PREVALENCE OF INTESTINAL HELMINTHS INFECTIONS AMONG SCHOOLING CHILDREN IN TROPICAL SEMI URBAN COMMUNITIES

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ABSTRACT

Prevalence of intestinal helminths infections among school children in Igbo-Eze South Local Government Area, Enugu State, Nigeria were studied between July and December 2005. Significant differences (P < 0.05) were recorded among the 1,296 school children (ages 4 – 15) randomly sampled and examined for intestinal helminthes. The prevalence of intestinal helminths varied significantly among schools sampled (P < 0.05). Central School, Ovoko had the highest percent prevalence for Ascaris lumbricoides (9.3 %), hookworm (6.0 %) and Trichuris trichiura (2.3 %). The least per cent prevalence of A. lumbricoides was recorded in Community Primary School, Iheakpu-Awka (2.3 %), while the least per cent prevalence of hookworm occurred in Community Primary School 3, Itchi. T. trichiura was not recorded in community primary schools in Itchi, Unadu and Iheakpu-Awka. Similarly, the prevalence of these parasitic helminths varied significantly among the age groups (P < 0.05), with age groups 4 – 6, highly infected with A. lumbricoides (7.0 %), 13 – 15 with hookworm (3.7 %) and 7 – 9 with T. trichiura (1.2 %). T. trichiura was absent in stool samples of 4 – 6 and 13 – 15 age groups. The prevalence of these intestinal parasites also varied significantly between the sexes, with females having comparatively more A. lumbricoides (5.4 %), hookworm (3.2 %) and T. trichiura (0.8 %) than males. Our study indicated that intestinal helminthiasis was prevalent in the area, and as such, control measures such as chemotherapy, provision of adequate sanitary facilities and potable drinking water, improved personal hygiene and health education should be the focus of non-governmental and governmental health institutions in Nigeria.

Keywords: Prevalence, Intestinal helminths, *Ascaris lumbricoides*, Hookworm, *Trichuris trichiura*, Helminthiasis Schooling children

INTRODUCTION

Intestinal helminths infections are among the most common infections occurring throughout the developing world (Agbolade *et al.,* 2004). Between 500 million and one billion people are estimated to be infected annually (WHO, 1987). There are an estimated 280 million hookworm infected children, 478 million with *Ascaris lumbricoides* and 347 millions with *Trichuris trichiura* in the world (Michael *et al.,* 1997). In sub-Saharan Africa alone, there are 41 million hookworm-infected school-age children (Albonico *et al.,* 2002). In Nigeria, the occurrence of human intestinal helminthiasis is high (Nwosu, 1981; Udonsi, 1984; Obiamiwe and Nworsi, 1991). Other reports on the prevalence of intestinal helminthiasis are those of Holland *et al*. (1989), Awogun *et al.* (1995), Nwaorgu *et al.* (1998), Taiwo and Agbolade(2000) and Adeyeba and Akinlabi (2002). Intestinal worm infections thrive in communities without better housing, sanitation, water supplies, health care, education and low income (Crompton, 1999). In Nigeria, intestinal helminths infections have continued to prevail because of low levels of living standards, poor environmental sanitation, and ignorance of simple health-promoting behaviours (Nwosu, 1981; Udonsi, 1984). The burden of disease associated with worm infection is enormous. School-age children (0 – 15 years of age) harbour heavy intestinal parasites and thus are a good study group; they are the group most responsible for contaminating the environment and transmitting these infections (Albonico *et al.,* 2002).

In view of the negative socio-economic impact of these parasitic infections on children, there is a need for the development of good preventive and control measures adaptable for the tropics. This cannot be done effectively without baseline data on the occurrence of parasitic infections in a particular area. The occurrence of intestinal helminth infections among school children in Nigeria, particularly in Igbo-Eze South Local Government Area (LGA) of Enugu State, which is largely unreported, was our concern. Thus, the results of this study will be useful to both researchers and health authorities in diagnosis, planning and implementing control programmes for intestinal helminths infections in the area.

MATERIALS AND METHODS

Study Area: The study was carried out in Igbo-Eze South Local Government Area (LGA) of Enugu State (Figure 1). The various communities in Igbo-Eze South LGA include Ibagwa-Aka, Iheakpu-Awka, Uhonowerre, Iheaka, Ovoko, Nkalagu Obukpa, Itchi, Alor-Agu and Unadu. The headquarters is at Ibagwa-Aka. There are three development councils in the area; Igbo-Eze South Central, Ekete and Udeze.

Igbo-Eze South LGA is located between latitudes 7°19' East and 7°28' East, and longitudes 7°00' North and 6°53' North (Igbo-Eze South LGA, 2005). The area is in the guinea savannah forest mosaic zone of Nigeria. The study area has two main seasons; the rainy and dry seasons. The rainy season usually starts in April and ends in September. The dry season usually starts in October and ends in March. The inhabitants of this area are mainly subsistent farmers and traders. There are seventeen health centres in the area, with a General Hospital at Itchi. There are forty-four primary schools in the area. There are 14,994 pupils in the study area; 8,860 males and 6,134 females (SUBEB, 2005). The total population of people in the study area is 75,368 (NPC, 1991).

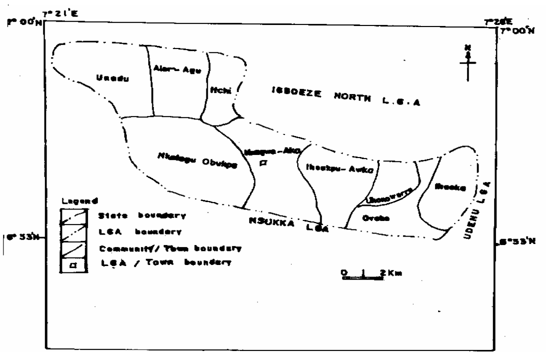

Figure 1: Map of Igbo-Eze South Local Government Area showing the sampled sites.

Selection of Schools: Six schools were used for this study. Primary schools in the study area were listed out and two schools were selected from each developmental council using random sampling technique. The schools selected for this study were Township School 1, Ibagwa, Community Primary School, 3, Itchi, Central School, Ovoko, Central School, Iheaka, Community Primary School 1, Unadu and Community Primary School, Iheakpu-Awka. Table of random numbers was used for the random sampling.

Collection and Examination of Faecal Samples: From each of the six schools selected, thirty-six pupils were selected and sampled using random sampling technique. Table of random numbers was again used for the random sampling. Six pupils were selected from each class (classes 1 – 6) to make up a total of 36 pupils. A total of 1,296 pupils were sampled at the end of six months. Faecal samples were collected monthly for a period of six months. Each of the selected pupils was given a small bottle in which they collected their faeces. The bottles were labeled with the pupil's name, age and sex. . At the end of the exercise, the age and sex of the selected pupils were recorded.

On collection of the faecal samples, they were taken to the laboratory for examination. At the laboratory, a drop of fresh physiological saline was placed on a slide. Using a piece of clean stick, a small amount of faecal sample was mixed with the saline. In order to concentrate the parasites in the faeces, formol-ether concentration technique was employed. Using a stick, about 1g of the faeces mixed with physiological saline was put in a screw-cap bottle containing 4ml of 10 % formol water. The bottle was capped and mixed by shaking for about 20 seconds. Thereafter, the faeces were sieved, and the sieve suspension collected in a beaker. The suspension was transferred to a tube and 3 ml of ether was added. The tube was stoppered and mixed by shaking for one minute. Thereafter, the stopper was removed and centrifuged immediately at 3000 rpm for one minute. After centrifuging, four layers were evident; the top layer of ether, thin layer of debris, formalin, and sediment in bottom with parasites. An applicator stick was used to loosen the layer of faecal debris from the side of the tube. The ether, debris and formalin were then carefully poured off. The sediment was mixed, transferred to a slide and covered with a cover glass. The slide was examined under the microscope using first, the 10x objective followed by 40x objective to identify the eggs (Ash and Orihel, 1997). The number of pupils infected with intestinal helminths, and the type of intestinal helminths observed were recorded.

Data Analysis: Differences in the prevalence of infection between ages and sexes were determined using the χ^2 tests from the contingency tables. The analysis was done using the Epi Info Database Package (Centre for Disease Control and Prevention, Atlanta, GA) and SPSS (Statistical Package for Social Sciences) version 11.0.

RESULTS

Prevalence of Intestinal Helminths Infections among School Children: The intestinal helminth parasites observed in this study were *T. trichiura*, *A. lumbricoides* and hookworm (Figure 2). Of the 1,296 school children examined for intestinal parasites, 64 (4.9 %) were infected with *A. lumbricoides*, 33 (2.5 %) with hookworm, and 9 (0.7 %) with *T. trichiura* (Table 1). From Table 1, it can be seen that *A. lumbricoides* had the highest prevalence (4.9 %) while *T. trichiura* had the lowest (0.7 %). There were significant differences in the prevalence of the parasites ($P < 0.05$).

Prevalence of Intestinal Helminths Infections in the Different Schools Sampled: Out of the 1296 school children examined, 216 were from each of the six different schools. Central School, Ovoko had the highest prevalence for *A. lumbricoides* (9.3 %), hookworm (6.0 %) and *T. trichiura* (2.3 %) infections (Table 2). There was significant difference between the prevalence of infections among the schools sampled ($P < 0.05$).

Age Distribution and Prevalence of Intestinal Helminths Infections among School Children: School children between the ages of 4 – 15 were sampled.

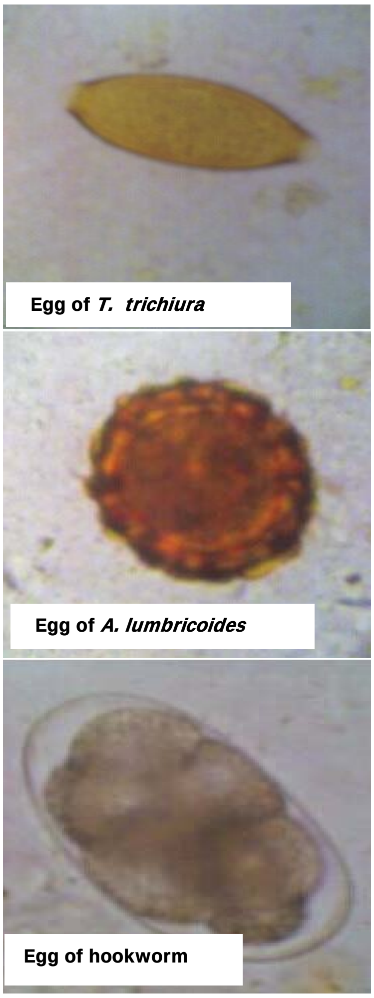

Figure 2: Intestinal helminth eggs associated with sampled school children from a community in Southeastern Nigeria

Table 1: Prevalence of intestinal helminths infections among school children in Igbo-Eze South, South eastern Nigeria

Parasites found	Number examined	Number infected	Prevalence (%)
A. lumbricoides	1296	64	4.9_b
Hookworm	1296	33	2.5_c
T. trichiura	1296	9	0.7_d
Total		376	28.9

Different letters indicate statistically different percentages (P < 0.05)

Children between the ages of 4 – 6 had the highest prevalence of *A. lumbricoides* (7.0 %) infections (Table 3). Hookworm was most prevalent in the 13 - 15 age group (3.7 %) while *T. trichiura* was most prevalent in the 7 - 9 age group (1.2 %) (Table 3).

The differences in prevalence between the different age groups were not statistically significant for *A. lumbricoides*, hookworm and *T. trichiura* infections (P > 0.05).

Sex Distribution and Prevalence of Intestinal Helminths Infections among School Children: Out of the 1296 school children sampled, 648 were males and 648 were females. Out of the 648 males examined, 29 (4.5 %) had *A. lumbricoides* infections, 12 (1.9 %) had hookworm infections and 4 (0.6 %) had *T. trichiura* infections (Table 4). Out of the 648 females examined, 35 (5.4 %) had *A. lumbricoides* infections, 21 (3.2 %) had hookworm infections and 5 (0.8 %) had *T. trichiura* infections (Table 4). From Table 4, it can be seen that the females had the highest prevalence of *A. lumbricoides* (5.4 %), hookworm (3.2 %) and *T. trichiura* (0.8 %) infections. There were no significant differences between sex and the prevalence of *A. lumbricoides*, hookworm or *T. trichiura* infections (P > 0.05).

Interaction Between Sex, Age Group and the Prevalence of Intestinal Helminths Infections Among School Children: The analysis of the interaction of sex, age group and the prevalence of parasites showed that females (4 - 6 years old) had the highest prevalence of *A. lumbricoides* infections (8.8 %), ma1es (13 - 15 years old) had the highest prevalence of hookworm (4.2 %), while males (7 - 9 years old) and females (7 - 9 years old) had the highest and equivalent prevalence of *T. trichiura* infections (1.2 %) (Table 5).

Seasonal Distribution of Intestinal Helminths Infections among School Children: 216 school children were sampled monthly from July to December for intestinal helminths infections. There was a gradual decrease in the prevalence of intestinal helminths infections from July through December. July had the highest prevalence while December had the lowest prevalence for all the parasites observed (Table 6). There were significant differences between monthly prevalence of *A. lumbricoides*, hookworm and *T. trichiura* infections (P < 0.05).

DISCUSSION

Prevalence of Intestinal Helminths Infections among School Children: Our study has shown the overall prevalence of *A. lumbricoides* (4.9 %), hookworm (2.5 %) and *T. trichiura* (0.7 %) infections (Table 1) among school children in Igbo-Eze South LGA, Enugu State. *A. lumbricoides* had the highest prevalence (4.9 %), followed by hookworm (2.5 %), while *T. trichiura* had the least (0.7 %). The higher prevalence of *A. lumbricoides* infection than that of hookworm infection and *T. trichiura* infection is consistent with the reports of Taiwo and Agbolade (2000) and Adeyeba and Akinlabi (2002), but disagrees with that of Nwaorgu *et al.* (1998). The high prevalence of *A. lumbricoides* infection may be attributed to high level of unhygienic practices among the pupils which enhanced transmission. The presence of *T. trichiura* infections in the study area was not unexpected since it is known that similar conditions which influence the endemicity of *A. lumbricoides* also influence its endemicity (O'Larcain and Holland, 2000). It is also known that *A. lumbricoides* infections are rarely found alone in human communities (Crompton, 1994).

Table 2: Prevalence of intestinal helminths in the different schools sampled in Igbo-Eze South LGA, Enugu State

Schools	Number examined	Prevalence (%) *A. lumbricoides*	Hookworm	*T. trichiura*
Township School 1, Ibagwa	216	7.9_g	3.2_m	1.4_s
Community Primary School 3, Itchi	216	2.8_h	0.5_n	0.0
Central School, Ovoko	216	9.3_i	6.0_o	2.3_u
Central School, Iheaka	216	4.6_j	0.9_p	0.5_v
Community Primary School, Unadu	216	2.8_k	2.9_q	0.0
Community Primary School, Iheakpu-Awka	216	2.3_l	1.9_r	0.0
Total	1296	4.9	2.5	0.7

Different letters represent significantly different percentages (P < 0.05)

Table 3: Age distribution and prevalence of intestinal helminths infections among school children in Igbo-Eze South LGA, Enugu State

Age groups (years)	Number Examined	Prevalence (%) *A. lumbricoides*	Hookworm	*T. trichiura*
4 – 6	228	7.0	2.2	0.0
7 – 9	508	5.7	3.0	1.2
10 – 12	478	3.1	2.1	0.6
13 – 15	82	4.9	3.7	0.0
Total	1296	4.9	2.5	0.7

Different letters indicate statistically different percentages (P < 0.05)

Table 4: Sex distribution and prevalence of intestinal helminths infections among school children in Igbo-Eze South LGA, Enugu State

Sex	Number examined	Prevalence (%) *A. lumbricoides*	Hookworm	*T. trichiura*
Male	648	4.5	1.9	0.6
Female	648	5.4	3.2	0.8
Total	1296	4.9	2.5	0.7

Different letters represent significantly different percentages (P<0.05)

Table 5: Interaction between sex, age group and prevalence of intestinal helminths infections among school children in Igbo-Eze South LGA, Enugu State

Sex	Age groups (years)	Number examined	Prevalence (%) *A. lumbricoides*	Hookworm	*T. trichiura*
Male	4 – 6	115	5.2	0.9	0.0
	7 – 9	248	6.5	2.0	1.2
	10 – 12	237	2.1	1.7	0.4
	13 – 15	48	4.2	4.2	0.0
Female	4 – 6	113	8.8	3.5	0.0
	7 – 9	260	5.0	3.8	1.2
	10 – 12	241	4.1	2.5	0.8
	13 – 15	34	5.9	2.9	0.0
Total		1296	4.9	2.5	0.7

Table 6: Seasonal distribution of intestinal helminth infections among school children in Igbo-Eze South LGA, Enugu State

Months	Season	Number examined	Prevalence (%) *A. lumbricoides*	Hookworm	*T. trichiura*
July	Wet	216	9.7_g	7.9_m	2.3_s
August	Wet	216	8.3_h	3.7_n	1.4_t
September	Wet	216	4.2_i	1.9_o	0.0
October	Dry	216	3.2_j	1.9_p	0.5_u
November	Dry	216	2.8_k	0.5_q	0.0
December	Dry	216	1.4_l	0.0_r	0.0
Total		1296	4.9	2.5	0.7

Different letters indicate statistically different percentages (P<0.05)

Generally, the occurrence of intestinal helminths infections in the area was not unusual because the area is in a rural area. Parasitic diseases are known to be common in rural areas because of poverty, ignorance and low sanitary conditions (Ukoli, 1992).

Prevalence of Intestinal Helminths Infections in Schools Sampled: This study revealed that the prevalence of intestinal helminths in the different schools was generally low. There were significant differences in the prevalence of parasitic infections among the schools. The differences are probably a reflection of population densities. The differences in the different schools sampled could also be related to the local environmental factors inherent in the different schools' location. Central School, Ovoko also had the highest prevalence of *A. lumbricoides*. This may be because of the nature of the soil which is clayey. *Ascaris* eggs are known to develop best in less permeable clay soils, with survivability increasing with their soil depth (Crompton, 1989). Clay soils are believed to prevent egg dispersal by water (Mizgajska, 1989). Thus, the eggs would have been more concentrated in the soils found in this area leading to higher rates of infection. Wetter areas are usually associated with increased transmission of *A. lumbricoides,* hookworm and *T. trichiura* eggs (Brooker and Michael, 2000). Central School, Ovoko, which had the highest prevalence of parasitic diseases, is located in a semi-urban environment with poor sanitation. The correlation of parasitic diseases with poor environmental sanitation and unhygienic practices has been established (Crompton and Savioli, 1993).

Age Distribution and Prevalence of Intestinal Helminths Infections among School Children: In our study, it was found that children between the ages of 4 and 6 had the highest prevalence of *A. lumbricoides* infections (Table 3) compared with the other age groups. This may be due to the fact that at this age, their immunity to parasitic infections has not been fully developed (Stephenson *et al.,* 2000). This observation was in line with that of Angyo *et al.* (1996) who recorded higher prevalence of parasitic infections in younger children. The prevalence of parasitic infections has been found to reduce with age (Bundy *et al.,* 1992). Furthermore in this study, older children (13 - 15 years) had the highest prevalence of hookworm, (Table 3). These observations confirmed the reports of Asaolu *et al.* (1992) and Mafiana *et al*. (1998) which attributed higher prevalence of hookworm infections in older children to changes in behaviour as one gets older. The prevalence of parasitic infections among the different age groups was significant ($P < 0.05$), indicating that the occurrences of these infections were age dependent.

Sex Distribution and Prevalence of Intestinal Helminths Infections among School Children: Our study also indicated that intestinal helminths infections were more common in the female than in the male subjects (Table 4). There were significant differences between the prevalence of parasitic infections and the sex of those examined. This indicated that the prevalence of the studied parasitic infections were sex-dependent which was in conformity with Narain *et al*. (2000) had earlier observed that these differences may be related to levels of exposure.

Interaction between Sex, Age Group and Prevalence of Infections among School Children: In this study, *A. lumbricoides* infection had the highest prevalence in females, ages 4 - 6 (Table 5). This may be attributed to their less developed immune systems. Also, *Ascaris* infection is considered higher among females compared with males, regardless of age (Crompton, 1989). Males (13 - 15 years) had the highest prevalence of hookworm infections. This may be so because of their older ages. Hookworm infection is said to increase as a person progresses in life (Crompton, 2000).

Seasonal Distribution of Intestinal Helminths Infections among School Children: The prevalence of intestinal helminths infections among school children in Igbo-Eze South LGA, Enugu State decreased progressively from July when the study started through December when it ended (Table 6). July had the highest prevalence of parasitic infections while December had the least. The months, July, August and September fall within the rainy season, while October, November and December fall within the dry season. From Table 6, it was seen that the prevalence of parasitic infections was more in the rainy season than in the dry season. During this season, sources of drinking water may become easily polluted due to runaway water and erosion contaminated with eggs of intestinal helminths. Thus, on taking in water, persons become infected with eggs of intestinal helminths. Moreover, during rainy season, conditions are wet and warm and these are ideal for the survival and embryonation of helminths' eggs (Crompton, 1987).

Conclusion: This study has shown that intestinal helminths infections are prevalent among school children in Igbo-Eze South LGA, Enugu State. Thus, the public health and economic implications of these findings should not be overlooked.

Given the growing concern about the public health importance of intestinal helminths infections, chemotherapeutic control of intestinal helminths infections in children should also be undertaken. Even though child-targeted treatment can never be more effective than treatment of the total population, Guyatt and others found, in a follow-up analysis of the same data source, that because children tend to have higher intensities of infections, child-targeted treatment can be more cost-effective than population treatment in reducing the number of disease cases (Guyatt *et al.,* 1995). Also, there is a need for concerted periodical health education and mass treatment to effectively control intestinal helminth infections in the area. In the long term however, the prevention and control of parasitic diseases will be dependent upon economic development with consequent improvements in water supplies, sanitation, health education and socio-economic status. Further studies on control of parasitic diseases should be carried out and these should be coordinated with and integrated into epidemiological research so that the maximum benefits can be derived.

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