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Prevalence of Urinary Schistosomiasis among Primary School Pupils in Kaiama Local Government Area, Kwara State, Nigeria

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ABSTRACT

Background

Urinary schistosomiasis is still a disease of public health concern in most tropical regions particularly in Africa. A study was conducted among school pupils aged 5-14 years to determine the prevalence and intensity of urinary schistosomiasis in Kaiama local government area of Kwara State, Nigeria from April to September, 2025.

Methods

Urine specimens were collected from 382 school pupils comprising 253 (66.2%) boys and 129 (33.8%) girls, then preserved in formalin and processed. Ten milliliter of the urine specimen collected was then filtered through 25µm Wire Mesh and the supernatants examined using a compound microscope for the characteristic eggs of *Schistosoma haematobium* and the intensity of the infection was defined by the number of eggs per the 10 ml of urine specimen.

Results

Altogether, 74 (19.4%) of the 382 pupils examined were positive for the characteristic eggs of *S haematobium* ($p<0.05$). This prevalence was also significantly higher ($p<0.05$) among boys (21.7%) as compared to girls (14.7%). The highest prevalence of infection (25.8%) was seen among pupils in the age group 5-7 years. The intensity of the infection ranges from light, moderate to heavy infection both in boys and girls.

Conclusions

This study shows that urinary schistosomiasis is endemic in Kaiama Local Government Area of Kwara state, North-central Nigeria. We recommend a consistent and sustainable Health Educational Programs (HEP) and Mass Drug Administration (MDA) as immediate public health interventions that will alleviate the suffering of the infected pupils in the communities and elsewhere.

Keywords: Infection Intensity; Nigeria; Prevalence; Schistosomiasis; School-aged children.

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INTRODUCTION

Schistosomiasis (bilharzia) is a chronic parasitic disease caused by trematodes of the genus *Schistosoma*, notably *S. haematobium*, *S. mansoni*, and *S. japonicum*. Although rarely fatal, it represents a major public health problem with significant medical and socioeconomic consequences.[1] Globally, over 700 million people are at risk and more than 250 million are infected, particularly in communities with frequent freshwater contact.[2] Transmission occurs when infective cercariae penetrate the skin during activities such as farming, fishing, irrigation, and domestic water use.[3] Chronic infection may result in anemia, malnutrition, hepatosplenomegaly, neurological complications, and an increased risk of bladder cancer and HIV transmission in urogenital schistosomiasis.[4-6] Children in endemic areas are especially vulnerable due to repeated water exposure. In Nigeria, inadequate epidemiological data limit effective control efforts.[7-10] This study determined the prevalence of urinary schistosomiasis among primary school pupils in Kaiama Local Government Area, Kwara State, North-central Nigeria.

METHODS

A cross-sectional, school-based community and laboratory study conducted among primary school children in Kaiama Local Government Area (LGA), Kwara State, Nigeria. There was a massive community mobilization for sample collection and confirmation of positive samples was through the microscopic examination of the characteristic eggs in the lab.

The study was conducted in Kaiama Local Government Area (LGA) of Kwara State, Nigeria, located at approximately 10°28′N and 5°03′E, and covering about 5,334 km². The LGA comprises ten wards and numerous villages, with a population of approximately 581,653 based on the 2006 national census.

Kaiama lies within the Guinea savannah zone and experiences two distinct seasons: a wet season from April to October, with peak rainfall in August, and a dry season from November to March. Annual rainfall ranges from 1,100 to 1,600 mm, mean temperatures range between 30°C and 35°C, and relative humidity varies from about 54% in the dry season to 90% during the wet season.

The area has predominantly acidic soils, including loamy, sandy, and clayey loam types, especially in Fadama areas, with some locations affected by erosion and gully formation. The major occupations of residents include farming, fishing, livestock rearing, trading, and public service. Social amenities in the area include educational institutions, healthcare facilities, electricity supply, municipal water systems, and boreholes.

School aged children in primary schools in Kaiama Local Government Area were the target population of this study. This is because the school aged children are easily accessible with the help of school teachers and head masters and are representatives of virtually every family in the community. More so, their bio data such as age and origin are readily available in the class register.

The sample size was determined using the modified Fisher's sample size formulae.[11] Therefore, total minimum sample size was 373 calculation and rounded it up to 382 samples for the study.

Ten primary schools were selected by simple random technique from 435 schools within the LGA. Pupils within the inclusion criteria were then selected by systematic sampling technique from each school.

All the pupils attending the selected school who fall within the age of 5-14 years that were present and willing to participate were included in the study.

Ethical approval for the study was obtained from the Ethical Review Committee of the Faculty of Basic Medical Sciences (UIL/FBCS/ERC-2024-023), University of Ilorin, Ilorin and the Kwara State Ministry of Health (ERC/KSMOH/2024/04/186).

Community leaders, parents, pupils, and teachers were sensitized on study procedures, roles, and relevance to enhance awareness and cooperation. Participation was entirely voluntary, with the right to withdraw at any time. All data were kept

strictly confidential and used solely for research purposes. Trained field assistants with the help of school teachers administered pretested and standardized questionnaires to collect demographic data (age, sex, religion, ethnicity, duration of stay in the community, presence of blood in urine and stool, parents' educational background, water contact habit and history of deworming) of pupils in the selected schools. The urine specimens were collected during school hours (9:00 am-12:00 noon because *S. haematobium* eggs are at peak of excretion within this period. Prior to the collection of the urine specimens, the pupils were encouraged to run a distance of 100 m across the fields of the school selected to stimulate urination. All subjects (pupils) selected for the study were provided with disposable plastic cups (which were well labeled to code for school age, class, and a serial number). Other demographic parameters, history of haematuria and Knowledge, Attitude and Practices (KAP) were captured in the questionnaire earlier distributed to the pupils. The pupils under thorough supervision and maximum cooperation from their class teachers were made to void their urine specimens into the already distributed plastic cups.

From the urine specimen collected into the disposable plastic cups, 10 ml of urine was transferred into the universal bottles with the aid of 10 ml syringes. It was examined macroscopically for haematuria and preserved with 10% formalin in a well labeled universal bottle before transportation to the laboratory for microscopic analysis.

Each preserved urine specimen was dispensed through a conically folded 25µm mesh sieve (filter).[12] The sediment on the mesh was washed onto a cross hatched petri dish with the use of a plastic dropper followed by microscopic examination at 20x magnification for characteristic eggs of *Schistosoma haematobium*.

The number of eggs present per 10ml of urine was counted and graded as follows- heavy (>500 eggs/10 mL), moderate (51- 499 eggs/10 mL) and light (≤50 eggs/10 mL) according to the guidelines of World Health Organization.[2] Data obtained from the study were analyzed using the Statistical Package for Social Sciences (SPSS) version 20 and statistical significance was set at $p<0.05$.

RESULTS

Overall prevalence of urinary schistosomiasis in the 10 primary schools studied. Of the 382 pupils whose urine specimen were examined, 74 (19.4%) were positive for the characteristic eggs of *S. haematobium*. Three schools LGEA School B, Kemanji (39.0%), LGEA School A, Kemanji (37.2%) and LGEA School Gwaria (32.3%) had the highest prevalence while LGEA Primary School Kugizi (8.3%), LGEA Islamiyya School (6.4%) and LGEA Primary School Moshigada (6.3%), had the lowest prevalence. The differences in the prevalence of infection among these schools were not statistically different (p = 0.062) (Table 1).

Table 1. Prevalence of urinary schistosomiasis by school in Kaiama LGA (n= 382).

Schools	Number Examined	n (%) Infected
Kemanji B	41	16 (39.0%)
Kemanji A	43	16 (37.2%)
Gwaria	31	10 (32.3%)
Worro	45	9 (20.0%)
Demonstration	39	7 (17.9%)
Adena	51	7 (13.7%)
Central	36	3 (8.3%)
Mosigada	32	2 (6.3%)
Islamiyyah	47	3 (6.4%)
Kugizi	17	1 (5.9%)

p = 0.062

Prevalence of urinary schistosomiasis is high among male than female but not significant statistically (Table 2).

Table 2. Prevalence of urinary schistosomiasis by sex among primary schools studied in Kaiama LGA, (n= 382).

Sex	Number Examined	n (%) Infected
Male	253	55 (21.7%)
Female	129	19 (14.7%)

p =0.002

The age group 5-7 years had the highest prevalence of urinary schistosomiasis (25.8%) among the 10 schools studied. The prevalence among the other age groups was 21.7% in 8-10 years, 17.9% in 11-

13 years, and 13.6% in those aged ≥14 years. The differences in prevalence of urinary schistosomiasis across the age groups were not statistically significant (p=0.063) (Table 3).

Table 3. Prevalence of urinary schistosomiasis by age group (n= 382).

Age Groups	Number Examined	n (%) Positive
5-7 years	31	8(25.8)
8-10 years	152	33 (21.7)
11-13 years	140	25 (17.9)
≥14 years	59	8 (13.6)

p=0.063

Intensity of urinary schistosomiasis infection among the study population. Of the three categories of urinary schistosomiasis infection (light, moderate and heavy), light infection is highest (68.9%) followed by moderate infection (27.1%) and heavy infection is the least (5.4%). For the 10 primary schools studied, a combined prevalence of light and moderate infection was 94.6% (Table 4).

Table 4. Prevalence of light, moderate and heavy infection of urinary schistosomiasis (n= 382).

Sex	Light Infection	Moderate Infection	Heavy Infection	Total Positive, n (%)
Male	41 (55.4%)	12 (16.2%)	2 (2.7%)	55 (74.3%)
Female	10 (13.5%)	7 (9.5%)	2 (2.7%)	19 (25.6%)

**Light infection is defined by the egg count of 50 or less for S. haematobium per 10 ml of urine; Moderate infection is defined as egg count of 51-500 S. haematobium eggs per 10 ml of urine; and heavy infection is defined as >500 S. haematobium eggs per 10 ml of urine.*

DISCUSSION

Overall prevalence of schistosomiasis using microscopy, the gold standard for the diagnosis of schistosomiasis, the prevalence of urinary schistosomiasis among pupils in 10 primary schools in Kaiama LGA was found to be high (19.4%). This prevalence was distributed almost evenly among all the schools studied, signifying how serious urinary schistosomiasis is in these communities. It may be the same scenario even among other children of the same age bracket who are not in school. This result agrees with the previous findings which also demonstrated that schistosomiasis is widely spread in many parts of Nigeria.[12] The prevalence of schistosomiasis is our study has proven that if this disease remains unchecked, it could pose a threat to the health of infected children and the communities at large. Research has also demonstrated how Schistosomiasis has negative impacts on the performance of school children and the debilitation caused by untreated infections affects both social and economic developments in endemic areas.[13] Rivers create suitable ecology for the transmission and spread of schistosomiasis while the nearness of communities to these rivers increases the frequency of water contact of the dwellers in those communities. Interestingly these water bodies were seen in close proximity in the study area, thus predisposing these communities to the infection. Another factor observed in our study is the participation of school pupils in water-related occupations with their parents, such as irrigation farming, fishing and sometimes recreational activities such as swimming in infested water bodies.

The high prevalence of urinary schistosomiasis observed in this study is most likely attributable to favorable ecological conditions within the communities that support transmission of the disease. This is further compounded by poor awareness of schistosomiasis and inadequate access to safe water supply, which were identified as key risk factors contributing to the endemicity of urinary schistosomiasis in the study area. The prevalence recorded in this study is consistent with reports of high levels of infection in similar endemic settings.[14,15]

The differences in the prevalence of schistosomiasis by gender in our findings is also statistically significant ($p<0.05$). This significant association of urinary schistosomiasis by gender had been reported across Nigeria.[12,16,17] Although *King et al.,*[18] reported higher infection among girls, *Allan et al.,*[19] suggested that there is no consistent pattern attributable to sex differences with respect to infection in Nigeria. However, these variations are likely to be associated with the methodology used,

the environment, demographic factors, and the degree of exposure to water bodies due to cultural, social, and behavioral differences. The significant differences in the infection rate between boys and girls in our study is attributable to the exposure of boys to larger water contact activities (like open swimming) as opposed to girls who are more timid to expose their femininity; religious beliefs and socio-cultural practices that may restrict girls from exposing their bodies in open water bodies, boys being more adventurous in traveling to other communities within and outside the LGA and state where they are more likely to acquire more infection; participation of school pupils in water-related occupations with their parents, such as irrigation farming and sometimes fishing.

In this study, the significantly higher infection rate is observed among boys compared to girls. It may be attributed to differences in water-contact behaviors. Boys are more frequently involved in activities such as open swimming and other recreational water contacts, which increase their risk of exposure to infection. In contrast, girls may have reduced exposure due to socio-cultural and religious norms that discourage open body exposure in communal water bodies. Additionally, boys are generally more adventurous and are more likely to travel within and outside the LGA and state, thereby increasing their chances of acquiring infection. Participation of school pupils in water-related activities alongside their parents, such as irrigation farming or occasional fishing, may further contribute to the higher prevalence among boys. *Buck et al.,*[20] has also reported more exposure of boys to inter community travels aiding transmission by been carries of this infection to and from other communities.

Generally, ignorance about the transmission of schistosomiasis and the proximity of the communities to infested streams and rivers are most likely the major factors possibly responsible for the endemicity of urinary schistosomiasis in our study area. These water bodies create suitable ecology for the transmission and spread of schistosomiasis as the nearness of the community to these water bodies increases the frequency of water contact activities, which is in consonance with *Léger et al.,*[21]

Although school-aged children of 11-13 years are often considered at higher risk due to frequent water contact, our findings suggest that younger children (5-7 years) in this area may also be exposed early, possibly through domestic activities or play in infested water. This observation aligns with N*yamngee et al.,*[12] who reported that urinary schistosomiasis can affect children and adolescents soon after first exposure. The decreasing trend in prevalence among older pupils (≥14 years) may reflect the development of partial immunity over time or changes in behavior that reduce water contact. These findings underscore the need for early preventive interventions targeting all school-aged children, including the youngest age groups.

Comparison of light and moderate infection by gender.

In this study, the intensity of infection, as determined by egg count, ranged from light to heavy. Males were more frequently observed to have moderate to heavy infections than females. The higher infection intensity among males may be attributed to their greater involvement in water-contact related activities, which increases their exposure to re-infection or repeated infections. This finding is consistent with the report of *Allan et al.,*[19], who also observed a higher intensity of S*chistosoma haematobium* infection among males than females.

CONCLUSIONS

This study concludes that urinary schistosomiasis is endemic among schools pupils in Kaiama Local Government Areas of Kwara State North-central Nigeria affecting both males and females. The intensity of this disease cuts across light, moderate and heavy with reference to egg count. We recommend Mass Drug Administration (MDAs) with intensive Health Education Campaigns (HECs) about schistosomiasis in Kaiama Local Government Area and elsewhere to alleviate the sufferings of these endemic communities.

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Availability of data and materials: All data analysed during this study will be made available upon reasonable request from the corresponding author.

Authors' contributions

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