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Urinary Schistosomiasis in HIV Infected and Uninfected Women in Three Southern Local Government Areas of Adamawa State

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ABSTRACT

Urinary schistosomiasis is one of the major illnesses in the communities of Shelleng, Numan and Demsa LGAs. This cross-sectional community-based study was carried out to investigate the prevalence of urinary schistosomiasis in HIV infected and uninfected women between January and July2026.Structured questionnaires wereadministered to obtain socio-demographicdata, including age, educational status and marital status of the participants. A total of 423 urine samples (HIV infected 326, uninfected 97) urine samples were collected in sterile containers, packaged in a specimen box with ice packs, and taken to the Parasitology Laboratory, Zoology Department, Modibbo Adama University. Urine samples were analysed using the sedimentation (centrifugation) technique and examined microscopically to detect ova of *Schistosomahaematobium*. The overall prevalence of urinary schistosomiasis across the three study areas was 36.0%(153/423). The prevalence of urinary schistosomiasis was found to be highest among HIV uninfected women (43.9%) and lowest among the HIV infected women(10.3%) ($P \leq 0.05$).High infection burdens were particularly pronounced among HIV-uninfected participants residing in Numan(Bilachi), older adults aged 51 and above, secondary school students, and single individuals. In contrast, HIV-infected participants demonstrated lower overall prevalence, with the highest co-infection rates observed among older individuals, participants in Shelleng, secondary students, and married women. Statistical analysis confirmed that the differences across age, educational status, marital status, and location (Numan, Demsa, and Shelleng) in HIV-uninfected individualsare statistically significant($P<0.05$), suggesting that HIV status may be a critical factor influencing the risk or susceptibility to urinary schistosomiasis co-infection, which is supported by distinct immunological mechanisms. This significance underscores the urgency of integrating urinary schistosomiasis screening and praziquantel treatment into routine reproductive health and HIV care frameworks in Adamawa State.

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INTRODUCTION

Urinary schistosomiasis is a major public health concern in tropical and subtropical regions, predominantly affecting rural and underprivileged communities with limited access to clean water and adequate sanitation (Colley *et al.*, 2014; Nwosu *et al*., 2015). The disease is caused by the blood fluke *Schistosoma haematobium*, a parasitic trematode transmitted through contact with freshwater bodies harbouring infected intermediate snail hosts, predominantly *Bulinus* species (Colley *et al*., 2014). When humans come into contact with contaminated water during routine domestic, agricultural, or recreational activities, cercariae penetrate the skin and migrate to the venous plexus of the bladder and urogenital system (Colley *et al*., 2014). In women, egg deposition in the genital tract frequently manifests as Female Genital Schistosomiasis (FGS), characterised by vulvar nodules, mucosal inflammation, contact bleeding, and chronic lower abdominal pain (Kjetland *et al.*, 2005; Ekpo *et al.*, 2017).Concurrently, Human Immunodeficiency Virus (HIV/AIDS) remains a critical global health burden, with sub-Saharan Africa bearing a disproportionate share of global infections, particularly among adolescent girls and young women (Karuga *et al*., 2025). The biological synergy between urogenital schistosomiasis and HIV transmission has emerged as a crucial intersection in public health (Hotez *et al*., 2019). Local mucosal inflammation and tissue damage caused by *S. haematobium* ova recruit CD4+ T-lymphocytesthe primary target cells for HIVto the genital tract, thereby increasing susceptibility to HIV acquisition upon exposure (Colley *et al.*, 2014; Hotez *et al*., 2019). Conversely, structural genital lesions associated with FGS facilitate virus shedding in HIV-positive individuals, raising the risk of onward viral transmission (Patel *et al*., 2021).

Despite the substantial overlap in the geographic distribution of both diseases across sub-Saharan Africa, the global health and HIV control frameworks have historically neglected the opportunity to leverage schistosomiasis control for HIV prevention (Hotez *et al*., 2019; Patel *et al*., 2021). Extensive epidemiological studies have documented the high prevalence of urinary schistosomiasis in rural riverine areas, yet significant knowledge gaps remain regarding the localised co-infection dynamics and demographic predictors among HIV-infected versus HIV-uninfected women (Brodish & Singh, 2016; Osinoiki*et al.*, 2025). Most routine clinical settings lack integrated diagnostic screening protocols, leaving many subclinical or low egg-excreting urogenital infections undetected and untreated (Karuga *et al*., 2025).

In Adamawa State, Nigeria, communities along the Benue River basin and around major water impoundments (such as the Kiri Dam) show persistent hyper-endemic pockets of schistosomiasis due to ongoing freshwater contact for domestic chores and agricultural activities (Birma *etal*., 2017; Naphtali &Ngwamah, 2019). Understanding how *S. haematobium* infection varies across HIV status, age, educational level, and marital status in these specific focal transmission areas is essential for tailoring effective interventions (Ekpo *et al*., 2013; Mijah *et al*., 2024). Therefore, this study aims to investigate the prevalence and demographic correlatesof urinary schistosomiasis among HIV-infected and uninfected women across three southern Local Government Areas (Numan, Shelleng, and Demsa) in Adamawa State, Nigeria, providing essential data to guide integrated reproductive health and schistosomiasis control policies.

MATERIALS AND METHODS

Study Area

The study was conducted in three(3)LGAs in the southern part of Adamawa State: Shelleng, Numan, and Demsa. Demsa is an LGA located on the Benue River, coordinates: 9°25'N 12°8'E; Numan is a port town located on the Benue River, coordinates: 9°28'N 12°2'E; and Shelleng is a LGA with coordinates: 9°53'5"N 12°0'32"E. The study covered six (6) communities: women in Bare and Bilachi, close to the Gongola and Benue Rivers in Numan LGA; Gundo and Bobere, close to Kiri Dam in Shelleng LGA; and Linga and Gwasala, close to the Gongola River in Demsa LGA. These areas are located near water bodies, where women engage in domestic activities.

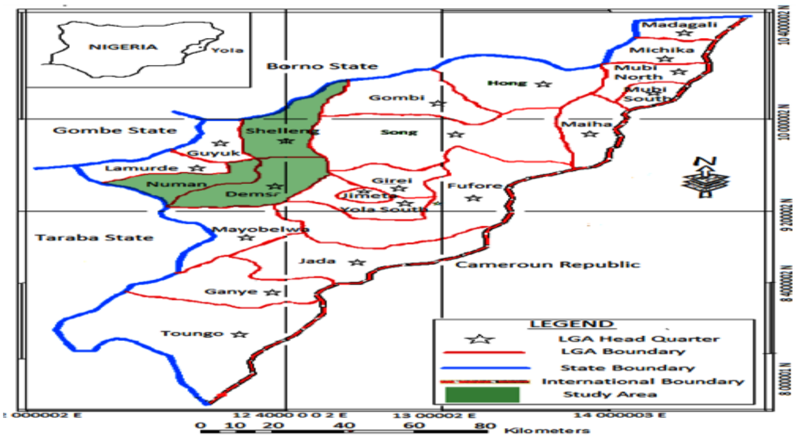

Figure 1: Map of Adamawa Stateshowing Shelleng, Numan and DemsaLGA
Source: Adamawa State Ministry of Land and Survey, Yola.

Study Population

The study population were the women and girls of the three (3) LGAs. This is because bodies of water surround the communities. Urine will be collected from residents in the 3 LGAs: Bare, Bilachi, Bobere, Gundo, Linga, and Gwasala. HIV infected women receiving care at the Antiretroviral therapy clinic of the Specialist Hospital, Numan, were included in the study.

Inclusion and Exclusion Criteria

The study's inclusion criteria comprised of adolescent girls and women aged 11 years and above residing in selected communities within Numan, Demsa, and Shelleng Local Government Areas, as well as women receiving care or treatment at the Antiretroviral Therapy Clinic at Specialist Hospital, Numan. Eligible participants were required to voluntarily provide informed consent or assentor parental/guardian consent for minorsand agree to complete the socio-demographic questionnaire alongside submitting a 10 mL urine sample for parasitological testing. Conversely, the exclusion criteria encompassed children under 11 years of age, female participants actively menstruating during sample collection to prevent blood contamination, individuals who had received anti-schistosomal treatment such as Praziquantel within the preceding 4 to 6 weeks, and anyone who refused consent, failed to complete the questionnaire, or provided an inadequate or unusable urine sample.

Study Design

This study adopted a cross-sectional community and hospital-based study design and was carried out between January and July 2026. Urine samples were collected from women and young girlsat the Primary health care (PHC) clinics in the communities and from the Antiretroviral Therapy Clinic at the Specialist Hospital, Numan. The study consists of parasitological examination of urine for *Schistosoma haematobium* ova.

Sample Size

The sample size for this study was determined using Cochran's formula, assuming a prevalence of urinary schistosomiasis(46,7%) from previous studies (Birma *et al.*, 2017) around Kiri Lake, Shelleng LGA, Adamawa State.

Cochran's formula is written as (n) = $\frac{(Z)^2 . p. (1-p)}{E^2}$Where:

P (Estimated proportion of the population) = 0.467

Z (Z-score) is usually set at 1.96, which corresponds to a 95 per cent confidence level.

E (margin of error) = 0.05

n= ((1.98)2 × 0.467(1-0.467)) ÷ 0.0025

Sample size is 383

The calculated sample size was 383. To account for potential non-response or missing data, 423 participants were successfully evaluated in the study

Demographic information

A pre-survey was conducted at Antiretroviral Therapy clinics and PHCs in the communities to sensitise and educate participants about the consequences of urinary schistosomiasis to encourage them to seek treatment, underscoring the need to participate in the research program. Participation was optional.

Sampling Technique

A structured sampling approach was implemented across designated Antiretroviral Therapy clinics (ART) and Primary Health Centres (PHCs) across the six villages of the three LGAs. At each PHC, eligible women attending routine health clinics were provided with a sterile, wide-mouth, leak-proof universal urine container labelled with a unique participant identification code. Prior to collection, women were given clear verbal instructions in their preferred language on how to collect a clean-catch midstream urine sample. A total volume of 10 mL of terminal urine was collected from each participant between 10:00 AM and 2:00 PM to align with the peak microhematuria and egg excretion period for *Schistosoma haematobium*. Immediately following collection at the respective PHCs, each 10 mL sample was preserved with 10% formaldehyde to fix the eggs and prevent cell lysis. Preserved samples from all three PHCs were packed into insulated cold boxes equipped with ice packs to maintain a low temperature during transit. The specimens were transported by road to the Department of Zoology Laboratory at Modibbo Adama University within three hours of collection for processing and microscopic examination.

Questionnaires Administration

A semi-structured questionnaire that sought information on participants' socio-demographic characteristics was designed and pre-tested in a community outside the study area. The findings from the pre-test were used to refine the tools for ease of comprehension, the time required to administer the questionnaires, and cultural acceptability. Study details were communicated to participants in their local languages. Data collection utilised the structured questionnaire assessing demographics. Literate participants self-administered the questionnaire, whereas an oral interview format was conducted for non-literate individuals to capture their socio-demographic information. An epidemiological form was also designed to record the test result for each participant

Parasitological Examination

Parasitological examination of the urine samples for the presence of *S. haematobium* ova was carried out using the sedimentation (centrifugation) technique as described by Cheesbrough (2006). Briefly, 10ml of each urine sample was transferred into a clean centrifuge tube and spun at 2000 rpm for 10 minutes in a benchtop centrifuge. The supernatant was decanted, and the sediment was mixed thoroughly. A 0.15 mL drop of the sediment was then applied onto a clean microscope slide using a pipette, covered with a coverslip, and examined for *S. haematobium* ova under 10× and 40× magnification lenses.

Statistical Analysis

Data from this study were subjected to statistical analysis using SPSS version 27. Prevalence rates were calculated and expressed as percentages. Pearson's chi-squared test was used to assess the relationship between the variables and the prevalence of infection.

Ethical Consideration

Ethical Approval was obtained from the Adamawa State Ministry of Health, Nigeria, with Ethical Number S/MOH/1131/1.

RESULTS AND DISCUSSION

Prevalence of Urinary Schistosomiasis in HIV Uninfected Women

Prevalence of Urinary Schistosomiasis among HIV uninfected participants in Table 1 shows 326 HIV uninfected participants with 43.6% (143/326) prevalence. Regarding the village of origin, the distribution of infections was as follows: Bilachi 45 (75.0%), Bobere 27 (49.0%), Bare 20 (36.4%), Gwasala 23 (33.8%), Gundo 18 (36.0%) and Linga 10 (26.3%). Statistical analysis indicated no significant difference in prevalence across the village categories ($p < 0.05$). In terms of age, the prevalence was 57.8% (66) for those aged 51 years and above, 51.6% (46) for the 21–30 age group, 45.6% (31) for the 31–40 age group, 35.0% (41) for the 11–20 age group, and 31.3% (10) for the 41–50 age group. A statistically significant difference in prevalence was observed across these age categories ($p = 0.003$). Educational status did not show a statistically significant difference in infection ($p < 0.05$). The distribution was 55.8% (66) among secondary students, followed by 34.8% (45) among those with no formal education, 30.4% (14) among primary pupils, and 14.0% (7) among tertiary students. Marital status was found to have no statistically significant association with infection prevalence ($p = 0.08$), with 45.7% (98) of single participants infected compared to 34.8% (45) of married participants.

Table 1: Prevalence of Urinary Schistosomiasis in HIV Uninfected Women

Variables	NumberExamined	No infected (%)	X^2	P value
Study Villages				
Bilachi (Numan)	60	45(75.0)		
Bare (Numan)	55	20(36.4)		
Gwasala (Demsa)	68	23(33.8)		
Linga (Demsa)	38	10(26.3)		
Bobere(Shelleng)	55	27(49.0)		
Gundo (Shelleng)	50	18(36.0)		
Subtotal	326	143(43.6)	34.281	<0.05
Age group (yrs)				
11 20	117	41(35.0)		
21 30	89	46(51.6)		
31 40	68	31(45.6)		
41 50	32	10(31.3)		
51& above	20	15(75.0)		
Subtotal	326	143(43.6)	15.933	0.003

Variables	**NumberExamined**	**No infected (%)**	**X^2**	**P value**
Educational status				
Primary	46	14(30.4)		
Secondary	114	66(57.8)		
Tertiary	50	7(14.0)		
Adult Education	129	45 (34.8)		
Subtotal	326	143(43.6)	31.510	<0.05
Marital status				
Single	197	98(49.7)		
Married	129	45(34.8)		
Subtotal	326	143(43.6)	6.993	0.080

Prevalence of Urinary Schistosomiasis among HIV Infected Women

Prevalence of Urinary Schistosomiasis among HIV uninfected participants in Table 2 shows that the prevalence of urinary schistosomiasis among the 97 HIV infected participants was 10.3% (10/97). Regarding the local government areas (LGAs), the distribution of the infection was 4 (16.7%) in Shelleng, 3 (9.7%) in Demsa, and 3 (7.1%) in Numan. There were no statistically significant differences (p =0.468). With respect to age, the prevalence was 3 (30.0%) for those aged 51 years and above, 2 (14.3%) among the 41–50 age group, 1 (10.0%) in the 11–20 age group, 2 (8.7%) for the 21–30 age group, and 2 (5.0%) for the 31–40 age group. There were no statistically significant differences (p= 0.221). Results on educational status showed the highest number, 2 (9.1%), among tertiary students, followed by 6 (8.8%) among those with no formal education, and 2 (28.5%) among secondary students; no participants were recorded in the primary education category.There were no statistically significant differences (p =0.256). About marital status, 9 (10.8%) of married participants were infected, compared to 1 (1.7%) among single participants.There were no statistically significant differences (p =0.674). Overall, the analysis indicated no significant association (p > 0.05) between urinary schistosomiasis and LGA, age, educational status, or marital status within the HIV infected group.

Table 2: Prevalence of Urinary Schistosomiasis in HIV Infected Women

Variables	**Number Examined**	**No infected (%)**	**X^2**	**P value**
LGAs				
Numan	42	3(7.1)		
Demsa	31	3(9.7)		
Shelleng	24	4(16.7)		
Subtotal	97	10(10.3)	1.518	0.468
Age group(yrs)				
11 20	10	1(10.0)		
21 30	23	2(8.7)		
31 40	40	2(5.0)		
41 50	14	2(14.3)		
51& above	10	3(30.0)		
Subtota	97	10(10.3)	5.718	0.221
Educational Status				
Primary	-	-		
Secondary	7	2(28.5)		
Tertiary	22	2(9.1)		
Adult Education	68	6(8.8)	2.722	0.256
Subtotal	97	10(10.3)		
Marital Status				
Single	14	1(7.1)		
Married	83	9(10.8)		
Subtotal	97	10(10.3)	0.117	0.674

Overall Prevalence of Urinary Schistosomiasis among HIV-infected and Uninfected Women in the Three (3) LGAs

Prevalence of Urinary Schistosomiasis among HIV infected and uninfected participants in Table 3 shows 423 HIV infected and uninfected women examined, with a prevalence of 36.1%(153/423). Regarding the LGAs, the distribution of infections was as follows: Numan 68 (43.3), followed by Demsa 36 (26.3%), and Shelleng 49 (37.9%). Statistical analysis indicated a non-significant difference in prevalence across the LGA categories (p =0.864). In terms of age, the prevalence was 18(60.0%) for those aged 51 years and above, 48(42.9%) for the 21–30 age group, 33(30.6%) for the 31–40 age group, 42(33.1%) for the 11–20 age group, and 12(26.1%) for the 41–50 age group. A statistically significant difference in prevalence was observed across these age categories (p =0.009). Educational status showed a statistically significant difference in infection (p <0.05). The distribution was 68(56.2%) among secondary graduates, followed by 62(33.7%) among those with no formal education, 14(30.4%) among primary school graduates, and 9(12.5%) among tertiary graduates. Marital status was significantly associated with infection prevalence (p <0.05), with 99 (46.9%) of single participants infected compared with 54(25.5%) of married participants.

Table 3: Prevalence of Urinary Schistosomiasis among the HIV Infected and Uninfected Participants in Relation to Location, Age, Educational Status and Marital Status

Variables	No Examined	No infected	Percentage(%)	X^2	P value
LGAs					
Numan	157	68	43.3		
Demsa	137	36	26.3		
Shelleng	129	49	37.9		
Subtotal	423	153	36.1	0.292	0.864
Age group (yrs)					
11 20	127	42	33.1		
21 30	112	48	42.9		
31 40	108	33	30.6		
41 50	46	12	26.1		
51 & above	30	18	60.0		
Subtotal	423	153	36.1	13.577	0.009
Educational status					
Primary	46	14	30.4		
Secondary	121	68	56.2		
Tertiary	72	9	12.5		
Adult Education	184	62	33.7		
Subtotal	423	153	36.1	39.639	<0.05
Marital status					
Single	211	99	46.9		
Married	212	54	25.5		
Subtotal	423	153	36.1	21.070	<0.05

Discussion

Prevalence of Urinary Schistosomiasis in HIV Uninfected Women in the Three LGAs

This finding aligns with wider epidemiological trends in the Benue and Gongola River basins in Adamawa State, where endemicity ranges from low in urbanised zones to extremely high around major hydrological impoundments.The prevalence varied across settlements, ranging from Bilachiand Bobere to Linga.Higher prevalence in riverine settlements like Bilachi reflects similar observations in the Shelleng LGA, where studies around the Kiri Dam recorded endemic rates ranging between 48% and 76.1% due to constant human-water contact (Birma *et al*., 2017; Tidi *et al*., 2015). Conversely, lower-prevalence villages in this data mirror studies in Numan LGA, which reported lower transmission rates around 9.5% among school children due to reduced direct exposure to open water bodies (Alexander *et al*., 2026).Age-specific prevalence demonstrated a statistically significant difference (p=0.003). The highest rates were recorded among individuals aged 51 years and above and the 21–30 age group, while the lowest rate was in the 41–50 age group. However, elevated rates in working-age adults (ages 51 and above and 21–30 years) closely align with occupational exposure patterns seen in agricultural and fishing communities around Shelleng LGA, where adult men and women engage heavily in manual irrigation farming and riverine economic activities (Birma *et al*., 2017; Tidi *et al*., 2015). Educational level showed a statistically significant variation (p<0.05), despite secondary students recording the highest proportion of cases, followed by those with no formal education, primary pupils, and tertiary students. In rural Adamawa State, secondary school-aged adolescents (typically 12–18 years) often assume increased domestic and agricultural duties, such as fetching household water, washing clothes at riverbanks, and engaging in riverbank farming or fishing. Additionally, increased physical mobility and recreational swimming during or after school hours heighten their contact with cercariae-infested water bodies (Mijah *at al*., 2024) This pattern mirrors findings by Awosolu *et al. (2020)* in Southwestern Nigeria and Aliyu(2024) in Jigawa State, where educational background and water-contact behavior significantly influenced *S. haematobium* infection rates, with school-aged adolescents bearing heavy burdens due to occupational water exposureA statistically non-significant association (p =0.080) was found between marital status and infection, with single participants showing higher prevalence than married participants.Single individuals, who often skew younger or hold occupational roles involving higher mobility, are frequently exposed through recreational water contact, domestic water collection, and agrarian labour. This pattern parallels findings in Demsa LGA, where younger, unmarried group demonstrated significantly higher exposure rates compared to older domestic households with established, safer water collection routines (Yaro *et al*., 2020).The elevated infection among single women in the HIV-uninfected group is consistent with findings by Onile*et al*. (2011), who observed that unmarried, younger females are more frequently tasked with daily water fetching and recreational stream activities.

Prevalence of Urinary Schistosomiais in HIV Infected Women in the Three LGAs

The lower prevalence of *Schistosoma haematobium* egg excretion in urine among HIV-infected individuals controls is consistent with several observational and hospital-based studies across endemic regions. Onile*et al*. (2011) reported a low urinary schistosomiasis prevalence of 0.3% among HIV-infected subjects in Benin City, Nigeria, while Matee*et al.* (2021) recorded a 5% prevalence among women living with HIV/AIDS in Tanzania. Schistosome egg excretion through the bladder and intestinal walls relies on an intact host cell-mediated immune response, specifically CD4+ T-cell-driven granuloma formation. In HIV-infected individuals, CD4+ T-cell depletion can impair granuloma formation around trapped eggs, potentially reducing the efficiency of egg passage into the urinary tract. Consequently, standard urine filtration methods may underestimate active infection intensity in immunocompromised patients. Individuals diagnosed with HIV often receive continuous health counselling, antiretroviral therapy (ART) monitoring, and increased clinical oversight. This interaction frequently promotes altered water-use behaviours and reduced exposure to open freshwater bodies compared to the broader population. This prevalence sits between extremes reported in other parts of Nigeria. It is considerably lower than the 20.0% prevalence observed by Okwori and Alao (2014) among HIV/AIDS patients in Otukpo, Benue State, but significantly higher than the 0.3% prevalence recorded by Nwokedi *et al.* (2011) among 2,000 HIV-infected subjects in Benin City, Edo State. These variations are largely driven by geographic and environmental disparities: study sites along the Benue/Gongola river basins feature greater water-contact opportunities compared to urban tertiary centregroup.Infection rates varied numerically across LGAsShelleng, Demsa, and Numan,though without reaching statistical significance ($p>0.05$).The higher proportion in Shelleng mirrors established epidemiological surveys in Adamawa State. Studies around the Kiri Dam area in Shelleng LGA consistently document elevated schistosomiasis transmission due to extensive irrigation schemes, artificial reservoirs, and water-dependent agrarian livelihoods. Conversely, lower proportions in Demsa and Numan align with findings in less impounded riverine sectors where human-water contact varies seasonally. The lack of statistical significance within this specific group suggests that HIV status itself does not alter geographical exposure risk when individuals share common water sources. In general, in immunocompetent populations across Nigeria, schistosomiasis typically shows a peak in school-aged children (5–15 years) due to recreational swimming;for example, Usman *et al.* (2025) recorded a prevalence across the 5-15 age group. However, non-significant or adult-skewed trends among the HIV group are frequently reported. For instance, Nwokedi *et al.* (2011) also found no significant age association among HIV-positive adults. The elevated proportions in older age brackets (≥51 years) in your findings likely reflect occupational exposuressuch as farming and fishingrather than age-dependent biological susceptibility.The infection occurred across educational categories (secondary, tertiary, non-formal education, andprimary), but without statistical significance ($p>0.05$).These findings are consistent with Nwokedi *et al.* (2011), who observed that formal educational attainment had no significant effect on schistosomiasis prevalence among HIV patients in Benin City ($p=0.679$). In endemic rural and semi-urban settings across Nigeria, reliance on natural stream water for domestic chores and agricultural activities affects individuals across educational backgrounds when potable municipal water infrastructure is lacking. Infected participants were overwhelmingly married compared to single participants, though the overall relationship remained non-significant ($p=674$).This observation contrasts with trends reported in general community surveys and urban HIV studies. For example, Nwokedi *et al.* (2011) reported a statistically significantly higher prevalence among single HIV patients ($p=0.002$), attributing it to greater mobility and recreational stream contact among youth. The higher absolute case count among married individuals in this HIV group likely reflects domestic water collection roles and agricultural responsibilities typically managed by married heads of households in rural Adamawa communities.

Prevalence of Urinary Schistosomiasis in HIV Infected and Uninfected Women in the Three (3) LGAs

The overall prevalence of this study aligns with similar rural and riverine community studies in northeastern Nigeria. Mijah *et al.* (2024) reported a 37.4% prevalence of intestinal parasitic infections in Demsa LGA, Adamawa State, identifying age and occupation as significant correlates of the infection. This places this study area within the mesoendemic zone according to World Health Organisation (WHO, 2022) benchmarks for schistosomiasis. This prevalence also aligns closely with previous findings in Adamawa State, Nigeria. For instance, Houmsou*et al.* (2017) reported a 36.7% prevalence in Numan LGA. However, higher infection rates have been documented in hyperendemic pockets along the same river basin, such as Abubakar *et al.* (2016), who recorded 48.0% around Kiri Lake in Shelleng LGA, and Balla *et al.* (2015), who noted infection up to 76.1% in localised riverine communities. Infection prevalence was highest in Numan, followed by Shelleng and Demsa. The geographic variation reflects proximity to open water bodies (e.g., River Benue and Kiri Dam) and associated occupational activities such as farming, fishing, and sand harvesting. The non-significance across LGAs suggests that transmission environmental factors (e.g., snail vector habitats and open water dependence) are relatively uniform across these neighbouring riverine LGAs. The highest prevalence was recorded among participants aged 51 years and above, and the lowest among those aged 41–50 years, with a statistically significant association. Similar adult-dominated peaks are observed in agrarian communities where older adults engage in prolonged occupational water contact (irrigation farming, fishing, riverbank laundry). Furthermore, in groups with HIV co-infection, adult immune dysfunction may reduce age-acquired immunity, leading to persistent chronic infections into older age. Prevalence was highest among secondary school graduates and lowest among tertiary graduates. The low prevalence among tertiary graduates strongly agrees with studies across Nigeria (Otuneme*et al*., 2019), which demonstrate that higher educational attainment correlates with improved water, sanitation, and hygiene (WASH) practices and lower occupational exposure to infested surface water. The elevated infection in secondary graduates compared to those with no formal education may be linked to age demographics or specific outdoor occupational/recreational routines unique to young adults in this sample. Single participants had a significantly higher infection rate compared to married participants. Single individuals who skew younger frequently engage in higher-risk water activities such as swimming, bathing, and communal river washing. In contrast, married individuals often have settled household roles, potential access to improved domestic water sources (e.g., boreholes or wells), or less frequent recreational river exposure.

CONCLUSION

This study demonstrates that while *S. haematobium* remains highly endemic among HIV-uninfected community members driven by age and marital risk profiles, the HIV-infected group presents a lower detectable prevalence without strong demographic clustering. These findings highlight the need for targeted mass drug administration with praziquantel across endemic villages, coupled with routine schistosomiasis screening in HIV clinic settings to capture subclinical or low egg-excreting co-infections. Praziquantel administration should be expanded beyond school-aged children to include adult women, particularly those involved in agricultural and riverbank activities. Provision of safe, potable water sources (such as boreholes) in high-risk riverine villages like Bilachi, Bare, Bobere, and Linga is advised to reduce direct dependence on infected water bodies.

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