

SOIL TRANSMITTED HELMINTHS AMONG SCHOOL AGED CHILDREN IN HONG LOCAL GOVERNMENT AREA OF ADAMAWA STATE, NIGERIA

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Received September 05, 2021; Revised November 02, 2021; Accepted February 23, 2022

ABSTRACT

*Soil transmitted helminths (STH) are major public health problem affecting the growth of children. 360 stool samples were collected and analyzed using Formol-ether concentration technique. Daksiri Primary School had the highest prevalence with 22(6.11 %), while the least was Uba Primary School with 13(3.61 %). There was no significant difference ($p>0.05$) in STH among schools. *Ascaris lumbricoides* had the highest prevalence with 52(14.44 %), followed by *Trichuris trichiura* with 28(7.78 %), while the least was hookworm 18(5.00 %). In relation to sex, males had the higher prevalence 56(15.56 %) than females with 42(11.67 %). There was no significant difference ($p>0.05$) between infection and sex. In relation to age group, the age groups 7 – 9 years had the highest prevalence of 42(11.67 %), while 3 – 6 years had the least prevalence with 23(6.39 %). There was no significant difference ($p>0.05$) in relation to STH by age groups. Those whose parents are civil servants had the least prevalence of 16(4.44 %), while those whose parents are farmers had the highest prevalence of 58(16.11 %). There was no significant difference on parents occupation at ($p>0.05$). Children, who used water closet system, had the least prevalence of 18(5.00 %), while those who used pit toilet recorded highest prevalence of 51(14.17 %). There was no significant difference ($p>0.05$) between infection and methods of stool disposal. There is need to promote child health, through health education, personal hygiene. Deworming should be sustained as control against outbreak of soil transmitted helminthes among school aged children.*

Keywords: Soil transmitted helminths, *Trichuris trichiura*, *Ascaris lumbricoides*, Hookworm, Hygiene

INTRODUCTION

Soil transmitted helminths (STH) are round worms of the phylum nematoda that are transmitted through soil contaminated with faecal matter. Three types of soil transmitted helminths can be distinguished: *Ascaris lumbricoides* Linnaeus, 1758 (Ascaridida: Ascarididae - round worm), *Trichuris trichiura* Linnaeus, 1771 (Trichocephalida: Trichuridae - whipworm), *Ancylostoma duodenale* Dubini, 1843 (Rhabditida: Ancylostomatidae - hookworm) and *Necator americanus* Stiles, 1902 (Rhabditida: Ancylostomatidae - hookworm), over 80 % of the

disease burden occurs in developing countries (Pullan *et al.*, 2014). STH is the most common parasitic disease of human worldwide approximately two billion people are infected, and four billion at risk (WHO, 2022). Large numbers of cases occur in impoverished rural areas of Sub-Saharan African, Latin America, Southeast Asian and China (WHO, 2012). Areas with inadequate water, sanitation and hygiene conditions are at higher risk of infections with STH (Knopp *et al.*, 2013). Although STH are not among the killer disease, but the affected children are usually malnourished and anaemic (Odu *et al.*, 2011). Long term effects of STH are associated with poor physical fitness, growth

retardation and intellectual development (Freeman *et al.*, 2015). Strunz *et al.* (2014) stated that, soil transmitted helminths are regarded as one of the world's most important causes of intellectual and physical retardation in children. The helminthic disease is so named because the infection is transmitted through ingestion of the nematode eggs in the soil, which is contaminated through excrements. Therefore, the disease is most prevalent in warm and moist climates where sanitation and hygiene are poor and waters are unsafe, including the temperate zones during warmer months. STH is categorized among neglected tropical diseases because it inflicts tremendous disability and suffering, which can be clinically treated and easily prevented primarily through improved sanitation. Most conditions of STH have a light worm burden and usually have no discernible symptoms. Heavy infections however cause a range of health problems, including abdominal pain, diarrhea, blood and protein loss, rectal prolapse, physical and mental retardation. Severe ascariasis is typically pneumonia like, as the larvae invades lungs, producing fever, cough and dyspnea during early stage of infection (WHO, 2012). Treatment of helminths infection in school children have an impact on their physical fitness, growth and performance in schools. Educating the community on intestinal helminths will go a long way in the interruption of the parasitic transmission cycle which is the best management strategy for the prevention and control of soil transmitted helminths. Thus, the objective of this study was to determine the prevalence of soil transmitted helminths among school aged children in schools in Hong Local Government of Adamawa State, Nigeria.

MATERIALS AND METHODS

Study Area: Hong Local Government Area (LGA) is located in Adamawa Central Senatorial Zone of Adamawa State, Northeast Nigeria. It is located on Latitude $10^{\circ} 13'543N$ and Longitude $12^{\circ} 55'493E$ of the Greenwich meridian. It is bordered by Gombi, Song, Mubi and Michika LGAs. It has an estimated population of 169,126 inhabitants with the majority of inhabitants

being members of the Kilba ethnic groups. The LGA has an average temperature of $32 \pm 4^{\circ}C$ and it is generally warm and humid. With marked two seasons, dry and wet seasons. Wet season commences from late April to early or ending October; while dry season is from November to April. Farming is the major source of livelihood for the people of Hong LGA with the area renowned for the cultivation of a variety of crops (NPC, 2006).

Ethics: The identity of all persons used for the study was protected as no names were used instead numbers were assigned to the entire study participant. Informed consent of the participant or their parents were sought and obtained. In addition the local education authority in Hong LGA approved the conduct of the research.

Study Design: A cross-sectional school survey design was adopted for the study in which questionnaire and laboratory analyses were used. Six primary schools were randomly selected, three each from the two constituency in Hong local government. 360 faecal samples was collected, the sample size for the study was calculated using Yamane (1967) formula: $N = N/1 + N(e)^2$. 180 each from male and female, sixty (60) stool samples from each school was collected using stratified random sampling method to select the participants through the use of even number in each class register. The faecal sample was collected from each individual in an appropriate labeled specimen container.

Instrument for Data Collection: A structured questionnaire was administered to every selected pupil. The questionnaire was used to obtain information on the school, age, sex, methods of faecal disposal and parent's occupation of all the eligible children. Questionnaire was face validated, pretested and tested for reliability before administration (Roopa and Rani, 2012). The questionnaire was interpreted in local language if any respondent finds it difficult to understand.

Formal-Ether Sedimentation Technique: Stool samples were examined microscopically

using formal-ether concentration techniques for effective detection of ova, cysts and larvae of parasite as described by Cheesbrough (2006).

Statistical Analysis: The data was analyzed using SPSS version 26.0. Chi-square (χ^2) was used to determine parasite prevalence in terms of sex and age group, among schools, methods of faecal disposals and parent's occupation.

RESULTS

Prevalence of Soil Transmitted Helminths Infection among Six Selected Primary Schools: Out of the 360 stool sample collected from school aged children, 98(27.22 %) were infected with STHs. The distribution of infection in relation to schools showed that pupils of Daksiri Primary School were the most infected with 22(6.11 %), followed by Kalaa Primary School 18(5.00 %), Mijili Primary School 17(4.72 %), Gashala and Thabu Primary Schools had similar prevalence of 14(3.89 %), while Uba Primary School had the least prevalence of 13(3.61%) (Table 1). Chi-square test showed no association between STHs and schools at $p>0.05$. *A. lumbricoides* recorded the highest prevalence of 52(14.44 %), followed by *T. trichiura* 28(7.78 %) and hookworm 18(5.00 %), while 28(7.78 %) pupils were infected with non STH parasites.

Relationship between Soil Transmitted Helminths among School Aged Children in Relation to Sex: Infection in relation to sex showed that males had the highest prevalence of STHs with 56(15.56 %), while female had the least with 42(11.67 %), Chi-square test showed that there was no significant relationship between STHs and gender ($\chi^2_{cal} = 2.75$, $\chi^2_{tab} = 3.84$, 1 df, $p>0.05$) (Table 2).

Relationship between Soil Transmitted Helminths among School Aged Children in Relation to Age Group: Age related prevalence showed that pupils belonging to age group 7 – 9 [42(11.67 %)] year age bracket had the highest prevalence of STHs, followed by those within 10 – 12 [33(9.17 %)] years old, while the age group 3 – 6 [23(6.39 %)] years

had the lowest prevalence of STHs (Table 3). Chi-square test showed that there was no significant relationship between STHs and age group ($\chi^2_{cal} = 0.73$, $\chi^2_{tab} = 5.99$, 2 df, $p>0.05$).

Relationship between Soil Transmitted Helminths and Parent Occupation: The result in relation to parents occupation revealed that, STHs infection was higher among children of farmers with 58(16.11 %), followed by children of private business with 24(6.67 %), while the least occur among children of civil servants with 16(4.44 %) (Table 4). Chi-square test showed that there was no significant relationship between STHs and parent occupation ($\chi^2_{cal} = 0.28$, $\chi^2_{tab} = 5.99$, 2 df, $p>0.05$).

Relationship between Soil Transmitted Helminths and Methods of Faecal Disposal among School Aged Children: Prevalence of STHs in relation to methods of faecal disposal revealed that pupils using pit toilet had the highest prevalence with 51(14.17 %), followed by open defecation with 29(8.06 %), while the least occurs among those using water closet 18(5.00 %) (Table 5). Chi-square test showed that there was significant relationship between STHs and methods of faecal disposal ($\chi^2_{cal} = 6.85$, $\chi^2_{tab} = 5.99$, 2 df, $p<0.05$).

DISCUSSION

The highest prevalence of STHs infection among school aged children in the six selected primary schools occurred in Daksiri Primary School, while Uba Primary School had the least prevalence. This was attributed to lack of proper hygienic practice and sanitary facilities in the schools which contributed to the high prevalence (Adams *et al.*, 2009). In terms of parasite species, *A. lumbricoides* recorded the highest prevalence, while hookworm had the list record. These findings were in agreement with the reports of Harhay *et al.* (2010) and Shoff (2018), that ascariasis was prevalent in at least 150 out of the 218 countries of the world.

Sex related infection showed that males recorded higher prevalence of STHs than females although the difference was not statistically significant.

Table 1: Prevalence of soil transmitted helminths among schools aged children in Hong

Primary Schools	Number Examined	Number Infected	<i>Ascaris lumbricoides</i>	Hookworm	<i>Trichuris trichiura</i>	Prevalence (%)
Dakisiri Primary School	60	22	13(3.61)	4(1.11)	5(1.39)	6.11
Gashala Primary School	60	14	7(1.94)	4(1.11)	3(0.83)	3.89
Kalaa Primary School	60	18	10(2.78)	2(0.56)	6(1.67)	5.00
Thabu Primary School	60	14	8(2.22)	2(0.56)	4(1.11)	3.89
Mijili Primary School	60	17	9(2.50)	3(0.83)	5(1.39)	4.72
Uba Primary School	60	13	5(1.39)	3(0.83)	5(0.83)	3.61
Total	360	98	52(14.44)	18(5.00)	28(7.78)	27.22

($\chi^2 = 4.82$, p -value = 0.44), number in parenthesis = %

Table 2: Relationship between soil transmitted helminths among school aged children in Hong in relation to sex

Sex	Number Examined	Number Infected (%)	Prevalence (%)
Male	180	56(57.14)	15.56
Female	180	42(42.86)	11.67
Total	360	98	27.22

($\chi^2 = 2.75$, p -value = 0.10)

Table 3: Relationship between soil transmitted helminths among school aged children in Hong in relation to age group

Age Group	Number Examined	Number Infected (%)	Prevalence (%)
3 – 6	93	23(23.47)	6.39
7 – 9	142	42(42.86)	11.67
10 – 12	125	33(33.67)	9.17
Total	360	98	27.22

($\chi^2 = 0.73$, p -value = 0.69)

Table 4: Assess relationship between soil transmitted helminths among school aged children in Hong in relation to parent's occupation

Parent Occupation	Number Examined	Number Infected (%)	Prevalence (%)
Farmers	218	58(59.18)	16.11
Civil Servants	53	16(16.33)	4.44
Private Business	89	24(24.49)	6.67
Total	360	98	27.22

($\chi^2 = 0.28$, p -value = 0.87)

Table 5: Soil transmitted helminths among school aged Children in Hong in relation to methods of faecal disposal

Method of Faecal Disposal	Number Examined	Number Infected (%)	Prevalence (%)
Water Closet	103	18(18.37)	5.00
Pit Toilet	176	51(52.04)	14.17
Open defecation	87	29(29.59)	8.06
Total	360	98	27.22

($\chi^2 = 6.85$, p -value = 0.03)

This observation confirmed equal exposure to STHs eggs among the study population. However, numerical higher prevalence of STHs in male children was an indication that special

activities of males such as playing in contaminated soils could have predisposed them to infections. Sometimes these activities are carried out in the study area while they are bare

footed. This finding was in agreement with previous studies of Adeyeba and Akinlabi (2002) that recorded higher Intestinal parasitic infections in males than females among school children in a rural community of Southwest Nigeria.

Age related infection showed that pupils belonging to age group 7 – 9 years had the highest rate of infection while age group 3 – 6 years had the lowest infection rate. This was in agreement with Tekalign *et al.* (2019), that the prevalence of soil-transmitted helminth infection was significantly higher in children of ages 7 to 9 years than children of ages 3 to 6 years among rural community of southwest Ethiopia. Children of age bracket 7 - 9 had high exposure to STHs resulting from their activities such as; playing with soil, eating food without washing hands and eating unwashed fruits (Bassey *et al.*, 2020). Children aged 3 – 6 are often taken care of by their parents and as such had low exposure to STHs.

By occupation, the highest STHs infection was recorded among children of farmers, while the least occur among children of civil servants. Parental socio-economic status is an important variable in the determination of risk factors predisposing pupils to STHs infection. This result was in conformity with the report of Kirwan *et al.* (2009).

Prevalence of STHs infection in relation to methods of faecal disposal revealed that pupils with pit toilet had the highest infection, while the least occurs among those with water closet. This finding agreed with the report of Ogbaini-Emovon *et al.* (2014), who reported that poor environmental and personal hygiene with respect to disposal of human faeces and hand washing after defecation and before eating, are the driving forces of STH infection.

Conclusion: Soil-transmitted helminths species causing helminthic infection among children in study area includes *A. lumbricoides*, *T. trichiura*, and hookworms. The study revealed that *A. lumbricoides* was the most prevalent parasite among the children. The result of this study also showed relatively moderate prevalence of STH infection among the school children. Study also identified risk factors associated with STHs

infections in the study area; such as types of toilets in home and occupational practices. Community members should be educated on the mode of transmission of STH infections and preventive methods. Deworming programme for children should be introduced and sustained. The farmers should be encouraged to wear boots and hand gloves during farm work. There is the need for periodic assessment of STHs among children in the study area.

ACKNOWLEDGEMENTS

We wish to appreciate the head teacher and staff of the Schools used for the study. Appreciation also goes to Mr. Timothy Ibrahim for his assistance during analysis. We wish to also appreciate Local education Authority, Hong LGA for the approval to conduct the study.

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