

## ENVIRONMENTAL PUBLIC HEALTH IMPLICATIONS OF GEOHELMINTHS IN PATIENTS ATTENDING THE UNIVERSITY OF PORT HARCOURT TEACHING HOSPITAL, RIVERS STATE

**Authors:** Akeru Chukwuemeka Clinton<sup>1</sup>, Ishado Stephen Ayeni\*<sup>2</sup>, Innocent Chibuikwe Okafor<sup>3</sup>, Alika Ezeibunwo Leonard<sup>4</sup>, Udogwu Emiri<sup>1</sup>, Idorenyin Emem Abang<sup>2</sup>

<sup>1</sup>Department of Data Science, Faculty of Engineering, Computational and Environmental Sciences, Coventry University, United Kingdom

<sup>2</sup>Department of Zoology and Environmental Biology, University of Calabar, Calabar, Nigeria

<sup>3</sup>University of Uyo Teaching Hospital, Uyo, Akwa Ibom State, Nigeria

<sup>4</sup>Department of Health System Management, School of Public Health, University of Port Harcourt, Rivers State, Nigeria

Corresponding author email: [ishadostephen86@gmail.com](mailto:ishadostephen86@gmail.com)

### Author's contributions

This study was a collaborative effort of the authors. The authors reviewed and approved the final version of the manuscript for publication.

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### Abstract

Geohelminths are a group of soil-transmitted parasites most prevalent in tropical and subtropical regions and capable of causing serious health issues to vital human organs such as the liver. This study investigated the prevalence of geohelminths in patients attending University of Port Harcourt Teaching Hospital (UPTH), East-West Road, Rivers state, Nigeria, between 15<sup>th</sup> and 27<sup>th</sup> March, 2021. Faecal samples of 108 (57 males and 51 females) outpatients from the pediatric ward were collected and examined for the presence of geohelminths. In all 108 samples examined using a saturated brine solution (floatation method) in search of the three mentioned geohelminths: *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm, only one sample was positive for *Ascaris lumbricoides*, which was found in a female child. The prevalence of the study was 0.93%. In urban areas and semi-urban areas, anthelmintics are administered continuously for regular deworming and there is also better sanitation and hygiene in such areas compared to rural. The low prevalence observed may reflect improved sanitation and deworming programs in the study area, although larger community-based studies are required to confirm this trend. The study further recommends continuous administration of anthelmintics, as well as health education and proper hygiene to keep improving the decline of geohelminths in the region.

**Keywords:** *Geohelminths, Pediatric Health, Urbanization, Ascaris lumbricoides, Epidemiological transition.*

### INTRODUCTION

Geohelminths, also known as soil-transmitted helminths (STHs), are intestinal parasitic nematodes transmitted through soil contaminated with human faeces. They possess a direct life cycle without intermediate hosts, and infection occurs via ingestion of infective eggs or skin penetration by larvae (Bethony *et al.*, 2006; Hotez *et al.*, 2004). The principal species of public health importance include *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms (*Necator americanus* and *Ancylostoma duodenale*) (Pullan *et al.*, 2014). After infection, juvenile stages migrate through tissues such as the liver and lungs before maturing in the intestine, resulting in both local and systemic disease manifestations (Bethony *et al.*, 2006). STH infections are most prevalent in warm, humid

regions with poor sanitation, although transmission may also occur seasonally in temperate climates (Brooker *et al.*, 2006). Globally, school-aged children bear the highest burden of infection, with chronic exposure linked to malnutrition, anaemia, growth retardation, and impaired cognitive development (Hotez *et al.*, 2008; Jourdan *et al.*, 2018). Nigeria carries one of the highest STH burdens in sub-Saharan Africa, with reported prevalence rates of 25% for *A. lumbricoides*, 16.86% for hookworms, and 9.74% for *T. trichiura*. Higher prevalence is observed in southern Nigeria, largely influenced by environmental factors such as temperature, rainfall, and altitude (Yaro *et al.*, 2018). Despite existing data, there is a need to monitor these trends within urban clinical settings to evaluate the impact of ongoing public health interventions. The objective of this study was to determine the prevalence of soil-transmitted helminths among pediatric patients attending the University of Port Harcourt Teaching Hospital.

## **MATERIALS AND METHODS**

### **Study Area**

The University of Port Harcourt Teaching Hospital (UPTH) is located along East-West Road in Port Harcourt, Rivers State, Nigeria. As a major federal tertiary-care and research facility, it serves as a primary referral center for the South-South geopolitical zone. The facility is geographically situated at approximately latitude 4°53' 12.912" N and longitude 6°55' 27.768" E.

### **Study Design**

This research employed a hospital-based cross-sectional design to investigate the prevalence of soil-transmitted helminths among a pediatric population.

### **Study Population and Ethical Approval**

The study population consisted of 108 pediatric outpatients (57 males and 51 females) aged 6–16 years attending the pediatrics ward. Participation was voluntary, and informed consent was obtained from the parents or guardians of all participants. Ethical approval for this study was obtained from the Ethics Committee of the University of Port Harcourt Teaching Hospital.

### **Sample Collection**

Stool samples were taken from 108 outpatients (57 males and 51 females), who came for stool analysis at the University of Port Harcourt Teaching Hospital in Rivers State and the stool was collected in specimen bottles and quickly taken to a laboratory for immediate examination. Formalin was used to preserve stool samples and geohelminths in the samples. Samples were collected within 12 days, 15<sup>th</sup> March- 27<sup>th</sup> March 2021

### **Parasitological Examination of Samples**

A total of 108 faecal samples were processed and analyzed at the Department of Microbiology and Parasitology Laboratory. Each specimen underwent an initial macroscopic evaluation to document physical characteristics, including pigmentation (ranging from dark to light brown), consistency (classified as formed, semi-formed, or watery), and the presence of visible inclusions such as blood, mucus, or adult helminths. For the microscopic detection of geohelminth ova, samples were analyzed using the direct wet mount method (Salawu *et al.*, 2014) and the saturated sodium chloride (*NaCl*) flotation technique. The flotation medium was prepared by dissolving sodium chloride in heated, distilled, or filtered water until reaching a point of supersaturation, evidenced by the presence of undissolved salt sediments at the base of the solution. To facilitate egg recovery, a representative portion of the faecal matter was emulsified in the saturated brine within a flotation vial using an applicator stick. The vial was filled to the brim to form a convex meniscus, over which a clean glass slide was placed in direct contact with the solution. After a 20-minute incubation period to allow for the buoyancy-driven migration of eggs to the surface, the slide was removed, fitted with a coverslip, and examined via light microscopy. Systematic screening for geohelminth eggs and ova was conducted using 10× and 40× objective lenses.

### **Statistical Analysis**

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics were used to summarize the prevalence of infection. Due to the low prevalence observed in this sample, inferential statistical testing (such as Chi-square analysis) was deemed inappropriate for comparing variables, and results are presented as absolute values.

## RESULTS

### Prevalence of Geohelminths

Analysis of the 108 faecal samples collected from the University of Port Harcourt Teaching Hospital (UPTH) pediatric department revealed a very low occurrence of infection. Out of the total study population, only one participant tested positive for geohelminths, representing an overall prevalence of 0.93%. No cases of double helminth infections were recorded. The specific species identified was *Ascaris lumbricoides*, found in a 10-year-old female participant. Macroscopic examination of the positive sample showed a dark brown, formed stool with no visible blood or mucus. Microscopic identification was confirmed by the presence of *A. lumbricoides* ova. Regarding the physical characteristics of all samples, 90.7% were brown, while 9.3% appeared dark in color. In terms of consistency, 15.7% of the samples were formed, and 84.3% were classified as semi-formed.

### Prevalence of Geohelminths by sex

Out of 108 students sampled, there was only one female infected; the males were all negative which shows a positive case of ova of *Ascaris lumbricoides* in the female Table 1.

**Table 1: Showing Sex Related Prevalence in Geohelminths**

SEX	No. Examined	Ova of geohelminths	% Prevalence
F	51	1	1.96
M	57	0	0
TOTAL	108	1	0.93

**Table 2: Overall Prevalence of Geohelminths by Sex**

Sex	No. Examined	A. L	T. T	H. W
Male	57	0(0)	0(0)	0(0)
Female	51	1(1.96)	0(0)	0(0)
Total	108	1(0.93)	0(0)	0(0)

A.L= *Ascaris lumbricoides*, T.T= *Trichuris trichiura*, HW= Hookworm

### Prevalence of Geohelminths by Age

The distribution of geohelminth infection across the various age cohorts is summarized in Table 1. The study population was categorized into four age groups: 6–8 years, 9–11 years, 12–14 years, and 15–16 years. The findings indicate that the prevalence of infection was concentrated entirely within the 9–11 age bracket. Specifically, one infection was recorded among the 35 participants in this group, resulting in a category-specific prevalence of 2.86%. Conversely, no infections were detected in the 6–8 years (n=26), 12–14 years (n=29), or 15–16 years (n=18) cohorts, all of which recorded a 0.0% prevalence rate.

**Table 3: Age related prevalence of Geohelminths**

Age group	No. Examined	No. of infected	% Prevalence
6-8	10	0	0
9-11	50	1	2
12-14	44	0	0
15-16	4	0	0
Total	108	1	0.93

**Table 4: Age-related prevalence**

Age Group	No. Examined	A. L	T. T	HW
6-8	10	0(0)	0(0)	0(0)
9-11	50	1.(2)	0(0)	0(0)
12-14	40	0(0)	0(0)	0(0)
15-16	3	0(0)	0(0)	0(0)
Total	108	1(1.96)	0(0)	0(0)

**A.L=** *Ascaris lumbricoides*, **T.T=** *Trichiuris trichiura*, **HW=** Hookworm

## DISCUSSION

The findings of this study reveal an exceptionally low prevalence of geohelminth infections (0.93%) among pediatric outpatients at the University of Port Harcourt Teaching Hospital (UPTH). Out of 108 children examined, only a single case of *Ascaris lumbricoides* was identified in a 10-year-old female. This observed prevalence is significantly lower than previous reports from the same region; for instance, Nwokeocha *et al.* (2018) reported a 27.1% prevalence in nearby shanty settlements, while Odu *et al.* (2013) found a 15.7% rate among primary school children in urban Port Harcourt. While these results might suggest a downward trend in geohelminthiasis, the low infection rate within this specific hospital-based sample must be interpreted with caution rather than as a definitive regional decline. The near-absence of *Trichuris trichiura* and hookworms in this cohort may reflect the specific demographic characteristics of patients seeking care at a tertiary institution like UPTH. Patients attending such facilities often originate from urban or semi-urban areas where sanitation infrastructure and health literacy are relatively superior to rural settings. Furthermore, the findings likely highlight the impact of the World Health Organisation's recommended preventive chemotherapy (PC) programs. In Nigeria, routine anthelmintic administration (deworming) has become a cornerstone of pediatric public health, effectively reducing the intensity and prevalence of soil-transmitted helminths (STHs) in accessible populations (WHO, 2017). Despite the low prevalence, the identification of *A. lumbricoides* remains clinically significant. As noted by Dold and Holland (2011), the juvenile tissue-migratory stage of *Ascaris* can lead to pulmonary complications or visceral damage even before adult worms mature in the intestine. The presence of even a single case underscores the persistent risk of environmental contamination and the need for maintained vigilance in public health surveillance.

## CONCLUSION

This study observed an exceptionally low prevalence (0.93%) of soil-transmitted helminths among pediatric outpatients at the University of Port Harcourt Teaching Hospital, with *Ascaris lumbricoides* being the only species identified. While these findings suggest a potential reduction in the burden of geohelminthiasis within this specific urban clinical setting, they do not necessarily indicate a total regional decline. The results likely reflect the positive impact of ongoing deworming programs and improved sanitation among the hospital's catchment population. However, maintaining public health surveillance and larger community-based longitudinal studies remain essential to confirm these trends and to ensure the total eradication of soil-transmitted helminths within Rivers State.

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## Conflict of Interests

No conflict of interest.

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