



Urinary Schistosomiasis among Primary School Children in Dutsin-Ma Town, Katsina State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors JAB, IM and YAU designed the study, performed the statistical analysis, wrote the protocol and author TA wrote the first draft of the manuscript. Authors JAB and IM managed the analyses of the study. Author TA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: To assess the prevalence of urinary Schistosomiasis among primary school pupils in Dutsin-Ma town, Katsina State, Nigeria.

Study Design: Five schools were selected using simple random sampling technique without replacement.

Place and Duration of Study: Dutsin-ma Local Government Area of Katsina state, Nigeria and laboratory study was at Department of Biological Sciences, Federal University Dutsin-Ma between April and June 2015.

Methodology: Urine filtration technique was employed to process urine specimens and presence of *Schistosoma haematobium* eggs were determined microscopically. Questionnaires were also administered to children to collect socio-demographic data and water contact activities information.

Results: Out of the 300 urine samples examined, 52 (17.3%) were positive for urinary schistosomiasis, with 37 (12.3%) males and 15 (5.0%) females showing significant difference in the prevalence rate in the sex ($\chi^2_{cal} = 25.0$, $\chi^2_{tab} = 9.5$ at $P < 0.05$ and $df = 2$). Age group 10-13 years,

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25 (61.0%) had highest prevalence of infection, while the lowest was in age group of 2-5 years, 3 (7.9%). Those who use dams/reservoirs as source of water for domestic use had highest prevalence, 17 (23.9%) while the lowest was among pupils who use tap water, 4 (10.3%). Pupils whose parents' occupation is farming had highest prevalence of 27 (24.6%), while those whose parents are civil servants had 3 (10.0%). Pupils who swim in dams had the highest prevalence of 25 (22.7%) while pupils who use swimming pools had zero (0%) prevalence.

Conclusion: Infection with *Schistosoma haematobium* has been established in this study area and there is need for public health campaign among pupils and parents/guardians.

Keywords: Schistosomiasis; sex; age; water contact; occupation.

1. INTRODUCTION

It is estimated that schistosomiasis and geohelminths represent more than 40% of the global disease burden caused by all tropical diseases, excluding malaria [1]. Schistosomiasis, also known as bilharzias or snail fever is a parasitic disease caused by blood flukes (trematodes) of the genus *Schistosoma*. After malaria and intestinal helminthiasis, schistosomiasis is the third most devastating tropical disease in the world, being a major source of morbidity and mortality for developing countries in Africa, South America (Brazil, Venezuela and Suriname), the Caribbean (including Puerto Rico but not Cuba), the Middle East, and Asia [1,2,3]. More than 207 million people, 85% of who live in Africa, are infected with schistosomiasis, and an estimated 700 million people are at risk of infection in 76 countries where the disease is considered endemic, as their agricultural work, domestic chores, and recreational activities expose them to infested water [2,4,5].

Globally, 200,000 deaths are attributed to schistosomiasis annually [6]. Transmission is interrupted in some countries. About 66 million children in 76 countries are affected and in some villages in Africa, over 99% of the children are estimated to be infected by the disease. The disease is common in Nigeria and is found in many countries of the West African sub- region. In these regions Schistosomes are next to other important organisms responsible for infectious disease such as trypanosome, filarial worm and cestodes [7]. Urinary schistosomiasis is widely distributed in Nigeria and is considered a significant health problem [8]. The disease occurs mainly in school-aged children and young adults in sub-Saharan Africa [9,10]. The estimates for morbidity and mortality in affected populations are high with school age children having the highest prevalence and intensity of infection [11].

Reports on Schistosomiasis due to *S. haematobium* has indicated its widespread in Nigeria, with estimated 101.28 million persons at risk and 25.83 million people infected thereby constituting a public health problem particularly in children [12-19]. The distribution of the disease is focal, aggregated and usually related to water resources and development schemes such as irrigation projects, rice/fish farming and dams. It is prevalent in all the states of the federation, with a high infection rate among school children [20-23].

Though there are reports of Schistosomiasis in Katsina State and other neighbouring States [24,25,26], there is dearth of information on the prevalence of this disease and its concomitant morbidity in some parts of Northern Nigeria, especially in the rural areas of Katsina State where most families are engaged in subsistent farming and fresh water fishing. They predominantly depend on the two reservoirs, Dutsin-Ma and Zobe Dams for their daily water needs and other water related activities. Hence, this study reported prevalence of urinary Schistosomiasis among primary School children in Dutsin-Ma, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

Dutsin-ma Local Government Area of Katsina state, lies on the latitude 12°26N and longitude 07°29E. It is bounded by Kurfi and Charanchi LGAs to the north, kankia LGA to the east, Safana and Dan-Musa LGA to the West, and Matazu LGA to the southeast. Dutsin-ma has a size of about 552.323km² with a population of 169 829 as at 2006 national census [27]. The people are predominantly farmers, cattle rearers and traders.

The climate of Katsina state is a tropical wet and dry type (tropical continental climate) classified

by Koppen as Aw climate. Rainfall is between May and September with a peak in August. The average annual rainfall is about 700mm. The pattern of rainfall in the area is highly variable. This can result to severe and widespread droughts that can impose serious social-economic constraints [28]. The mean annual temperature ranges from 29°C – 31°C. The highest air temperature normally occurs in April/May and the lowest in December through February. Evapo-transpiration is generally high throughout the year. The highest amount of evaporation occurs during the dry season. The vegetation of the area is the Sudan savannah type which combines the characteristics and species of both the Guinea and Sahel Savannah [29,30].

2.2 Sampled Schools

Five schools were selected using simple random sampling technique without replacement. The five primary schools visited between the month of April and June were: Dammy Preparatory Primary School, Darawa Primary School, Yarima Primary School, Na'Alhaji Primary School and Jamu Primary School, all in Dutsin-Ma.

2.3 Sample Collection

A total of 300 urine samples were collected among school age children by stratified random sampling method. Structured questionnaires were used to collect some information on age, sex; source of water for drinking, parent's occupation and water contact activities from the children during samples collection. Each child was given a cleaned, dried wide mouthed screw-capped universal bottle which were appropriately labelled and instructed by demonstration on how to collect urine samples used for this study. The samples were collected from 10 am-12 pm during the period of the sampling. The samples were placed in black polyethylene bag to prevent the ova of *Schistosoma haematobium* from hatching during transportation to the laboratory.

2.4 Laboratory Analysis

Urine samples collected were each examined physically for the evidence of haematuria. Each sample was then processed by simple sedimentation techniques. The technique involves taking 10 mls of urine samples and centrifuging at 2000 rpm for 2 minutes after which it was allowed to stand for 30 minutes. The supernatant was discarded while the sediment was pipetted on to a grease-free glass slide and

covered with a cover slip. The slide was then examined under the microscope at x10 and x40 magnifications. *Schistosoma haematobium* ova seen were identified as described by [31].

2.5 Data Analysis

The data obtained were analysed by using simple percentage while Chi-square test was used to compare differences at $P < 0.05$ was considered significant.

3. RESULTS AND DISCUSSION

Results from the study showed 17.3% (52) total prevalence of urinary schistosomiasis among the school children, with Tashar Mangwaro Primary School having the highest prevalence of 33.3% (20), while Jamu School had the lowest prevalence of 10.0% (6) (Table 1). The prevalence of infection, 17.3% recorded in this study is low when compared to 49.4% reported among Primary School Pupils in Gwange Ward of Maiduguri, Borno State [32], 41.6% observed in Danjarima community, in Kano State [33], 31.1% recorded in the Federal Capital Territory, Abuja [13], 24.30% reported among school aged children in Konduga, Borno State [18] and 41.5% reported among school children in Buruku and Katsina-Ala LGAs of Benue State [19]. Also lower than 31.2% reported among volunteers examined in Ihieve-Ogben [34], 75.6 among primary school pupils in Ogbese-Ekiti [35] and 37.7% reported among dwellers of Wurno Rural Area of Sokoto State, Nigeria [22]. It is higher than findings of [36] who reported prevalence of 11.3% in Ohaji/Egbema LGA, Imo State, Nigeria and [37] who reported 2.07% among residence of Gwong and Kabong Jos North, Plateau State, Nigeria. The comparably differences in prevalence among these studies could be attributed to presence of water bodies and water contact practices [16].

There was significant association of prevalence of infection with sex ($P=0.037$), with males having the highest prevalence of 24.67% (37.0) (Table 2). The significant difference of prevalence between sexes, with males having higher prevalence of infection than the females is similar to reports by [13,19,22,36]; who also reported significant association of infection with sex, with higher prevalence of infection among males. This could be attributed to occupation, frequent exposure to water bodies that are likely to harbour effective cercariae; adventurous water activities, irrigation farming, fishing and

swimming etc. associated with male gender which exposes them to schistosomiasis. Females are reported to be less prone to long periods of swimming and, therefore, have less exposure to water activities (swimming) compared to males [22,38]. However, other studies had reported that there was no association between schistosomiasis and gender, with no significant difference between the incidence for males and females, respectively [34,35,37]. This strongly reinforced the notion that the association between gender and *S. haematobium* infection varied in different communities [22].

Among the age groups, age 2-5 years had lowest prevalence of infection 7.89%(3), while highest prevalence 60.98% (25) was recorded among age group of 10-14 years, with no significant association of the prevalence with age groups (P=0.056) (Table 3). The prevalence of infection in this study followed the typical age group pattern for urinary schistosomiasis, attaining a peak of 60.98% in subjects 10 – 13 years of age, decreasing to 9.09% in subjects of 14-17 years.

This pattern is similar to that of [13,37]. The rise in prevalence of schistosome infection with age could be attributed to the exposure factor. At early age, water contact activities such as swimming, washing and bathing inside the water (river) body are less and these activities could increase with age and maturity [22,38]. The highest prevalence in the age group 10-13 years could be because they are more independent than the lower age groups, hence, more adventurous in terms of fishing, swimming, snail hunting and washing of clothes. This age group has the potential to contribute significantly to the contamination of the environment and consequently to the transmission of the disease [39,40]. The drop in prevalence observed among age group of 14-17 years could be attributed to maturity, with children at that age bracket not swimming in water bodies like rivers or dams. The non-significant prevalence of urinary schistosomiasis with age of pupils as recorded in this study is in contrast with previous works by [41,42,43,44], but similar to [40].

Table 1. Prevalence of urinary schistosomiasis by the selected schools sampled in Dutsin-Ma

Name of schools	No. examined	No. infected	Percentage infected (%)
Sabon-Gari Zobe	60.00	9.00	15.00
Na-Alhaji	60.00	10.00	16.67
Jamu	60.00	6.00	10.00
Tashar Mangwaro	60.00	20.00	33.33
Damy	60.00	7.00	11.67
Total	300.00	52.00	17.33

$$\chi^2_{cal} = 1.67; \chi^2_{crit} = 5.99; df = 1 \times 2 = 2; P = .045$$

Table 2. Prevalence of urinary schistosomiasis by sex

Name of schools	Male			Female		
	NE	NI	% infected	NE	NI	% infected
Sabon Gari Zobe	30.00	5.00	16.67	30.00	2.00	6.67
Na- Alhaji	30.00	5.00	16.67	30.00	1.00	3.33
Jamu	30.00	9.00	30.00	30.00	1.00	3.33
Tashar Mangwaro	30.00	5.00	16.67	30.00	4.00	13.33
Damy	30.00	13.00	43.33	30.00	7.00	23.33
Total	150.00	37.00	24.67	150.00	15.00	10.00

$$\chi^2_{cal} = 24.97; \chi^2_{crit} = 9.488; df = 1 \times 2 = 2; P = .037; NE: Number examined and NI: Number infected$$

Table 3. Prevalence of urinary schistosomiasis by age group

Age group (years)	No. examined	No. infected	Percentage infected (%)
2 - 5	38.00	3.00	7.89
6 - 7	210.00	23.00	10.95
10 - 13	41.00	25.00	60.98
14 - 17	11.00	1.00	9.09
Total	300.00	52.00	17.33

$$\chi^2_{cal} = 0.747; \chi^2_{crit} = 5.991; df = 2 P = .056$$

In relation to source of water for domestic use and consumption, those who use dams/reservoirs as their source had highest prevalence of 23.94% (17), while those who use tap as source had lowest prevalence of 4.00 (10.20%). There was no significant association of prevalence with source of water for domestic use and consumption (Table 4). Though no significant association of prevalence of *S. haematobium* with parents' occupation was also established, pupils whose parents are farmers by occupation had the highest prevalence of 24.55% (27), while the children of civil servants had lowest prevalence of 10.0% (3) (Table 5). Considering the hobbies of the pupils, those who bathe/swim in dams/reservoirs had the highest prevalence of 22.73 (25), with no infection (0%) among those pupils who bathe/swim in pools. There was no significant association in the prevalence of *S. haematobium* infection with their hobbies (Table 6).

infection in the area in this study. The highest prevalence among pupils who used dams / reservoirs as source of water is similar to reports by [45,46]. It is generally known that those that depend on such water bodies as source of water are more likely to contract the disease. Similar to other reports that associated highest prevalence of Schistosomiasis with farming when compared to other parents/guardians occupations [19,36, 43,45,46,47], this study also showed that children whose parents/guardians are farmers are more prone to highest prevalence of Schistosome infection. This was probably because they joined their parents at farm during the holidays [43] and this could have exposed them to contaminated water bodies. It is clear that water bodies such as dams/reservoirs and other stagnant/slow flowing water bodies serve as suitable habitats for snails, the intermediate-hosts schistosomiasis, thus, contributing to the sustenance of transmission cycle of the disease in the area [46].

Water contact activities of the pupils generally increased the prevalence of Schistosoma

Table 4. Prevalence of urinary schistosomiasis in relation to source of water for domestic use and consumption

Source of water	No. examined	No. infected	Percentage infected (%)
Dam/reservoir	71.00	17.00	23.94
Rivers/streams	69.00	12.00	17.39
Well	62.00	11.00	17.74
Borehole	59.00	8.00	13.56
Tap water	39.00	4.0	10.26
Total	300	52.00	17.33

$$\chi^2_{cal} = 0.18; \chi^2_{crit} = 7.81; df = 1 \times 2 = P = .083$$

Table 5. Prevalence of urinary schistosomiasis in relation to parents occupation

Occupation	No. examined	No. infected	Percentage infected (%)
Farming	110.00	27.00	24.55
Fishing	100.00	16.00	16.00
Trading	60.00	6.00	10.00
Civil service	30.00	3.0	10.00
Total	300.00	52.00	17.33

$$\chi^2_{cal} = 0.75; \chi^2_{crit} = 7.81 \text{ at } P = .065 \text{ and } 2df$$

Table 6. Prevalence of urinary schistosomiasis in relation to hobbies of the pupils

Hobbies	No. examined	No. infected	Percentage infected (%)
Bath/swimming in dam	110.00	25.00	22.73
Bath/swimming in river	100.00	17.00	17.00
Bath/swimming in open water	85.00	10.00	11.76
Bath/swimming in pools	5.00	0.00	0.00
Total	300.00	52.00	17.33

$$\chi^2_{cal} = 4.03; \chi^2_{crit} = 3.84; 2df \text{ } P = .078$$

4. CONCLUSION

Infection with *Schistosoma haematobium* has been established in this study area. Regular chemotherapy and surveillance of Schistosomiasis in this area is necessary to reduce or possibly eliminate it completely. Safe drinking water and recreational facilities such as swimming pools should be made available in this community to reduce contact with infected water. The need for public health campaign among pupils and parents/guardians cannot be overemphasized.

CONSENT

All authors declare that verbal informed consent was obtained from the staff and parents of pupils who participated in this study.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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