution of the geohelminths among the children

Sex	No of sample examined	*Ascaris lumbricoides* No. (%)	Hookworm No. (%)	*S. stercoralis* No. (%)	*Trichuris trichiura* No. (%)	Total
MALE	100	49(49.0)	52(52.0)	7(7.0)	1(1%)	109
FEMALE	120	55(45.8)	70(58.3)	10(8.3)	3(2.5)	138

of geohelminth eggs/larvae in soil with respect to schools were; Umuji primary school 42(52.5%), Umuogbuefi primary school 50(83.3%) and Obuno primary school 26(32.5%).

Figure 1 shows the prevalence of eggs/larvae in soil with respect to the sample sites as follows; back of toilet 70%, behind classroom block 70%, playground 43.3% and front of classroom 37%. Hookworm ova showed the highest occurrence in the soil sample followed by *Ascaris* ova and *Strongyloides* larvae.

The overall prevalence of geohelminth eggs in the stool samples of 220 pupils examined in the three schools was 87.7% with distribution as follows; eggs of Ascaris 199(54.1%), hookworm 100(45.5%), *T. trichiura* 4 (1.8%) and larvae of strongyloides 13 (5.9%). The distribution according to schools showed that Umuji primary school had a prevalence of 70(87.5%), Umuogbuefi primary school had 78 (97.5%) and Obuno primary school, 45 (75%) (Table 2).

Table 3 shows that the prevalence rate of hookworm in children 6-8years is 58%, followed by *Ascaris lumbricoides* 56.7%. Infection with *Strongyloides stercoralis* is very low (9.6%) and ova of *T. trichiura* was not seen (0.0%). For children aged 9-12, the prevalence rate for Ascaris is highest 97.5% followed by hookworm 34.5%. Infection with *Strongyloides* and *T. trichiura* were low with 6.0% and 3.4% respectively. Prevalence of the infection is higher in females 91.6% than in males 83%. Mixed infections were also observed (Table 4).

DISCUSSION

The results of this investigation revealed a 53.6% geohelminth egg content from the study environment and this comprised eggs of *Ascaris*, hookworm and larvae of *Strongyloides* species. Due to the fact that the adult stages of these worms reside in the intestine, the presence of the eggs in soil is indicative of faecal pollution. This is proved by the fact that Umuogbuefi primary school which had the highest prevalence of geohelminths in the environment does not have toilet facilities. The pupils normally defecate in the nearby bush surrounding the school. This results in the eggs being washed into the school compound when it rains resulting in the environment of the school and surrounding area being highly contaminated with eggs of the parasites. Most of the school children go to school barefooted leading to the high prevalence of geohelminth infections especially hookworm infections.

Similar observations have been made from other parts of Nigeria like Zaria, Kaduna State [9] and Cross River State [10]. Ebenebe is still a virgin area and no study on geohelminths has been done in the area. About 70% of the pupils have never taken anti-helminthic drugs in their life. This further accounted for the high prevalence of the geohelminths egg/larvae in the stool samples and environment. Most of the pupils especially those from Umuogbuefi and Umuji primary schools have mixed infection of *Ascaris lumbricoides* and hookworm. This results in the environment being heavily contaminated with geohelminths. The presence of helminthic eggs in the soil is of great public health concern. The pupils either seed the soil with eggs from their faeces or contract infection from contaminated soil especially from behind the classrooms and back of toilet which more or less provided a hideout for defecation for the pupils. Mixed infections either by two or more geohelminths have also been reported by other investigators [4, 6, 7].

The finding that *Ascaris lumbricoides* has the highest prevalence rate is similar to what has been reported by other investigators [5-7]. The high prevalence of *Ascaris lumbricoides* in the stool of these pupils could be due to unhygienic habit of not washing hands before eating after playing in school and also due to their habit of picking and eating food like biscuits and sweets that had fallen on the ground as they play. This indicated that geophagia is a specific risk factor for infection with this orally acquired soil transmitted nematode. This observation is similar to the one made by [3] in their study. Further evidence that indicated geophagia as a risk factor is that geophagia is culturally accepted by mothers of children. The high incidence of hookworm infection in male students is from their habit of going to school, hunting and fishing without foot wear. This observation had also been made by other investigators [9, 11].

The prevalence of *Ascaris lumbricoides* was significantly increased as the age of the pupils increased. Dada-Adegbola et al. [4] also supported this finding and reported a prevalence of 81.6%, 63.3% and 52.4% among children aged 12 -17years, 6-11 years and 0-5 years respectively. Hookworm and *Strongyloides stercoralis* however were more prevalent among the younger age group contrary to the reports of [6] and [7] who reported that the worm burden of all three species of parasites decreased as children moved to higher classes. Male pupils had increased *A. lumbricoides* infection than females. This finding is supported by those other investigators who in addition also reported that males carried a heavier burden of *Trichuris trichuria* than females. However the prevalence of Hookworm, *S. stercoralis* and *T. trichuria* were higher in female children [7].

The findings from this study thus support the need for the establishment of a health programme for the control of the helminthes in the community. Education regarding geophagia prevention should be an integral component of the control programme. This would reduce the worm burden; reduce contamination of the environment by these children and enable the pupils perform better in schools. It is therefore important that public health promotion be stepped up. Education is an important tool that can be used and the primary school level is a good starting point.

REFERENCES

1. Cheesbrough, M., 2000. District Laboratory practice in tropical countries Cambridge University press, pp: 209-211,212-215.

2. Ogbe, M.N., E.E. Edet and N.N. Isichel, 2002. Intestinal Helminth infection in primary School Children in areas of operation of shell petroleum development company of Nigeria (SPDC) western division in Delta State. The Nig. J. Parasitiol., 23: 3-10.
3. Glickman, L.T, A.O. Camara, N.W. Glickman and G.P. McCabe, 1999. Nematode intestinal parasite of Children in rural Guinea Africa: Prevalence and relationship to geophagia. Int. J. Epidemiol., 28: 169-174.
4. Dada-Adegbola, H.O., A.O. Oluwatoba and C.O. Falade, 2005. Prevalence of multiple intestinal helminths among children in a rural community. Afr. J. Med. Med. Sc., 34(3): 263-367.
5. Ndenecho, L., K.J. Ndamukong and M.M. Matute, 2002. Soil transmitted nematodes in children in Buea Health District of Cameroon. East Afr. Med. J., 79(8): 442-445.
6. Widjana, D.P. and P. Sutisna, 2000. Prevalence of soil-transmitted helminth infections in the rural population of Bali, Indonesia. Southeast Asian J. Trop. Med. Public Health, 31(3): 454-459.
7. Ndamukong, K.J., M.A. Ayuk, J.S. Dinga, T.N. Akenji and V.A. Ndiforchu, 2000. The pattern of soil-transmitted nematode infections in primary school children of the Kumba Health District, South-West Cameroon. Afr. J. Health Sci., 7(3-4): 103-106.
8. Phiri, K., C.L.M. Whilty and S.M. Graham, 2002. Urban/rural differences in prevalence and risk factors for intestinal helminth infection in southern Malawi. J Parasitiol., 18: 461-466.
9. Nock, I.H. N. Duniya and M. Galadima, 2003. Geohelminth eggs in the soil and stool of pupils of some primary schools in Samaru, Zaria Nigeria. The Nig. J. Parasitiol., 24: 115-122.
10. Okon, M.N., E.E. Edet and N.N. Isichel, 2002. Intestinal parasites among school children in two contrasting communities in Cross River State, Nigeria. The Nig. J. Parasitiol., 22: 115-120.
11. Seppo, T.R, A.G. Regina, R. Edgar and L.T. Glickman, 2002. Prevalence and risk factors for protozosan and Nematode infections of children in Santa Anna, Ecuador Publication for health education programme planning. Medicine., 18: 15-20.