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Prevalence of Urinary Schistosomiasis among School Aged Children in Bakura Local Government Area of Zamfara State Nigeria

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Abstract

Urinary schistosomiasis (Bilharziasis) is a parasitic disease caused by digenic trematode called Schistosoma haematobium, it is a water based parasitic disease transmitted by water snails of the genus Bulinus that mainly affect children. A study was carried out to determine the prevalence of Urinary Schistosomiasis among School aged children of three selected communities in Bakura LGA of Zamfara State to determine the prevalence of S. haematobium from urine samples of the pupils and to relate the prevalence of infection with socio-demographic factors such as age, sex and water contact activities of the sampled subject. A total of 360 urine samples comprising of 120 each from the Yargeda, Kwanar Kalgo and Tungar Maiburtu Primary Schools were collected and examined by sedimentation technique for the presence of S. haematobium eggs. The overall percentage of infection recorded was 30.0% while percentages of infection obtained among the selected Primary Schools were 33.3%, 16.7% and 40.0% in Yargeda, Kwanar Kalgo and Tungar Maiburtu respectively. Male pupils recorded the highest rate of infection (44.9%) than female pupils (23.6%). Age group 8-11 years old had highest infection rate (35.7%), while the age group 12-15 years had the least prevalence rate (23.5%). In relation to sources of drinking water, pupils with rivers/streams as their main sources of drinking water recorded the highest rate of infection (38.7%), whereas those using tap/bore-hole water had the least prevalence of infection (18.2%). Based on water contact activity, pupils whose water contact activity was mostly fishing had the highest rate (41.4%), while lowest rate of infection of 18.0% was observed among pupils swimming in rivers. In all the cases, chi-square analysis showed no significant association between the rate of infection and water contact activities (P<0.01). Since infection with S. haematobium had been established in the study area, there is therefore a need for public health campaign among pupils to adapt preventive measures with control programs for snails' intermediate host.

Keywords: *S. haematobium, Schistosomiasis, Snails, Water contact, Bakura, pupils.*

INTRODUCTION

Schistosomiasis is a chronic, debilitating parasitic disease infecting more than 200 million people and is second only to malaria in terms of public health importance. About 95% of African population is infected with the disease (WHO, 2014). Urinary Schistosomiasis (Bilharzia) is a water-born parasitic disease caused by *Schistosoma heamatobium*, the digenic treamatode found in the blood vessels of man and livestock (Bello *et al.*, 2003). In Nigeria, the incidence of urinary schistosomiasis is so common in some communities that young men pass the bloody urine at some stage of the disease (Eni *et al.*, 2008). There are several complications of chronic urinary schistosomiasis such as bladder cancer, which is the major cause of morbidity and mortality in endemic areas (Eni *et al.*, 2008).

Globally, about 200,000 deaths are attributed to schistosomiasis annually (Nour, 2010). 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 (Abdelwahab *et al.*, 2000). The disease is common in Nigeria and is found in many countries of the West African sub- region (Mahmoud, 2001). In Nigeria, about five species of the genus *Schistosoma* are pathogenic to man. These species include *Schistosoma heamatobium*, *Schistosoma mansoni*, *Schistosoma japanicum*, *Schistosoma intercalatum and Schistosoma Mekongi* (Uko *et al.*, 2003; Agi and Okafor, 2005). however three species, *S. haematobium*, *S. mansoni* and *S. japonicum* account for more than 95% of all human cases of schistososmiasis worldwide (Mogasale *et al.*, 2014).

The disease caused by S. *haematobium* is characterized by bloody urine, lesion of bladder, kidney failure and bladder cancer in children (Butterworth, 2007), and is the major cause of female genital schistosomiasis, which is a risk factor for transmission of sexually transmitted diseases and HIV (WHO, 2014). Though the disease kills few people, its clinical effects, incidence and association with other diseases and expansion of agriculture and water development projects, movement of population and increase in population density and some social habits like passing urine and faeces near water bodies makes it a problem of great health importance (WHO, 2010). Reports on schistosomiasis due to S. *haematobium* has indicated its widespread in Nigeria, with estimated 101.28 million person at risk and 25.83 million people infected thereby constituting a public health problem particularly in children (Engels *et al*., 2002; Houmsou *et al*., 2012). 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 (Mafe *et al*., 2000; Sing *et al*., 2016).

In the study area, Sokoto Rima River Basin Development Authority (SRRBDA) has executed considerable number of development irrigation project for rice farming in progress. This situation provide conducive environment for the survival of the intermediate host and the causal agent of bilharzia. There is apparently little concern on health, the risk associated with the irrigation practices, migration and other water contact activity that predispose humans to *Schistosoma* infection. Though there are reports of schistosomiasis in Zamfara states and other neighboring states (Adamu, *et al*., 2001; Bala, *et al*., 2012), there is dearth of information on the prevalence and its morbidity in Northern Nigeria especially in the rural areas of Zamfara state where must population are engaged in subsistence farming and fresh water fishing. Hence, this study is designed to access the prevalence of urinary schistosomiasis among school aged children and its association with sociodemographic factors of primary school children in three communities in Bakura Local Government Area LGA of Zamfara State Nigeria.

MATERIALS AND METHODS

Study area

Bakura LGA of Zamfara state is located in the Sudan Savannah zone in the extreme North-west part of Nigeria, between longitude 5°44'30'E and 6° 0'0" E and latitude 12° 33'30"N and 12°49'0"N. Rainfall in this area is between May/June to early October, when the natural water bodies are often flooded (Umar and Ipinjolu, 2010). Annual rainfall in the area ranges between 500mm and 1300 mm, while the dry season last for up to 7 to 8 months (November to May). It shared common boarders with Tureta LGA of Sokoto state to the North, Bukkuyum and Anka LGAs to the south-west, Talata Mafara and Maradun LGAs to the South-East. The total land area is about 892 square kilometers. The settlement areas in the district are mostly low lying with various types of fresh water bodies such as dams and rivers. This area has two rivers that are, river Bakalori and river Nato Gamji village. The vegetation is mainly grassland with trees. Bakura is a rural district around the Bakalori Dam and river Nato of Gamji the district has mainly farmers and fishermen. People around the area are very poor and dependent on fish, irrigation farming and other animals for food and nutrition and they use water from river Bakalori and Gamji for their domestic need (Bala *et al.,* 2012).

Sampled schools

Three (3) schools one from each community were selected. The primary schools visited were: Yargeda community primary school, Kwanar Kalgo community primary school and Tungar Maiburtu community primary school.

Ethical Approval

The protocols for this study were sought from Zamfara State Hospitals Management Board through the local Government Education Authority (LGEA) Bakura.

Informed Consent

The village Heads and the parents of the examined pupils were informed and fully briefed on the objectives of the study. The study was explained to each participant for their understanding and cooperation. This research covers three months duration.

Sample Collection

A total of 360 school aged children were selected for the survey using stratified random sampling method. Structured questionnaires were used to collect information regarding age, sex; source of drinking water and domestic use, parent's occupation and water contact activities of the children during samples collection. Each child was given a cleaned, dried universal bottle which were appropriately labeled and instructed by demonstration on how to collect urine samples to be used for the 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. The urine specimens were transported to the Parasitology laboratory for parasitological examination of Usman Danfodio University Sokoto.

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 10mls 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. *S. haematobium* ova Seen were identified as described by (Cheesbrough, 2006).

Data Analysis

The data obtained were analysed by using simple percentage while Chi-square test was used to compare differences at $P<0.01$ was considered significant.

RESULTS

Results obtained from this study showed 30.0% total prevalence rate of urinary schistosomiasis among the school aged children with Tungar Maiburtu primary school having the highest rate of 40.0%, followed by Yargeda primary school with 33.3% while Kwanar Kalgo Primary School had the lowest prevalence rate of 16.7%. Total average parasite load is 14 eggs/10ml of urine, with Tungar Maiburtu primary School having the highest parasite load of 15, followed by Yargeda primary school with 14 and Kwanar Kalgo had the least average parasite load of 11 eggs/10ml of urine. Chi-square analysis showed no significant differences in the rate of infection with selected schools at $P<0.01$ considered significant, **(P value =0.0442)** (**Table 1).**

Table 2: Showed the prevalence of urinary schistosomiasis by Age group and Sex of the pupils: Among the age groups, age 8-11 years had the highest prevalence rate of infection 35.7% (60) followed by 4-7 age group with 26.6% (25) and the lowest rate of 23.5% (23) was observed among the age group of 12-15 years, with average parasite load of 16, 11 and 14 parasite load/10ml of urine. Furthermore the prevalence rate by Sex was also recorded with Male pupils having the highest rate of 44.9% (69) while female pupils had the lowest rate of 23.6% (39), average parasite load/10ml of urine were 16 and 10. Chi square analysis showed no significant difference between the prevalence rate of infection with the age groups and sex of pupils **(P= 0.5685 and P= 0.7517).**

Table 3: Showed the Prevalence of Urinary Schistosomiasis in relation to source of water of pupils for consumption and domestic use in the study area. Pupils whose source of drinking water were Rivers/streams had the highest prevalence rate of 38.7% (43) followed by dam 28.6% (30), those from well had 28.1% (25) while that of tap/bore holes had the lowest rate of 18.2% (10). The average parasite load/10ml of urine for sources of water from Dam, Rivers/stream, well and Tap/bore holes were 15, 14, 12 and 11. However, variables are not significantly difference in the rate of infection with pupils source of water for consumption and domestic used **(*P* = 0.2205).**

Table 4: Showed Prevalence of Urinary Schistosomiasis in relation to water contact activities of pupils in the study area. It was observed that children who were involved in fishing had the highest prevalence of 41.4% (29), followed by those involved in irrigation farming 35.4% (41), swimming in dams had 33.3% (20) and pupils involved in swimming in rivers had the lowest prevalence of 18.0% (18) respectively. Parasite load observed in relation to water contact activities for those involved in Swimming in dams, fishing, irrigation farming and swimming in rivers, were 15, 15, 14, and 12 eggs per 10 ml of urine respectively. However, chi square analysis showed variables are not significantly difference in the prevalence rate of infection with water contact activities of the pupils **(*P* = 0.0408).**

Table 1: Prevalence of Urinary Schistosomiasis by the selected schools sampled in Bakura LGA of Zamfara State

Schools	No. Examined	No. Infected	Prevalence (%)	APL/10ml of urine
Yargeda	120.0	40.0	33.3	14
Kwanar Kalgo	120.0	20.0	16.7	11
Tungar Maiburtu	120.0	48.0	40.0	15
TOTAL	**360.0**	**108.0**	**30.0**	**14**

(X^2 = 9.786, df = 2, p<0.01) P = 0.0442. KEY: APL =Average parasite load.

Table 2: Prevalence of Urinary Schistosomiasis by Age group and Sex of the pupils

Variables	No. Examined	No. Infected	prevalence (%)	APL/10ml of urine
Age groups				
4 -7	94.0	25.0	26.6	16
8-11	168.0	60.0	35.7	14
12-15	98.0	23.0	23.5	11
Total	**360.0**	**108.0**	**30.0**	**14**
(X^2 = 2.937, df = 2, p<0.01) P = 0.5685. KEY: APL = Average parasite load.				
Sex/Gender				
Male	195.0	69.0	44.9	16
Female	165.0	39.0	23.6	10
Total	**360.0**	**108.0**	**30.0**	**14**

(X^2 = 6.719, df = 1, p<0.01) P = 0.7517. KEY: APL =Average parasite load.

Table 3: Prevalence of Urinary Schistosomiasis in relation to source of water for consumption and domestic use

Source of water	No. Examined	No. Infected	Prevalence (%)	APL/10ml of urine
Dam	105.0	30.0	28.6	15
Rivers/Stream	111.0	43.0	38.7	14
Well	89.0	25.0	28.1	12
Tap/Bore holes	55.0	10.0	18.2	11
TOTAL	**360.0**	**108.0**	**30.0**	**14**

(X^2 = 8.248, df = 3, p<0.01) P = 0.2205. KEY: APL =Average parasite load.

Table 4: Prevalence of *S. haematobium* in relation to water contact activity of the pupils in the study area

Water contact activities	No.Examined	No.Infected	Prevalence (%)	APL/10ml of urine
Irrigation farming	134.0	41.0	35.4	14
Fishing	66.0	29.0	41.4	15
Swimming in dams	69.0	20.0	33.3	15
Swimming in rivers	91.0	18.0	18.0	12
Total	**360.0**	**108.0**	**31.4**	**14**

(X^2 = 13.142, df = 3, p<0.01) P = 0.0408. KEY: APL =Average parasite load.

DISCUSSION

It was clear that urinary schistosomiasis is modestly prevalent in the study area. The prevalence rate of infection, (30.0%) observed in this study is low when compared to 60.8% reported in some riverine areas of Sokoto, Nigeria (Singh *et al.*, 2016), 49.4% reported in Gwange Ward of Maiduguri, Borno State (Balla *et al.*, 2010), 41.6% observed in Danjarima community, in Kano State (Sarkinfada *et al.*, 2009), and 41.5% reported in Buruku and Katsina-Ala LGAs of Benue State (Houmsou *et al.*, 2012). Also, 75.6% in Ogbese-Ekiti (Ologunde *et al.*, 2012) and 37.7% reported in Wurno Rural Area of Sokoto State, Nigeria (Bello *et al.*, 2014).

However, it is higher than the findings of Bawa *et al.*, (2016) with prevalence rate of 17.3% in Dutsin-ma town, Katsina State. It is also higher than the findings by Okoli *et al.*, (2006) who reported a prevalence of 11.3% in Ohaji/Egbema LGA, Imo State, Nigeria and Dawet *et al.*, (2012) who reported 2.07% in Gwong and Kabong Jos North, Plateau State, Nigeria. The comparable differences in prevalence among these studies could be attributed to the presence of water bodies and water contact practices (Ekpo *et al.*, 2010).

But our findings were in agreement to the report with a prevalence of 31.1% recorded in the Federal Capital Territory, Abuja (Ifeanyi *et al.*, 2009). There was no significant difference in the prevalence rate of infection with the sex of pupils (*P*=0.0442), with males having the highest prevalence of 44.9% (Table 2). The non-significant difference of prevalence between sexes, with males having higher prevalence of infection than the females is in agreement with the reports by (Ifeanyi *et al.*, 2009; Houmsou *et al.*, 2012; Bello *et al.*, 2014; Okoli *et al.*, 2014) who also reported no significant difference of infection with sex, with higher prevalence of infection among males.

This could be attributed to occupation, exposure to water bodies that are likely to harbor effective cercariae, Water contact activities, such as irrigation farming, fishing and swimming are mostly 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 swimming compared to males (Bello *et al.,* 2014; Auta *et al.,* 2013). However, other studies had reported that there was association between schistosomiasis and gender, with significant difference between the prevalence for males and females, respectively (Nmorsi *et al.,* 2007; Ologunde *et al.*, 2012; Dawet *et al.*, 2012). This strongly reinforced the notion that the association between gender and *S. haematobium* infection varies in different communities (Bello *et al.*, 2014).

Among the age groups, age 12-15 years had lowest rate of infection 23.5%, while highest prevalence 35.7% was recorded among the age group 8-11 years, with no significant differences in the rate of infection with the age groups (P=0.5685) (Table 2). The prevalence of infection in this study followed the typical age group pattern for *S. haematobium*, attaining a peak of 35.7% in subjects 8 – 11 years of age, decreasing to 23.5% in age of 12-15 years. This pattern is in agreement with that of (Ifeanyi *et al.*, 2009; Dawet *et al.*, 2012). The rise in prevalence rate 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 (Bello *et al.*, 2014; Auta *et al.*, 2013).

The highest prevalence in the age group 8-11 years could be due to they are more independent than the lower age groups, hence, more adventurous in terms of fishing, 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 (Pukuma and Musa, 2007; Igumbor *et al.*, 2010). The drop in prevalence rates observed among age group 12-15 years could be attributed to maturity, with children at that age mostly not swimming in water bodies like rivers or dams. The non-significant association in the prevalence rate of *S. haematobium* with age of pupils as recorded in this study is in contrast with previous works by (Ejima and Odaibo, 2007; Mbata *et al.*, 2008; Ekwunife, 2004; Sam-wobo *et al.*, 2009), but in agreement to (Igumbor *et al.*, 2010).

In relation to source of water for domestic use and consumption, those who use rivers/stream as their source of water had highest rate of 38.7%, while those who use tap/borehole as source had lowest prevalence of 18.2%. There was no significant association of the prevalence with source of water for domestic use and consumption.

Considering the water contact activity of the pupils, those whose water activity is fishing had the highest prevalence of 41.4, while lowest rate of 18.0% was among those pupils whose swim in rivers. There was no significant difference in the prevalence rate of *S. haematobium* infection with their hobbies. Water contact activities of the pupils generally increased the rate of Schistosoma infection in the area in this study. The highest prevalence among pupils who used dams/reservoirs as source of water is in agreement with reports by Okwelogu *et al.*, (2012) and Alhassan *et al.*, (2013).

Generally it is 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 rate of Schistosomiasis with fishing when compared to other parents/guardians occupations (Ekwunife, 2004; Okoli *et al.,* 2006; Houmsou *et al.,* 2012; Okwelogu *et al.*, 2012; Anum *et al.*, 2014), 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'of schistosomiasis, thus, contributing to the sustenance of transmission cycle of the disease in the area (Alhassan *et al.*, 2013).

CONCLUSION

Infection with *S. haematobium* has been established and is highly prevalent in the study area. Prevalence of infection with *S. haematobium* has been found to be associated with Socio-demographic factors of the sampled subjects such as sex, age, water contact activities, and source of pupils water for drinking and domestic used.

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