Prevalence of Schistosoma Haematobium in Kiri, Shelleng Local Government Area of Adamawa State, Nigeria

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ABSTRACT

Schistosomiasis affects approximately 250 million people worldwide and ranks as the second most significant parasitic disease in humans after malaria. It remains a major public health concern in Nigeria. Urinary schistosomiasis, caused by *S. heamatobium*, is a prevalent illness in the Kiri community. This study examined 360 fresh urine samples collected from consenting individuals in Kiri, Shelleng Local Government Area, using the sedimentation method to detect *S. heamatobium* eggs. Prevalence was analyzed by age, gender, occupation, water source, and location. Infection rates were highest among males (46.7%), the 51–60-year age group (54.3%), and Lazan village (60%). No significant differences were observed in prevalence by sex ($p>0.05$), age group, or community. Prevalence was notably higher among fishermen (47.6%) and individuals using borehole or dam water (72.2%), with significant differences by occupation and water source ($p<0.05$).

These findings confirm that *S. heamatobium* is endemic in Kiri, Shelleng Local Government Area. This research study recommends government-led interventions, including chemotherapy, mass awareness campaigns by healthcare providers, and community education to avoid water-contact activities such as swimming and washing. Such measures will help curb transmission and mitigate socioeconomic and public health impacts.

Keywords: Schistosomiasis; Sedimentation; Kiri.

INTRODUCTION

Urinary schistosomiasis is a parasitic disease caused by infection with the trematode *Schistosoma haematobium*, which resides in the venous plexus draining the human bladder [1]. During infection, the parasites deposit terminal-spined eggs that obstruct the plexus, impair blood flow, and cause veins to rupture. This allows blood and eggs to enter the urinary bladder, producing the hallmark symptom of hematuria (blood in urine) [1]. Ranking second only to malaria among major human parasitic diseases, urinary schistosomiasis specifically involves *S. haematobium*. Transmission occurs via aquatic snails serving as intermediate hosts. *Schistosoma haematobium* eggs excreted in urine or feces hatch in fresh water into miracidia, which infect snails. Cercariae then emerge from infected snails to penetrate human skin in water [1].

In Africa, schistosomiasis is endemic in most rural settlements along coastal and inland water bodies. This is due to favorable environmental conditions that support proliferation of intermediate hosts, including rivers, creeks, ponds, lakes, and slow-flowing waters. These sites are often used for domestic activities and indiscriminate sewage disposal. The genus *Bulinus* is implicated in urinary schistosomiasis, with several species serving as intermediate hosts for the blood fluke *S. heamatobium*. *Bulinus* snails are medically important due to their sinistral shells, characterized by a large body whorl and small spire. Urinary tract schistosomiasis typically presents with hematuria (blood in urine) and dysuria (pain during or after urination) [2].

In Brazil and Africa particularly Nigeria, refugee movements due to insecurity and rural-to-urban migration are introducing schistosomiasis to previously unaffected areas. Expanding populations have heightened transmission through increased demands for irrigation farming, hydroelectric power and water supply infrastructure. Infections are not uniformly distributed within communities, varying by differences in hygiene knowledge, attitudes, and practices. An estimated 5–10% of residents in endemic areas suffer heavy infections, while the rest experience mild to moderate cases. Risk is highest among those living near lakes, rivers, or dams, where daily water-contact activities are common [3].

In the Kiri community, children and adults frequently engage in water-contact activities such as washing, fetching water, swimming, fishing, bathing and snail hunting along stream edges and fringes that increase exposure to streams, the dam, and snail intermediate hosts. Reports of hematuria (bloody urine) are exacerbated by limited access to potable water for domestic and agricultural use. Most inhabitants are farmers or fishermen, with children particularly vulnerable due to frequent water-body contact. This threatens community health, as prolonged exposure can lead to severe complications like bladder cancer; many residents reportedly live with and succumb to chronic infections. Overpopulation of snails, driven by the dam and swampy farmlands, further amplifies transmission.

This study therefore assesses the prevalence of *Schistosoma haematobium* and freshwater intermediate host snails at Kiri Dam, Shelleng Local Government Area.

MATERIALS AND METHOD

Study area

The survey was conducted in Kiri Shelleng local of Adamawa state. Shelleng is a local government in the Northern part of Adamawa state with the area of 1,359km to density 146.0/km. The area has numerous freshwater habitats like Dams, Streams, and manmade Lakes. The area is predominantly rural with inadequate social amenities. Thus inhabitants often depend on various Streams, Ponds and open wells water. Owing to the scarcity of proper latrines, defecation and urination are often in the open or sometimes in running water.

Study population

A study population was made up of Children and Adults of kiri. A total number of 360 inhabitants were sampled. Some selected villages were used for this study.

Ethical clearance

Prior to sample collection, Ethical clearance was obtained from the Adamawa State Ministry of Health.

Sampling Techniques

Clean and sterile 20 mL universal urine containers were distributed to each randomly selected participant for mid-morning urine collection (between 10:00 and 14:00). Containers were serially numbered to match the corresponding questionnaire IDs and carefully documented to prevent sample mix-ups. Collected samples were immediately stored in a cold ice box. Participants were strictly instructed to wash their hands thoroughly beforehand to minimize contamination from feces or other sources. Samples showing visible blood were noted. All samples were transported to the laboratory for analysis within two hours of collection [5].

Laboratory Analysis

The sedimentation technique was employed to detect *S. heamatobium* ova in urine samples. Prevalence was calculated as the presence of at least one ovum per 10 mL of urine. Ova appeared golden-yellow, elliptical, and bearing a terminal spine [5].

Data Analysis

Data analysis was performed using SPSS Version 23.0 statistical software programs. Pearsons chi-square test was used to compare the proportions of *S. heamatobium* infection in relation to gender, age, location and occupation. *p-values <0.05 were considered statistically significant*

RESULTS

Prevalence of *Schistosoma heamatobium* in relation to Gender

Out of 360 inhabitant examined, 156(43.3) were infected. The Males where 95(46.76%) were more infected than their Females with 61(39.1%) equivalent. There was no significant difference ($\varkappa^2$=2.007, *df=1, p*= 0.157). Higher prevalence of *Schistosoma heamatobium* was recorded among the males than the females. The infection was high among the age group 41-50 with 54.3% prevalence, while the least among the age group were those between the age group 21-30 years with prevalence of 32.3%. there is no significant difference in the prevalence between the Gender and age ranges. Prevalence of the *Schistosoma haematobium* based on the sources of water recorded that that Borehole and Dam had the highest of 72.2% prevalence and those that use borehole had the least of 10.6 %. The highest prevalence based on Occupation was recorded that fishermen had the highest of 47.4% and others had the lowest of 29.4%, there is a significant difference. The prevalence of *Schistosoma haematobium* based on the location was high in Lazan Community with 60% and low in the Gundo Community 38.8%, there is no significant differences among the different villages.

Plate 1: Schistosoma heamatobium egg viewed under the microscope (x10)

Table 1: Prevalence of *Schistosoma heamatobium* in relation to Gender

Sex	No. examined	No. Infected	Prevalence (%)
Male	204	95	46.6
Female	156	61	39.1
Total	**360**	**156**	**43.3**

$\varkappa^2$ =2.007, *df* =1, *p* = 0.157

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Table 2: Prevalence of *Schistosoma heamatobium* in relation to Age

Age (Yrs.)	No. examined	No. Infected	Prevalence (%)
1 - 10	84	32	38.09
11 - 20	72	40	55.5
21 -30	56	20	35.7
31 - 40	58	29	50
41 - 50	50	20	40
51 - 60	40	15	37.5
Total	**360**	**156**	**43.3**

$\varkappa^2$= 8.473, *df*= 5, *p*= 0.182

Table 3: Prevalence of *Schistosoma heamatobium* in relation to Occupation

Occupation	No. examined	No. Infected	Prevalence (%)
Farmers	73	30	41
Fishermen	71	46	64.7
Students/Pupils	120	41	34.2
Housewives	49	21	42.9
Others	47	16	34
Total	**360**	**156**	**43.3**

$\varkappa^2$=19.958, *df*= 4, *p*= 0.001

Table 4: Prevalence of *Schistosoma heamatobium* in relation to the Location

Location	No. examined	No. Infected	Prevalence (%)
Bobere	110	47	42.72
Gundo	107	43	40.2
Lazan	65	35	53
Lapapiri	78	31	39.7
Total	**360**	**156**	**43.3**

$\varkappa^2$=5.651, *df*= 3, *p* = 0.130

DISCUSSION

This study revealed a notable prevalence of *Schistosoma haematobium* infection among inhabitants of Kiri, a community in Nigeria prone to urinary schistosomiasis due to environmental and sanitation factors. Four villages; Bobere, Gundo, Lazan, and Lapapiri were systematically surveyed to provide a representative sample across the region.

Overall prevalence rates aligned with the World Health Organization (WHO) classification for endemic areas, where infection exceeds 10% in the general population or 50% in high-risk groups such as school aged children. These findings underscore the persistent public health burden of urogenital schistosomiasis in this locale, highlighting the need for targeted interventions like mass drug administration, improved water sanitation, and community education to curb transmission.

[6]. This prevalence is lower than [7] reported a higher prevalence among primary school children of the communities surrounding Kiri Lake in Adamawa State, [8] also reported a high prevalence among residents of Kiri Shelleng Adamawa state. The prevalence is lower than [9] who reported a high prevalence among School Children in Ibadan, [10] reported a high infection rate among School Children in Langai Community Mangu, Plateau State, Nigeria which were done in different part of the country.

The study observed significantly higher *S. haematobium* infection rates among males, consistent with patterns reported in endemic regions of sub-Saharan Africa [11, 6]. This disparity likely stems from greater male exposure to infested freshwater bodies, as cultural norms impose no restrictions on movement or water contact based on religion, sex, or age. Males predominantly engage in high-risk occupations such as fishing and farming near the Kiri Dam and swampy areas, fostering frequent cercarial penetration during activities like bathing and swimming [12]. Proximity to these sites exacerbates risk, as most participants reside adjacent to the dam.

Contributing factors include limited awareness of schistosomiasis transmission, reliance on contaminated dam water due to insufficient safe supplies, and inadequate healthcare infrastructure hallmarks of endemic transmission [13, 14]. In contrast, females exhibited lower infection rates, possibly due to better adherence to hygiene practices, restricted water-contact activities (e.g., avoidance of streams despite dam proximity), and access to boreholes, which reduce reliance on infested sources [15].

Infection prevalence peaked among teenagers, youths, and elders, while remaining low in children a distribution mirroring occupational and cumulative exposure risks [16]. Youths and adults face elevated odds through fishing and farming, while elders often harbor chronic infections from lifelong untreated exposure, progressing to complications like bladder cancer. Notably, some elderly residents normalize hematuria as a "sign of maturity," delaying treatment and perpetuating transmission a cultural belief documented in Nigerian communities [17]

Lower childhood rates may reflect reduced water-contact behaviors, such as swimming, alongside protective factors like community playgrounds and borehole provision, which limit exposure [18]. These patterns underscore the need for age tailored interventions, including praziquantel distribution, health education, and sanitation improvements to disrupt the transmission cycle [6].

This study documented peak *S. haematobium* prevalence in the 41-50 age group, contrasting with reports of highest rates in 10-14-year-olds in Danjarima, Kumbotso LGA, Kano State and 15-20-year-old males elsewhere [12]. Another study noted peaks in 21-25-year-old males. Elevated rates in 41-50-year-olds likely reflect chronic occupational exposure to infested waters through farming, fishing, bathing, and washing, while 10-20-year-olds face risks from recreational and domestic activities like errands, swimming, and play [16] Cumulative exposure without treatment amplifies endemicity in these groups [14]. Despite widespread borehole use, dual reliance on boreholes and the dam correlated with highest infection rates, attributable to frequent water-body contact, borehole shortages, and convenient dam access [12]. Increased contact with *S. heamatobium* infested habitats drives prevalence, as extensively reported [13]. Dam users showed elevated rates due to contamination vulnerability and *Bulinus* snail proliferation, key intermediate hosts [6]. This aligns with findings of 22.3% infection among stream-water users. Residents exhibited high dam and fadama contact, peaking seasonally during rainy (July-September) and hot-dry (January-March) periods. Economic contacts (e.g., fishing, farming) predominated, especially early rainy season, followed by leisure, domestic, and fishing-related activities mirroring patterns in Oba-Ile [19]. Contact frequency and proximity to sites strongly predict infection risk, though findings vary across studies [18, 20].

Prevalence was highest among fishermen and students, driven by occupational immersion (fishing, farming near swamps) and school proximity to water bodies, facilitating swimming and bathing [21]. Housewives and schoolchildren also showed notable rates from routine water-dependent tasks. These align with 73.1% prevalence in Ikpeshi-Akoko schoolchildren high pupil/student rates and peaks of 22% in fishermen, 19.5% in farmers, and 16.3% in students in Udege, Nasarawa [22]

Village disparities were evident: Lazan had high prevalence due to absent boreholes, dam/fadama proximity, and low awareness. Conversely, Gundo's low rates linked to borehole access, disease awareness, primary healthcare (PHC) for bilharziasis treatment, and PHC proximity [15]. Overall low prevalence signals reduced water contact from alternative sources (boreholes, playgrounds) and rising awareness reinforcing health education's role in prevalence reduction [6,22]

CONCLUSION AND RECOMMENDATIONS

In conclusion, this study confirms a high prevalence of urinary schistosomiasis (S. *haematobium*) in Kiri's population, with adults serving as key reservoirs and transmission foci in this endemic setting. While control programs such as mass drug administration (MDA), snail control and sanitation improvements have reduced morbidity globally, persistent challenges like reinfection, incomplete coverage and behavioral factors limit their efficacy in resource constrained areas like Nigeria.

Recommendations:

i. There is a need for immediate praziquantel distribution: Implement community-wide MDA targeting infected adults and high-risk groups (e.g., fishermen, farmers), aiming for greater or equal to 85% coverage to interrupt transmission, as recommended by WHO guidelines. Annual or biannual rounds could avert complications like bladder cancer in chronic cases.

ii. There is a need to deliver targeted education on transmission modes (cercarial skin penetration), sanitary habits (handwashing, avoiding infested waters), and symptoms (hematuria) via schools, PHCs, and community leaders. Culturally sensitive messaging can dispel myths (e.g., infection as "maturity sign"), boosting compliance as evidenced by 30-50% prevalence drops post-intervention in similar Nigerian sites.

iii. There is a need to install motorized boreholes to minimize dam/fadama contact, reducing economic, domestic, and recreational exposures. Integrate with latrine construction to curb snail habitats and fecal contamination, aligning with Nigeria's NTD Master Plan.

iv. There is a need to establish sentinel surveillance in villages like Lazan (high-risk) and Gundo (low-risk model), combining parasitological exams with behavioral surveys to track progress and adapt strategies.

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