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Incidence of urinary schistosomiasis and the contributory risk factors among primary school children in Lafia Metropolis, Nasarawa State, Nigeria

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Abstract

Urinary schistosomiasis though not very prevalent is still found in some parts of Nigeria especially among primary school children who do not know effective sanitary measures of protecting themselves from the infection. This research therefore aimed at evaluating the incidence of urinary schistosomiasis and factors that promote the infection among primary school children in Lafia Local Government Area of Nasarawa State so as to provide information relating to this area of study. One hundred (100) urine samples were collected randomly from three basic primary schools of Lafia Local Government Area of Nasarawa State, namely; St. James Primary School, L.G.E.A Primary School Mararraba-Akunza, Ta'al Model School and Lafia East Local Government Schools. Urine samples collected from the various primary schools were examined in the laboratory using the sedimentation technique. The infection was highest in L.G.E.A Primary School Mararraba-Akunza, behind federal housing estate extension lafia, 4(8%) out of 50 pupils in that school were infected, in the St. James Primary School and Ta'al Model School 2 cases (5.7%) were recorded, in Lafia East Local Government School lafia the infection was 13.3 % (2), the difference was not statistically significant (P=0.70). Majority of the participants were aged between 5 years and 10 years, (84%), and they were the most infected 7(8.3%) the difference was statistically insignificant when compared P = 0.79. Sex; was found to be statistically associated with prevalence of the infection P=0.00, majority of the participants were males 66(66%) and 6(9.1%) of them were infected, females were 34(34%) and 2(5.8%) of them were infected. Children are to be protected from risk factors that endanger them especially the type of water they were exposed to.

Keywords: Urinary schistosomiasis; Primary school children; Incidence; Factors; Nigeria

1. Introduction

Schistosomiasis or Bilharziasis is one of the most widespread of all parasitic diseases, ranking second only to malaria in terms of its socio-economic and public health importance in tropical and subtropical areas [5]. Over 90% of the disease is currently found in sub-Saharan Africa, where more than 200,000 deaths are annually attributed to schistosomiasis, and Middle East and North Africa regions [3]. This disease mainly affects developing countries where water resources and poor sanitation allow development and infection of snail [2]. Majority of the human form of the disease is mediated by *Schistosoma haematobium, S. mansoni* and *S.japonicum*. Each of these species has a tropism for different body organs, with *S.haematobium* being the main cause of urinary schistosomiasis [1].

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1.1. Statement of the problem

Schistosoma haematobium is the aetiologic agent of urinary schistosomiasis and it is the most prevalent in Africa. In SubSaharan Africa, *S. haematobium* infection is estimated to cause 70, 32, 18 and 10 million cases of hematuria, dysuria, bladder-wall pathology and major hydronephrosis, respectively. The infection is also responsible for nutritional deficiencies and growth retardation, adverse effects on cognitive development, as well as for decreasing physical activity, school performance, and work capacity and productivity [4]. This causes untold hardship as a result of the associated morbidities and mortalities. Proteinuria, dysuria and especially haematuria are among the morbidities. High mortality rate can occur as a result of complications arising from granulomatous inflammation, ulceration, and depletion of the vesical and ureteral walls renal insufficiency and failure [6]. Schoolchildren, adolescents and young adults have been found to have the highest prevalence and morbidity rate due to Schistosomiasis. Thus, the negative impacts caused by untreated infections demoralize both social and economic development on school performance among infected children in endemic areas [8].

1.2. Justification of the study

Urinary schistosomiasis though not very prevalent is still found in some parts of Nigeria especially among primary school children who do not know effective sanitary measures of protecting themselves from the infection. The current state of schistosomiasis in Nigeria is not completely known to most researchers especially those in the middle belt region of Nigeria and more studies will be necessary in order to completely determine the state of the infection. This research therefore aims at evaluating the incidence of urinary schistosomiasis and factors that promote the infection among primary school children in Makurdi so as to provide information relating to this area of study.

Aim of the study

To determine the incidence of Urinary Schistosomiasis among school aged children in Makurdi.

Objectives of the study

- To assess the prevalence of urinary schistosomiasis among school aged children in Makurdi.
- To assess the risk factors of urinary schistosomiasis among school aged children in Makurdi.

2. Materials and methods

2.1. Study area

The study was conducted in Lafia Local Government Area (LGA) of Nasarawa State, Nigeria. The population of the area is 330,712 (13). The wet season lasts from about the beginning of May and ends in October while the dry seasonis experienced between November and April. Annual rainfall figures range from 1200 mm to about 2000mm. The average maximum and minimum daily temperatures are35°C and 21°C in rainy season and 37°C and 16°C in dry season respectively and relative humidity of 30% (14,15).

2.2. Study Period

The study was carried out between December 2022 and April 2023.

2.3. Ethical approval

Ethical approval to conduct the survey with reference number NS/UBEB/S/EDU 259/VOL.1 was approved on 19 November 2022 and obtained from the Nasarawa State Universal Basic Education Board, Nasarawa State Ministry of Education. Also, verbal consent was sought from both the authorities of the four public schools as well as the parents or guardians of the pupils. Pupils whose parents did not sign the consent were, however, not recruited into the study.

2.4. Selection of schools

This study was carried out in four public primary schools in Lafia metropolis of Nasarawa State namely, Ta'al Model Primary School(School 1) (Latitude 8.519037°; Longitude 8.521850°), Lafia East Pilot Science School (School 2) (Latitude 8.492773°;Longitude 8.529467°), L.G.E.A. Primary School MararrabaAkunza (School 3) (Latitude 8.474422°; Longitude 8.583168°), and St. James Pilot Science School(School 4) (Latitude 8.498988°; Longitude 8.513107°). Schools were selected from schools' list using simple random sampling. This was achieved through theprocedure described by Hesse (16). A sketch or map was obtained of the study area. The corner of the map was selected and two baselines were drawn at right angles to each other. The interval width was then determined and a point was selected from the interval width and the four schools that were surveyed were randomly selected.

2.5. Pre-testing of questionnaires

Prior to start of data collection, pre-testing of questionnaire was done at the four selected schools.

2.6. Questionnaire administration

Structured questionnaires were administered to the pupils shortly after urine samples were collected. Demographic data obtained were name of school, sex and age of the pupils, sources of water for drinking and household activities, sanitation, parents' occupation, types of toilets, history of bloody urine and terminal haematuria and outdoor activities of the pupil such as swimming and fishing in water bodies.

2.7. Examination of the samples

Urine samples collected from the various primary schools were examined in the laboratory according to the sedimentation technique highlighted in Tetteh-Quarcoo, [6].

2.8. Sedimentation technique of detection of *Schistosoma haematobium*

The examination of urine samples for ova of *Schistosoma haematobium* was carried out using sedimentation method as described by [6]. This involves the transfer of the urine samples into a centrifuge tube and centrifuging at 3000 rpm (rotations per minute) for 3 minutes to sediment the *Schistosoma* ova. After centrifugation, the supernatant was decanted and a drop of sediment was added onto a grease-free slide and covered with a cover slip. The sediment was then examined microscopically using x10 objective lens and x40 objective lens respectively and the number of the ova on the slide was counted and reported as number per High Power Field (HPF) of urine samples.

2.9. Data analysis

The analysis of the collected, observed and recorded samples were done using simple arithmetic percentages (%), Chi-square (X^2) Statistical test method. The general incidence was determined by simple percentages of infected and non-infected individuals. The rates of incidence were compared using Chi-square test. Similarly, the difference in incidence of infection between school ages and the variation rate by sex of pupils were also calculated by arithmetic percentages.

3. Results

The infection was highest in School 2, 4(8%) and there 50 students in that school, in the 1st school, 2 cases (5.7%) was recorded, in the third school the infection was 13.3%(2), the difference was not statistically significant (*P=0.70*). The prevalence of the infection was 8(8%). Intensity of the infection, Light intensity was recorded in all three schools, an indication that all the students infected had Light infection, only the first and third schools had moderate infection cases 2.95 and 6.7% respectively, the prevalence of moderate infection was 2% overall, and there was no record of heavy infection, there was no statistically significant association (*P=0.64*) (Table 1).

Table 1 Prevalence and intensity of infection among study participants

Location	No. Tested	No. infected	Intensity		
			Light	Moderate	Heavy
School 1	35	2(5.7%)	2(5.7%)	1(2.9%)	0
School 2	50	4(8%)	2(4.0%)	0(0%)	0
School 3	15	2(13.3%)	2(13.3%)	1(6.7%)	0
TOTAL	100	8(8%)	6(6%)	2(2%)	0(0%)
P Value	0.70		0.64		
χ2	2		2		
DF	0.69		0.89		

DF= Degrees of Freedom

Majority of the participants were aged between 5 years and 10 years, (84%), and they were the most infected 7(8.3%) the difference was statistically insignificant when compared *P = 0.79.* Sex; was found to be statistically associated with prevalence of the infection *P=0.00,* majority of the participants were males 66(66%) and 6(9.1%) of them were infected, females were 34(34%) and 2(5.8%) of them were infected the difference was not statistically significant (*p=0.60*). Educational status was not associated with the prevalence of the infection (*P = 0.56*), 69(69%) of them were in Grade 5 -6 and 6(8.7%) were infected, 19(19%) were in Grade 3 -4 and 2(10.5%) were infected while 12(12%) were in Grade 1-2 and none was infected. Eighty-nine (89%) of the participants were students and had no occupation, 8(9%) were infected, the occupational status was not associated significantly with the infection (*P=0.91*) (Table 2).

Table 2 Sociodemographic Factors of the participants

Item		No. examined	No. Positive (%)	P Value	DF	$\chi 2$
Age						
	5 – 10	84(84%)	7(8.3%)	0.79	1	0.06
	11 – 15	16(16%)	1(6.25%)			
Sex						
	Male	66(66%)	6(9.1%)	0.60	1	0.27
	Female	34(34%)	2(5.8%)			
Educational Level						
	Grade 1 – 2	12(12%)	0(0%)	0.56	2	1.13
	Grade 3 – 4	19(19%)	2(10.5%)			
	Grade 5 – 6	69(69%)	6(8.7%)			
Occupation						
	Farming	2	0(0%)	0.91	4	0.97
	Trading	6	0(0%)			
	Fishing	2	0(0%)			
	Civil servant	1	0(0%)			
	Student	89	8(9%)			

DF= Degrees of Freedom

Ninety-five (95%) of the participants had knowledge of the disease, only 8(8.4% were infected but it was not statistically associated with the diseases (*P= 0.52*). Thirty-six of the participants experienced painful urination 4(11.1%) were infected, while 50 of the participants had body itch and 4(8%) were infected, there was no significant association between the symptoms and the prevalence of infection (*P=0.47*). 76% of the participants visited the stream and 6(7.89%) were infected, 24 did not visit the stream, 2(8.33%) of them were infected and the difference was statistically insifgnificant (*P=0.95*). Forty-three (43%) of the participants visited the stream daily and 2(4.65%) were infected, 33(33%) visited weekly, 4(12.1%) were infected, the difference was statistically insignificant (P=0.46). The reason for visit to the stream, 26(34.2%) indicated swimming and bathing and 4(15.4%) were infected, 16(21.1%) went for fishing, 2(12.5%) were infected, the difference was insignificant (*P=0.46*). The source of drinking water; 31% of the participants used pipe-borne water and 2(6.45%) were infected, Borehole was indicated as source of water for drinking by 25% of the participants, 2(8.0%) were infected, 35% of the participants used well water 2(5.71%) were infected, while 9% used stream and 2(22.2%) were infected, there was no statistical association between the infection rate and source of drinking water (*P=0.53*). The participants type of toilet; Majority 73% indicated Flush water closet and they were the most infected 6(8.2%), only 4(4%) of the participants indicated Nearby stream and 2(50%) were infected and the difference was statistically insignificant (*P=0.05*)(Table 3).

Table 3 Risk Factors of urinary schistosomiasis

ITEM		NO. EXAMINED	No. Positive (%)	P VALUE	DF	$\chi 2$
Knowledge						
	Yes	5(5%)	0(0%)	0.52	1	0.42
	No	95(95%)	8(8.4%)			
Symptoms						
	Painful urination	36(36%)	4(11.1%)	0.47	2	1.51
	Blood in urine	14(14%)	0(0)			
	Body itch	50(50%)	4(8%)			
Visit to the Stream						
	Yes	76(76%)	6(7.89%)	0.95	1	0.00
	No	24(24%)	2(8.33%)			
Frequency of visit						
	Daily	43(43%)	2(4.65%)	0.27	1	1.21
	Weekly	33(33%)	4(12.1%)			
Reason for Visit						
	Domestic purposes	25(32.9%)	0(0)	0.46	5	4.67
	Swimming bathing	26(34.2%)	4(15.4%)			
	Farming	6(7.89%)	0(0)			
	Fishing	16(21.1%)	2(12.5%)			
	Grazing	2(2.63%)	0(0)			
	Collection of snails	1(1.32%)	0(0)			
Source of drinking water						
	Pipe-borne water	31(31%)	2(6.45%)	0.53	3	2.17
	Borehole	25(25%)	2(8.0%)			
	Well	35(35%)	2(5.71%)			
	Stream	9(9%)	2(22.2%)			
Type of Toilet						
	Flush water closet	73(73%)	6(8.2%)			
	Pit latrine	16(16%)	0(0)	0.05	3	7.72
	Nearby stream	4(4%)	2(50%)			
	Nearby farm	7(7%)	0(0)			

DF= Degrees of Freedom

4. Discussion

4.1. Prevalence of Infection

The world is constantly being challenged by various kinds of diseases and too often they turn out to be of Public Health concern. Especially within Africa, or at least SubSaharan Africa and tropical regions of the world where certain diseases have been considered as endemic due to poverty, mainly because they are associated with the lifestyle of people who are impoverished. This is not unlike the disease considered in this study, and here, the prevalence of urinary schistosomiasis was 8% out of 100 school aged children studied. The finding is in agreement with [9]. (13% prevalence), the only difference is that, the study was conducted outside Nigeria (Malawi), but Malawi is also a Tropical country in SubSaharan Africa and is thus not different from the study location used here. The findings of [10]. are different from the findings obtained here because, the population was five and a half times larger (551) than the sample size used here, their prevalence of 17.8% is therefore considered high because it is more than 8 persons in 100 which is the finding obtained in this study, the location of their study (Kano) is also a tropical region which poverty stricken. Out of the 300 students examined by ,11]. the prevalence was 8%, which is not different from the prevalence obtained in this study, hence both studies are in agreement, Ebonyi state which was the study location in [11] is not very different from Makurdi because they are both in the Tropical area and are within Nigeria. This study does not agree with [12] because the prevalence was 7 times higher than the prevalence of this study in a population of 487, which was higher than the sample size considered in this study [13] in their study conducted in Murbai and Surbai communities of Ardo-Kola, Taraba state obtained a high prevalence of 58.54% which is significantly higher than the prevalence of this study, hence both studies are not in agreement on the basis of high prevalence but agree on the presence of infection within the population type. [13]. is also not in line with the findings of this study because the prevalence obtained (75.8%) is higher than the prevalence of this study, a major point to note is that, their study was conducted among children living in a hamlet an indication of extreme poverty. This study is closely in line with [13]. because, the prevalence 12.9% in a population of 170 primary school kids, which is nearly twice the sample size of this study. Geleta *et al.* (2015) in their study conducted in Gambella Ethiopia, revealed that, the prevalence of urinary schistosomiasis was 35.9% among 304 school kids which is different from the findings obtained here, although the study is similar in terms of the study area used here, both communities are in the Tropics of SubSaharan Africa. A prevalence of 55% was obtained by Amuta and Houmsou, (2014) in a population of 300 school aged children studied in a community next to Makurdi, although the sample size and prevalence is larger than the prevalence of this study, both studies are similar on the basis of locations which are within the same state and side by side. Out of the 388 school kids studied by [8]. in Mali, 51.2% were infected and its higher than the findings of this study hence not in agreement. The findings here are also dissimilar to [9] because 32.0% of the school kids out of 400 were found with the infection which is higher than the prevalence of this study.

Majority of the participants were aged between 5 years and 10 years, (84%), and they were the most infected 7(8.3%) the difference was statistically insignificant when compared (*P = 0.79*) this is not in agreement with Moyo *et al.* (2016) and in their study, four year old pre-school children were the most infected and is unlike the findings of this study. Dissimilar to the findings here, [14]. also found that age was statistically associated with prevalence of the infection. [15]. also differs from this study, a significant association was found between age and prevalence of the infection. This study also different from [15]. age was found to be significantly associated with the infection. The results here different from Amuta and [15]. they found a significant link between the prevalence of the diseases and age. [14]. also determined that there was no significant relationship between infection and age and hence is similar to this study. Sex; was not statistically associated with prevalence of the infection *P=0.60,* majority of the participants were males 66(6%) and 6(9.1%) of them were infected, females were 34(34%) and 2(5.8%) of them were infected this is not in agreement with [13]., the infection was statistically associated with sex and being male was a major factor. The findings here are similar to [12]. sex was associated significantly with the infection. Amuta and [11]. also found a significant relationship between the prevalence of infection and sex, in their study, males were more infected than females, hence it is similar to the findings of this study. Unlike the findings here, [8]. revealed that there was no significant association between the infection and sex. Educational status was not associated with the prevalence of the infection (*P = 0.56*), 69(69%) of them were in Grade 5 -6 and 6(8.7%) were infected, 19(19%) were in Grade 3 -4 and 2(10.5%) were infected while 12(12%) were in Grade 1-2 and none was infected. Eighty-nine (89%) of the participants were students and had no occupation, 8(9%) were infected, the occupational status was not associated significantly with the infection (*P=0.91*). [12]. found a significant connection between farming and prevalence of the infection. [11]. established that having a father who is a farmer is associated with infection.

Ninety-five (95%) of the participants had knowledge of the disease, only 8(8.4% were infected but it was not statistically associated with the diseases (*P= 0.52*). Most of the study participants were primary school kids in [13]. they did not significantly possess knowledge regarding to the disease. Thirty-six of the participants experienced painful urination 4(11.1%) were infected, while 50 of the participants had body itch and 4(8%) were infected, there was no significant association between the symptoms and the prevalence of infection (*P=0.47*). 76% of the participants visited the stream and 6(7.89%) were infected, 24 did not visit the stream, 2(8.33%) of them were infected and the difference was statistically insignificant (*P=0.95*). Forty-three (43%) of the participants visited the stream daily and 2(4.65%) were infected, 33(33%) visited weekly, 4(12.1%) were infected, the difference was statistically insignificant (P=0.46). The reason for visit to the stream, 26(34.2%) indicated swimming and bathing and 4(15.4%) were infected, 16(21.1%) went for fishing, 2(12.5%) were infected, the difference was insignificant (*P=0.46*). These findings are in line with [12]. contact with water was found to be associated with the disease. [14]. does not agree with the findings of this study because, water contact activities were found to increase the chances of infection significantly. [16]. also found that the infection was associated significantly with swimming. The source of drinking water; 31% of the participants used pipe-borne water and 2(6.45%) were infected, Borehole was indicated as source of water for drinking by 25% of the participants, 2(8.0%) were infected, 35% of the participants used well water 2(5.71%) were infected, while 9% used stream and 2(22.2%) were infected, there was no statistical association between the infection rate and source of drinking water (*P=0.53*). Umoh *et al.* (2020) agrees with the findings here on the basis of type of water for cooking and bathing. Proximity to water source was implicated as significant cause of infection in the findings of [15].The participants type of toilet; Majority 73% indicated Flush water closet and they were the most infected 6(8.2%), only 4(4%) of the participants indicated Nearby stream and 2(50%) were infected and the difference was statistically insignificant (*P=0.05*). the findings here are in line with [15]. the type of basic amenities available to children could prevent the infection.

5. Conclusion

The prevalence of urinary schistosomiasis in this study was found to be 8%, this is low compared to the prevalence obtained in similar studies. The sociodemographic factors were not associated with the prevalence of the infection. The risk factors enlisted, only type of toilet was statistically associated with the prevalence of the infection significantly except the type of rest room used by the participants.

Recommendations

- Children are to be protected from risk factors that endanger them especially the type of toilet used.
- Surveillance studies ought to be conducted to monitor the prevalence of the infection across all ages.
- Parents are to ensure that their children are not at risk by practicing proper sanitation and hygiene.
- Parents and guardians should be enlightened on the causes, effects and preventive measures of schistosomiasis.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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Appendix

Figure 1 Sample collection

Figure 2 Respondents (Pupils of L.G.E.A Primary School Mararraba-Akunza)

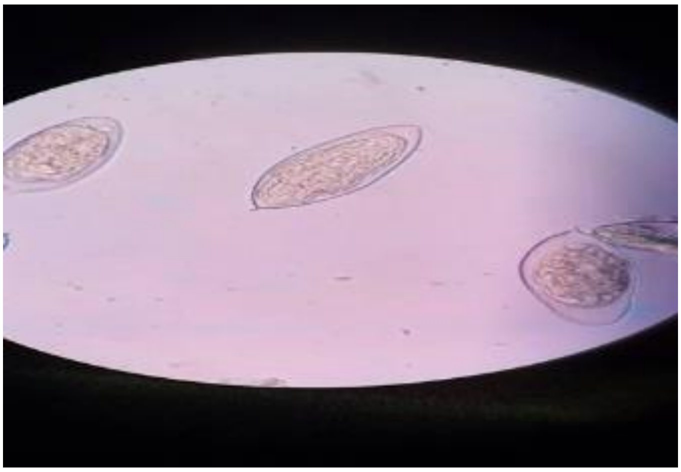

Figure 3 Microscopic view of Schistosoma haematobium ova