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Research Article

Prevalence and Associated Risk Factors of Urinary Schistosomiasis among Primary School Pupils of Agyaragu Community, Lafia LGA, Nasarawa State, Nigeria

Ayuba SO[1], Danladi GS[1], Ombuagdu A[1]*, Pam VA[1], Njila HL[2], Nkup CD[3], Luka I[4] and Mamot LP[4]

[1]*Department of Zoology, Faculty of Science, Federal University of Lafia, Nasarawa State, Nigeria*

[2]*Department of Science Laboratory Technology, Faculty of Natural Sciences, University of Jos, Plateau State, Nigeria*

[3]*Department of Biology, College of Arts, Science and Technology, Kurgwi, Qua'an Pan LGA, Plateau State, Nigeria*

[4]*Department of Zoology, Faculty of Natural Sciences, University of Jos, Plateau State, Nigeria*

***Corresponding Author:** Ayuba S O, Department of Zoology, Faculty of Science, Federal University of Lafia, Nasarawa State, Nigeria. Email: scholasticaayuba@gmail.com

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Abstract

Schistosomiasis is one of the most prevalent tropical disease which is posing a great threat to public health and socio-economic development. Thus, this study evaluated the prevalence and associated risk factors of urinary schistosomiasis among primary school pupils in Agyaragu Community, Lafia Local Government Area, Nasarawa State, Nigeria. One hundred and twenty consenting pupils from 2 primary schools between ages 4 and 14 were screened for the study from September to October 2019. Urine samples of each pupil was collected and examined for Schistosoma haematobium which is responsible for urogenital schistosomiasis. The urine samples were examined both macroscopically and microscopically using standard sedimentation methods. A well-structured questionnaire was administered to 120 pupils to obtain socio-demographic status and risk factors. The overall prevalence for urinary schistosomiasis in the study area was 5.8%. Angwan Alhaji Yakubu Pilot Science Primary School pupils had higher infection rate 8.3% than pupils in Musa Lawal Islamiya Primary School 3.3%. However, there was no significant difference ($P > 0.05$) in the prevalence rate of urinary schistosomiasis in pupils in relation to the two selected primary schools and as well as sex but showed significant variation ($P < 0.05$) between age groups. Also, the prevalence rate of the infection in relation to water sources utilized by the primary school pupils varied significantly ($P < 0.05$). Furthermore, there was a significant difference ($P < 0.05$) in the prevalence rate of urinary schistosomiasis in relation to pupils who swim to those who don't swim. Contrarily, the prevalence rate of disease in relation to the types of toilet facilities used by the pupils showed no significant difference ($P > 0.05$). The pooled geometric mean intensity among pupils from the two selected schools was 1.21901. Microhematuria rate among infected pupils was 71.43% in which age group 8-11 had the highest microhematuria rate 42.86%. Males had higher microhematuria rate 42.86% than females 28.57%. In conclusion, there is need to for both the pupils and inhabitants of the area to be sensitized on personal hygiene, prevention and treatment on urinary schistosomiasis.

Keywords: Urinary Schistosomiasis; Associated Risk Factors; Primary School Pupils; Geometric Mean Intensity; Microhematuria Rate

Introduction

Schistosomiasis is a disease caused by *Schistosoma* species and is a prevalent tropical disease, ranking second to malaria and posing a great public health and socio-economic threat in sub-Saharan Africa [1,2]. According to Gryseels., *et al.* [3] the main disease causing schistosome species are *Schistosoma haematobium, Schistosoma mansoni, Schistosoma japonicum, Schistosoma mekongi* and *Schistosoma intercalatum*. *Schistosoma haematobium* is the aetiologic agent of urinary schistosomiasis and it is most prevalent in Africa [4]. *Schistosoma haematobium* is endemic in over 77 countries of Africa and the Middle East [5]. The persistent human infection have been directly linked to contact with fresh water infested with snail intermediate host during fishing and swimming in ponds or dam water, and increasing contact with agricultural and irrigation contaminated water systems [4].

The socioeconomic consequences on developing countries is enormous, especially in Africa where it constitutes a major public health burden in riskiest children group impeding school at-

tendance, absenteeism, ill health and weak memory, poor performance and productivity, disability and death [6, 7]. Nigeria has the greatest number of cases of schistosomiasis worldwide, with about 29 million infected people, among whom 16 million are children, and about 101 million people are at risk of schistosomiasis [2,8, 9]. Studies have shown high incidence of the disease in some areas of Zaria with the very poor personal and public hygiene, among children within the age 5 - 13 years old [10].

Nasarawa State is one of the Nigerian States that is endemic to the disease with a very poor personal hygiene among school aged children within the ages 4 - 13 years old [11]. The problem of lack of awareness on the disease, portable water supply in schools and homes in Nasarawa State and its environment put the children at high risk of exposure to the disease [11,12]. Several studies have been carried out in Nasarawa State to determine the prevalence of urinary schistosomiasis [11-15]. However, little is known about schistosomiasis in Agyaragu community of Lafia LGA, Nasarawa State. Information on the distribution and the associated risk factors of the disease in different transmission settings is a prerequisite for appropriate intervention against schistosomiasis. To this end, a study on the prevalence and associated risk factors of *Schistosoma haematobium* infection among school-aged children in Agyaragu in Lafia Local Government Area of Nasarawa State, Nigeria was investigated.

Materials and Methods

Study area

The study was carried out in Agyaragu area (08° 24´ N, 08° 33´ E) which is a community under Lafia LGA of Nasarawa State, Nigeria. It is a peri-urban area that is well known for agricultural and commercial activities.

Duration of the study

The study was carried out between September and October 2019.

Ethical permission

Ethical approval was obtained from Nasarawa State Local Education Authority, Lafia Central as well as the authorities of the community involved in the study. Consent was sought from both parents and guardians.

Selection of school

The study was carried out in two selected schools namely: Musa Lawal Islamiya Primary School (08° 40´ N, 08° 54´ E) and Angwan Alhaji Yakubu Pilot Science and Primary School (08° 40´ N, 08° 55´ E) in Agyaragu area under Lafia Local Government Area of Nasarawa State.

Sampling size

A total of 120 school-aged children which cut across 60 pupils from each of the selected school between age 4 and 14 years old were randomly selected according to WHO guideline of 2002 [16] for survey of schistosomiasis.

Questionnaire administration

Questionnaire was administered through face to face interview with each subject in order to obtain information on demographic, anthropogenic and hygiene practices. Demographic data include name of pupil, age, sex, source of water for domestic use, outdoors activities such as washing, swimming and sanitation, presence of pain when urinating and toilet types.

Collection and examination of urine samples

Midstream and terminal urine sample were collected in clean plastic bottles between the hours of 10:00am and 2:00 pm. About 10 ml of urine samples were poured each into a test tube and set to two thousand five hundred revolutions per minute (2500 rpm) for five minutes. After the centrifugation, the tubes were removed from the centrifuge machine and the supernatants were discarded, leaving only the deposits at the bottom of the tubes. Then, a drop of the sediments was dropped unto a clean grease-free slide and covered with a cover slip gently without the formation of air bubbles. The slides were examined using bright field microscope for eggs of *S. haematobium* using x10 and then x40 objective lenses respectively.

Statistical analysis

Data obtained were analyzed using R Console software (Version 3.2.2). Pearson's Chi-square test was used to compare prevalence rate of urinary schistosomiasis infection in primary school age pupils in relation to the two selected schools, age groups, sex and as well as some associated risk factors. The P-values < 0.05 were considered statistically significant.

Geometric mean intensity and microhematuria rate

The geometric mean intensity (GMI), by definition, is the nth root of the product of the n units in a data set. The geometric mean is well defined only for sets of positive real numbers [17].

$$\bar{x}_{\text{geom}} = \sqrt[n]{\prod_{i=1}^{n} x_i} = \sqrt[n]{x_1 \cdot x_2 \cdot \ldots \cdot x_n}$$

The formula for microhematuria rate (MR [%]) is expressed as:

$$\text{MR} = \frac{\text{Number of infected samples present with blood}}{\text{Number of infected samples}} \text{ X } 100\%$$

Results

The overall prevalence of urinary schistosomiasis recorded in this study was 5.8% (7/120) as shown in table 1. Angwan Alhaji Yakubu Pilot Science Primary School had higher prevalence rate of 8.3% over Musa Lawal Islamiya Primary School 3.3%. However, there was no significant difference ($x^2 = 0.60683$, df = 1, P = 0.436) in prevalence rate of urinary schistosomiasis in pupils in relation to the two sampled schools.

Table 1: Prevalence of urinary schistosomiasis in primary school pupils in relation to the two selected schools in Agyaragu community, Lafia Lga, Nasarawa state, Nigeria.

Schools	No. Examined	No. Infected (%)
Musa Lawal Islamiya Primary School	60	2 (3.3)
Angwan Alhaji Yakubu Pilot Science Primary School	60	5 (8.3)
Total	120	7 (5.8)

Prevalence rate between the two schools: $\chi^2 = 0.60683$, df = 1, P = 0.436^{ns}. ^{ns}: Not significant.

Infection was highest 9.5% in age group 4 - 7 pupils followed by age group 8 - 11 7.6% while none was infected among age group 12 - 14 individuals. Therefore, there was a significant difference (x^2 =8.0462, df = 3, P = 0.04507) in prevalence rate of urinary schistosomiasis in relation to age groups of pupils from both schools sampled.

Sex related prevalence was higher in males 8.33% than females 3.33% as shown in table 2. However, there was no significant difference (x^2 = 0.60683, df = 1, P = 0.436) in the prevalence of the infection in relation to sex of the pupils from the schools sampled.

The prevalence rate of urinary schistosomiasis in relation to water sources utilized by the school children was most prevalent 50.0% among stream/river users while tap water utilizers had the least prevalence rate 3.33%. Thus, prevalence rate of the disease in relation to water sources utilized by the school children showed a significant difference (x^2 = 8.0462, df = 3, P = 0.04507).

Table 2: Prevalence of urinary schistosomiasis in pupils in relation to age and sex from the two selected schools in Agyaragu community, Lafia LGA, Nasarawa State, Nigeria.

	Musa Lawal Islamiya Primary School		Angwan Alhaji Yakubu Pilot Science Primary School		Total No. Examined	Total No. Infected (%)
Age	**No. Examined**	**No. infected**	**No. Examined**	**No. infected**		
4 - 7	10	1 (10.0)	11	1 (9.1)	21	2 (9.5)
8 - 11	38	1 (2.63)	28	4 (14.3)	66	5 (7.6)
12 - 14	12	0 (0.00)	21	0 (0.00)	33	0 (0.00)
Sex						
Male	30	2 (6.7)	30	3 (10.0)	60	5 (8.33)
Female	30	0 (0.0)	30	2 (6.7)	60	2 (3.33)

Prevalence of urinary schistosomiasis in relation to age groups: $\chi^2 = 8.0462$, df = 3, P = 0.04507*.

Prevalence of urinary schistosomiasis in relation to gender: $\chi^2 = 0.60683$, df = 1, P = 0.436^{ns}.

*: Significant variation. ^{ns}: Not significant.

The prevalence of the infection in relation to those who swim was higher 15.3% than those who do not swim 2.3%. Therefore, there was a significant difference (x^2 = 5.0453, df = 1, P = 0.02469) in the prevalence rate of urinary schistosomiasis in relation to those who swim and don't swim.

Pupils who use the bush as toilet facility were the most infected 22.2% followed by pit toilet 5.9% individuals while water system users had a low prevalence of 2.3% as shown in table 3. Nevertheless, there was no significant difference (x^2 = 5.3642, df = 2, P = 0.06842) in the prevalence rate of urinary schistosomiasis in relation to types of toilet facilities used by the pupils.

The overall geometric mean intensity among the pupils in the selected primary school was 1.21901. The pooled microhematuria rate among infected pupils was 71.4% (5/7) in which age group 8 - 11 had higher MR 42.7% (3/7) than age group 4 - 7 28.6% (2/7). Microhematuria rate in males was more 57.1% (4/7) than in females 14.3% (1/7).

Discussion

Urinary schistosomiasis low prevalence rate of 5.8% among primary school age children in this study may be due to increased awareness on the prevention and as well as effective treatment on the infection. This agrees with Omenesa., *et al.* [18] who reported a prevalence of 4.0% in Zangon Shanu Zaria. Also, Negussu., *et al.* [19] recorded a low prevalence of 16.0% in Afder and Gode Zone of Somalia Region in Ethiopia. On the contrary, Okwor., *et al.* [14] reported a total prevalence of 78.1% in LGEA Pilot School Gadabuke Development Area, Toto LGA, Nasarawa State.

The lack of variation in the prevalence rate of the infection in pupils in relation to the two schools possibly suggests that there is even distribution of the parasite in the area. Contrarily, Negussu., *et al.* [19] found that the prevalence rate of the disease was not uniform across six studied communities.

The presence of variance across age groups attributes to the fact that the *S. haematobium* infection is age specific especially on very young school-aged children of less than 7 years. Also, this may be as a result of them having a developing immune system and when exposed to infected water bodies and or drink untreated water from other sources end up being susceptible to the parasite. On the other hand, Negussu., *et al.* [19] and Bishop and Akoh [20] showed that there was no significant variation in infection rate across ages of

Table 3: Prevalence of urinary schistosomiasis in pupils in association to some risk factors.

Variables	No. Examined	No. Infected (%)
Water sources		
Well	77	5 (6.5)
Pipe borne	2	0 (0.0)
Stream/ River	2	1 (50.0)
Tap	39	1 (3.33)
Total	120	7 (5.8)
Swimming in water		
Yes	33	5 (15.3)
No	87	2 (2.3)
Total	120	7 (5.8)
Toilet facilities		
Pit toilet	68	4 (5.9)
Water system	43	1 (2.1)
Bush	9	2 (22.2)
Total	120	7 (5.8)

Prevalence of the infection in relation to water sources: $\chi^2 = 8.0462$, df = 3, P = 0.04507*.

Prevalence of the infection in relation to those who swim and don't swim: $\chi^2 = 5.0453$, df = 1, P = 0.02469*.

Prevalence of urinary schistosomiasis in relation to toilet facilities: $\chi^2 = 5.3642$, df = 2, P = 0.06842^{ns}).

*: Significant variation.^{ns}: Not significant.

children based on the fact that prevalence increased with increase in age as it peaked between age group 11 - 13.

The lack of variance in relation to sex of the pupils suggests that the paraistes have no preferred sex. In contrast, Negussu., *et al.* [19] obtained significant association between infection with *S. haematobium* and sex. Also, the finding of Bishop and Akoh [20] in a study on risk factors, symptoms and effects of urinary schistosomiasis on anthropometric indices of school children in Zaria, Kaduna State, Nigeria showed higher prevalence males 14.8% than females 5.4%.

Although, males in this study had higher prevalence rate than the females due to freedom to move around and play in various areas as compared to the girl-child. Also, this could be due to socio-cultural and economic factors that expose the males to activities at the infested water bodies such as swimming, fishing, and washing of clothes.

The variance recorded across sources of water shows that children who utilize stream or river as water source are highly predispose to being infected with urinary schistosomiasis due to the fact that the intermediate hosts of the parasites are found in such water bodies. This disagrees with the finding of Chigozie., *et al.* [21] who reported the use of ponds as the major source of water supply in Ebonyi State predisposes the inhabitants to the risk of acquiring schistosomiasis.

The high number of pupils that swim as obtained in this study showed a positive relationship on the prevalence of urinary schistosomiasis infection. Thus, suggest water contact as a predisposing factor to infection. This report agrees with Omenesa., *et al.* [18] and Bishop and Akoh [20] who reported the possibility of contact with cercaria-infested water bodies causes schistosomes to penetrate intact skin during the contact. The low geometric mean intensity of 1.21901 among the pupils in the selected primary schools possibly suggests low transmission risk since the number of eggs was one. Males had higher microhematuria rate than females possibly because they carry parasitic load. This is in agreement with the report of Samuel., *et al.* [22] who reported microhematuria rate of 68% among the same subjects in Ilorin, Nigeria.

Conclusion

In conclusion, the findings in this study shows that urinary schistosomiasis is prevalent among primary school-aged children in Agyaragu Community, Lafia Local Government Area, Nasarawa State. However, it falls under low risk category which could be attributed to quarterly administration of drugs and improved awareness. Also, could be as a result of availability of portable drinking water and availability of health care facilities in the area. Age group 4 - 7 were predominantly infected. A higher prevalence was recorded among males than females. Children who swim in stream or river showed higher prevalence of the infection which could be as a result of the presence of intermediate host in the water bodies and also the ingestion of infested water with cercaria.

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