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Original Article

Prevalence of schistosomiasis among primary school pupils in local government education authority nursery and primary school, Gangare, Jos North Local Government Area, Jos, Plateau State

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Abstract

Background: Schistosomiasis is a waterborne snail-transmitted parasitic disease and a major public health challenge in sub-Saharan Africa, mostly affecting populations living in low-resource countries where water supply and sanitation are poor and inadequate. It is the most predominant neglected tropical disease (NTD) after malaria and intestinal helminthiases in global parasitism. The study was conducted to determine the prevalence of *Schistosoma haematobium* among primary school pupils in Gangare and to relate the prevalence to age groups, gender, and the water sources used by the pupils. **Methodology:** Thirty (30) millilitres of urine were collected into universal containers, including the last portion of the urine specimen. Ten millilitres of the specimen were transferred into a centrifuge tube and centrifuged at 2,000 rpm for five minutes. A drop of the sediment was placed at the centre of a clean, grease-free slide and examined under ×10 and ×40 objectives. **Results:** Of the 200 urine samples examined, 14 were positive for *S. haematobium*, giving a prevalence of 7.0%. The 11–13 years age group had the highest prevalence at 9.2%, while the lowest, 5.3%, was in the 8–10 years age group. Males had the highest prevalence, 8.7%, while females had the lowest, 4.1%. Subjects who bathe and wash in stream or river water recorded the highest prevalence of 26.4%, while subjects drinking tap water recorded the lowest prevalence of 6.7%. **Conclusion:** This study showed that there was a low prevalence of *Schistosoma haematobium* among primary school pupils in Gangare Jos North Local Government, which may be attributed to increased awareness and government intervention.

Keywords: *Bilharziasis, Schistosomiasis, Schistosoma haematobium..*

Introduction

Schistosomiasis is a waterborne, snail-transmitted parasitic disease and a major public health challenge in sub-Saharan Africa, primarily affecting populations in low-resource countries with poor water supply and sanitation. [1–2] It is the most predominant neglected tropical disease (NTD) after malaria and intestinal helminthiases in global parasitism.[3] It is also the most devastating prevalent parasitic disease due to morbidity and mortality in developing countries of Africa, South America, the Caribbean, the Middle East and Asia, [3] and is targeted for elimination by the World Health Organisation (WHO) through global

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efforts that involve preventive chemotherapy.[4–5]

Schistosomiasis is a parasitic infection caused by blood trematodes of the genus *Schistosoma* and transmitted to humans by certain freshwater snails after skin contact with infected water.[3-6] Transmission occurs when the parasites deposit terminal-spine eggs in the host during infection, which block the venous plexus and prevent blood flow. This causes the veins to break, allowing blood and eggs to enter the urinary bladder.[7]

Schistosomiasis is caused by five major species of schistosome. *Schistosoma mansoni*, *S. intercalatum*, *S. japonicum*, and *S. mekongi* cause intestinal schistosomiasis, while *S. haematobium* causes urogenital morbidities. *S. mansoni* and *S. haematobium* are the predominant species in sub-Saharan African countries. Transmission occurs when an infected person passes urine or faeces into water bodies. This is common in resource-limited rural, peri-urban or urban areas. The eggs that enter the water develop into miracidia, which swim to locate specific freshwater snail hosts. They develop in the snails into sporocysts, which in turn develop into the infective stage of the parasite called cercariae. Humans acquire the infection during contact with cercariae-infested freshwater bodies.[8]

Schistosomiasis affects about 258 million people worldwide.[6] Sub-Saharan African countries, which account for about 90% of the world's total cases, are the most affected regions.[9] In recognition of the global health importance of intestinal helminth infections, the World Health Organisation (WHO) recommends a baseline survey in school-aged children to determine the prevalence and intensity of infections, which will be useful in the diagnosis, planning, and implementation of effective and sustained control programmes.[5]

In 2001, the World Health Assembly (WHA) prioritised schistosomiasis on the international health agenda. The member states passed a resolution to control the disease in endemic areas. The countries were urged to meet a target of regular treatment of "at least 75% and up to 100% of all school-aged children at risk of morbidity by 2010."[10–11] In Nigeria, during this period, the national disease control policy did not prioritise schistosomiasis. This resulted in a very low praziquantel (PZQ) coverage index in schistosomiasis endemic areas.[11] In January 2012, stakeholders and partners, including the governments of NTD-endemic countries, donors, a coalition of global health institutions, pharmaceutical companies, and non-governmental organisations, endorsed the London Declaration.[12] Since 2012, the Nigerian government has given more attention to NTDs' control. The country has recorded a gradual increase in the PZQ coverage index among people at high risk of schistosomiasis.[6–7]

The World Health Organisation (WHO) set a target for endemic countries to reduce schistosomiasis morbidity to <5% prevalence among children aged 5–14 years by 2020.[13] Despite a decade of efforts to mitigate disease transmission, Nigeria is far from achieving the WHO's target. The Nigerian experience calls for the adoption of a holistic approach towards control of schistosomiasis. The integrated approach could include intervention informed by appropriate and reliable mapping of the disease, snail control, provision of safe water, and evidence-based decision-making in policy development.[11]

This study is aimed at determining the prevalence of schistosomiasis among primary school children attending L.E.A Nursery and Primary School, Gangare District, a rural community of Jos North Local Government Area, Plateau State, Nigeria.

Materials and methods

Study Area

The study was carried out in Jos North LGA, Plateau State, Nigeria.

Study Design

This was a cross-sectional study evaluating *Schistosoma haematobium* among primary school pupils in Gangare, conducted between May and August 2025. The sample size was 200 primary school pupils.

Sampling Technique

The pupils recruited for the study were randomly selected from the primary school classes. A consent form and questionnaire were given to each subject's parent/teacher/guardian before commencement of the study.

Study Population

The study population comprised children aged five to thirteen (5–13) years. The study was conducted among primary school pupils in Gangare, a community located around water bodies in the state.

Ethical Clearance

Ethical clearance was obtained from the Ethical Committee of Jos University Teaching Hospital, Plateau State, via a letter. Correspondingly, the Plateau State Universal Basic Education Board approved the study following ethical clearance from the Plateau State Specialist Hospital Ethical Committee. The purpose of the study was explained to the Headmistress of the school, and informed

consent from the pupils and their parents or guardians was sought before the commencement of the work and kept confidential.

Analytical Methods

Collection and processing of urine samples

The specimen container for the study was a clean universal container. Each participant interviewed received a pre-labelled, sterile 30 mL urine container with their identification number and was asked to submit a urine sample as soon as possible. Before receiving the container, each participant was briefed on the importance of collecting a sample at that time and, when possible, asked to provide the required volume of urine. Each participant was given a sterile, transparent, wide-mouth screw-capped universal container into which they voided the terminal urine, including the last portion. This was carried out between 10:00 am and 2:00 pm, when the ova count of *S. haematobium* was expected, and the specimens were transported in a cold box to the parasitology laboratory of the Jos University Teaching Hospital for analysis. In this study, urinary schistosomiasis at its peak was defined as the presence of S. haematobium ova in the urine.[14]

Urine microscopy using the sedimentation technique

The samples were examined for the presence of *S. haematobium* eggs using the sedimentation method as described by Chami et al.[15] The urine samples were mixed thoroughly with a glass rod, and 10 mL of each of the urine sample was analysed using the sedimentation centrifugation technique. The 10 mL was transferred into centrifuge tubes and centrifuged at 2,000 rpm for 5 minutes at room temperature. The supernatant was discarded, and the sediment was transferred onto microscope glass slides and covered with a coverslip. Examination of the entire sediment was carried out using the ×10 objective of a compound light microscope.

Parasitological examination

Two hundred (200) urine samples were collected by assigning a number to each randomly selected participant from the different classes. In appropriately labelled plastic screw-cap urine and stool containers, the children were asked to collect a 10 mL urine sample at midday. The pupils were also instructed on how to collect the urine sample, advising them to include the first and last drops, as these often contain the highest number of *Schistosoma* eggs. Urine samples were taken in an ice container to the Parasitology unit, Microbiology Laboratory, Jos University Teaching Hospital, Plateau State, Nigeria, for immediate processing. The urine samples were processed using the sedimentation technique as described in a previous study.[14] The supernatants were discarded using a syringe and needle, and the sediment was transferred to a plain slide with a coverslip, and the sediment was examined first at ×10 and then ×40 magnification under the light microscope. Eggs were detected and identified by the shape and terminal spine characteristic of *S. haematobium* in urine.

Data Analysis

The data generated were analysed using SPSS version 18.0 (IBM Corporation, NY, USA). The demographic characteristics and socioeconomic variables of the research participants were presented as frequencies and percentages. Chi-square was used to test the association between demographic, socioeconomic and behavioural variables with infection. A linear regression analysis was used to identify risk factors significantly associated with schistosomiasis infection ($p < 0.05$).

Results

A total of 200 urine samples were collected from primary school pupils aged 5–13 years and assayed for schistosomiasis (*S. haematobium*). Of the 200 samples assayed, 14 were positive for S. haematobium, yielding a prevalence of 7.0%. The chi-square value was 0.565, which is $P > 0.05$.

Table 1 shows the age distribution of *S. haematobium* among L.E.A Nursery and Primary School pupils in Gangare. 1/11 (9.1%) was found positive in the age group 5–7 years, 6/113 (5.3%) in the age group 8–10 years and 7/76 (9.2%) in the age group 11–13 years.

The result showed the prevalence of *S. haematobium* in relation to the source of water used by the subjects. Regarding sources of drinking water, 2/30 (6.7%) were found positive among tap water users and 12/170 (7.1%) among well water users. For bathing in stream/river water, 14/53 (26.4%) were positive among those who bathe in stream or river water, while no positive result (0.0%) was found among those not bathing in river water. Regarding washing in stream or river water, 14/53 (26.4%) were positive among those who wash in stream or river water, and no positive result was recorded among those not washing in stream or river water (Table 2).

Table 1: Age distribution of *S. haematobium* among primary school pupils in Gangare

Age group (years)	No. Examined	No. Positive (%)
5–7	11	1 (9.1)
8–10	113	6 (5.3)
11–13	76	7 (9.2)
Total	**200**	**14 (7.0)**
p-value		0.565

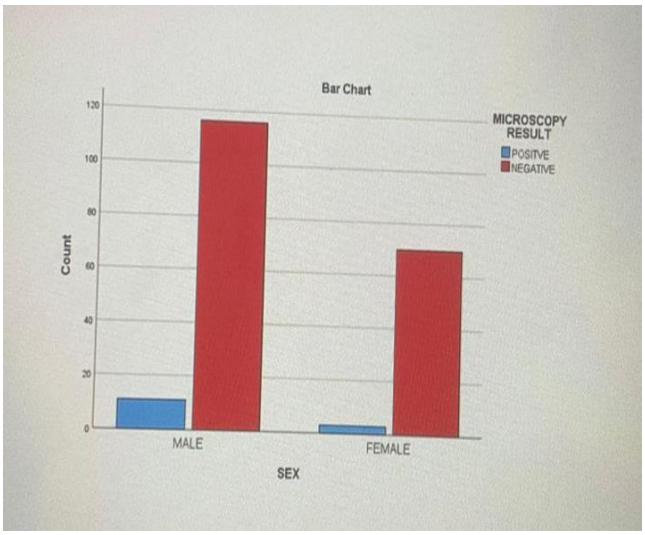

Figure 1: Bar chart showing the prevalence of schistosomiasis in relation to gender.

Table 2: Prevalence of *S. haematobium* in relation to source of water used by the participants

Variables	No. Examined	No. Positive (%)	*p* value
Sources of drinking water			
Tap	30	2 (6.7)	
Well	170	12 (7.1)	
River	0	0(0.0)	
Total	200	14 (7.0)	**0.938**
Bathing in stream/river water			
Yes	53	14(26.4)	
No	147	0 (0.0)	
Total	200	14 (7.0)	**0.000**
Washing in stream/river water			
Yes	53	14(26,4)	
No	147	0 (0.0)	
Total	200	14 (7.0)	**0.000**

Discussion

The public health importance of schistosomiasis is often underestimated, partly because, like all helminth infections, its distribution is widespread: few people have heavy infections or severe disease, while the majority are asymptomatic with lighter infections.[16-8] Previous estimates have put the infection at about 120 million people, with 20 million being symptomatic or at risk of infection. The study showed a prevalence of 7.0% for urinary schistosomiasis among primary school pupils in Gangare, Jos. This prevalence is similar to that reported by Ojo et al,[6] who found 9% among primary school-aged children. This finding contradicts the report of Odoya et al.[17,] who recorded a low prevalence rate of 4.2% among primary school pupils in the south-southern part of Nigeria. Also, a high prevalence rate of 11.4% was reported by Gerald et al.[18] among schoolchildren in the Langai community, Mangu LGA, Plateau State. This work also does not agree with the report of Amaechi et al.[19,] who reported a high prevalence of 20% among primary school pupils in Jebba, Moro LGA of Kwara State. The difference in prevalence rates may be influenced by specific ecological characteristics, the level of individuals' contact with infected water

bodies, and the degree of exposure to infective Schistosoma cercariae across different locations. The conformity in prevalence may be due to increased awareness of the sources of infection and the enforcement of certain rules and regulations by school teachers, parents, guardians, and community health personnel, aimed at educating pupils on the need for personal hygiene.

Prevalence by age group showed that pupils aged 11–13 years had the highest prevalence, at 9.2%, likely because they are more often in contact with contaminated water through swimming, washing clothes, fishing, and farming. The present result is quite similar to the findings in the southwestern part of Nigeria, where Ojo et al.[6] recorded a 9% infection rate among school-aged children. This study agrees with the findings of Dogara et al.[14,] who, in separate research, reported a high prevalence of 10.1% in Jigawa State, and Ondo having a higher prevalence of 48.4% (Jacob et al).[20] A similar trend, though lower, was also observed in the south-southern part of Nigeria, where a 4.2% infection rate was reported.[17]

The high prevalence observed could be attributed to frequent contact with water since these groups engage in activities such as errands, washing, bathing/swimming, while a lower prevalence was recorded in the age group 5–7 years. This was because pupils of these groups were much younger and mostly under the care of their guardians, parents and teachers. They are not mostly allowed to roam about freely, so personal hygiene is under close monitoring. They do not gain access to contact with water, farming activities or swimming easily, considering their age and how prone they can be to certain harsh environmental conditions. This also agrees with the report of Feleke et al.[21] which showed that children infected with the parasite were found to be more commonly between the ages of 11–16 years.

The study also revealed that those most affected by urinary schistosomiasis are pupils whose sources of water are tap, well, and river, with prevalence rates of 6.7%, 7.1%, and 26.4% for bathing/washing with stream/river water, respectively. The high prevalence among those whose water source was well, followed by washing/bathing with stream water, contradicts Amaechi et al.[19,] who reported 87.0% infection among pupils who had their water from river/stream and washed with stream water. It also contradicts Olusegun et al,[22] who observed that all 33.0% of the prevalence had tap water. The high prevalence among those who used river/stream and well could be attributed to the openness of these water sources to contamination. Some of the wells were not always covered, and children were mostly seen fetching water without basic hygiene, as the quality of water in Gangare, Jos North Local Government, does not meet the minimum World Health Organisation standard.

In relation to gender, the higher prevalence of *S. haematobium* in males (8.7%) than in females (4.1%) is consistent with the findings of Amaechi et al. [19,] Gerald et al. [18] and Jacob et al.[20.] This agrees with reports in Uganda and with Ukpai and Ahia[23] in southeastern Nigeria. Another author, however, reported a higher prevalence among females (Tefera et al.).[24] The higher prevalence and intensity observed among males than females could be attributed to the diverse outdoor activities they engage in, which expose them to cercariae-infected water.

Conclusion

In this study, there was a low prevalence of schistosomiasis among primary school pupils in Gangare, Jos North, due to increased awareness of sources of infection, government intervention to control parasitic diseases, and the enforcement of rules and regulations aimed at preventing infection, compared with studies in other areas. It was found that *Schistosoma haematobium* was more common in pupils who frequently come in contact with water bodies, and more among children of higher age groups and among male pupils.

Recommendations

Based on the findings of this study, we make the following recommendations:

1. There is a need for adequate attention to be given to public awareness campaigns, health education programmes, construction of more toilet facilities by the inhabitants of the locality, provision of safe water for drinking and domestic use, and educating the pupils on the dangers of polluting farm soil and water supplies with human excreta.
2. The school authorities should advocate for periodic medical examinations, and infected pupils should be adequately treated promptly.
3. The school authority should advocate for the vector control agency to ensure that snail intermediate hosts around the streams in the Gangare area are adequately taken care of.
4. Immigrants who have been to endemic areas should be made to present a medical certificate of fitness or undergo laboratory screening for the infection before being allowed to stay in Gangare Jos.
5. Periodic treatment with single-dose praziquantel should be implemented to control the infection in Gangare Jos.

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