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PREVALENCE OF URINARY SCHISTOSOMIASIS AMONG PRIMARY SCHOOL PUPILS IN ADANKOLO, LOKOJA KOGI STATE

BY

ABDULAZEEZ, SIYAKA UMAR., ONIEMOLA, JOAN MAYOWA., ABDULLAHI, DANLAMI MOHAMMED, HUSSEIN, SALIHU

School of Applied Science,
Department of Science Laboratory Technology,
Kogi State Polytechnic Lokoja, Kogi State.

Corresponding author: abdulazeezumar97@gmail.com

Abstract
This research was evaluated to determine the current pervasiveness of urinary schistosomiasis among primary school pupils in Adankolo Lokoja Kogi State, Nigeria. The study was carried out to assess the prevalence of schsitosomiasis in relation to age group and sex among the sampled population. The investigation was carried out in five (5) randomly selected Public and private primary schools in Adankolo, Lokoja; with eighty (80) pupils comprising 55 males and thirty (25) females selected and their urine samples were collected and analysed using saline urine prepation and standard filteration methods as described by (WHO) 1991 and Ladan et al. (2014). The result of the analysis showed that 8 samples were infected in male and 3 samples were infected in females with prevalence of infection of 14.55% and 12% respectively.

Keywords: Prevalence, schistosomiasis, urinary, infection

Introduction

Schistosomiasis is a human disease syndrome caused by infection from one of the several species of parasitic trematodes (fluke) of the genus Schistosoma. It is second only to malaria in human impact among tropical diseases and the third (after malaria and intestinal *helminthiasis*) in global parasitism (Abdullahi et al., 2020). It is the most devastating prevalent parasitic disease in terms of morbidity and mortality for eveloping countries in Africa, South America, the Caribbean, the Middle East and Asia (Muhammed et al., 2018). Schistosomiasis is exhibits both acute and chronic symptoms, and the disease is predominantly associated with abject poverty in more than 78 low and middle-income countries in the sub-tropical

and tropical parts where there is little access to potable water and adequate sanitation (Umoh et al., 2020). The agents of etiology of schistosomiasis are "blood-thirsty" digenetic *trematodes* in the genus *Schistosoma.* Urinary *schistosomiasis* caused by *Schistosoma haematobium* is endemic in the sub-Saharan region of Africa, including Nigeria (Abdullahi et al., 2020).
World Health Organization (WHO, 2023) pointed out that about 200 million people in about 74 countries are infected worldwide and at least 600 million are at risk of infection. An estimated 120 million suffer severe consequences of the infection with an estimated annual mortality rate of about 20,000 worldwide. An estimated 30 million Nigerians need to be treated annually for the disease (Dahal et al., 2023). In most endemic areas, the highest intensities of infection are found in children between 5 and 15 years of age. Dahal et al. (2023) gave an estimated figure of seventy (70) million infections by individuals experience *haematuria*, thirty two (32) million experience difficulties in urinating, eight (8) million bladder-wall pathology, and ten (10) million major *hydronephrosis* from infections caused by *S. haematobium* annually in the Sub-Saharan sub-region.

Schistosomiasis is predominantly referred to as the disease of the poor. This is in affirmation with the expression of Akinneye et al. (2018) that the distribution of the disease is localized and its effects are more common in rural areas in the tropics where the population uses natural fresh water for domestic water supply, recreational activities, and agricultural production (Adenowo et al., 2015). Hence, transmission of the disease is contingent on the presence of infected water, the primary snail host, and contact with the human population. Extreme poverty, lack of knowledge of the risks, inadequacy or total lack of public health facilities along with unsanitary conditions in which millions of people live their daily lives, particularly in the rural areas of developing tropical countries, are all factors contributing to the risk of infection (Abdullahi et al., 2020).

Nigeria has the highest number of cases of schistosomiasis worldwide (Mohammed et al., 2018), with about 29 million individuals infected, among which 16 million are children and about 101 million are at risk of the infection. Several studies, such as Abdullahi et al. (2020); Muhammed et al. (2018); Akinneye et al. (2018); and Dahal et al. (2023) indicated that the disease is found mostly among school children and transmission is via feacal contamination of either water or the soil. Stothard et al. (2022) added that primary school children are particularly vulnerable to schistosomiasis because of their habit of playing in water, where they may contract the infection. The high prevalence of urinary schistosomiasis has been attributed to the extensive distribution of intermediate host; freshwater snails, indiscriminate

micturition, poor sanitation, poverty, ignorance, and limited access, and unavailability of health facilities are factors that sustain the persistence of schistosomiasis in developing countries (Dahal et al., 2023). The report for 2021 indicated that 29.9% of people requiring treatment for the disease were reached globally, with a proportion of 43.3% of school-aged children requiring preventive chemotherapy for schistosomiasis being treated. A drop of 38% compared to 2019, was due to the COVID-19 pandemic which caused the suspension of treatment campaigns in many endemic areas (WHO, 2022). Patients suffering from urinary schistosomiasis often experience *haematuria* or blood in urine with progressive damage to the bladder, ureters, and kidneys (Ladan et al., 2014 cited in Dahal et al. (2023). School children, adolescents, and young adults have been found to have the highest prevalence and morbidity due to schistosomiasis. The negative impacts caused by untreated infections demoralize both the social and economic development of school performance among infected children in endemic areas (WHO, 2022). It causes growth retardation, anaemia, vitamin- A deficiency as well as possible cognitive and memory impairment, which limits their learning potential (Muhammed et al., 2020).

Literature Review

The human schistosomiasis otherwise known as Bilharziasis, is a fresh-water snail transmitted intravascular debilitating disease resulting from infection by the parasitic dimorphic Schistosoma trematode worms, which lives in the bloodstream of humans (Akinneye et al., 2018). The World Health Organization (WHO) regards schistosomiasis as a neglected tropical disease, with an estimated 732 million persons being vulnerable to infection worldwide in renowned transmission areas. The WHO further estimated that schistosome infections and geohelminths accounts for over 40% of world tropical disease burden with the exclusion of malaria. Humans get infected with this disease when they make contact with water contaminated with the skin-penetrating cercariae. Schistosomiasis, ranks second among the most widespread parasitic disease in various nations in sub-Saharan Africa (Adenowo et al., 2015). The neglected tropical diseases exert great medical, social and financial burden on the economies of households and governments (Mohammed et al., 2020). Schistosomiasis exerts profound negative impacts on child development, outcome of pregnancy, and agricultural productivity; thus constituting key reasons why the "bottom 500 million" inhabitants of sub-Saharan Africa continue to live in poverty (Dahal et al., 2023). Schistosomiasis is more rampant in poor rural communities especially place where fishing and agricultural activities are dominant. Domestic activities such as washing clothes and fetching

water from infected water bodies expose women and children to the infection (Dahal et al., 2023). And there is high degree of anthropogenic activities around river Niger which provides the main source of water to the inhabitant of Lokoja. And the majority of the inhabitants of Adankolo lack basic sanitation and access to portable water, hence the high degree of exposure to contaminated water (Umar et al., 2023).. Recreational activities like swimming and poor hygiene also make children vulnerable to schistosomiasis. Humans are often infected by five species of schistosomes namely; *Schistosoma mansoni, Schistosoma haematobium, Schisosoma japonicum, Schistosoma mekongi,* and *Schistosoma intercalatum.* But, the main burdens of the disease in sub-Saharan Africa is usually attributed to two species namely; *S. mansoni and S. haematobium* and are referred to as the major human schistosomes (ibid). Biomphalaria snails are responsible for the transmission of *S. mansoni* which is the source of hepatic and intestinal schistosomiasis (Umoh et al., 2020). The *Biomphalaria* snails comprise many species including *B. alexandrina, B. sudanica, B. pfeifferi*, and *B. hoanomphala,* while the genus *Bulinus* comprises the following species; *B. tropicus, B. globosus, B. truncatus, B. forskalli,* and *B. africanus. Schistosoma japonicum* is spread by the freshwater snail *Oncomelania* and it is responsible for intestinal and hepatosplenic schistosomal infections in Indonesia, Peoples (Umoh et al., 2020a).
Matured schistosomes are usually greyish or white worms with a length of 7–20 mm, having a cylindrical shape with two ending suckers, a blind digestive tract, a complex tegument, and reproductive organs (Abdullahi et al., 2020).

A distinguishing feature in this trematode compared to other trematodes is its possession of separate sexes. The male has a gyneaphoric channel on its groove, with which it grips the female which is usually longer and thinner. Male and female schistosomes often live permanently as embraced couple in the perivesical venous plexus (in *S. haematobium*) or in the mesentric venous plexus (in *S. mansoni* and *S. japonicum* species). The schistosomes get nourishment from host blood and globulins by means of anaerobic glycolysis and excrete the waste back into the body of the hosts (Abdullahi et al., 2020).

From studies conducted, it has been established that a female schistosome has the capacity to produce hundreds of eggs per day as discovered in the African species, and about thousands of eggs per day in the oriental species. The individual ovum is home to miracidium larva with cilia that produce proteolytic enzymes which aid the eggs to move either towards the lumen of the bladder or towards the host intestine. Early diagnosis and detection of the parasites in infected individuals is significant for the control and prevention of the disease, which is often done with

the administration of Praziquantel (Umoh et al., 2020b). Primary school pupils constitute the ideal target subjects for the assessment of urinary schistosomiasis in most endemic societies due to their known poor hygiene, and playing in contaminated water which often predispose them to infection by the parasite (Umoh et al., 2020c).

Methodology

This study was carried out in primary schools located in Adankolo within the geographical area of Lokoja, which is a residential and business suburb of Kogi state. Lokoja lies at the confluence of the Niger and Benue rivers and is the capital city of Kogi State. It lies at latitude $7^0$47` 48.77″ N and longitude $6^0$ 44` 25.73 E, with typical tropical climate characterise by wet and dry seasons and a total annual rainfall of 1150mm. While the Oworo, Bassa Nge and Nupe are indigenous to the area, other ethnic groups of Nigeria, including the Ebira, Kupa-Nupe, Hausa, Igala, Igbo, Bini/Edo, and Tiv have also established themselves as part of the community. The rural dwellers of Lokoja are mostly fishermen and farmers that predominantly engage in Rice farming.

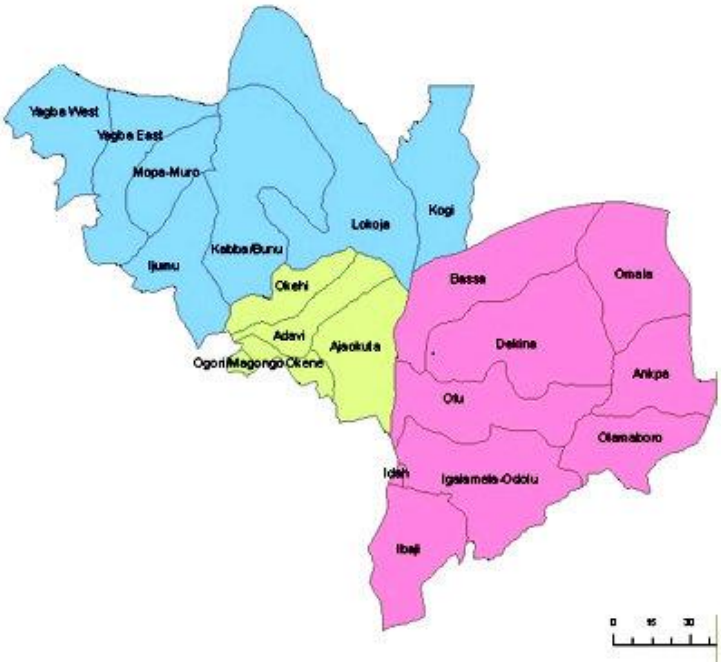

Figure 1: *Map of Kogi State Showing the Lokoja Metropolis.*

Apparatus and Equipment/Samples

Urine Samples

Vacuum-pump filtration machine
Filtration unit
Whatman No. 1 filter paper (5.5 cm diameter)
10ml syringe
Blunt ended forceps
Clean sheet of paper
Clean- glass slide
Microscope
Sterile plastic screw-capped bottle
Petri dish
Glass test tube

Reagents

Saturated ninhydrin solution.
Iodine solution

Ethical approval for the research was obtained from the Kogi State Ministry of Health Ethical Board in Lokoja following the submission of succinct concept note explaining the importance, purpose and procedure of the study. Also, written consents were obtained from the schools' headmasters and parent or guardian of the pupil, and anyone not willing to take part in the study was not included. Those participants who were found to be infected with the parasites will be given Praziquantel drugs provided by World Health Organization (WHO) through the Ministry of Health. A total of 80 urine samples comprising 55 from males and 25 from females pupils respectively, were collected from five randomly selected primary schools in Adankolo area of Lokoja, with the assistance of their teachers. About 10ml 0f urine sample was collected in a clean, dry, sterile, plastic, screw-capped 30ml universal urine bottles. It was collected between 9am and 2pm, because the excretion of *S. haematobium* in urine is high within these periods and transported to the Environmental Biology laboratory in the department of Science Laboratory Technology, Kogi State Polytechnic Lokoja, to test for the presence of the schistosomes ova. Each of the urine samples was observed microscopically and tested chemically using urinalysis strip for the presence of blood and protein before adding few drops of 10% formal saline for preservation. The urine samples collected were shielded from direct light to avoid *miracidia* hatching from the eggs, and were transported to the laboratory immediately, where they were analyzed by filtration technique.

3All the urine samples (80) collected were processed using the standard filtration technique as described by WHO (1991) and Ladan et al. (2014). The method

involved the use of vacuum-pump filtration machine (millipore corporation Bedford, Massachuse 01730 USA) coupled to a filtration unit; Whatman No. 1 filter paper (5.5 cm diameter) was inserted into the filtration unit. 10ml of the urine sample was thoroughly mixed and then withdrawn with a 10ml syringe into the filtration unit of the machine. The machine was switched on to drain the urine through the filter paper by suction. The filter paper was removed carefully by the use of pair of blunt ended forceps, and placed on a clean sheet of paper and stained with saturated Ninhydrin solution. Drops of iodine solution were also added to enhance staining. The filter paper was left for 3 hours at room temperature for the eggs to pick up the stain (Ladan et al., 2014). After three (3) hours the filter paper was placed on a clean- glass slide and examined under the light microscope, using X10 objective. Terminal spine eggs, characteristics of *S. haematobium* were counted for each positive sample. The result was expressed as eggs/10ml of urine. All the urine samples were treated in the same way.The data obtained were analyzed using descriptive statistics, and Pearson's Chi-square analysis was used to compare the differences in terms of sexes.

Results

Results of the prevalence of schistosomiasis among primary school pupils in Adankolo, Lokoja. A total of 85 urine samples were analyzed by direct saline urine preparation and standard filtration technique.

Table 1

Prevalence rate of infection in the male and female

Sex	No.examined	No. infected	Prevalence (%)
Male	55	8	14.5
Female	25	3	12
Total	80	11	26.5

Table 2:

The Distribution of Schistomiasis among School Children According to the Age

Age group	Number	Infected	Uninfected	Prevalence (%)

4-6	20	1	19	10
7-9	25	5	20	20
10-12	35	5	30	14.3
Total	80	11	69	44.3

Hypothesis:
Null hypothesis, H_o: there is a statistically significant association between prevalence of schistosomiasis and sex.
Alternative hypothesis, H_a: there is no statistically significant association between prevalence of schistosomiasis and sex.
Prevalence rate for males: ~14.55%
Prevalence rate for females: 12%

Expected frequencies:
For males infected; 55x11/80=7.5625
Expected frequency for males not infected; 55x69/80= 47.4375
Expected frequency for females infected; 25x11/80= 3.4375
Expected for females not infected; 25x69/80= 21.5625

Chi-square statistics: $X^2= \sum(O-E)^2/E$
For males sample infected: $(8-7.5625)^2/7.5625 \approx 0.0204$
For males samples not infected: $(47-47.4375)^2/47.4375 \approx 0.004$

For females samples infected: $(3-3.4375)^2/3.4375 \approx 0.0556$
For females samples not infected: $(22-21.5625)^2/21.5625 \approx 0.0094$
$X^2 \approx 0.0204+0.004+0.0556+0.0094=0.0894$
p-value = 0.05
significance level= 3.841.
Since 0.0894 < 3.41, the null hypothesis is rejected. Thus, there is no statistically significant association between sex and prevalence of infection with schistosomiasis in the male and female samples collected.

Discussion
The overall prevalence of urinary schistosomiasis with regards to sex is 27% in the sampled population, and this is lower than the 29.9% which has been reported by the WHO in 2021 as the percentage of those that require chemotherapy.

Nevertheless, it is a high prevalence compared to recent reports on prevalence that were recorded in some other states in Nigeria, like the reports of Markus and Bishop (2024) in Giwa and Makarfi LGAs in Kaduna, which reported prevalence rate of 10% and 9% respectively. Comparatively, the prevalence is slightly higher in the male samples than in the female samples, and this can be attributed to the fact that the male pupils were more exposed to fishing activities and swimming along the nearby river, than the female; and this agrees with the report of Ayabina et al. (2021). The difference in the prevalence rate may be due to the difference in the rate of open or exposure to open defecation among members of the sampled population. Also, based on the prevalence on age distribution, the study shows higher prevalence between age 10–12 with five (5) samples infected (14.3%), i.e more than half of the positive results for schistosomiasis infection. This is followed by 4–6 years age group with 2 (10%), while the highest prevalence is recorded in 7-9 age group with four (4) samples infected in 25 people (16%). This age group constitute the group that most active in school and have high degree of exposure to activities that predispose them to infection with the parasite

The prevalence of urinary schistosomiasis is influenced by key epidemiological determinants such as close proximity to freshwater bodies, irrigation farming, snail species, and indiscriminate defecation. This study analyzed the risk factors among the studied population and discovered that swimming and washing in rivers and ponds had a significant association with urinary schistosomiasis, and this also agrees with the work of Umar et al. (2023). This implies that open defecation or the use of untreated sewage as fertilizer may still be a practice in the area, and as such, more chemotherapy as well as proper sensitization programme on the nature of the disease and its risk factors needs to be carried out to help reduce the prevalence of the disease.

Conclusion

The prevalence of infection in male samples is 14.5%, while the female sample has infection prevalence of 12%. Thus, the overall prevalence of schistosmiasis among the primary school children in Adankolo, Lokoja kogi state is high.

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