

## Original Research Article

## Prevalence of Intestinal Helminthes among School-Aged Children in Ife Central Local Government, Nigeria: Implications for Targeted Interventions

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**Abstract: Background:** Soil-transmitted helminths (STHs) are a major health concern for children in developing countries. This study assesses the prevalence and intensity of STHs among pupils in private nursery and primary schools in Ile-Ife, Nigeria. **Methods:** The study was conducted in Ife Central LGA, Osun State, Nigeria, involving preschool and school-aged children from two private schools. A total of 55 samples, from 22 male and 33 female pupils, were analyzed for intestinal parasite ova to determine the prevalence of helminth infections among the children. Ethical approval was obtained from the Institute of Public Health, Obafemi Awolowo University, Ile-Ife. Consent was secured from parents or guardians. Samples were processed using the modified Kato-Katz technique and examined microscopically for soil-transmitted helminth (STH) eggs. Data was analyzed using descriptive statistics and chi-square tests, with significance set at  $p < 0.05$ . **Results:** Among the 55 fecal samples collected, the overall prevalence of soil-transmitted helminth (STH) infections was 78.2%. *Ascaris lumbricoides* were the most prevalent helminth (76.4%), followed by *Trichuris trichiuria* (14.5%) and hookworms (5.5%). Females had a higher infection rate (81.8%) than males (68.2%). The prevalence of STH infections was highest among pupils aged  $\geq 10$  years (81.8%) and lowest among those aged 2-3 years (66.7%). **Conclusion:** This study highlights a significant burden of STH infections, particularly *A. lumbricoides*, among schoolchildren in Ile-Ife, Nigeria. The high prevalence necessitates targeted deworming and improved sanitation interventions to reduce the burden of these infections among children in this region.

**Keywords:** Intestinal helminths, *Ascaris lumbricoides*, Prevalence, School-aged Children, Hookworm, *Trichuris trichiuria*, Parasitic Infections.

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## INTRODUCTION

Intestinal parasitic infections are a significant global health issue, affecting over 3.5 billion individuals annually and resulting in more than 450 million health-related problems [1-3]. A considerable number of these infections occur in preschool and school-aged children, particularly in regions where soil-transmitted helminths (STHs) are endemic [4-8]. In many developing countries, including Nigeria, intestinal parasitic infections remain a major childhood health concern, with school-aged children bearing the highest burden and experiencing the most significant morbidity.

The most prevalent nematode worms affecting humans are *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), and the hookworms *Ancylostoma duodenale* and *Necator americanus* [9]. Infection typically occurs through exposure to eggs or larvae in the environment, often from human fecal matter [9]. Favorable conditions for developing STH eggs and larvae include warm, moist soils in tropical and subtropical regions, particularly where sanitation facilities are inadequate [10]. While STH infections rarely result in mortality, chronic infestation can lead to various adverse outcomes, including stunted physical and cognitive development, increased school

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absenteeism and underperformance, reduced adult productivity, pregnancy complications, anemia, and potentially heightened susceptibility to other diseases such as malaria, tuberculosis, and HIV. The severity of these health effects is closely linked to the intensity of infection, the number of worms within the host, and the individual's overall health status [11].

In Nigeria, the prevalence of STHs varies by region. For instance, a study in southwestern Nigeria, specifically in Ile-Ife, Osun State, revealed that the prevalence of *Ascaris lumbricoides* among children aged 0–4 years was 50–60%, peaking at over 80% in the 11–14 age group, and gradually declining to 60% in those aged 50 years and above [12]. Recent studies on STHs among preschool children have predominantly involved pupils from public elementary schools or a combination of both public and private schools.

This study aims to provide updated information on the prevalence and intensity of soil-transmitted helminths among preschool and school-aged pupils attending private nursery and primary schools in Ile-Ife. We hypothesize that the findings from this study will provide valuable baseline information for mitigative strategies aimed at reducing the prevalence of intestinal helminths among school-aged children, and ultimately contributing to more effective targeted interventions.

## MATERIALS AND METHODS

### Study Area

The study was conducted in two privately owned schools in Ife Central Local Government Area (LGA) of Osun State, Nigeria. This region features a tropical climate characterized by significant rainfall, creating favorable conditions for developing and transmitting soil-transmitted helminths (STHs).

### Study Population

The study population comprised pre-school and school-aged children attending two privately-owned nursery and primary schools within the Ife Central LGA. The schools were selected to provide a representative sample of the demographic and environmental conditions typical of the area. A total of 55 children participated in the study, comprising 12 pre-school children (aged 2-5 years) and 43 school-aged children (aged 6-10 years and above). The children were randomly selected from a total of 106 pupils in the two schools.

### Ethical Considerations

Before the commencement of the study, Institutional Ethical Guideline Approval was obtained. After a thorough disclosure of the intent of the study and the public health relevance to the pupils, permission was sought from the authorities of the participating schools

through the headteachers and teachers for recruiting the pupils into the study. Written informed consent was obtained from the parents or guardians of the children, and only those pupils who returned signed consent forms were included in the study.

### Sample Collection

Each child was provided with a labeled plastic bottle and a wooden spatula for the collection of a small portion of their feces.

### Sample Preparation and Analysis

The collected fecal samples were processed and analyzed in the laboratory for the presence of STH eggs. Each fecal sample was collected in a clean 30 ml universal plastic bottle, mixed thoroughly with an applicator stick, and fixed in a 10% aqueous formaldehyde solution. The samples were examined using the modified Kato-Katz technique [13].

The fecal samples underwent a series of preparatory steps to facilitate microscopic examination. Initially, a portion of each sample was sieved through double-ply gauze to eliminate larger debris. Following this, the resulting filtrate was subjected to centrifugation at 2500 revolutions per minute (rpm) for 5 minutes, separating the sediment from the supernatant. Subsequently, the supernatant was carefully removed, and the sediment was allowed to settle for an additional 5 minutes to ensure optimal drainage.

Approximately 50 milligrams of the sediment were then meticulously transferred onto a pristine microscope slide. A cover slip, pre-treated by immersion in a solution comprising 50% glycerine and malachite green overnight, was delicately positioned over the sample. To guarantee uniform distribution, gentle pressure was applied to the cover-slip.

Subsequently, the prepared slide was meticulously examined under a microscope, employing a magnification of 100 times its original size. The number of observed helminth eggs was meticulously tallied, and the resulting count was multiplied by a factor of 20 to ascertain the number of eggs per gram (EPG) of fecal matter.

### Data Analysis

Analyses were performed using the Statistical Package for Social Sciences (SPSS) version 25.0, precisely we used descriptive statistics to determine the prevalence and intensity of STH infections among the sampled children. Chi-square tests were employed to evaluate the association between infection rates and demographic variables such as age, gender, and hygiene practices. A  $p$  value  $< 0.05$  was accepted as the level of statistical significance.

## RESULTS

### Prevalence of Helminth Infection

The overall prevalence of Soil Transmitted Helminth (STH) infection recorded in this study was 78.2%. The overall prevalences of *A. lumbricoides*, *T. trichiuria*, and hookworms recorded were 76.4%, 14.5%, and 5.5% respectively. The predominant helminth found in the two private schools was *A. Lumbricoides* while hookworm infection was very low in both schools. The prevalence of helminth infections in relation to sex of which female pupils have a greater rate of infection (Table 1).

**Table 1: Prevalence of helminth infection in relation to sexes**

Sex	N.E	N.I	%
Male	22	15	68.2
Female	33	27	81.8
Total	55	42	76.4

**Keywords:** N.E – Number Examined; N.I – Number Infected

The prevalence of Soil Transmitted Helminth (STH) parasite in relation to the age of the pupil. It was observed that pupils of ages 10 and above had the highest prevalence of STH infection (81.8%). Pupils within 2-3

years show the lowest prevalence of STH. The overall prevalence stood at 78.2% indicating a high rate of infection (Table 2).

**Table 2: Prevalence of Helminth Infection in relation to age**

Age group (Years)	N.E	N.I	%
2-3	3	2	66.7
4-5	9	7	77.8
6-7	16	12	75
8-9	5	4	80
≥10	22	18	81.8
Total	55	43	78.2

The prevalence of *A. lumbricoides* in relation to age and sex of the pupils. In both sexes, the prevalence is highest in pupils aged 10 and above (81.8%) (Table 3).

In males, the prevalence of infection is highest (83.3%) in pupils aged 6-7 years and lowest (33.3% in children aged 4-5 years while in females the prevalence of the infection peaked at 90%. The overall prevalence of *A. lumbricoides* was higher in females (81.8%) than in males (72.7%), with a significant difference in prevalence of infection between the two sexes since  $p < 0.05$  (Table 3).

**Table 3: Overall Prevalence of *A. lumbricoides* in relation to sex and age of pupils**

Age group (Years)	Male			Female			Both Sexes		
	N.E	N.I	%	N.E	N.I	%	N.E	N.I	%
2-3	0	0	0	3	2	66.7	3	2	66.7
4-5	3	1	33.3	6	5	83.3	9	6	66.7
6-7	6	5	83.3	10	7	70	16	12	75
8-9	1	1	100	4	4	100	5	5	100
≥10	12	9	75	10	9	90	22	18	81.8
Total	22	16	72.7	33	27	81.8	55	43	78.2

Table 4 shows the prevalence of soil-transmitted helminths (STHs) in private schools. It was observed that (76.4%) pupils were with *A. lumbricoides*,

(5.45%) of them had hookworm infection while (14.5%) pupils had *T. Trichiura*. Hence, the most prevalent STH was *A. lumbricoides*.

**Table 4: The prevalence of Intestinal Helminth Parasites in private schools**

Helminths	Number examined	Number infected	%
Lumbricoides	55	42	76.4
Hookworm	55	3	5.45
Trichiura	55	8	14.5

Table 5 shows the prevalence rate of *T. trichiuria* among the pupils. Since  $p > 0.05$ , this indicates no significant relationship between the sex of pupils and

the presence of *T. trichiura*. From the result, it implies that the prevalence *T. trichiura* is very low irrespective of age and sex.

**Table 5: The prevalence of Trichiura in private schools by age and sex**

	Number examined	Number Infected	%	df	p
<b>Age group (years)</b>					
2-3	3	0	0.0	1	0.532
4-5	9	2	3.6		
6-7	16	2	3.6		
8-9	5	0	0.0		
≥10	22	4	7.3		
<b>Total</b>	55	8	14.5		
<b>Sex</b>					
Male	22	4	7.3		
Female	33	4	7.3		

The prevalence of *A. lumbricoides* among the pupils; since  $p > 0.05$ , this implies there is no significant relationship between the sex of pupils and infection of *A.*

*lumbricoides*. Based on sex, the result showed that female have a higher rate of infection (49.1%) than male (27.3%) (Table 6).

**Table 6: The prevalence of Ascaris in private school by age and Sex**

	Number examined	Number Infected	%	Df	p
<b>Age group (Years)</b>					
2-3	3	2	3.6	1	0.244
4-5	9	6	10.9		
6-7	16	12	21.8		
8-9	5	4	7.3		
≥10	22	18	32.7		
<b>Total</b>	55	42	76.4		
<b>Sex</b>					
Male	22	15	27.3		
Female	33	27	49.1		

The prevalence of hookworm among the pupils. Since  $p > 0.05$ , it implies that there is no significant relationship between the sex of pupils and hookworm

infestation. From the result, infection among females is twice that of males (Table 7).

**Table 7: The prevalence of hookworm in private school by age and sex**

	Number examined	Number infected	%	Df	p
<b>Age group (Years)</b>					
2-3	3	1	1.8	1	0.808
4-5	9	0	0.0		
6-7	16	1	1.8		
8-9	5	0	0.0		
≥10	22	1	1.8		
<b>Total</b>	55	3	5.5		
<b>Sex</b>					
Male	22	1	1.8		
Female	33	2	3.6		

## DISCUSSION

In this study, fecal samples were collected from two privately owned schools, both located in Ife Central LGA of Osun State, Nigeria. The choice of these schools stems from the availability of demographic information peculiar to parents with somewhat a high socioeconomic status, in contrast to pupils from public schools with low

socioeconomic status. The overall prevalence of Soil Transmitted Helminth (STH) infection recorded in this study was 78.2%. Specifically, the prevalences of *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms were 76.4%, 14.5%, and 5.5%, respectively. *A. lumbricoides* was the predominant helminth found in the two private schools, while hookworm infections were very low.

The study presented in Table 1 highlights the prevalence of helminth infections among school-aged children in Ife Central Local Government, Nigeria, stratified by sex. Out of the total 55 children examined, 42 were found to be infected, resulting in an overall prevalence rate of 76.4%. A closer examination of the data reveals a notable disparity in infection rates between male and female children. Specifically, out of 22 males examined, 15 were infected, corresponding to a prevalence rate of 68.2%. In contrast, out of 33 females examined, 27 were infected, yielding a higher prevalence rate of 81.8%. These findings suggest a significant burden of helminth infections among both sexes, with a higher prevalence observed in females. This depicts a significant disparity in infection rates between sexes, which could be attributed to various socio-behavioral or environmental facts [14].

The age-specific prevalence of helminth infections among school-aged children in Ife Central Local Government, Nigeria, shows notable variations. Among the youngest cohort, aged 2-3 years, 66.7% were infected. Children aged 4-5 years exhibited a higher prevalence rate of 77.8%. For those aged 6-7 years, the infection rate was 75%. The prevalence increased to 80% in the 8-9 years age group (Table 2). The highest prevalence was observed in children aged 10 years and above, with 81.8% infected. The high overall prevalence of 78.2% indicates a substantial burden of helminth infections among school children in the studied area [15].

The data in Table 3 reveals a high prevalence of *Ascaris lumbricoides* among school-aged children in private schools, with an overall infection rate of 78.2%. A gender-specific analysis shows that females have a slightly higher prevalence (81.8%) compared to males (72.7%). The age-specific breakdown indicates the highest infection rates in children aged 8-9 years, with a prevalence of 100% in both sexes and children aged 10 years and above, with an overall prevalence of 81.8%. This sex-based difference in infection rates, with a significant p-value, suggests that gender-specific factors might influence the transmission dynamics of *A. lumbricoides* [16]. Further, *A. lumbricoides* shows the highest prevalence at 76.4%, followed by *Trichuris trichiura* at 14.5%, and hookworm infections at 5.45%. (Table 4) These findings emphasize the need for targeted deworming programs, particularly focusing on *A. lumbricoides* due to their high infection rate, and align with previous studies that identified *A. lumbricoides* as a common intestinal parasite in similar settings [17]. The prevalence of *Trichuris trichiura* infection in private schools is analyzed with respect to age and sex (Table 5). Among the age groups, the highest infection rate is observed in children aged 10 years and above, at 7.3%. There were no infections in the youngest age groups. The infection rates are identical for both males and females at

7.3%, indicating no significant gender disparity. The overall prevalence of *T. trichiura* in this population is 14.5%. The results indicate no significant relationship between sex and the presence of *T. trichiura*, suggesting that the prevalence of *T. trichiura* is low irrespective of age and sex. This low prevalence rate is consistent with findings in other regions where *T. trichiura* is less common compared to other STHs [18].

The overall prevalence of *Ascaris lumbricoides* was 76.4% (Table 6). The infection rates increased with age, peaking in the  $\geq 10$  years age group at 32.7%. The lowest infection rate was observed in the 2-3 years age group (3.6%). Females exhibited a higher prevalence (49.1%) compared to males (27.3%), although the difference was not statistically significant suggesting potential influences from environmental exposures or behavioral practices [19]. Conversely, the overall prevalence of hookworm was low at 5.5%. The infection rates were minimal across all age groups, with only the 2-3, 6-7, and  $\geq 10$  years age groups showing any infections, each with an infection rate of 1.8% (Table 7). The prevalence was slightly higher in females (3.6%) compared to males (1.8%), but again, the difference was not statistically significant ( $p > 0.05$ ). The low prevalence of hookworms points to differing ecological and socio-economic factors affecting helminth transmission within the population [17]. Consistent with previous studies, the high prevalence of *A. lumbricoides* aligns with observations in other regions where socio-economic and environmental conditions contribute to sustained transmission of STHs [20, 21]. The low prevalence of hookworm infections indicates that transmission dynamics for this parasite may differ significantly, potentially influenced by variations in local ecology and socio-economic factors [21].

## CONCLUSION

The high prevalence of helminth infections among school-aged children in private schools in Ife Central LGA, Osun State, Nigeria, underscores the persistent public health challenge posed by soil-transmitted helminths (STHs) in this region. The findings, particularly the significant burden of *Ascaris lumbricoides* and the notable prevalence of *Trichuris trichiura*, indicate a need for comprehensive and targeted deworming programs. Gender and age-specific differences in infection rates suggest that interventions should consider these demographic factors to enhance effectiveness. Further research is needed to understand the socio-behavioral and environmental factors contributing to the observed disparities in infection rates, which can inform more effective and tailored public health strategies.

## RECOMMENDATION

To reduce the burden of helminth infections, it is crucial to implement regular deworming initiatives, improve sanitation and hygiene practices, and enhance health education among school-aged children and their communities. Health education initiatives targeting pupils, teachers, and parents are essential to promote proper hygiene practices such as handwashing with soap, safe food handling, and the use of latrines, which can effectively lower transmission rates. Moreover, improving sanitation infrastructure by providing clean water and adequate toilet facilities is crucial in preventing helminth infections. Continuous monitoring of infection rates and rigorous evaluation of intervention effectiveness are necessary to adapt strategies to local conditions and ensure sustained impact on reducing STH prevalence in school settings.

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### Declarations

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