Original article

Occurrence of Intestinal Helminthic Infections among children: Case study of Nkalagu

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ABSTRACT

Intestinal helminthes are threat to the health of rural communities of developing countries. School children are predisposed to the infection caused by these parasites. This study reported the presence of intestinal helminthes among school children in Nkalagu area of Ishielu Local Government Area. Concentration method was used for microscopic analysis of the faecal samples. Out of the 100 faecal samples examined, 62(62%) were infected. Of which 53 males examined, 33(62.2%) was infected; 47 females, 29(61.7%) were infected; School 1 had the highest prevalence 34(68%). Significant differences was recorded at $p<0.05$. The total prevalence of infection among schools sampled is as follows; *Ascaris lumbricoides* 38(61.3 %), *Enterobius vermicularis* 15(24.2%) and *Trichuris trichiura* *9*(14.5%). The prevalence of these intestinal helminthic parasites also varied significantly between the gender with females having comparatively more *Ascaris lumbricoides* 20(69%), *Enterobius vermicularis* 4(13.8%) and *Trichuris trichura* 5(17.2%) and the males having *Ascaris lumbricoides* 18(54.5%), *Enterobius vermicularis* 11(33.3%) and *Trichuris trichiura* 4(12.1%). The prevalence of these helminthic infections varied significantly among the age groups, 5‧7 years was highly infected 25(64.1%), *Ascaris lumbricoides* infection was high in all the age groups. Our study indicated that intestinal helminthiasis has high prevalence in the area. Control measures such as, provision of adequate sanitary facilities and potable drinking water, improved personal hygiene and health education campaign should increase in the study area.

Keywords: Helminthes, Infection, prevalence, Intestinal parasites

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INTRODUCTION

Helminthic infections are among the parasitic diseases which continues to affect mankind [1]. They have plagued humans since before the era of our earliest recorded history. The eggs of intestinal helminths were seen in mummified faeces of humans dating back thousands of years [2, 3]. Helminths are parasitic worms that basically feed on a living host. They gain nourishment and protection, while causing poor nutrient absorption, weakness and disease in their hosts. These worms and larvae live in the intestine thus referred to as intestinal parasites. These helminthes are made up of three classes namely Nematodes or roundworms, Trematodes, which includes flukes or flatworms, Cestodes or tapeworms [4, 5]. Soil-transmitted helminthiasis are the most important helminthiasis, and are among the neglected tropical diseases [6, 7]. Most leading pharmaceutical companies are targeting this group of helminthiasis for control and eradication by 2030 [8, 9]. Reports have found these infestations to result in poor birth outcome, poor cognitive development, poor school and work performance, poor socio economic development, poverty, chronic illness, malnutrition, and anaemia [10, 11]. Soil-transmitted helminthiasis are responsible for parasitic infections in vast human population worldwide [12]. Helminthic worm infections thrive in communities without better housing, sanitation, water supplies, health care, education and low income [13, 15]. In Nigeria, helminthic infections have continued to prevail because of low standard of living, poor sanitary and hygienic conditions, and ignorance of simple health-promoting behaviours [16, 19]. Children (1 • 15 years of age) harbour parasitemia of intestinal worms and serve as a good study group [20, 21]. The occurrence of helminthic infections among school children in Nigeria, particularly in Nkalagu Area of Ebonyi State, which is largely unreported, was our concern. Nkalagu was chosen as study area, based on a recent research which observed *Biomphalaria glabrata*. Also, from preliminary survey conducted, school children consistently complain of abdominal aches. The results of this study will be useful to both researchers and health authorities in diagnosis, planning and implementing control programmes for helminthic infections. Therefore the aim of the study is Occurrence of intestinal helminthic infections among school children in Nkalagu of Ishielu Local Government Area in Ebonyi state, Nigeria. The study will help us to understand the causes of this helminthic infection. The Overall prevalence of Intestinal helminthic infection, the prevalence of Intestinal helminthic infection among age and gender, the prevalence of intestinal helminthic infections among schools and identification of the worms.

MATERIALS AND METHODS

Study area

Ebonyi State is situated in the southeastern part of Nigeria. Ebonyi State lies approximately within latitudes 5° 40°① and 6° 45°①N and longitudes 7° 30°①and 8° 30°①E and is inhabited and populated by the Igbo with the city of Abakiliki as its capital and largest city, other major townships include Afikpo, Onueke, Unwana, Ikwo, Ezzamgbo, Nkalagu etc. Ebonyi State prevailing climatic condition is primarily by two regimes which are rainy and dry seasons with the rainy season usually from April to October; while the dry season starts from October through to February thus this zone is

described to have a bimodal rainfall pattern and annual rainfall between 1613.8mm to 2136.27mm. Ebonyi State is widely an agricultural region, it is a leading producer of rice, yam, potatoes and beans in Nigeria with rice predominantly cultivated. The State has several solid mineral resources, including lead, crude oil, etc.

Study site

Nkalagu in Ishielu local government was selected based on the past and previous cases of helminthic infections. Nkalagu Community is made up of five (5) villages: Ishiagu, Amanvu, Uwule, Imoha, and Akiyi. The geographical coordinates of the study area lies between longitude 54°E and latitude 60°N. Nkalagu has lots of mineral deposits of limestone. The map of Ishielu L.G.A. (Fig.1) was obtained using geographic information system.

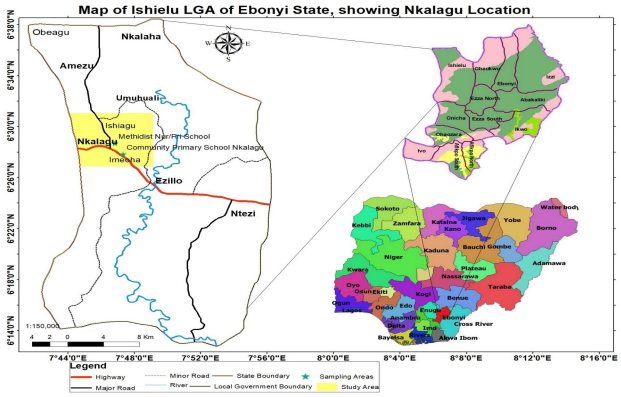

Fig. 1: Map of Ishielu Local Government Area showing Nkalagu Location.

Ethical clearance

Ethical approval and clearance was obtained from the research and ethics committee of Alex-Ekwueme Federal University Ndufu-alike and Ministry of Education, Ebonyi State before the research was carried out.

Selection of Schools

Two schools were used for this study, Community primary school Imeoha and Methodist primary school Nkalagu. The selection criteria was based on previous research carried out in the area which showed presence of snail intermediate hosts of Platyhelminthes and eggs of intestinal nematodes.

Sample collection and identification

The pupils were given specimen bottles for faecal samples collection. The bottles were well labelled with the sex and ages of the pupils. The samples were taken to the Biology laboratory of Alex Ekwueme Federal University Ndufu-alike for examination. Faecal concentration technique was employed according to [22]. Using a stirring rod, 5ml of normal saline was put in a screw-cap bottle and the stirring was done. 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 5ml of normal saline was added and mixed by shaking for one minute. Thereafter, they were centrifuged immediately at 3000 rpm for five minutes. After centrifuging, four layers were evident, the top layer of normal saline, thin layer of debris, alcohol 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 normal saline, debris and alcohol 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 [22]. The number of pupils infected with intestinal helminthic infections, and the type of helminthic worm observed were recorded.

RESULTS

Below is Fig.2, showing the Prevalence of intestinal helminthic Infections among School Children. The intestinal helminthic infection parasites observed in this study were *Trichuris trichiura*, *Ascaris lumbricoides* and *Enterobius vermicularis*. Out of the 100 school children examined for helminthic parasites, 62 pupils were infected giving a percentage prevalence of 62%. Prevalence of the various worms among children were as follows: *Enterobius vermicularis* (15%), *Ascaris lumbricoides* (38%) and *Trichuris trichiura* (9%). There was significant difference ($p<0.05$) in the prevalence of the different intestinal helminthes among the school children sampled.

Table 1. Prevalence of intestinal helminthic Infections among School Children

Number examined(N)	Helminthic worms Observed	Number infected(n)	Prevalence (%)
100	*Ascaris lumbricoides*	38	38.00
	Trichuris trichiura	9	9.00
	Enterobius vermicularis	15	15.00
TOTAL		62	62.00

Prevalence of Intestinal helminthic infection among age

The Prevalence of helminthic infection among age of children was observed. Among the age of 5-7years (39) pupils, 25(64.1%) were infected with the three worms that was found and 14 pupils were free of the infections. Among 8-10years (34) pupils sampled, 20(58.8%) were infected with worms and 14 were free of the infection. Among 11-13years (20) pupils sampled, 15(75%) were infected and 5 were free of the infection and from 14-16years (7) pupils examined, 2(28.6%) were infected and 5 were free of the infection as shown in Table 2. There was no significant difference ($p>0.05$) in the prevalence of the three intestinal helminthes observed in relation to age of the school children.

Table 2. Prevalence of Intestinal helminthic infection among age

Age groups	Number examined	No. Infected (%)	*Ascaris Lumbricoides n(%)*	*Trichuris trichiura n(%)*	*Enterobius Vermicularis n(%)*
5-7	39	25(64.1)	15(60)	4(16.0)	6(24.0)
8-10	34	20(58.8)	12(60)	3(15.0)	5(25.0)
11-13	20	15(75.0)	9(60)	2(13.3)	4(26.7)
14-16	7	2(28.6)	2(100)	0	0
Total	100	62(62.0)	38(61.2)	9(14.51)	15(24.1)
Chi-square			0.789	0.793	0.957
p-value			0.852	0.851	0.316

p value is significant at p<0.05, % =prevalence, n= number infected

The prevalence of Intestinal helminthic infection among gender

A total of 53 males and 47 females were sampled. Out of 53 males sampled, 33(62.2%) were infected. Out of the 47 female sampled, 29(61.7%) were infected as shown in Table 3. The prevalence of the three intestinal helminthes was not significantly associated (p<0.05) to gender of the school children.

Table 3: The prevalence of Intestinal helminthic infection among gender

Sex	Number examined	No. Infected (%)	*Ascaris lumbricoides n(%)*	*Trichuris trichiura n(%)*	*Enterobius vermicularis n(%)*
Male	53	33(62.2)	18(54.5)	4(12.1)	11(33.3)
Female	47	29(61.7)	20(69.0)	5(17.2)	4(13.8)
Total	100	62(62.0)	38(61.3)	9(14.6)	15(24.2)
Chi-square			0.780	0.291	2.929
p-value			0.414	0.731	0.101

P value is not significant at p<0.05

Prevalence of helminthic infection among schools.

Out of the 50pupils sampled in School 1, 5-7years (18) were sampled and 11(61.1%) were infected. Among 8-10years (20) sampled, 14 (70%) were infected. Among the 11-13 years (11) sampled, 9(81.8%) were infected and from 14-16years (1) examined, there was no infection. School two had a total number of 50pupils examined. Among the age of 5-7years (21) sampled, 10(47.6%) were infected; 8-10years (14) sampled, 10(71.4%) were infected; 11-13years (9) sampled, 6(66.7%) were infected and among 14-16years (6) sampled, 2(33.3%) were infected as shown

in Table 4. There was also no significant difference ($p<0.05$) in the prevalence of the three intestinal helminthes in relation to schools sampled.

Table 4: Showing the prevalence of Intestinal helminthic infection among schools

Schools	Age group	Number examined	Number Infected (%)	*Ascaris lumbricoides* n(%)	*Trichuris trichiura* n(%)	*Enterobius vermicularis* n(%)
Methodist primary/Nursery school Nkalagu (School 1)	5-7	18	11(61.1)	7(63.6)	2(18.2)	2(18.2)
	8-10	20	14(70.0)	8(57.1)	2(14.3)	4(28.6)
	11-13	11	9(81.8)	5(55.6)	1(11.1)	3(33.3)
	14-16	1	0	0.0	0.0	0.0
Total		50	34(68.0)	20(58.8)	5(14.7)	9(26.5)
Community primary school Imeoha (School 2)	5-7	21	10(47.6)	7(70.0)	1(10.0)	2(20.0)
	8-10	14	10(71.4)	4(40.0)	2(20.0)	4(40.0)
	11-13	9	6(66.7)	5(83.3)	1(16.7)	0.0(0)
	14-16	6	2(33.3)	2(100)	0.0(0)	0.0(0)
Total		50	28(56.0)	18(64.3)	4(14.3)	6(21.4)
Overall		100	62(62.0)	38(61.3)	9(14.5)	15(24.2)
Chi-square				2.716	0.122	0.706
p-value				0.149	0.727	0.577

P value is not significant at $p<0.05$

DISCUSSION

The study reported high prevalence of intestinal helminthic infections among school children in Nkalagu community of Ebonyi State, Nigeria. A total of three different intestinal helminthic infection parasites, including *Trichuris trichiura*, *Ascaris lumbricoides* and *Enterobius vermicularis* were observed in the study. There was significant difference ($p<0.05$) in the prevalence of the different intestinal helminthes among the school children sampled. This prevalence corresponds with the reports of Bekele and Shumbej (2019). The Prevalence of helminthic infection among ages of the school children was also high. Of the school children examined, the age range of 5-7years had highest prevalence and this report aligns with the findings that younger school children are expose to wider range of infection due to activities they engage themselves in [24]. From the total number of school children examined, the prevalence of *Ascaris lumbricoides* was greater than *Enterobius vermicularis* and *Trichuris trichiura*. This is in contrast to the work of some researchers [25, 26]. The high prevalence of *Ascaris lumbricoides* infection may be characterized to high level of unhygienic practices among the children that enhanced transmission of the parasite. The observation of *Trichuris trichiura* infections in the study area was not unexpected since it is known that similar conditions which influence the endemicity of *Ascaris lumbricoides* also influence its endemicity [27]. It is also known that *Ascaris lumbricoides* infections are rarely found alone in human communities [12, 14]. This study revealed that children ranging from 5-7 years had the highest prevalence of *A. lumbricoides*, *T. trichiura* and *E. vermicularis* than other age groups. This may be as a result of increased activities with the soil. This finding corresponds with the findings of Timothy et al., 2013.The work was

significantly different with the prevalence of *E. vermicularis.* Between genders, females were more infected than males (although this is not significant), which confirms earlier reports [29], but is incompatible with the report of which contrasts this work [30]. However, this gender observation should be treated with caution, because the number of positive cases is too small to make useful statistical inferences. Nevertheless, infectiousness is considered to be multifactorial and may not necessarily be affected by gender, but other factors are especially depending on the degree of environmental sanitary state, personal hygiene, and other infection prevention measures, the outside or the environment may increase the exposure of either sex to parasitic infections. The prevalence of infection was both high in males and females. This is an indication that the children were left unattended to which exposed them into having heavy infestation of helminthic worms. This was similarly observed in the work of Adeyeba and Tijani (2002). Most of the children were always in contact with water bodies contaminated with faecal materials. There is also evidence of synergy and antagonism in concurrent intestinal nematode and schistosomiasis infections as well as filarial nematode infections and soil-borne worm infections. Many epidemiological studies have shown that individuals infected with multiple worms are usually more severely infected than individuals infected with a single worm. An important consequence of simultaneous infection [32, 33, 34].

CONCLUSION

The study was designed to provide information on the occurrence of intestinal helminthic parasitic worms infesting school children. From this study the prevalence of parasitic worms among the school children is high. Most pupils were infected with different types of helminthic worms at the same time. The heavy infestation affected the psychological and physiological development of the pupils such as malnutrition, emaciation, abnormal pains, mental backwardness, and poor growth. The helminthic infection can be controlled through mass deworming of the school children using abendazole. Proper health education to the populace will help to prevent re-infection.

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Authors contributions

The study was conceived and designed by ACO and EC. All authors contributed to carry out the field work and statistical analysis. ACO prepared the first draft of the manuscript, reviewed by AIN, KN and EMM. All authors contributed to the development of the final manuscript, proof reading and approved its submission.

Competing interests

There is no conflict of interest among the authors.

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