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Research Article

Water and Soil-Transmitted Helminths Among Pupils in Selected Primary Schools in Jalingo Metropolis, Taraba State, Nigeria

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Abstract

This study investigated the prevalence of water and soil-transmitted helminths (WSTHs) among pupils in two selected primary schools in Jalingo Metropolis, Taraba State, Nigeria. A cross-sectional study was conducted involving 120 pupils (60 from Nukkai Model Primary School and 60 from UBE NTA Primary School). Stool samples were collected and analyzed using the formol-ether concentration method. Data on socio-demographics and risk factors were collected via questionnaires and analyzed using SPSS. The overall prevalence of WSTH infection was 61.7%. Nukkai Model Primary School had a higher prevalence (63.3%) compared to UBE NTA Primary School (60.0%), with no significant difference between the schools (P = 0.707). The helminths identified were Ascaris lumbricoides and hookworm. Ascaris lumbricoides had a significantly higher prevalence (50.8%) than hookworm (10.8%). Male pupils had a higher infection rate (70.9%) than females (53.8%), though this was not statistically significant (P = 0.055). Risk factor analysis revealed that pupils who ate food within the school premises and those who did not wash fruits before consumption had a significantly higher risk of infection (P = 0.000). The study concludes that WSTH infections are prevalent among school children in Jalingo, with A. lumbricoides being the most common. Poor hygiene practices, such as not washing fruits before eating, are significant contributing factors. It is recommended that schools implement comprehensive health education programs, improve sanitation facilities, and ensure access to clean water.

Keywords: *Ascaris lumbricoides, Helminths, Jalingo, Primary School Pupils, Soil-Transmitted Helminths.*

INTRODUCTION

Water and soil-transmitted helminths (WSTHs) are a group of intestinal parasites that cause human infections through contact with parasite eggs or larvae thriving in warm, moist soils. They belong to the class Nematoda and include the roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*), and hookworms (*Ancylostoma duodenale* and *Necator americanus*) (Schlosser et al., 2021). These helminths inhabit the intestine, and their immature stages require a period of development in the soil before becoming infective (Milgroom, 2023). The global burden of soil-transmitted helminths is enormous, with persistent infections affecting over two billion people and causing an estimated 135,000 deaths annually (Milgroom, 2023). The World Health Organization (WHO, 2022) reports that approximately one billion people are infected with *A. lumbricoides*, 800 million with hookworms, and 770 million with *T. trichiura*. School-aged children are among the most heavily infected groups globally (Hailegebreil, 2020).

Nigeria is endemic for helminthic infections, with pre-school and school-aged children (0-15 years) being at greater risk due to poor hygiene practices and play habits that bring them into close contact with contaminated soil (Osaiyuwu et al., 2025). Despite the known public health significance, there is a lack of recent data on the prevalence of water and soil-transmitted helminths among school children in Jalingo Metropolis. This study is therefore justified as it aims to provide recent epidemiological information on these infections, which is crucial for informing control strategies and improving

health outcomes for affected children. The aim of this study was to investigate water and soil-transmitted helminths among school pupils in selected primary schools in Jalingo metropolis. The specific objectives were to: (i) determine the prevalence of WSTHs among school pupils; (ii) compare the infections among school pupils in the study area; (iii) investigate the infection in relation to sociodemographic factors; and (iv) evaluate the risk factors associated with WSTH infections.

MATERIALS AND METHODS

Study Area

The study was conducted in Jalingo, the capital of Taraba State, Nigeria, situated at latitude 8.8937°N and longitude 11.3667°E. The city has a population of approximately 581,000 people and a tropical climate with distinct wet and dry seasons. Two primary schools were selected: Nukkai Model Primary School and Universal Basic Education (UBE) NTA Primary School.

Study Design and Population

A cross-sectional study design was employed. The sample size of 60 pupils per school (total N=120) was estimated using the WHO manual for sample size determination, with a 5% sampling error and a prevalence risk of 5.00% from a previous study (Alhassan et al., 2013). Pupils were selected using a systematic sampling technique from three classes in each school.

Ethical Considerations

Ethical clearance was obtained from the Taraba State University ethical committee. Informed consent was obtained from the pupils' parents/guardians, and permission was granted by the headteachers of the selected schools.

Data Collection

A structured questionnaire was administered to each participant to obtain information on age, sex, and risk factors (e.g., handwashing habits, eating habits, sanitation facilities). Pre-labeled sample containers were distributed to each pupil for stool collection. Samples were collected, placed in a cold box, and transported to the Biology Laboratory, Department of Biological Sciences, Taraba State University.

Laboratory Procedure

Stool samples were analyzed using the formol-ether concentration method as described by Ayele et al. (2021). Briefly, 2 grams of stool were emulsified in 10% formalin, filtered, and mixed with 3 ml of diethyl ether. The mixture was centrifuged at 3000 rpm for 5 minutes. The supernatant was discarded, and the sediment was examined under a microscope using x10 and x40 objective lenses for the presence of helminth eggs.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS). Chi-square tests were used to determine associations between variables, with a P-value of < 0.05 considered statistically significant.

RESULTS AND DISCUSSION

Prevalence of Water and Soil-Transmitted Helminths

Stool samples from 120 pupils were examined, revealing an overall prevalence of WSTH infection of 61.7% (Table 1). Nukkai Model Primary School recorded a higher prevalence (63.3%) compared to UBE NTA Primary School (60.0%), but this difference was not statistically significant (P = 0.707). The helminths identified were *Ascaris lumbricoides* and hookworm. *A. lumbricoides* was the predominant parasite, with a prevalence of 50.8% (61/120), while hookworm had a prevalence of 10.8% (13/120) (Table 2). The higher prevalence of *A. lumbricoides* is consistent with findings from Damen et al. (2010) and Punsawad et al. (2018), who also reported it as the most common soil-transmitted helminth in their studies.

Table 1: Prevalence of WSTHS among pupils in the selected schools

School	Number of pupils examined	Prevalence (%)
UBE, NTA Primary Sch. Jalingo	60	36(60.0)
Nukkai Model Primary Sch. Jalingo	60	38(63.3)
Total	**120**	**74 (61.7)**

P-Value 0.707 Shows insignificant differences

Table 2: Comparison of Infections among pupils in the study area

School	Helminths Observed	Occurrence	Prevalence (%)	Chi-Square value	P-value
UBE, NTA Primary School	Ascaris lumbricoides	29	(48.3)	0.311	0.856
	Ancylostoma duodenale	7	(11.7)	0.311	0.856
Nukkai Model Primary School	Ascaris lumbricoides	32	(53.3)	0.311	0.856
	Ancylostoma duodenale	6	(10.0)	0.311	0.856
Total	**Ascaris lumbricoides**	**61**	**(50.8)**	**Ancylostoma duodenale**	**(10.8)**

Socio-Demographic Factors and Helminthiasis

In relation to sex, male pupils had a higher prevalence (70.9%) than female pupils (53.8%), but this association was not statistically significant (P = 0.055). Age group analysis showed that pupils aged 11-15 years had the highest prevalence (71.4%), followed by those aged 6-10 (61.3%) and 1-5 (54.2%). No significant association was found between age and infection (P = 0.491) (Table 3). The higher prevalence in males and older children may be attributed to behavioral differences and increased outdoor play activities, a trend similarly observed by Emana et al. (2015) and Salawu & Ughele (2024).

Table 3. Helminthiasis in relation to socio-demographics factors

Sociodemographic parameters	Numbers Examined	Prevalence %	Chi-Square	P-value
Sex male	55	39(70.9)	3.669	0.055
Female	65	35(53.8)	3.669	0.005
Age 1-5	24	13(54.2)	1.421	0.491
6-10	75	46(61.3)	1.421	0.491
11-15	21	15(71.4)	1.421	0.491

Risk Factors Associated with WSTH Infection

The evaluation of risk factors (Table 4) revealed that pupils who ate food in the school premises (EFIS) and those who did not wash fruits before eating (WFBE) showed a significant association with WSTH infection (P = 0.000). Pupils who ate food at school had a prevalence of 50.0%, while those who did not had a much higher prevalence (93.8%). Similarly, pupils who washed fruits before eating had a prevalence of 37.9%, compared to 90.7% for those who did not. These findings highlight the importance of food and fruit hygiene. Other factors such as handwashing after defecation (WHAD), handwashing before eating (WHBE), defecation practices (WPDIS), and source of drinking water (SODWIS) showed no significant association. The significant association with eating food in school and not washing fruits underscores the critical role of personal hygiene in preventing WSTH infections, which aligns with the findings of Ojja et al. (2018).

Table 4. Evaluation of risk factors associated with pupils in both schools

Risk Factors		Numbers Examined	Prevalence %	Chi-Square	P-value
WHAD	Yes	103	63 (61.2)		
	No	17	11(64.7)	0.077	0.781
WHBE	Yes	110	66 (60.0)		
	No	10	8 (80.0)	1.551	0.213
EFIS	Yes	88	44 (50.0)		
	No	32	30 (93.8)	19.001	0.000
WFBE	Yes	66	25 (37.9)		
	No	54	49 (90.7)	35.109	0.000
WPDIS	Pit	38	22 (57.9)		
	Bush	46	25 (54.3)		
	Open space	36	27 (75.0)	3.978	0.137
SODWIS	Well	8	6 (75.0)		
	Pipe borne	27	14 (51.9)		
	Borehole	75	49 (65.3)		
	Stream	10	5 (50.0)	2.704	0.440

WHAD: Wash hands after defecation; WHBE: Wash hands before eating; EFIS: Eat food in school; WFBE: Wash fruits before eating; WPDIS: Where pupils defecate; SODWIS: Source of drinking water in school.

CONCLUSION AND RECOMMENDATIONS

This study confirms a high prevalence of water and soil-transmitted helminths among primary school pupils in Jalingo Metropolis, with *Ascaris lumbricoides* being the most common. The study found that poor hygiene practices, particularly not washing fruits before eating and consuming food within the school premises, are significant risk factors. Based on these findings, the following recommendations are made:

1. Schools should provide and maintain adequate toilet facilities and promote handwashing with soap.
2. Health education programs should be implemented to teach pupils about the importance of personal hygiene, including washing fruits and vegetables before consumption and proper handwashing.
3. There should be increased access to safe and clean drinking water for pupils in schools.
4. Parents and guardians should be educated to monitor and ensure their children practice good hygiene, especially concerning the food they eat.

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