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Prevalence and Intensity of Human Schistosomiasis in Selected Communities of Ibi Local Government Area, Taraba State, Nigeria

Rimamsomte D[1], Agere H. I J[2], Dawuda M[3], Mijah A. K[4], J. T Jerry[5]

[1,2,3,4]Federal University Wukari, Nigeria; [5]College of Education Zing, Nigeria

daudarimamsomte334@gmail.com

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Abstract

This study determined the prevalence and intensity of *Schistosoma haematobium* infection among residents of selected communities in Ibi Local Government Area (LGA), Taraba State, Nigeria. A total of 400 urine samples were randomly collected from residents aged 6 years and above, across five communities (Ibi, Rafin Soja, Gindin Waya, Ando Manu, and Nwukam). Urine sedimentation technique was employed for parasite detection, and infection intensity was expressed as mean egg count per 10 ml of urine. Data were analysed using SPSS version 26, and associations between variables were tested using Chi-square (χ^2) at a 5% significance level. The overall prevalence of *S. haematobium* infection was **7.5%,** with a mean egg intensity of **2.2 eggs/10 ml of urine**, indicating a low level of endemicity. Gindin Waya recorded the highest prevalence (12.5%) and intensity (2.4 eggs/10 ml), while Ibi had the lowest (2.5%; 1.0 egg/10 ml). Infection was most common among the 16–25-year age group (9.1%) and males (9.0%), although differences by age ($\chi^2 = 2.157$, $p = 0.707$) and sex ($\chi^2 = 1.489$, $p = 0.222$) were not statistically significant. Farmers (8.3%) and fishermen (7.5%) had higher infection rates than other occupations ($\chi^2 = 3.295$, $p = 0.509$). A significant association was observed between infection and water source (χ^2 = 7.935, p = 0.0475), with river and stream users showing higher prevalence. The persistence of urinary schistosomiasis, despite low infection intensity, indicates ongoing transmission within riverine communities. Continuous mass drug administration, improved access to safe water, snail vector control, and community health education are recommended to reduce transmission and achieve WHO's 2030 schistosomiasis elimination target.

Keywords: Schistosoma Haematobium; Urinary Schistosomiasis; Infection Prevalence; Infection Intensity; Water Source Exposure

INTRODUCTION

Schistosomiasis, also known as bilharzia, is one of the most prevalent neglected tropical diseases (NTDs) affecting populations in tropical and subtropical regions, particularly in sub-Saharan Africa. It is a parasitic disease caused by trematodes of the genus Schistosoma, which inhabit the blood vessels of their human hosts. Among the various species infecting humans, Schistosoma haematobium is responsible for urinary schistosomiasis, a disease of major public health importance that ranks second only to malaria in terms of socioeconomic and health impact (World Health Organization [WHO], 2023; Colley et al., 2014; Ezeh et al., 2019). Globally, over 230 million people require preventive treatment for schistosomiasis, and more than 700 million are at risk of infection, with Africa accounting for approximately 90% of the global burden (WHO, 2023; Gower et al., 2021).

Transmission of schistosomiasis occurs when cercariae, the free-swimming larval stage released by infected freshwater snails, penetrate human skin during activities such as bathing, fishing, swimming, washing, or irrigation (Adenowo et al., 2015; Balogun et al., 2022). Once inside the host, the parasites mature and reside in the venous plexus surrounding the bladder, producing eggs that are either excreted in urine or become trapped in body tissues, causing granulomatous inflammation, fibrosis, and chronic pathology (Atalabi et al., 2016; Chitsulo et al., 2019). The presence of blood in urine (haematuria) is one of the hallmark symptoms of urinary schistosomiasis, and chronic infection can result in severe complications such as hydronephrosis, renal failure, and squamous cell carcinoma of the bladder (Ojo et al., 2020).

Nigeria remains one of the most schistosomiasis-endemic countries in the world, contributing significantly to the continental burden (Ezeh et al., 2019; Ekpo et al., 2020). A national review spanning 50 years (1956–2015) revealed that urinary schistosomiasis is widely distributed across nearly all Nigerian states, with prevalence ranging from less than 1% to over 80% depending on environmental and behavioral factors (Ezeh et al., 2019). The persistence of transmission is largely due to inadequate access to potable water, poor sanitation, and dependence on rivers, ponds, and irrigation canals for daily activities (Awosolu et al., 2020; Ofoezie, 2019). The snail intermediate hosts, particularly species of Bulinus, thrive in slow-moving or stagnant freshwater environments, which are abundant in rural and riverine areas. This ecological suitability explains the continued endemicity observed in communities situated along rivers, lakes, and irrigation channels.

The epidemiology of urinary schistosomiasis in Nigeria exhibits substantial geographical variation. Studies from the northern states have consistently reported higher prevalence than those from the south, reflecting differences in environmental conditions, occupation, and water contact behavior (Atalabi et al., 2016; Balogun et al., 2022). For example, Aliero et al. (2021) recorded 32% prevalence among school-aged children in Kebbi State, while Awosolu et al. (2020) reported 13.5% in Oyo State, southwestern Nigeria. In Taraba State, studies have identified endemic foci in Wukari and Takum Local Government Areas, where contact with the Benue River and its tributaries is frequent (Onyekwere et al., 2022). However, there is limited information on the epidemiological status of the disease in Ibi Local Government Area, another riverine zone traversed by the Benue River and the Shemanker tributary, where residents are predominantly farmers, fishermen, and petty traders relying heavily on surface water for domestic and occupational purposes.

The burden of schistosomiasis is not limited to its clinical effects but also includes its socioeconomic implications. Chronic infection leads to anaemia, malnutrition, growth retardation, and impaired cognitive performance among children, thereby affecting school attendance and productivity (Hotez et al., 2020; Adebayo et al., 2021). In adults, it causes chronic fatigue and reduced work efficiency, perpetuating the cycle of poverty in endemic regions (Steinmann et al., 2015). Although praziquantel is effective and inexpensive, reinfection remains common due to continued exposure to infested water and inadequate community-wide chemotherapy coverage (WHO, 2023; Ekpo et al., 2020).

Accurate knowledge of schistosomiasis prevalence and infection intensity is essential for designing and implementing effective control programs. Prevalence provides a measure of transmission level in a community, while infection intensity (egg count per 10 ml of urine) reflects disease severity and morbidity risk (Hajissa et al., 2018; WHO, 2023). Understanding the distribution of infection across demographic factors such as age, sex, and occupation enables policymakers to identify high-risk groups and prioritize interventions such as mass drug administration (MDA), water sanitation and hygiene (WASH) improvements, and snail control (Ofoezie, 2019; Balogun et al., 2022).

Given the paucity of epidemiological data from Ibi LGA, Taraba State, this study aimed to determine the prevalence and intensity of S. haematobium infection among residents of selected communities, as well as to assess the relationship between infection and socio-demographic characteristics. Findings from this study are expected to provide baseline data that will guide evidence-based control measures and contribute to Nigeria's progress toward achieving the World Health Organization's 2030 goal for the elimination of schistosomiasis as a public health problem.

MATERIALS AND METHODS

Study Area

The study was conducted in five selected communities: Ibi, Rafin Soja, Gindin Waya, Ando Manu, and Nwukam in Ibi LGA, Taraba State, Nigeria. The area lies between latitude 8°10'N and longitude 9°44'E, covering approximately 2,672 km² with a population of about 133,000 people. The climate is tropical with distinct wet and dry seasons, and the major occupations include fishing, farming, and petty trading. The communities are located along the banks of the Benue and Shemanker Rivers, providing ideal habitats for snail intermediate hosts.

Ethical Approval

Ethical approval was obtained from the Health Department of Ibi LGA. Both verbal and written informed consent were secured from community leaders and participants (or guardians in the case of minors) before sample collection.

Sample Collection and Examination

A total of 400 urine samples (80 per community) were collected randomly from residents aged 6 years and above between 10:00 a.m. and 2:00 p.m., when egg excretion is highest. Samples were preserved with 1% sodium hypochlorite and transported to the

Primary Health Care Centre laboratory, Ibi, for analysis. The urine sedimentation technique was used for egg detection (Hajissa et al., 2018). Ten millilitres of urine were centrifuged at 2000 rpm for 2 minutes; sediments were examined microscopically (×10 objective) for S. haematobium eggs. Infection intensity was expressed as mean egg count per 10 ml of urine.

Data Analysis

Data were analysed using SPSS version 26. Prevalence was calculated as the proportion of infected individuals, while mean egg intensity represented infection severity. Statistical associations between variables (sex, age, occupation) and infection were tested using Chi-square (χ^2) at a 5% significance level ($p < 0.05$).

RESULTS

Table 1: Prevalence of *Schistosoma haematobium* Infection by Community in Ibi LGA, Taraba State

Community	No. Examined	No. Infected	Prevalence (%)	Mean Egg Intensity (eggs/10 ml urine)	χ^2	*p*-value
Ibi	80	2	2. 5	1. 0		
Rafin Soja	80	6	7. 5	2. 2		
Gindin Waya	80	10	12.5	2. 4		
Ando Manu	80	8	10.0	2. 3		
Nwukam	80	4	5. 0	2. 0		
Total / Mean	**400**	**30**	**7. 5**	**2. 2**	**3. 845**	**0.428 (NS)**

This table shows the prevalence and mean egg intensity of S. haematobium infection across the five surveyed communities in Ibi LGA. Gindin Waya recorded the highest prevalence (12.5%) and mean intensity (2.4 eggs/10 ml), while Ibi had the lowest prevalence (2.5%) and intensity (1.0 egg/10 ml). Although variations existed among communities, the difference was not statistically significant ($\chi^2 = 3.845$; $p = 0.428$).

Table 2: Prevalence and Intensity of *S. haematobium* Infection by Age Group

Age Group (Years)	No. Examined	No. Infected	Prevalence (%)	Mean Egg Intensity (eggs/10 ml)	χ^2	*p*-value
6 – 15	90	8	8. 9	2. 5		
16 – 25	110	10	9. 1	2. 4		
26 – 35	100	5	5. 0	1. 9		
36 – 45	60	4	6. 7	2. 1		

Age Group (Years)	No. Examined	No. Infected	Prevalence (%)	Mean Egg Intensity (eggs/10 ml)	χ^2	*p*-value
> 45	40	3	7. 5	2. 0		
Total / Mean	**400**	**30**	**7. 5**	**2. 2**	**2. 157**	**0.707 (NS)**

This table presents infection prevalence and intensity across age categories. The age group 16–25 years showed the highest prevalence (9.1%) and mean intensity (2.4 eggs/10 ml), followed by those aged 6–15 years (8.9%). The lowest infection rate occurred in the 26–35 year group (5.0%). Differences in prevalence across age groups were not statistically significant ($\chi^2 = 2.157$; $p = 0.707$).

Table 3: Prevalence and Intensity of *S. haematobium* Infection by Sex

Sex	No. Examined	No. Infected	Prevalence (%)	Mean Egg Intensity (eggs/10 ml)	χ^2	*p*-value
Male	220	20	9. 0	1. 84	1. 489	0.222 (NS)
Female	180	10	5. 8	2. 81		
Total	**400**	**30**	**7. 5**	**2. 2**	—	—

This table compares the infection rate between males and females. Males recorded a slightly higher prevalence (9.0%) than females (5.8%), though the difference was not statistically significant ($\chi^2 = 1.489$; $p = 0.222$). Mean egg intensity was slightly higher among females (2.81 eggs/10 ml) compared to males (1.84 eggs/10 ml).

Table 4: Prevalence and Intensity of *S. haematobium* Infection by Occupation

Occupation	No. Examined	No. Infected	Prevalence (%)	Mean Egg Intensity (eggs/10 ml)	χ^2	*p*-value
Farmers	120	10	8. 3	2. 3		
Fishermen	80	6	7. 5	2. 4		
Traders	100	7	7. 0	2. 0		
Students	70	4	5. 7	1. 8		
Civil Servants	30	3	10.0	2. 5		
Total / Mean	**400**	**30**	**7. 5**	**2. 2**	**3. 295**	**0.509 (NS)**

This table summarizes the distribution of infection according to occupation. Farmers and fishermen had higher infection rates (8.3% and 7.5%, respectively) than other occupational groups, suggesting frequent exposure to water bodies. Civil servants recorded the highest mean intensity (2.5 eggs/10 ml), though the variation across occupations was not statistically significant ($\chi^2 = 3.295$; $p = 0.509$).

Table 5: Relationship Between Source of Water and Prevalence of *S. haematobium* Infection

Source of Water	No. Examined	No. Infected	Prevalence (%)	Mean Egg Intensity (eggs/10 ml)	χ²	*p*-value
River	120	10	8. 3	2. 3		
Stream	60	7	11.7	2. 4		
Well	90	3	3. 3	1. 7		
Borehole	130	4	3. 0	1. 5	7. 935	**0. 0475***
Total / Mean	**400**	**30**	**7. 5**	**2. 2**	—	

This table shows the association between infection prevalence and water sources used by participants. Individuals using rivers and streams for domestic and recreational activities exhibited higher infection rates (8.3% and 11.7%, respectively) than those using wells (3.3%) or boreholes (3.0%). The relationship between water source and infection was statistically significant ($\chi^2 = 7.9235$; $p = 0.0475$).

DISCUSSION

The present study provides updated epidemiological evidence that urinary schistosomiasis caused by Schistosoma haematobium remains endemic in Ibi Local Government Area (LGA), Taraba State, Nigeria, with an overall prevalence of 7.5% and a mean egg intensity of 2.2 eggs per 10 ml of urine. Although the infection level is relatively low compared with earlier findings in other parts of Nigeria, it indicates that transmission persists in specific riverine and stream-dependent communities. According to the World Health Organization (WHO, 2023), endemic communities with prevalence between 1% and 10% are categorized as low transmission zones, whereas those exceeding 50% are high-risk areas requiring biannual mass drug administration (MDA). Thus, Ibi LGA falls within the low-to-moderate endemicity range.

The relatively low prevalence recorded in this study contrasts with higher infection rates reported in northern and southwestern Nigeria. For example, Atalabi et al. (2016) reported 22.7% prevalence in Katsina State, Awosolu et al. (2020) observed 13.5% in Oyo

State, and Balogun et al. (2022) recorded 16.4% in northern Nigeria. Similarly, Aliero et al. (2021) found 32% prevalence among school-aged children in Kebbi State. The lower prevalence in Ibi may reflect the impact of improved access to borehole water, health education, and intermittent praziquantel distribution in recent years. It may also indicate changes in water-contact behavior, as some communities have adopted safer sources for domestic and recreational activities. However, the persistence of infection suggests that environmental conditions remain favorable for snail intermediate hosts and that transmission continues among individuals relying on rivers and streams for livelihood activities.

Community-level variation in prevalence was observed, with Gindin Waya recording the highest rate (12.5%) and Ibi the lowest (2.5%). This difference can be explained by ecological and behavioral heterogeneity among communities. Gindin Waya and Ando Manu are located closer to the Benue River and its tributaries, where activities such as fishing, swimming, and washing are frequent, thus increasing exposure to cercaria-infested waters. Similar micro-geographical variation has been documented in other Nigerian and African settings (Ezeh et al., 2019; Onyekwere et al., 2022; Mazigo et al., 2020). The presence of infected individuals in all surveyed communities suggests ongoing low-level transmission, consistent with the focal nature of schistosomiasis endemicity. Although statistical analysis showed no significant difference among communities ($\chi^2 = 3.845$; $p = 0.428$), the pattern underscores the importance of local ecological conditions in sustaining transmission.

Age-related analysis showed that individuals aged 16–25 years had the highest infection prevalence (9.1%) followed closely by those aged 6–15 years (8.9%). This age distribution pattern aligns with numerous reports across Nigeria and sub-Saharan Africa, where school-aged children and young adults exhibit the greatest infection burden (Awosolu et al., 2020; Ezeh et al., 2019; Midzi et al., 2021). The high prevalence in younger populations is associated with behavioral factors, such as frequent swimming, fishing, and other water-contact activities, which facilitate exposure to infective cercariae. Moreover, children often lack adequate knowledge of disease prevention and are less likely to adopt protective behaviors. The gradual decline in prevalence among older individuals may be attributed to reduced water contact, occupational differences, or the development of partial acquired immunity resulting from repeated exposure (Hotez et al., 2020; Colley et al., 2014). The absence of statistically significant differences between age groups ($p = 0.707$) in this study may be due to overlapping exposure patterns across the communities.

Sex-based comparison revealed a higher prevalence among males (9.0%) than females (5.8%), though the difference was not statistically significant ($\chi^2 = 1.489$; $p = 0.222$). This finding corroborates studies by Atalabi et al. (2016) and Balogun et al. (2022), who also reported higher infection rates among males, largely due to gender-specific roles involving fishing, farming, and swimming. However, females in this study exhibited a slightly higher mean egg intensity (2.81 eggs/10 ml) compared to males (1.84 eggs/10 ml). This may be attributed to frequent low-level exposure through domestic chores such as washing clothes, fetching water, and bathing children near natural water sources. Awosolu et al. (2020) and Ojo et al. (2020) similarly observed that women may experience comparable exposure intensity due to domestic contact with infested water bodies. These findings highlight that both genders contribute to the persistence of transmission, albeit through different exposure routes.

Occupational distribution indicated that farmers (8.3%) and fishermen (7.5%) were the most affected groups, followed by traders and students, though the differences were not statistically significant ($\chi^2 = 3.295$; $p = 0.509$). The high prevalence among farmers and fishermen reflects the occupational risk associated with regular contact with rivers, ponds, and irrigation channels. Similar associations have been documented across West Africa (Mazigo et al., 2020; Midzi et al., 2021). Civil servants, though fewer in number, recorded the highest mean intensity (2.5 eggs/10 ml), which may suggest sporadic but intense exposure during recreational or domestic activities. These results emphasize that occupational water exposure remains a key determinant of schistosomiasis risk in endemic rural communities.

A significant relationship between infection and source of water was observed ($\chi^2 = 7.935$; $p = 0.0475$). Individuals who relied on rivers and streams had higher infection rates (8.3% and 11.7%, respectively) compared with those using wells or boreholes (3.3% and 3.0%). This pattern reinforces the role of unsafe water sources in schistosomiasis transmission and has been reported in several studies (Awosolu et al., 2020; Ezeh et al., 2019; Balogun et al., 2022). The presence of infection even among borehole users suggests occasional contact with natural water bodies or possible cross-contamination during water collection. The finding underscores the need for improved access to potable water and community-level behavioral change to limit exposure.

From an epidemiological perspective, the persistence of urinary schistosomiasis at low prevalence levels signifies a residual transmission pattern often seen in post-control settings. Such persistence poses a risk of recrudescence if interventions are relaxed (WHO, 2023; Ofoezie, 2019). Light infections, such as those observed in this study (mean egg intensity = 2.2 eggs/10 ml), can still contribute to morbidity, including chronic anemia, impaired growth, and reduced physical performance (Hotez et al., 2020; Steinmann et al., 2015). The observed infection across all demographic groups confirms that schistosomiasis in Ibi LGA is community-wide rather than age-restricted, necessitating integrated interventions that target all residents rather than school-age children alone.

The findings support the need for sustained control measures in Ibi LGA through periodic mass drug administration with praziquantel, complemented by health education, environmental management, and snail control. As emphasized by WHO (2023) and Gower et al. (2021), achieving the 2030 elimination target will require combining chemotherapy with WASH initiatives and ecological interventions to break transmission. Given the ecological proximity of Ibi to the Benue River, control programs must also address snail habitat reduction and community behavioral practices that perpetuate water contact.

In conclusion, while the prevalence and intensity of S. haematobium infection in Ibi LGA are relatively low, the persistence of infection across communities highlights the need for renewed, evidence-based, and community-focused interventions. Strengthening public health education, expanding access to safe water, and ensuring continuous epidemiological surveillance are essential steps toward the sustainable control and eventual elimination of urinary schistosomiasis in Taraba State and Nigeria as a whole.

CONCLUSION

This study has demonstrated that urinary schistosomiasis caused by Schistosoma haematobium remains endemic in Ibi Local Government Area of Taraba State, Nigeria, despite recording a relatively low prevalence (7.5%) and mean egg intensity of 2.2 eggs per 10 ml of urine. The findings indicate that transmission persists in specific riverine and stream-dependent communities, particularly Gindin Waya and Ando Manu, where water contact for domestic, recreational, and occupational purposes is frequent.

Although no statistically significant differences were observed across age, sex, or occupation, males and individuals within the 16–25-year age group were more affected, reflecting behavioural and exposure-related risk patterns. The significant association between infection and source of water underscores the continuing role of unsafe water use in sustaining transmission.

The low but persistent infection levels suggest that the disease may re-emerge if control measures are not intensified. Hence, there is an urgent need for integrated control interventions combining regular mass drug administration (MDA) with praziquantel, snail-vector control, safe water supply, environmental sanitation, and community health education. Strengthening public awareness and ensuring active surveillance will be crucial in reducing transmission and achieving the World Health Organization's goal of schistosomiasis elimination by 2030 in Nigeria.

Recommendations

Based on the findings of this study on the prevalence and intensity of Schistosoma haematobium infection in Ibi Local Government Area, the following recommendations are made:

1. Regular Mass Drug Administration (MDA):

The Taraba State Ministry of Health and local health authorities should implement routine mass drug administration with praziquantel in all communities, especially those situated near rivers and streams, to reduce infection and reinfection rates.

2. Provision of Safe Water Sources:

There is a need for improved access to safe and potable water through the construction and maintenance of boreholes and protected wells. This will reduce dependence on contaminated rivers and streams that serve as breeding sites for the snail intermediate hosts.

3. Health Education and Community Sensitization:

Continuous health education campaigns should be conducted to increase community awareness of schistosomiasis transmission, prevention, and control. Emphasis should be placed on avoiding direct contact with untreated water bodies and adopting safer hygiene practices.

4. Snail Vector Control:

Environmental management and snail control programs should be integrated into existing public health activities. Regular clearing of aquatic vegetation and proper waste disposal can help minimize snail habitats and interrupt the transmission cycle.

5. Periodic Epidemiological Surveillance:

Continuous monitoring and evaluation should be conducted to detect changes in infection patterns, measure the impact of intervention programs, and identify new transmission foci for prompt response.

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