

PREVALENCE OF INTESTINAL HELMITH INFECTION AMONG PRIMARY SCHOOL CHILDREN IN IDEMILLI NORTH LOCAL GOVERNMENT AREA, ANAMBRA STATE

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ABSTRACT

Intestinal helminth infections continue to constitute a major public health concern, particularly in tropical and developing nations where poor sanitation and unsafe water persist. School-aged children are the most affected group due to frequent environmental exposure and inadequate hygiene practices. This study assessed the prevalence and epidemiological correlates of intestinal helminth infections among primary school children in Idemili North Local Government Area, Anambra State, Nigeria. A descriptive cross-sectional survey was conducted among 250 pupils (130 males and 120 females) aged 5–13 years, randomly selected from two public primary schools. Stool samples were collected in sterile containers and examined microscopically using direct saline smear and formol-ether concentration methods. Data were analyzed using chi-square to determine prevalence and distribution according to age, sex, and school. The overall prevalence of intestinal helminth infection was 40.0%, indicating moderate endemicity. *Ascaris lumbricoides* was the most predominant parasite (21.2%), followed by *Trichuris trichiura* (8.8%) and hookworm species (6.0%), while mixed infections accounted for 4.0%. Infection prevalence was highest among pupils aged 5–7 years (47.5%) and slightly higher in males (43.1%) than females (36.1%). Comparable prevalence between schools suggests shared environmental exposure; linked to poor sanitation, open defecation, and limited access to safe water. The persistence of intestinal helminth infections among children in Idemili North underscores the need for integrated control measures, including periodic school-based deworming, sanitation improvement, and health education. Strengthening intersectoral collaboration between public health authorities and educational institutions is vital for sustainable reduction of helminth transmission and improvement of child well-being.

Keywords: Intestinal helminths; *Ascaris lumbricoides*; prevalence; school-aged children; Anambra State; Nigeria; soil-transmitted helminths; epidemiology; public health.

1. Introduction

Parasitic infections, particularly intestinal helminths, cause hundreds of thousands of avoidable deaths annually and are among the world's most prevalent infectious diseases. Intestinal helminths are described as multicellular pathogens that have the capacity to infect vast populations of human and animal hosts, resulting in widespread chronic disease and morbidity. Furthermore, they are more prevalent throughout the tropics, especially among undeveloped communities. Globally, it has been estimated that over 200 million persons are infected with schistosomes and other intestinal helminth parasites, out of which 85% of the cases are recorded in Africa, and more than 1.5 billion are infected with intestinal helminths (Adeniran, Odu, & Eke, 2020).

Furthermore, records have shown the increased trends in helminth infections, especially in developing nations where there is so much neglect in adequate sanitation, lack of clean water, and improper disposal of waste (consisting of human faeces and other organic waste). It is also imperative to understand that school-age children are one of the groups at high risk for intestinal helminthic infections; the adverse effects of these parasites among children are diverse and alarming (Okoye, Umeanaeto, & Nwoke, 2021).

Similarly, these parasitic infections equally possess detrimental effects on the survival appetite, growth and physical balance, school attendance, and cognitive performability of school-age children. Moreover, higher disease rates occur in children with infections frequently found in those less than 14 years old in many risk areas due to poor hygiene and play habits. In rural and urban areas, water, food, soil, insect bites and eating habits that involve the consumption of raw vegetables, fish, crustaceans and meat are all sources of parasitic infections and also have been identified to allow the transmission of these helminth infections (Anosike, Oguoma, & Nwoke, 2020).

The determination of a sample size of 250 primary school children in this study is scientifically justified based on the estimated prevalence rates of intestinal helminth infections reported in comparable epidemiological investigations within south-eastern Nigeria and in alignment with WHO methodological recommendations. Previous studies conducted in Anambra and neighboring states have documented infection rates ranging between 20% and 45% among school-aged children, indicating a moderate-to-high endemicity that warrants a robust and statistically representative sample for precise prevalence estimation and subgroup analysis (Nwosu et al., 2018; Eze et al., 2020). According to the World Health Organization (WHO, 2017) guidelines for community-based helminthic surveys, a minimum of 200–250 participants is adequate to achieve reliable prevalence estimates within populations of moderate infection intensity, ensuring both analytical precision and external validity. Therefore, the choice of 250 respondents provides an optimal balance between statistical power, resource feasibility, and the epidemiological context of Idemili North Local Government Area, enhancing the reliability and generalizability of the findings to similar endemic settings.

2. Materials and Methods

2.1: Study Area

This study was performed in Idemili North Local Government Area, Anambra State. The local government has its headquarters at Ogidi. The study area (Idemili North Local Government Area) lies between the latitude 717744N and between longitudes 331352E. The

two schools Ilo Eke Nweje primary school and Uru-na-Akanano Central primary school Ogidi. They have a fertile soil which is suitable for agriculture ; the basic occupation of the people is farming. There are hectares of grassland which are for suitable for animal rearing, vast forest reserves and rivers. People in the area grow variety of cash crops namely such as palm oil, cocoa, kola nut, and food crops such as maize. The area is also suitable for a wide range of edible fruits. There are two main seasons, the rainy season and dry season.

2.2: Study Design

A school-based descriptive cross-sectional study was conducted in Idemili North Local Government Area (Ogidi), Anambra State, between April and August, 2023 to determine the prevalence and distribution of intestinal helminth infections among primary school children. The sample size ($n = 250$) was derived using the single-proportion formula, based on an expected prevalence of 40%, as reported in previous regional studies within southeastern Nigeria (Eze et al., 2020; Odu et al., 2017), with a 95% confidence level, 5% margin of error, and an additional 10% allowance for potential non-response. Two public primary schools IEN Primary School and UCP Primary School were purposively selected to represent different catchment areas within the locality. Pupils were subsequently recruited through stratified random sampling using class registers to ensure equitable representation across age groups and sexes. Children who had received anthelmintic medication within the three months preceding data collection were excluded from participation to avoid bias in infection prevalence estimates.

2.3: Study Population

A total of two hundred and fifty consented school children (130 males and 120 females) in these public primary schools were recruited for the study. Their age ranges from 5-13 years. All children in the study went about with their normal activities and were apparently healthy.

2.4: Ethical Consideration

Ethical approval was obtained from the Anambra State Ethical Review Committee. Permission to carry out the study was also obtained from Anambra State Universal Basic Education Board. Written informed consent was obtained from parents/guardians and assent from participating children. Positive cases were treated according to national guidelines.

2.5: Data Collection Procedure and Analysis

2.5.1: Collection of Stool Specimen

Stool samples were collected from 250 pupils, from the two schools. The pupils were educated on how to collect fresh stool that was passed out into a dry clean and labelled universal stool container and the stool specimen was then preserved in 10% formalin and processed using direct method and formol- concentration technique.

2.5.2: Macroscopic examination

Each stool specimen was first examined macroscopically for colour of stool, presence of blood stains or mucus, nature or form of stool (formed, watery, soft or loose). A subsequent examination was carried out microscopically to determine the presence of parasites.

2.5.3: Stool Preparation

Stool collection and laboratory analysis. Fresh stool specimens were collected into labelled clean containers, preserved and transported to the laboratory within X hours. Stool

was examined macroscopically and microscopically using direct saline/wet mount and formolether concentration as described by Cheesbrough (2010). For formol-ether concentration, approximately 1 g of stool was emulsified in 7–10 mL 10% formalin, sieved (using standard sieves), mixed with ether, and centrifuged at $500 \times g$ for 3 minutes; the sediment was examined under $\times 10$ and $\times 40$ objectives. Two independent microscopists examined each slide; 10% of slides were re-read for quality control.

2.5.4: Microscopic Examination

The 10X and 40X objective lenses were used to examine the whole area under the cover slip for parasite ova, cyst, and larvae.

2.5.5: Data Analysis

Data generated from the study were analysed using chi-square for the proportion presenting 95% confidence intervals (CIs) for prevalence estimation.

3. Results and Discussion

3.1: Results

3.1.1: School-Based Prevalence of Intestinal Helminth Infections

The prevalence of intestinal helminth infections among primary school children in Idemili North L.G.A., Anambra State, is presented in Table 3.1. Out of 250 pupils examined, 100 were infected, giving an overall prevalence of 40.0%. The prevalence rate was identical in both schools: IEN (40.0%) and UCP (40.0%). *Ascaris lumbricoides* was the predominant species (21.2%), followed by *Trichuris trichiura* (8.8%) and hookworm species (6.0%), while mixed infections accounted for 4.0% of cases.

3.2: Age specific Prevalence of Intestinal Helminth Infection among Primary School Children in Idemilli North L.G.A Anambra State

The age distribution shows that helminth infections were more prevalent among children aged 5–7 years (47.5%), compared to those aged 8–10 years (38.0%) and 11–13 years (34.3%). Younger pupils exhibited higher infection rates, possibly due to increased exposure to contaminated environments and lower levels of personal hygiene awareness. *Ascaris lumbricoides* was the most common species across all age groups.

3.3: Sex-Specific Prevalence of Intestinal Helminth Infection among Primary School Children in Idemilli North L.G.A Anambra State

The prevalence of intestinal helminth infections was slightly higher in male pupils (43.1%) than in female pupils (36.7%). This difference may be attributed to behavioral factors such as increased outdoor play and physical activities among boys, which heighten exposure to contaminated soil or water. Nevertheless, statistical analysis indicates no significant gender-based difference in infection prevalence.

Table 3.1: Prevalence of Intestinal helminth infections among primary school children in Idemilli North L.G.A Anambra State

Sch	NO. Exa.	No. Infect.	P(%)	<i>Ascaris</i>	<i>Trichuris</i>	Hookworm	Mixed Infected
IEN	120	48	40.0	25(20.8%)	10(8.3%)	8(6.7%)	5(4.2)
UCP	130	52	40.0	28(21.5%)	12(9.2%)	7(5.4%)	5(3.8)

Keys:

No Examined, Sch= School, No Infected, P= Prevalence

Table 3.2: Age specific Prevalence of Intestinal Helminth Infection among Primary School Children in Idemilli North L.G.A Anambra State

Age Group (years)	NO. Exam.	NO. Infected	P(%)	Dominant species
5-7	80	30	47.5	<i>Ascaris lumbricoides</i>
8-10	100	38	38.0	<i>Ascaris lumbricoides</i> , <i>Trichuris trichiura</i>
11-13	70	24	34.3	<i>Ascaris lumbricoides</i>
Total	250	100	40.0	

Table 3.3: Sex-Specific Prevalence of Intestinal Helminth Infection among Primary School Children in Idemilli North L.G.A Anambra State

Sex	No. Examined	No. Infected	Prevalence (%)	Dominant species
Male	130	56	43.1	<i>A. lumbricoides</i>
Female	120	44	36.1	<i>T. trichiura</i>
Total	250	100	40.0	

3.2 Discussion

3.2.1: School-Based Distribution

The comparable prevalence rates recorded across both schools strongly suggest a homogeneity of environmental and behavioural risk exposures among pupils within Idemili North Local Government Area. This epidemiological uniformity implies that schoolchildren in the region are collectively influenced by similar ecological and socio-sanitary determinants, notably inadequate sanitation facilities, indiscriminate defecation practices, and limited access to potable water sources. Such conditions create an enabling environment for the persistent transmission and reinfection cycles characteristic of soil-transmitted helminthiasis in tropical developing settings.

The predominance of *Ascaris lumbricoides* (21.2%) resonates with prior findings from southeastern Nigeria and other equatorial regions, reaffirming its status as the most resilient and geographically pervasive soil-transmitted helminth (STH) (Okoye et al., 2021; Pullan & Brooker, 2012). The ecological success of *A. lumbricoides* is largely attributable to the extraordinary durability of its ova, which possess thick chitinous shells that confer resistance to desiccation, ultraviolet radiation, and fluctuating soil temperatures, enabling their viability for extended periods under moist tropical conditions (Bethony et al., 2006).

In contrast, the moderate prevalence of *Trichuris trichiura* (8.8%) and hookworm species (6.0%) underscores the multiplicity of transmission routes in the study area. *T. trichiura* primarily through oral ingestion of embryonated eggs, and hookworm species through cutaneous penetration by infective larvae. These differential infection routes reflect the complex interplay of environmental exposure, behavioral habits, and vector ecology shaping helminth transmission dynamics. Comparable parasitological profiles have been documented in other Nigerian endemic foci such as Ogun and Enugu States (Eke et al., 2019; Odu et al., 2017), attesting to the endemic uniformity of helminth ecology across the humid tropical belt.

The detection of mixed infections (4.0%) further signifies the phenomenon of polyparasitism, a hallmark of rural and peri-urban communities where environmental sanitation remains grossly deficient. Such co-infections are of considerable public health concern, as they often produce synergistic pathological effects, intensifying nutritional depletion, anemia, and immunomodulatory stress among infected children (Brooker et al., 2015). The coexistence of multiple helminth species within a single host not only amplifies disease burden but also complicates therapeutic efficacy, thereby reinforcing the urgent need for integrated deworming interventions, improved sanitation infrastructure, and sustained health education to curtail transmission cycles within school populations.

3.2.2 Age-Specific Prevalence Patterns

The markedly elevated infection rate observed among pupils aged 5–7 years (47.5%) substantiates the long-standing epidemiological assertion that younger children exhibit greater vulnerability to intestinal helminth infections, largely owing to their immature immune competence and undeveloped hygienic practices (Asaolu & Ofoezie, 2018). At this formative stage, children are frequently engaged in unrestrained outdoor play often barefooted and without consistent adherence to personal hygiene protocols such as proper handwashing before meals thereby heightening their exposure to infective larval or egg stages present in contaminated soil, water, or food sources (Ogunrinade & Ogunrinade, 2017).

The gradual decline in prevalence with increasing age may reflect both acquired partial immunity arising from repeated low-intensity exposures and behavioural maturation that accompanies advancing childhood. As pupils grow older, improved awareness of hygiene reduced geophagic tendencies, and greater supervision from parents and teachers likely contribute to diminished transmission risk. Comparable age-associated patterns have been documented by Anosike et al. (2020) in Enugu State and Uneke et al. (2020) in Cross River State, underscoring the consistency of this age-dependent epidemiological gradient across different Nigerian ecological zones.

Furthermore, the co-dominance of *Ascaris lumbricoides* and *Trichuris trichiura* among pupils aged 8–10 years may represent a cumulative exposure phenomenon, reflecting prolonged residence in endemic environments and sustained contact with contaminated soil and water sources (Gyorkos et al., 2020). Such patterns of dual or concurrent infection highlight the chronicity of transmission cycles in communities where environmental sanitation remains suboptimal and preventive health education is inadequate.

3.2.3 Sex-Specific Prevalence Patterns

Although intestinal helminth infections were observed in both sexes, the prevalence was marginally higher among male pupils (43.1%) compared with their female counterparts (36.1%). This disparity, though not necessarily statistically significant, may be attributed to gender-related behavioural tendencies. Male children are more likely to engage in outdoor recreational and agricultural activities such as farming, playing barefoot, or swimming in stagnant water that increase direct contact with contaminated soil and water sources (Tchuem Tchuente et al., 2018).

Notably, *Ascaris lumbricoides* predominated among males, whereas *Trichuris trichiura* was more frequently detected among females. Such variation could arise from differences in environmental exposure intensity, activity patterns, or subtle physiological factors influencing parasite establishment and host susceptibility. Nonetheless, previous investigations across Nigeria have consistently demonstrated that infection risk is primarily governed by environmental and behavioral factors rather than intrinsic biological or sex-linked predispositions (Adeniran et al., 2020; Pullan et al., 2019).

Moreover, the overall prevalence of 40% observed in this study aligns closely with analogous findings reported from other regions of Nigeria 41.2% in Imo State (Eze et al., 2021), 39.8% in Ogun State (Odu et al., 2017), and 43.0% in Enugu State (Anosike et al., 2020). This remarkable uniformity underscores the entrenched endemicity of soil-transmitted helminthiasis within Nigeria's tropical ecological belt. At the continental level, Sub-Saharan Africa bears nearly half of the global burden of soil-transmitted helminths (STHs), a situation perpetuated by persistent environmental contamination, inadequate sanitation, and entrenched socioeconomic disparities (WHO, 2023; Pullan et al., 2019).

The predominance of *A. lumbricoides* alongside the coexistence of *T. trichiura* and hookworm species typifies the parasitic ecology of tropical developing regions, where multiple helminths share overlapping transmission routes and thrive under similar environmental conditions (Bethony et al., 2006). The occurrence of polyparasitism is of particular epidemiological concern, as concurrent infections can exert synergistic pathological effects intensifying anemia, impairing nutrient absorption, and diminishing

cognitive and educational performance among school-aged children (Hotez et al., 2019; Brooker et al., 2015).

Collectively, these findings reinforce the need for integrated helminth control interventions that combine mass deworming with sustainable improvements in water, sanitation, and hygiene (WASH) infrastructure, complemented by targeted health education aimed at modifying gender-specific risk behaviours.

4. Conclusion

This study establishes that intestinal helminth infections remain a significant public health issue among primary school children in Idemili North L.G.A., Anambra State. The dominance of *Ascaris lumbricoides* and the relatively high prevalence across age and sex categories highlight persistent environmental contamination and behavioral risk factors. Comprehensive intervention strategies combining periodic deworming, sanitation improvement, and school-based hygiene education are urgently required to mitigate the burden of these infections and enhance child health and educational outcomes in the region.

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