IJABR Vol. 16 (1): 170 - 177 (2025)

Original Article

Impacts of major Neglected Tropical Diseases in selected communities in Niger State

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Submitted: January 2025; Accepted: May 2025; Published: June 2025

ABSTRACT

Neglected Tropical Diseases (NTDs) remain a significant public health burden in Nigeria, particularly in underserved regions such as Niger State, where environmental, socio-economic, and behavioural factors favour their persistence. This study investigated the prevalence, clinical symptoms, and risk factors of major NTDs across three Local Government Areas (LGAs): Lapai, Bosso, and Kontagora. A total of 750 individuals were examined through stool and urine sample analyses, and structured questionnaires were administered to assess awareness, symptoms, and risk behaviours. Parasitological examination was conducted using standard microscopy techniques. Statistical analyses included chi-square tests and risk estimations. Overall, 45.33% of participants were infected based on stool analysis, with Lapai showing the highest prevalence (75.2%), followed by Bosso (36.8%) and Kontagora (24.0%). The most prevalent parasites were Hookworm (17.87%) and *Ascaris lumbricoides* (4.2%). Urinary infections showed an overall prevalence of 15.47%, with *Schistosoma haematobium* being most common. Significant spatial differences in infection were observed ($p<0.05$), and individuals in Lapai were 3.13 times more likely to be infected than those in Kontagora. Clinical symptoms such as abdominal pain (65%), general body weakness (58%), and blood in urine (82%) were frequently reported. Behavioural risk factors including walking barefoot (56%) and children playing in soil (80%) were strongly associated with infection rates. In conclusion, NTDs remain endemic in Niger State, with spatial clustering and behavioural patterns influencing transmission. Targeted mass drug administration, improved sanitation, and intensified health education focused on behavioral change to support NTD control and align with the WHO 2030 elimination roadmap.

Keywords: Neglected Tropical Diseases (NTDs), Prevalence, Risk factors and Soil-transmitted helminths (STHs)

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INTRODUCTION

Neglected tropical diseases (NTDs) represent a diverse group of parasitic, viral, bacterial, and fungal infections that primarily affect impoverished populations living in tropical and subtropical regions (1). These diseases flourish in environments characterized by inadequate sanitation, poor access to clean water, limited healthcare infrastructure, and proximity to animal and insect vectors. Globally, more than one billion people—mostly in rural and marginalized communities—suffer from at least one NTD, often resulting in long-term disability, social stigma, and economic hardship (2).

In Nigeria, and particularly in Niger State, the burden of NTDs is especially profound. Nigeria accounts for the highest number of NTD cases in Africa and bears approximately one-quarter of the global NTD burden (3). Thirteen of the twenty WHO-recognized NTDs are endemic in the country, including lymphatic filariasis, onchocerciasis, schistosomiasis, and trachoma (2). Niger State, like many other regions in Northern Nigeria, is plagued by factors that facilitate the transmission and persistence of these diseases, such as environmental degradation, conflict-related displacement, and limited disease surveillance.

The impacts of NTDs in affected communities go beyond physical health outcomes. Research has shown that NTDs significantly hinder educational attainment and workforce participation by limiting children's school attendance and adults' productivity (4). Households often experience catastrophic medical costs, further entrenching poverty in regions already facing socioeconomic challenges (5). Climate change, migration, and the adaptation of parasites and vectors also threaten to exacerbate the spread and impact of NTDs in the future (6, 7).

Recent studies have provided updated estimates on the global burden of NTDs infections. In 2021, there were an estimated 642.72 million cases and 1.38 million disability-adjusted life years (DALYs) caused by STH infections. Among these, ascariasis accounted for approximately 293.80 million cases and 647,530 DALYs; hookworm infections for 112.82 million cases and 540,200 DALYs; and trichuriasis for 266.87 million cases and 193,920 DALYs. Notably, the global age-standardized prevalence rate (ASPR) of STH infections decreased by 69.6% compared to 1990, indicating progress in control efforts (8).

In response to the global challenge posed by NTDs, the World Health Organization (WHO) has outlined an ambitious roadmap aiming to eliminate or significantly reduce the burden of these diseases by 2030 (2). This includes mass drug administration (MDA), improved disease surveillance, vector control, and community engagement. Despite the scale-up of preventive chemotherapy in Nigeria, gaps remain in the integration of intensified disease management and in addressing barriers to MDA uptake, such as lack of awareness, cultural beliefs, and logistical challenges (9, 10).

This study is designed to examine the impacts of major NTDs in selected communities across Niger State. Specifically, it aims to determine the prevalence, clinical signs, and risk factors of NTDs; assess their socio-economic and health impacts; evaluate the effectiveness of mass drug administration campaigns; and identify obstacles to MDA uptake. Furthermore, the study will investigate the

species composition and transmission potential of vectors responsible for NTD spread and applying both field data approaches to inform future control and elimination strategies (11, 12).

MATERIALS AND METHODS

Study Area

The study was conducted in selected communities within Lapai, Bosso and Kontagora Local Government Areas (LGA) of Niger State, Nigeria. Lapai LGA, Coordinates: 9°31′31″ N, 6°30′16″ E (decimal 9.52515 N, 6.50441 E), covers approximately 3,051 km^2 . The area lies within the Guinea Savanna ecozone and experiences tropical continental climate with distinct wet and dry seasons. Key activities include agriculture and public service employment. The river valleys and farmland spaces also serve as potential habitats for NTD vectors such as mosquitoes and freshwater snails. Bosso LGA, Coordinates: Approx. 9°36′53″ N, 6°21′57″ E (decimal 9.6146 N, 6.3659 E), with an area of ~1,592 km^2 and an estimated 2019 population of ~208,000, Bosso lies northwest of Minna. Predominantly rural, this semi-arid Sahelian zone includes savannah plains conducive to vector breeding. Bosso hosts a campus of the Federal University of Technology Minna, influencing localized demographic and socioeconomic dynamics. And Kontagora LGA, Coordinates: Approximately 10°24′12″ N, 5°28′15″ E (decimal ~10.4032 N, 5.4708 E), lies in the northwest region of Niger State, straddling the Kontagora River and serving as the emirate's capital. Town elevation is around 339 m above sea level, with an estimated population of ~98,800. Its riverine setting supports irrigation and agriculture, offering suitable environments for aquatic vectors and NTD transmission.

Study Design

A **community-based cross-sectional descriptive survey** was employed to assess the prevalence, associated risk factors, and community practices related to NTDs. This design is ideal for identifying health indicators in a defined population at a specific point in time.

Ethical Considerations

Ethical approval was obtained from the Niger State Ministry of Health Ethical Review Committee. Informed consent will be sought from all adult participants, and assent will be secured from minors aged 12–17 years alongside consent from their guardians. Participants will be informed about the purpose of the study, procedures involved, potential risks and benefits, and their right to withdraw at any time without consequences.

Sample collection *and Analysis*

The study targeted residents of all age groups, with a special focus on Children (5–14 years) – due to high vulnerability and exposure. Adults – especially food handlers and caregivers and Elderly individuals – for comparative risk assessments

Participants received labeled sterile containers and instructions on stool sample collection. Samples were analyzed at a nearby public health lab using: Direct wet mount and Formol-ether concentration technique was used.

Filtration technique for detection of *Schistosoma haematobium* eggs.

Data analysis

A validated semi-structured questionnaire was used to collect data on: Descriptive statistics, frequency, percentage, mean, and standard deviation and Inferential statistics, Chi-square tests and binary logistic regression were used to examine associations between parasitic infections and risk factors (e.g., water source, hygiene behavior, open defecation). A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 750 individuals were examined and 340 (45.33%) infected. The infection rates for Lapai, Bosso and Kontagora were 75.20%, 36.80% and 24.00 respectively (Table 1). Lapai shows the highest prevalence rate, followed by Bosso and Kontagora. A chi-square test showed a statistically significant result ($p<0.05$) given the differences in proportions (especially between Lapai and Kontagora). The most common parasite is Hookworm (17.87%) and least common is *Trichuris trichiura* (0.13%) while *Entamoeba* spp. is notably high in Lapai (15.2%). Given the Relative Risk (RR) and Odds Ratio (OR) at approximately 3.3 showed that individuals in Lapai are 3.13 times more likely to be infected than those in Kontagora.

Prevalence in urine samples is 15.47%. Lapai has the highest infection rate (Table 2), followed by Bosso and Kontagora. indicating that infection prevalence is significantly associated with LGA. Some unidentified worms were found in urine and highly localized in Lapai only. This indicates a spatially clustered infection.

Majority (86%) experienced symptoms (Table 3), suggesting high local disease burden. Abdominal pain 227 (65%), General body weakness 204 (58%), Itching/rashes 168 (48%), Worms in stool 122 (35%), Anal itching 91 (26%), Blood in urine 82 (82%), Swollen limbs/genitals 64 (18%) (Table 4). Abdominal pain and weakness are the most common reported symptoms. High prevalence of soil-related behaviours (barefoot walking, children playing in soil) explains the dominance of STHs found in Table 1. Abdominal pain, body weakness, and itching/rashes are the most common symptoms.

A total of 308 (88%) had awareness of NTDs and 301 (86%) has Experienced at least one clinical symptom suggesting a high exposure or disease burden. Open defecation (40%) remains a significant public health challenge, facilitating environmental contamination. Encouragingly, over 2/3 of the population practices good hygiene, suggesting that behavioural change programs are having some effect.

Table 1. Prevalence of major neglected tropical diseases in stool samples of selected communities in Lapai, Bosso and Kontagora Local Government Areas, Niger State

LGAs	No. Exam.	No. infected (%)	Species encountered						
			Hookworm No. infected (%)	*Trichuris trichiura* No. infected (%)	*Ascaris lumbricoides* No. infected (%)	*Strongyloides stercoralis* No. infected (%)	*Schistosoma mansoni* No. infected (%)	*Entamoeba* spp No. infected (%)	*Taenia saginata* No. infected (%)
Lapai	250	188(17.41)	64(25.60)	1(0.40)	38(15.20)	32(12.80)	1(0.40)	38(15.20)	14(5.60)
Bosso	250	92(8.40)	40(16.00)	0	4(1.6)	20(8.00)	0	20(8.0)	8(3.20)
Kontagora	250	60(24.00)	30(12.00)		25(10.00)		5(2.00)		
Total	750	340(28.01)	134(17.87)	1((0.13)	67(4.20)	52(6.93)	6(0.8)	58(3.80)	22(2.93)

Table 2. Prevalence of major neglected tropical diseases in urine samples of selected communities in Lapai, Bosso and Kontagora Local Government Areas, Niger State

LGAs	No. Exam.	No. infected (%)	Species encountered	
			Schistosoma haematobium No. infected (%)	Unidentified worm No. infected (%)
Lapai	250	61(24.40)	3(1.20)	58(23.00)
Bosso	250	50(20.00)	50(20.00)	0
Kontagora	250	5(2.00)	5(2.00)	
Total	750	116(15.47)	58(7.73)	

Table 3. Knowledge and clinical sign/symptoms of major neglected tropical diseases in stool samples of selected communities in Lapai, Bosso and Kontagora Local Government Areas, Niger State

Parameters	**Frequency (%)**
Heard of NTDs	308 (88%)
Aware of STH	224 (70%)
Experienced at least one clinical symptom	301 (86%)
Abdominal pain	227 (65%)
Itching /rashes	168 (48%)
Blood in urine	82 (82%)
Swollen limbs/genitals	64 (18%)
Worms in stool	122 (35%)
Anal itching	91 (26%)
General body weakness	204 (58%)

Table 4. Risk factors of major neglected tropical diseases in stool samples of selected communities in Lapai, Bosso and Kontagora Local Government Areas, Niger State

Risk factors	**Yes (%)**	**No (%)**
Practices open defecation	140 (40%)	210 (60%)
Walks barefoot regularly	197 (56%)	153 (44%)
Children play in soil	208 (80%)	70 (20%)
Washes hands after toilet use	236 (67%)	114 (33%)
Washes fruits/vegetables before eating	250 (71.4%)	100 (28.6%)

DISCUSSION

The findings of this study provide strong evidence of a substantial burden of neglected tropical diseases (NTDs) across the selected communities in Lapai, Bosso, and Kontagora LGAs of Niger State. These results align with global and national data indicating that NTDs remain endemic in low-resource settings where inadequate sanitation, poor hygiene practices, and limited access to healthcare services prevail (1, 2).

Overall, 45.33% of the participants tested positive for at least one NTD in stool samples. This high prevalence is consistent with previous reports that Nigeria, particularly Northern Nigeria, bears one of the highest burdens of NTDs globally (3). The significantly higher prevalence in Lapai (75.2%) compared to Bosso (36.8%) and Kontagora (24.0%) may be due to environmental and behavioural risk factors such as higher rates of open defecation, greater environmental contamination, and limited sanitation infrastructure in Lapai.

The statistical significance ($p < 0.05$) between infection rates in Lapai and Kontagora, and the Relative Risk (RR = 3.13), confirm that individuals in Lapai are more than three times as likely to be infected compared to those in Kontagora. This supports the assertion that NTD distribution is spatially heterogeneous, influenced by geography, poverty levels, and hygiene practices (6).

Among the pathogens detected, *Hookworm* was the most prevalent (17.87%), followed by *Ascaris lumbricoides* (4.20%) and *Strongyloides stercoralis* (6.93%), while *Trichuris trichiura* showed the least prevalence (0.13%). These findings mirror global trends that show *Ascaris*, *Hookworm*, and *Trichuris* as the most common soil-transmitted helminths (STHs) globally (8), with *Hookworm* often dominating in adults due to its mode of transmission through skin penetration (walking barefoot).

The high frequency of clinical symptoms such as abdominal pain (65%), general body weakness (58%), and skin rashes/itching (48%) further underscores the health impact of these infections. Notably, 82% of those infected reported blood in urine, which aligns with the presence of *Schistosoma haematobium* infections detected in the urine samples. The association between clinical symptoms and parasitic infections affirms previous findings on the morbidity caused by NTDs, especially schistosomiasis and STHs (4).

The high prevalence of risky behaviours—such as children playing in contaminated soil (80%) and walking barefoot (56%)—explains the high rates of STHs in these communities. These behaviours are well-documented transmission routes for helminths like *Hookworm* and *Strongyloides* (WHO, 2020). The persistence of open defecation in 40% of respondents contributes to ongoing soil contamination and is a critical public health concern. Despite these risk factors, encouraging data were observed: 67% of respondents reported washing hands after using the toilet and 71.4% reported washing fruits and vegetables before consumption. These practices likely

contribute to the moderate infection rates in Bosso and Kontagora and suggest that hygiene education and behaviour change communication are beginning to take root.

A notable 88% of participants had heard of NTDs and 70% were aware of soil-transmitted helminths (STHs). This level of awareness is relatively high and may be attributed to ongoing public health campaigns and school-based interventions. However, the gap between awareness and practice remains evident. For instance, although handwashing rates are commendable, the persistence of barefoot walking and soil exposure highlights areas where further health education is needed. These findings corroborate prior observations that awareness alone is not always sufficient to drive behavioural change, especially when structural barriers (e.g., lack of footwear, absence of toilets) are present (9, 10).

The detection of unidentified worms in the urine of participants from Lapai only (23%) raises questions about underdiagnosed or emerging parasitic infections. This finding warrants further parasitological and molecular studies to determine the identity and transmission dynamics of these organisms. It may also reflect poor diagnostic coverage or limited health infrastructure in rural areas where uncommon infections may go unnoticed.

Conclusion

This study highlights a persistently high burden of NTDs in Niger State, particularly in Lapai. The data reinforce the need for localized, multisectoral interventions, including targeted MDA campaigns, intensified health education, improved sanitation, and follow-up studies to identify emerging parasitic threats. While awareness levels are promising, the persistence of risky behaviours and spatial clustering of infections demonstrate that there is still much work to be done to meet WHO's 2030 NTD elimination targets.

Disclosure of Funding

This work was supported by the Tertiary Education Trust Fund (TETFUND) under the TETFUND Institutional Based Research Intervention (IBRI) scheme (TETFUND/FUTMINNA/2024/041).

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