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PREVALENCE AND RISK FACTORS FOR SOIL TRANSMITTED HELMINTH INFECTIONS AMONG PUPILS IN AWKA SOUTH L.G.A, ANAMBRA STATE, NIGERIA=SHORT COMMUNICATION

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ABSTRACT

Soil transmitted helminth (STH) infection is a neglected tropical disease of the poorest and most disadvantaged people in various parts of the world. This study was on the prevalence and risk factors for STH infections among pupils in Awka South Local Government Area, Anambra State, Nigeria. A total of 568 pupils, composed of pupils from Nnamdi Azikiwe University Nursery and Primary School, Ifite (NAUNPSI), (n=232); Community School, Nkwelle (CSN), (n=164), and Central Primary School, Amawbia (CPSA), (n=172) volunteered for the study. Stool samples were collected and analysed using Formol-ether concentration and direct smear methods to detect positive samples. Questionnaires were used to elicit information on pupils' hygiene habits. Chi-square test in SPSS software was used to compare differences among variables at 95% confidence level. Of the 568 samples examined, 56(9.86%) were positive for intestinal helminths, comprising*Ascarislumbricoides*44(7.75%), hookworm 8(1.41%) and *Taenia* spp. 4(0.70%). Mixed infection was not recorded. Overall, males had the higher prevalence of 32(11.80%) than females, 24(8.11%) (P>0.05). Age group of1-5yearshad the highest prevalence,4(12.50). There was no significant difference (P>0.05) between pupils from NAUNPSI with highest prevalence, 28(12.07%) and CSN with least prevalence, 12(7.32%). Pupils whose parents were Civil servants, and those dewormed over 7months ago had highest infection rates of 96(12.50%) and 52(10.40%) respectively. Although a low prevalence rate was observed, potential health threats from infections and re-infections demands for improved hygienic habits, environmental sanitation, and strategic deworming of all pupils, as well as health awareness programs in the study area.

Keywords: prevalence, soil-transmitted, helminth, infection, *Ascaris*, *lumbricoides*

INTRODUCTION

Soil-transmitted helminths (STHs) cause a major public health issue in poor countries (Aleka *et al*., 2015). Low and middle-income nations have the highest prevalence of STH infections, which thrive and persist in areas with high levels of poverty, poor hygiene, and a lack of basic health care (Alemu *et al*., 2011; Dakha *et al*., 2019; Vandemark *et al*., 2010). Soil-transmitted helminth infections are most common in Sub-Saharan Africa, Southeast Asia, Latin America, and China (Akinsanya *et al*., 2021). Three-quarters of those in need of treatment are in Southeast Asia and Africa, with around a quarter in the Western Pacific, Eastern Mediterranean, and the Americas (WHO, 2012).

Soil transmitted helminths are spread by eggs of helminth parasites voided in human faeces, which pollute the soil in areas where cleanliness is lacking (WHO, 2022) especially in warm and humid tropical setting where the environment is conducive for survival of STH eggs and larvae, as well as hatching and embryonation (Aribodor *et al*., 2019). The most prevalent human STHs infections are caused by *Ascaris lumbricoides*, *Trichuristrichiura* and hookworms. These STHs may cause anaemia, stunted growth, decreased cognitive development and is one of the leading causes of absenteeism and days lost from work (De Silva *et al*., 1997). Total worm burden, as well as age and immune status of the infected, are some of the factors that influence morbidity and mortality due to STH infections (Pasaribu *et al*., 2019).

Most STH infections are acquired through the faecal-oral route, directly or indirectly through ingestion of contaminated food, water, vegetables, and fruits (Singh and Idris, 2016; Onyido *et al*., 2016). Children appear to be most vulnerable to infections acquired by playing in polluted soil and poor eating habits (Ojja *et al*., 2018). According to epidemiological studies of STH infections, the prevalence and severity of infection are highest in children aged 4 to 15years, and helminth ova have been found on the underside of children's fingernails (Dyek *et al*., 2016; Ekejindu *et al*., 2005).

Multiple factors, such as behaviour, environment, health system, and socioeconomic level, influence the spread of STHs (Coulibaly *et al*., 2012; Gabrie *et al*., 2014). Long-term STH control and elimination will necessitate an integrated approach that includes deworming, improved water access, sanitation, and hygiene practices like hand washing habits and wearing shoes (Campbell *et al*., 2014; Bartram *et al*., 2012; Greene *et al*., 2010; Truscott *et al*., 2014). It has been reported that deworming only reduces transmission for a short time, but does not prevent reinfection (Campbell *et al*., 2014).

For effective control of STHs, it is important to understand the factors that influences transmission in an endemic area (Lustigman *et al*., 2012). It is also crucial to analyse the public's understanding, attitudes and perceptions about causes and sources of infection. Hence, this study investigated the prevalence and risk factors associated with STH infections among pupils in Awka South Local Government Area (L.G.A) to provide baseline data that will aid in the implementation of mass drug administration and the execution of

the global elimination program of soil-transmitted helminths.

MATERIALS AND METHODS

Study Area

This study was conducted in Awka South L.GA in Anambra State between October and December 2021. Awka South is geographically located between 6°10′N, 7°04′E. It has a population size of 189,654 (NPC, 2006). Awka South LGA has two distinct seasons in a year namely, rainy season (March – October) and dry season (November - February), with annual estimated precipitation of 2950mm, average humidity of 70% and average temperature of 27^0C. The major economic activities of the inhabitants include handcraft, farming, trading and civil/public servants.

Study Design

The study was a cross-sectional survey of helminth parasites among primary school children. Three primary schools were selected from three communities in Awka south namely, Ifite, Nkwelle and Amawbia.

Study population and Sample size

The study population were pupils from three primary schools namely, Nnamdi Azikiwe University Nursery and Primary School, Ifite (NAUNPSI; N=423), Community School, Nkwele (CSN; N=248), and Central Primary School, Amawbia (CPSA; N=198). Sample size was obtained using the formular by Yamane (1967).

$$n = N/1+N(e)^2$$

where n = sample size, N = population size, e = the level of precision (0.05). The calculated minimum sample size (n) in each of the schools were NAUNPSI = 205, CSN=153 and CPSA=132. Total minimum sample size was 490 pupils.

Ethical Approval

Ethical approval to conduct the study was obtained from the Health Research Ethics Committee of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) Amaku, Awka (Ref No. COOUTH/CMAC/ETH.C/VOL.1/FN:04/153). Sensitization program was done before the study and involved the parents, guardians and the school authorities. Informed oral consent was obtained from the parents/guardians of the study participants assuring them of absolute confidentiality of information provided.

Faecal Sample Collection

Sterile universal containers with tight lids**,** pre-labelled with the pupil's name and identification numbers, were issued to each pupil. Also contained within was instruction for the parents/guardians on how to collect the early morning stool of their wards safely without contamination. The samples from the participants were stored in an ice bag stacked with ice cubes for preservation. Samples were immediately transported to the laboratory of the Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka for examination.

Laboratory Examinations

Direct smear (wet mount) and Formol-ether Concentration Techniques were used for identification of helminth eggs (Chesbrough, 2000). The prepared slides were examined under the objective lens of the microscope.

Administration of Questionnaires

Structured questionnaires were administered to each participant and their responses were recorded. The risk factors analysed were hygiene practices such as nail biting, hand washing, footwear usage, playing with sand, toilet usage, washing of fruits and vegetables, water source, parents/guardian occupation, as well as their knowledge of soil-transmitted helminths.

Statistical Analysis

The data obtained was analysed using the SPSS software for Chi-square test to compare significant difference among variables at 95% confidence level.

RESULTS

Of the 568 faecal samples examined, 56(9.86%) were positive while 512(90.14%) were negative. Overall prevalence of STH infection showed NAUNPSI with higher prevalence, 28(12.07%), and CSN with lower prevalence, 12(7.32%). There was no significant difference in prevalence among the schools (P>0.05) (Table 1). Age group1-5years had highest prevalence of 4(12.5), but no significant difference was observed in prevalence across the age groups (P>0.05) (Table 1). More males, 32(11.8%) were infected with STH than the females, 24(8.1%) (Table 1). There was no significant difference in prevalence between the gender (P>0.05). *Ascarislumbricoides* was the most prevalent,44(7.75%), while *Taenia* spp. had the least prevalence,4(0.70%) (Table 2). Most participants practiced good hygienic habits such as hand washing, 320(11.25%), washing of fruits and vegetables, 320(11.25%), wearing of footwears, 368(9.78%) and most do not bite their nails, 424(8.49%). It was also observed that most participants reported playing with sand, 356(10.11%). Infection was high among children whose parents are Civil servant, 96(12.5%), and among participants who dewormed at least 7months before the study period, 500(10.4%) (Table 3). The higher mean prevalence was reported in nail biting habit, 11.18% while toilet use had lower mean prevalence of 4.97% (Table 3).

Table 1: Overall prevalence of STH infections among pupils according to schools, age-groups and gender

	Pupils examined [no. (%)]			Pupils infected [no. (%)]		
	Total	Males	Female	Total	Male	Female
Schools:						
NAUNPSI	232(40.8)	116(20.4)	116(20.4)	28(12.07)	20(17.2)	8(6.9)
CPSA	172(30.3)	92(16.2)	80(14.1)	16(9.30)	8(8.7)	8(10.0)
CSN	164(28.9)	64(11.3)	100(17.6)	12(7.31)	4(6.3)	8(8.0)
Total	568(100)	272(47.9)	296(52.1)	56(9.86)	32(11.8)	24(8.1)
Age (years)						
1-5	32(5.6)	28(4.9)	4(0.7)	4(12.5)	4(14.3)	0(0.0)
6-10	452(79.6)	208(36.6)	244(43.0)	52(11.5)	28(13.5)	24(9.8)
11-15	84(14.8)	36(6.3)	48(8.5)	0(0.00)	0(0.0)	0(0.0)
Total	568(100)	272(47.9)	296(52.1)	56(9.86)	32(11.8)	24(8.1)

Table 2: Overall prevalence of specific soil transmitted helminths in pupils according to schools, gender and age

	Stool samples [no. (%)]		Stool samples with STHs [(no. (%)]		
	Examined	Infected	*Ascaris lumbricoides*	Hookworm	*Taenia* spp.
Schools:					
NAUNPSI	232	28(12.07)	20(8.62)	4(1.72)	4(1.72)
CPSA	172	16(9.30)	12(6.98)	4(2.33)	0(0.00)
CSN	164	12(7.32)	12(7.32)	0(0.00)	0(0.00)
Total	568	56(9.86)	44(7.75)	8(1.41)	4(0.70)
Gender:					
Male	272	32(11.76)	24(8.82)	8(2.94)	0(0.00)
Female	296	24(8.11)	20(6.76)	0(0.00)	4(1.35)
Total	568	56(9.86)	44(7.75)	8(1.41)	4(0.70)
Age(years)					
1-5	32	4(12.50)	4(12.50)	0(0.00)	0(0.00)
6-10	452	52(11.50)	40(8.85)	8(1.77)	4(0.88)
11-15	84	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Total	568	56(9.86)	44(7.75)	8(1.41)	4(0.70)

Table 3: Risk factors for overall soil transmitted helminth infections among pupils examined

Risk factors studied	Pupils' responses	Pupils (no.)	Stool +ve for STH (no.)	Prevalence (%)	Mean prevalence (%)
STH Knowledge	Yes	300	24	8.00	9.97
	No	268	32	11.94	
Handwashing before eating	Yes	320	36	11.25	9.67
	No	248	20	8.06	
Nail biting	Yes	144	20	13.88	11.18
	No	424	36	8.49	
Barefoot	Yes	200	20	10.00	9.89
	No	368	36	9.78	
Playing with sand	Yes	356	36	10.11	9.77
	No	212	20	9.43	
Eating unwashed raw fruits and vegetables	Yes	248	20	8.06	9.66
	No	320	36	11.25	
Toilet use	Water closet	232	24	10.34	4.97
	Squatter toilet	336	32	9.52	
	Pit	0	0	0.00	
	Open defecation	0	0	0.00	
Water source	Borehole	456	36	7.89	9.30
	Well	100	20	20.00	
	Stream	12	0	0.00	
Parents' occupation	Civil servant	96	12	12.50	10.27
	Artisan	260	28	10.77	
	Trader	212	16	7.55	
Deworming history	1-3months	24	0	0.00	6.50
	4-6m	44	4	9.09	
	>7m	500	52	10.40	

DISCUSSION

The prevalence of STH infections in the study was 9.86%. This classifies the community as a "low risk area" for preventive therapy by WHO standards (WHO, 2017). The prevalence value recorded is relatively comparable to findings by Akinseye *et al.* (2017) with an overall prevalence of 16.05% in Ondo State, Nigeria, but much lower to the previous studies by Chukwuma *et al*. (2009) and Nwankwo *et al*. (2021) who recorded 87.7% in Ebenebe community and 44.2% in Omogho and Awa communities in Anambra state. This could be because some of the participants were recently dewormed as observed from their responses.

Highest prevalence (12.5%) of infection was recorded in age group 1-5 years. Children in this age group have little or no knowledge of personal hygiene such as prompt washing of hands, walking barefooted among other poor sanitary habits that expose them to soil-transmitted infections, and they are usually dependent on caregivers for proper hygiene maintenance. This however contrasts

Onyido *et al.*, (2017) who reported highest prevalence (17.65%) in age group 13-16 years, followed by 9.8% in age group 5-8 years among school pupils in Ekwulummili community, Anambra State. Prevalence of infection according to gender indicates that males (11.8%) had more infection than females (8.1%). This could be because male children are usually more active and engage in outdoor activities more than the females. The report agrees with study by Rwang *et al.* (2014) who recorded a higher prevalence of 25.0% among male school children in Obehie, Abia State. This is also in agreement with Odinaka *et al.,* (2015) who reported a higher prevalence in males (38.4%) than females in a rural community in Imo state. However, the report contrasts Anyaegbunam and Uwa, (2019) in his study of STH among school children which recorded a higher prevalence of 94.44% among females; and Chukwuma *et al*., (2009) who observed a higher prevalence of infection among female school children in Ebenebe, Anambra State.

The predominance of *Ascarislumbricoides* (7.75%) as the most common helminth parasite observed in this study was in line with the previous findings by Onyido *et al.* (2016); Ukibe *et al.* (2018) and Hassan *et al.* (2017) in Nigeria who also reported *Ascarislumbricoides* as the most prevalent helminth parasite in their studies. *Ascaris* eggs remain viable in the environment for a long time until ingested by humans. Some pupils reported non-washing of hands, fruits and vegetables, this could serve as sources of infection since *Ascaris* eggs may be attached to the hand, fruits and vegetables and infection occur through faecal-oral route (Onyido *et al*., 2016).Hookworm observed in this study has also been reported in other studies among primary school children (Onyido *et al.,*2016; Ukibe *et al.,*2018; Amaechi *et al.,*2013). Hookworm infective larvae require penetration of human skin for infection to occur. Most pupils in this study reported wearing footwears often. This may be the reason hookworm was not the most prevalent in this study.

A relatively high knowledge of STH was reported among the pupils. Most participants maintain good hygienic practices such as hands, fruits and vegetables washing, wearing of footwear, and these practices reduce the transmission rate of these helminths infections. This may have contributed to the low prevalence rate of infection recorded in the study area. It was also observed that there was good water source as most participants reported using borehole water, which is considered safer, than a few who reported stream as their source of water.

CONCLUSION

Although prevalence of STH is relatively low in the study area, control measures are still necessary. There is need for improved environmental sanitation, health education, administration of anthelminthic drugs in schools and periodic surveillance to ensure that the risk factors associated with the transmission of the infection are reduced.

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