

Soil-transmitted helminth infections in relation to the knowledge and practice of preventive measures among school children in rural communities in South-Eastern Nigeria

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Abstract : *The relationship between soil-transmitted helminth infections and the knowledge and practice of preventive measures among school children in rural communities in Igbo-Eze South Local Government Area of Enugu State, South-Eastern Nigeria, was investigated. Stool samples were obtained from 1,296 school children (ages 4 – 15 years) from six schools randomly selected from the study area. Structured epidemiological questionnaires were administered to the children. Out of 1,296 school children examined, 106 (8.1 %) of the children were infected by soil-transmitted infections thus: 64 (4.9 %) with *Ascarislumbricoides*, 33 (2.5 %) with hookworm, and 9 (0.7 %) with *Trichuristrichiura*. There were significant differences in the prevalence of these infections ($P < 0.05$). Soil-transmitted helminth infections showed statistically significant ($P < 0.05$) relationships with knowledge and practice of preventive measures among school children in the study area. The study revealed that soil-transmitted helminth infections were abundant among school children of the study area, indicating the necessity of implementing control measures such as chemotherapy, provision of adequate sanitary facilities and safe drinking water.*

Keywords -Preventive measures, rural communities, school children, soil-transmitted helminths

I. Introduction

Soil-transmitted helminth (STH) infections are a major health problem in many developing countries. It is estimated that more than one billion of the world's population, including at least 400 million school-age children are chronically infected with soil-transmitted helminths such as *Ascarislumbricoides*, *Trichuristrichiura*, and the hookworms, *Ancylostomaduodenale* and *Necatoramericanus* [1]. School-age children infected with soil-transmitted helminths usually have malnutrition, growth stunting, intellectual retardation, and cognitive and educational deficits [2, 3, 4, 5]. Clearly, soil-transmitted helminth infections remain an enormous public health problem in the 21st century.

Measures aimed at controlling soil-transmitted helminth infections are based on regular anthelmintic treatment, improved water supply, sanitation and health education [6, 7, 8]. These control measures can be successfully implemented with information on the prevalence of infections based on baseline surveys. World Health Organization (WHO) recommends a baseline survey in school children to determine the prevalence of infections [9] and to develop effective treatment strategies and case management options [10]. Baseline surveys also provide basis for development of control programmes at national, regional and district levels.

Many studies previously carried out in Nigeria gave due attention to the distribution of different soil-transmitted helminth infections in different explanatory groups such as preschool children, school children and pregnant women [11, 12, 13, 14, 15, 16, 17, 18, 19, 20]. However, much still remains to be known about soil-transmitted helminth infections in relation to the knowledge and practice of preventive measures among school children, especially in the study area, Igbo-Eze South. Thus, this study was carried out to investigate the relationship between soil-transmitted helminth infections and the knowledge and practice of preventive measures among school children in the study area. It is hoped that the results of this study will be useful to both researchers and health authorities in the diagnosis, planning and implementation of control programmes for soil-transmitted helminth infections in the area.

II. Materials and Methods

2.1 Study area

The study was carried out in Igbo-Eze South Local Government Area (LGA) of Enugu State, South-Eastern Nigeria. The various communities in Igbo-Eze South LGA include Ibagwa-Aka, Iheakpu-Awka, Uhonowerre, Iheaka, Ovoko, NkalaguObukpa, Itchi, Alor-Agu and Unadu. The headquarters is at Ibagwa-Aka. There are three development councils in the area; Igbo-Eze South Central, Eketete 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 [21]. 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 while the dry season usually starts in October and ends in March. The soil is moist and porous which favours the survival of soil-transmitted helminths ova. 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 with 14,994 pupils in the study area; 8,860 males and 6,134 females [22]. Each of the schools have six classes; Primary 1 – 6. The total population of people in the study area is 75,368 [23].

2.2 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. From each of the six schools selected, thirty-six pupils were selected and sampled using again the 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. This was done using the register of each class. When any selected pupil was absent, a pupil after the indicated one was sampled for replacement. A total of 1,296 pupils were sampled at the end of six months.

2.3 Ethical consideration

Verbal consent was obtained from headmasters/headmistresses of the schools. In addition, a meeting was held with the parents/guardians of the pupils, informing them of the importance of the study and seeking for their consent. Consent was obtained from the parents. Anyone not willing to take part in the study was excluded. Pupils who were positive for soil-transmitted helminth infections were treated accordingly by appropriate anthelmintic drugs.

2.4 Collection and examination of stool samples

Stool 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 stool samples. The bottles were labeled with the pupil's name, age and sex. On collection of the stool samples, they were taken to the Parasitology laboratory for examination. The stool samples were examined according to the methods of [24]. The number of pupils infected with soil-transmitted helminths, and the type of soil-transmitted helminths observed were recorded.

2.5 Knowledge and practice of preventive measures

Well-structured questionnaire based on the known risk factors of soil-transmitted helminth infections was developed. The questionnaire addressed the presence of latrine and its usage, water source for drinking and other domestic uses, and other risk factors. The ages and sexes of the pupils were also included in the questionnaire. Responses of pupils to the questionnaire were correlated with the presence or absence of soil-transmitted helminth infections.

2.6 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.

III. Results

3.1 Prevalence of soil-transmitted helminth infections among school children

Of the 1296 school children examined for soil-transmitted helminth infections, 106 (8.1%) were infected with soil-transmitted helminths thus; 64 (4.9%) were infected with *A. lumbricoides*, 33 (2.5%) were infected with hookworm while 9 (0.7%) were infected with *T. trichiura*. However, within the infected group (106), the prevalence was 60.4%, 31.1% and 8.5% for *A. lumbricoides*, hookworm and *T. trichiura* infections respectively (TABLE 1). There was significant difference in the prevalence of infections among the school children ($P < 0.05$).

Table 1: Prevalence of soil-transmitted helminth infections among school children in the study area

Soil-transmitted helminths found	No. infected	Overall prevalence (%)	Prevalence (%) within the infected group (106)
<i>A. lumbricoides</i>	64	4.9	60.4
Hookworm	33	2.5	31.1
<i>T. trichiura</i>	9	0.7	8.5
Total	106	8.1	100.0

3.2 Relationship between type of latrine system used and the prevalence of soil-transmitted infections

Of the 1296 pupils examined, pupils using open field for defecation had the highest prevalence of infections thus; 19.3 % for *A. lumbricoides*, 7.2 % for hookworm, and 28.2 % for *T. trichiura*. There were no infections in pupils using water closet latrine system (TABLE 2). There were significant differences between latrine type used and the prevalence of *A. lumbricoides* and hookworm infections ($P < 0.05$). There was no significant difference between latrine type used and the prevalence of *T. trichiura* infection ($P > 0.05$).

Table 2: Relationship between type of latrine system used and the prevalence of soil-transmitted helminth infections in the study area

Latrine system	No. of pupils using it	<i>A. lumbricoides</i>		Hookworm		<i>T. trichiura</i>	
		No. infected	Prevalence (%)	No. infected	Prevalence (%)	No. infected	Prevalence (%)
Open field	124 (9.6%)	24	19.3	9	7.2	35	28.2
Pit latrine	1150 (88.7%)	40	3.5	24	2.1	71	6.2
Water closet	22 (1.7%)	0	0	0	0	0	0
Total	1296 (100%)	64	4.9	33	2.5	106	8.1

Fig. 1 below shows the relationship between latrine type used and the prevalence of *A. lumbricoides*, hookworm and *T. trichiura* infections. From Figure 1, it can be seen that those that used open field for defecation had the highest prevalence of intestinal helminth infections, followed by those that used pit latrine. Those that used water closet system were not infected.

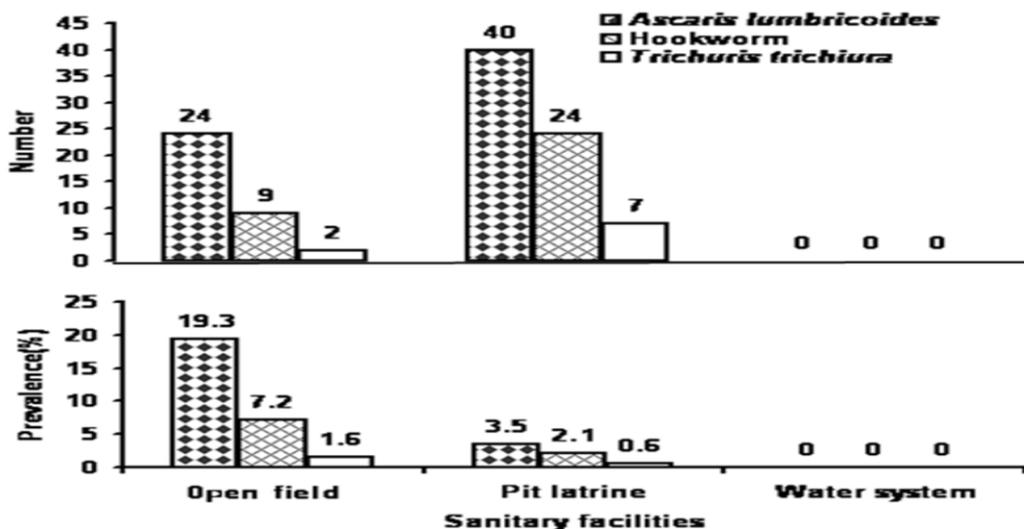


Figure 1: Distribution of intestinal helminths among school children in Igbo-Eze South LGA as influenced by sanitary facilities

3.3 Relationship between source of drinking water and soil-transmitted helminth infections in the study area

Out of the 1296 school children sampled, 654 (50.5 %) used water from tankers, 426 (32.9 %) used water from wells while 216 (16.7 %) used water from taps (TABLE 3). School children that used tap water had the least prevalence of *A. lumbricoides* (4.9 %) and hookworm (2.5 %) infections. Those that used water from

tankers had the highest prevalence for *A. lumbricoides*(37.5 %) while those that used water from wells had the highest prevalence of infections for hookworm (48.5 %) and *T. trichiura*(44.4 %). There was significant difference between water source and the prevalence of *A. lumbricoides* infection ($P < 0.05$). There was no significant difference between water source and the prevalence of hookworm infection ($P > 0.05$). There was no significant difference between water source and the prevalence of *T. trichiura* infection ($P > 0.05$).

Table 3: Relationship between source of drinking water and the prevalence of soil-transmitted helminth infections in the study area

Source of drinking water	No. of pupils using it	<i>A. lumbricoides</i>		Hookworm		<i>T. trichiura</i>	
		No. infected	Prevalence (%)	No. infected	Prevalence (%)	No. infected	Prevalence (%)
Tanker	654 (50.5%)	24	37.5	10	30.3	2	22.2
Well	426 (32.9%)	23	35.9	16	48.5	4	44.4
Tap	216 (16.7%)	17	26.6	7	21.2	3	33.3
Total	1296 (100%)	64	4.9	33	2.5	9	0.7

IV. Discussion

This study has shown that soil-transmitted helminth infections are prevalent in the study area. Among the soil-intestinal helminths observed, *A. lumbricoides* had the highest prevalence (4.9 %), followed by hookworm (2.5 %), while *T. trichiura* had the least (0.7 %) (TABLE 1). The higher prevalence of *A. lumbricoides* infection than that of hookworm infection and *T. trichiura* infection is consistent with some previous reports [13, 15].

There were significant differences between the type of latrine system used and the prevalence of *A. lumbricoides* and hookworm infections ($P < 0.05$). This indicated that there was a direct relationship between the type of latrine system used and the prevalence of these infections. There was no significant difference between the type of latrine system used and the prevalence of *T. trichiura* infection suggesting that there was no relationship between the type of latrine system used and the prevalence of *T. trichiura* infection. Those who used water closet latrine system had no infections (0.0 %) (TABLE 2; Fig. 1). This was in contrast to those using pit latrine and bush, both of which had infections. However, infections were more prevalent in those using bush (Fig. 1). This is not unexpected. According to [25], in a setting in which indiscriminate defecation prevails, it is easy for the general surroundings to become polluted or contaminated with human wastes containing infective agents like eggs of parasitic worms. Also, [26] and [27] noted that the use and availability of latrines enhanced the reduction of helminth infections. It therefore follows that the establishment and maintenance of suitable and efficient excreta disposal facilities will limit the spread of parasitic infections.

The result of this study is consistent with that of [28] where they reported of increased prevalence of intestinal helminths infections due to bad defecation practices. Also, this result suggests that the type of latrine system used has a major impact on the prevalence of intestinal helminths infections among school children.

There were significant differences between source of drinking water and the prevalence of *A. lumbricoides* infection ($P < 0.05$). Moreover, those using water from tankers had the highest prevalence of *A. lumbricoides* infections (TABLE 3). This suggests that probably, the water supplied to the people from tankers is not safe. Therefore, relevant authorities should endeavor to check the purity of water being supplied to the communities. The source of drinking water may therefore be said to have a direct effect on the prevalence of *A. lumbricoides* infection. There was no significant difference between source of drinking water and the prevalence of hookworm infections ($P > 0.05$), and no significant difference between source of drinking water and the prevalence of *T. trichiura* infections ($P > 0.05$). This suggests that source of drinking water does not affect the prevalence of either hookworm infections or *T. trichiura* infections. This may be so because the route of hookworm infection is usually through skin penetration.

The result of this study revealed that those using tap water had lower prevalence of intestinal helminth infections (TABLE 3). This report is similar to that of [26] in which they indicated that the use and availability of safe water sources enhanced a reduction in the prevalence of intestinal helminth infections. Poor water sources have been known to increase the prevalence of intestinal helminth infections [27]. Moreover, this result revealed that the percentage of those using tap water was the lowest (16.7 %) compared to those using pumps (32.9 %) or tanks (50.5 %) (TABLE 3). Thus, the government should make more effort in providing potable drinking water as this would reduce the prevalence of soil-intestinal helminth infections.

V. Conclusion

Soil-intestinal helminth infections are prevalent among school children in the study area. Thus, efforts should be made to undertake adequate control measures against soil-transmitted helminth parasites in the area.

In order to reduce the morbidity associated with soil-transmitted helminth infections, the practice of preventive measures such as using a proper latrine system (water closet) and drinking of potable water (tap water), which the present study has shown to be effective, should be encouraged. In addition, large-scale deworming should be carried out. However, where water supplies and sanitation remain poor, chemotherapy cannot be relied on for sustainable reductions in the prevalence of infections. Therefore, the government should aid in the provision of safe and adequate water supply and construction of latrine to reduce open field defecation. Health education aimed at bringing positive behavioural change in the area should be intensified.

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