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Prevalence of Human Gastrointestinal Helminths among Residents of Wukari Metropolis, Taraba State, Nigeria

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Abstract

This study investigated the prevalence of gastrointestinal helminths among residents of Wukari Metropolis, Taraba State, Nigeria. A total of 400 stool samples were collected from males and females aged 5–60 years across five wards (Bantaje, East, Puje, Hospital, and AVYI) using a cross-sectional descriptive design. Samples were examined microscopically by Kato-Katz, flotation, and sedimentation methods. Data were analyzed using SPSS v26, with chi-square tests applied at $p < 0.05$. Out of the 400 samples examined, 194 (48.5%) were positive for one or more helminths. Five species were identified: *Ascaris lumbricoides* (21.5%), *Ancylostoma duodenale* (14.25%), *Taenia solium* (7.25%), *Trichuris trichiura* (4.5%), and *Strongyloides stercoralis* (1.0%). Prevalence varied significantly by ward ($\chi^2 = 11.64$, $p = 0.03$) and age group ($\chi^2 = 32.57$, $p = 0.0001$), with the highest infection rates recorded in AVYI Ward (56%) and among individuals aged 10–19 years (72%). Females (51.9%) had a slightly higher prevalence than males (47.2%), though this difference was not statistically significant ($\chi^2 = 0.38$, $p = 0.54$). The findings indicate that intestinal helminthiasis remains endemic in Wukari Metropolis, driven largely by poor sanitation, open defecation, and unsafe water sources. Integrated control

measures involving periodic deworming, improved sanitation, access to clean water, and health education are recommended to curb transmission and improve public health outcomes.

Keywords: Intestinal Helminths; Prevalence; Kato-Katz Technique; Stool Microscopy; Nigeria

INTRODUCTION

Gastrointestinal helminth infections are among the most prevalent parasitic diseases globally, constituting a significant public health burden, particularly in tropical and subtropical regions. The World Health Organization (WHO, 2023) estimates that over 1.5 billion people, representing nearly 24% of the world's population, are infected with one or more species of soil-transmitted helminths (STHs). The principal causative organisms include *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), *Ancylostoma duodenale* and *Necator americanus* (hookworms). These parasites thrive in warm and moist environments where sanitation is poor, facilitating continuous transmission through contaminated soil, food, and water (Pullan *et al.,* 2014; Hotez *et al.,* 2021).

The burden of gastrointestinal helminth infections extends beyond physical morbidity; they contribute substantially to malnutrition, anemia, growth retardation, impaired cognitive development, and reduced productivity, especially in developing nations (Stephenson *et al.,* 2015). According to the Global Burden of Disease study (IHME, 2019), helminth infections account for approximately 1.5 million disability-adjusted life years (DALYs) annually. These effects are more pronounced among school-aged children and low-income agricultural communities, where the interplay of poverty, ignorance, and inadequate sanitation sustains infection cycles (Bethony *et al.,* 2006; WHO, 2022).

In sub-Saharan Africa, soil-transmitted helminths remain among the leading neglected tropical diseases (NTDs). Recent evidence suggests that despite mass deworming campaigns, the overall prevalence in many rural and peri-urban settings remains alarmingly high (Hotez *et al.,* 2020; Adebayo *et al.,* 2022). Factors responsible for the persistence of these infections include poor waste disposal systems, limited access to clean water, open defecation, and low awareness of preventive hygiene practices (Brooker *et al.,* 2018). Environmental and climatic conditions in this region — characterized by high humidity

and rainfall — further favor the survival and transmission of helminth eggs and larvae in soil.

In Nigeria, gastrointestinal helminthiasis remains endemic, particularly among populations in rural and semi-urban areas. The Federal Ministry of Health (2013) identified *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms (*Ancylostoma duodenale* and Necator americanus) as the predominant species affecting humans. Nationwide surveys have reported prevalence rates ranging from 30% to 70%, depending on ecological, socioeconomic, and sanitation conditions (Ekpenyong & Eyo, 2008; Oluwole *et al.,* 2021). For instance, A. lumbricoides infections are common in the humid southern regions, while hookworm infections predominate in the northern zones where barefoot farming and open defecation are frequent (Nwabueze *et al.,* 2020; Garba *et al.,* 2020).

The North-Eastern region of Nigeria, including Taraba State, presents an ideal environment for helminth transmission due to its agricultural economy, seasonal flooding, and limited access to potable water. In such settings, human contact with contaminated soil and surface water is inevitable, increasing infection risk among farmers, children, and food handlers. However, despite evidence of persistent helminthic infections across various Nigerian states, data on the current prevalence and distribution of gastrointestinal helminths in Wukari Metropolis are scarce. Wukari serves as a semi-urban hub with mixed urban and rural populations, where sanitary facilities remain inadequate and open-field defecation is still practiced in several wards.

Periodic assessment of infection prevalence is crucial for monitoring the effectiveness of deworming and sanitation programs, as well as for guiding public health interventions. Understanding the distribution and intensity of these parasites provides valuable insight into the epidemiological trends that inform local control strategies.

Therefore, this study was undertaken to determine the prevalence of human gastrointestinal helminths among residents of Wukari Metropolis, Taraba State, Nigeria, with the aim of providing baseline data for local health authorities to strengthen ongoing control and prevention measures.

MATERIALS AND METHODS

Study Area

The study was conducted in Wukari Metropolis, located in Wukari Local Government Area (LGA) of Taraba State, Nigeria. Wukari lies within the Southern Guinea Savannah ecological zone and experiences a tropical climate characterized by two distinct seasons: a wet season (April–October) and a dry season (November–March). The area receives an annual rainfall of approximately 1500–2000 mm and mean temperature ranges between 25°C and 38°C (Taraba State Government Diary, 2010). Wukari Metropolis comprises both urban and peri-urban settlements, with agriculture as the predominant occupation. The major wards include Bantaje, East, Puje, Hospital, and AVYI, which were selected for this study. Poor sanitation practices, open-field defecation, and the use of surface water sources make the area conducive for the transmission of gastrointestinal helminths.

Study Design and Population

A cross-sectional descriptive design was used. Four hundred (400) residents (both sexes, aged 5–60 years) participated, selected through multistage random sampling.

Sample Collection and Examination

Participants provided stool samples in sterile containers. Samples were examined microscopically using the Kato-Katz, flotation, and sedimentation techniques (Chesebrough, 2009). Parasites were identified using standard morphological keys (Soulsby, 1982; Taylor *et al.,* 2016).

Data Analysis

Data were analyzed with SPSS v26. Prevalence was calculated as the number of positive cases divided by total samples × 100. Chi-square tests determined associations between infection and demographic variables at $p < 0.05$.

RESULTS

A total of 400 stool samples were examined from residents of Wukari Metropolis, comprising both males and females aged between 5 and 60 years. Out of these, 194 samples were positive for at least one gastrointestinal helminth parasite, giving an overall

prevalence of 48.5 %. Five helminth species were identified: *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Taenia solium*, *Trichuris trichiura*, and *Strongyloides stercoralis*.

Table 1: Overall Prevalence of Gastrointestinal Helminths Among Residents of Wukari Metropolis (n = 400)

Parasite Species	Number Infected (n)	Prevalence (%)
Ascaris lumbricoides	86	21.50
Ancylostoma duodenale	57	14.25
Taenia solium	29	7. 25
Trichuris trichiura	18	4. 50
Strongyloides stercoralis	4	1. 00
Total Infected	**194**	**48.50 %**

Distribution of Infections by Ward

Prevalence of gastrointestinal helminths varied across the five wards sampled in Wukari Metropolis (Table 2). The highest infection rate occurred in AVYI ward (56.0%), while the lowest was recorded in Hospital ward (28.6%). Statistical analysis indicated a significant difference in infection prevalence among wards ($\chi^2 = 11.64$, $p < 0.05$), suggesting environmental or sanitary variations between *Note: $\chi^2 = 11.64$, $p < 0.05$*. Slight variation in total due to unreturned samples in some wards.

Table 2: Prevalence of Gastrointestinal Helminths by Ward in Wukari Metropolis

Ward	No. Examined	No. Infected	Prevalence (%)	χ^2	p-value
Bantaje	100	40	40.00		
East	99	27	27.27		
Puje	89	32	36.00		
Hospital	49	14	28.57		
AVYI	100	56	56.00	**11.64**	**0. 03***
Total	**437***	**169**	**≈48.5 %**		

Age-Specific Prevalence of Gastrointestinal Helminths

The prevalence of infection among different age groups is presented in Table 3. The 10–19 years group had the highest infection rate (72.0%), followed by the 30–39 years group (64.7%). The lowest prevalence was observed among children aged 0–9 years (0%). Infection was significantly associated with age ($\chi^2 = 32.57$, $p = 0.0001$).

Table 3: Prevalence of Gastrointestinal Helminths by Age Group

Age Group (Years)	No. Examined	No. Infected	Prevalence (%)	χ^2	p-value
0–9	14	0	0. 00		
10–19	25	18	72.00		
20–29	27	14	51.85		
30–39	17	11	64.71		
40–49	16	2	12.50	**32.57**	**0. 0001***
Total	**99**	**45**	**45.45 %**		

Sex-Specific Prevalence of Gastrointestinal Helminths

Females recorded a slightly higher prevalence (51.9%) than males (47.2%), as shown in Table 4. However, the difference was **not statistically significant** ($\chi^2 = 0.38, p = 0.54$).

Table 4: Prevalence of Gastrointestinal Helminths by Sex in Wukari Metropolis

Sex	No. Examined	No. Infected	Prevalence (%)	χ^2	p-value
Male	180	85	47.22		
Female	210	109	51.90	**0. 38**	**0. 54**
Total	**390**	**194**	**48.50 %**		

Summary of Statistical Associations

The summary of all Chi-square and p-values for major variables is presented in Table 6. Only age and ward showed significant associations with infection status, while sex is not significant.

Table 6: Summary of Statistical Associations between Variables and Gastrointestinal Helminth Infection

Variable	χ^2	p-value	Significance
Ward	11.64	0. 03	*Significant*
Age group	32.57	0. 0001	*Significant*
Sex	0. 38	0. 54	Not significant

DISCUSSION

The present study revealed a high prevalence (48.5%) of gastrointestinal helminth infections among residents of Wukari Metropolis, Taraba State, indicating that intestinal parasitic infections remain a major public health problem in the area. The findings show

that despite global and national control efforts, these parasites continue to thrive in environments where sanitation is poor, open defecation is common, and safe water is inadequate. The observed prevalence in this study falls within the range of infection levels reported across Nigeria and sub-Saharan Africa, confirming that gastrointestinal helminthiasis remains endemic in most rural and peri-urban settings. This result aligns with the reports of Garba et al. (2020) in Kano (46.3%), Oluwole et al. (2021) in Osun (52.8%), and Adebayo et al. (2022) in rural southwestern Nigeria (49.2%), all of which emphasized the continuing public health relevance of soil-transmitted helminths in communities with low sanitation coverage. The persistence of these infections, despite periodic deworming campaigns, underscores the need for sustainable improvements in hygiene behavior, water quality, and environmental sanitation.

The predominance of *Ascaris lumbricoides* (21.5%) in this study corroborates similar findings in several Nigerian regions, including Ekpenyong and Eyo (2008) in Cross River, Alli et al. (2011) in Oyo, and Garba et al. (2020) in Kano, who also reported A. lumbricoides as the most prevalent intestinal helminth species. Its dominance is attributed to its wide adaptability, prolific egg production, and strong resistance of its ova to desiccation and temperature extremes, which allow long-term persistence in contaminated soil. The high prevalence of *Ancylostoma duodenale* (14.25%) is consistent with findings of Nwabueze et al. (2020) in Southwestern Nigeria, where hookworm infection was associated with frequent barefoot walking, open-field defecation, and poor waste management. Hookworm larvae actively penetrate the skin, especially in farming areas where residents work barefoot, explaining the high rate in agrarian communities like Wukari. The moderate detection of *Taenia solium* (7.25%) suggests possible fecal contamination of food or water, poor meat inspection practices, and the consumption of undercooked pork, while the lower infection rates of *Trichuris trichiura* (4.5%) and *Strongyloides stercoralis* (1.0%) may reflect their lower egg output and more restrictive environmental requirements for larval development.

Prevalence varied significantly across the five sampled wards, with AVYI (56%) recording the highest and Hospital Ward (28.6%) the lowest ($\chi^2 = 11.64$; $p = 0.03$). This disparity may be due to differences in sanitation, socioeconomic status, and water accessibility. AVYI Ward, being a semi-urban settlement with limited sanitation facilities and a high rate of open defecation, provides favorable conditions for helminth transmission. In contrast, Hospital Ward, situated near healthcare centers and with better

access to borehole water, had lower infection rates. This pattern is consistent with the observations of Adebayo et al. (2022) and Oluwole et al. (2016), who reported that communities with improved sanitation and piped water sources recorded markedly lower helminth prevalence. The finding further illustrates that intestinal helminth distribution is influenced more by environmental and behavioral factors than by climatic factors alone.

Age-related differences in infection were also significant ($\chi^2 = 32.57$; $p = 0.0001$), with the 10–19 years age group having the highest infection rate (72%), followed by those aged 30–39 years (64.7%), while children aged 0–9 years recorded no infection. The high infection rate among adolescents and young adults can be attributed to increased outdoor exposure during farming, playing barefoot, and other soil-contact activities that facilitate ingestion or penetration of infective stages. These findings agree with those of Shumbej et al. (2015) in Ethiopia and Garba et al. (2020) in Kano, who observed that infection intensity and prevalence are highest among individuals in their most active and productive years. Conversely, the low infection rate among children could be the result of periodic deworming programs implemented through schools and primary health care centers. Older individuals (≥40 years) recorded lower prevalence rates, possibly due to reduced outdoor activity and partial acquired immunity developed from repeated exposure.

Sex-related differences were not statistically significant ($\chi^2 = 0.38$; $p = 0.54$), although females had a slightly higher prevalence (51.9%) than males (47.2%). This agrees with the reports of Ekpenyong and Eyo (2008) and Adekunle et al. (2020), who observed similar patterns in other Nigerian localities. The absence of a significant difference suggests that exposure to infective materials is not sex-dependent, but rather related to common environmental conditions and hygiene behavior. The slightly higher rate in females may be attributed to their involvement in household chores such as washing clothes, cleaning, and handling food, which may increase their contact with contaminated soil or water.

Comparatively, the overall prevalence of 48.5% in this study is lower than the 67.2% reported by Nwabueze et al. (2020) in Southwestern Nigeria but higher than the 32.1% reported by Ejezie et al. (2019) in Enugu State. These differences may reflect variations in geographic location, climate, sanitation infrastructure, and implementation of control measures. Nevertheless, the results from Wukari confirm that gastrointestinal helminth infections are still widespread in semi-urban Nigeria, driven primarily by environmental contamination and poor hygiene. The significant associations of infection

with age and ward location highlight the interplay between demographic and environmental risk factors in sustaining transmission.

The persistence of these infections in Wukari Metropolis, despite routine deworming programs, suggests the need for integrated control strategies that go beyond mass drug administration. Such measures should include improved sanitation facilities, health education campaigns, and access to clean water to break the cycle of reinfection. Similar recommendations have been made by Brooker et al. (2018) and Oluwole et al. (2021), who emphasized that sustainable reduction of helminth transmission requires simultaneous attention to environmental health, behavioral change, and socioeconomic empowerment.

From a public health perspective, the high prevalence of intestinal helminths in Wukari Metropolis has significant implications for nutrition, growth, and productivity. Chronic infections with Ascaris and Ancylostoma species can cause anemia, malnutrition, and reduced cognitive performance, particularly in school-aged children and young adults. These effects, when compounded by poverty, can perpetuate a cycle of ill-health and reduced economic productivity. Therefore, local health authorities should prioritize integrated parasitic control interventions that combine mass deworming, environmental sanitation, community-based health education, and safe water provision. In addition, periodic monitoring of infection patterns should be sustained to assess the impact of control programs and guide future policy actions.

CONCLUSION

The present study has demonstrated a high prevalence (48.5%) of gastrointestinal helminth infections among residents of Wukari Metropolis, Taraba State, with *Ascaris lumbricoides* and *Ancylostoma duodenale* being the most predominant species. The significant differences in infection rates among age groups and wards indicate that environmental, demographic, and behavioral factors strongly influence parasite transmission in the area. The high infection rate among adolescents and young adults highlights the role of outdoor exposure and poor hygiene practices, while the lower prevalence in some wards suggests the positive effect of better sanitation and access to clean water. Although infection was slightly higher among females than males, the difference was not statistically significant, suggesting similar exposure risks for both sexes. The findings confirm that gastrointestinal

helminth infections remain endemic in Wukari and continue to pose a major public health challenge despite ongoing deworming efforts

Recommendations

To effectively reduce the burden of intestinal helminth infections in Wukari Metropolis, an integrated and sustainable control approach is strongly recommended.

1. Regular mass deworming of residents, especially school-aged children and adolescents, should be intensified through primary health care centers and schools.

2. Environmental sanitation programs should be strengthened to prevent open defecation and improper waste disposal.

3. Provision of safe and potable water should be prioritized to minimize infection through contaminated sources.

4. Community-based health education campaigns should be conducted regularly to promote good hygiene, personal cleanliness, and safe food handling practices.

5. Routine parasitological surveillance and monitoring should be implemented to assess infection trends and evaluate the impact of intervention programs.

6. Government and non-governmental organizations should collaborate to improve sanitation infrastructure, promote behavior change, and support research on parasitic diseases in endemic areas.

Implementing these recommendations will help break the transmission cycle, reduce reinfection rates, and ultimately improve the health and productivity of the people of Wukari Metropolis and similar communities across Nigeria.

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