IJABR Vol. 5(1): 72 - 81 (2013)

Prevalence and Selected Risk Factors ofIntestinal Schistosomiasis among Primary School Children in Birnin-Gwari Local Government Area, Kaduna State, Nigeria

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Submitted: May 15th 2013; Accepted: December 16, 2013; Published: January 14, 2014.

ABSTRACT

A survey on prevalence of intestinal schistosomiasis was carried out among primary school pupils between the ages of 6 – 17 years, from ten primary schools, in Birnin Gwari Local Government Area of Kaduna State. The study was conducted between July 2010 and February 2011. Questionnaires were administered to obtain demographic information from each pupil. A total of 300 pupils were recruited comprising 215 males and 85 females from whom stool samples were collected. The stool samples were examined using the formal-ether concentration technique. Out of the 300 stool samples examined, the overall prevalence of *Schistsoma mansoni* was 61 (20.3%) of the study population were positive. The intensity of the disease was light (1-18 eggs per gram of stool). The disease occurred in 40(13.3%) males and 21 (7.0%) females. There was no significant difference in prevalence between males and females ($P>0.05$). The highest prevalence in males (4.0%) and females (2.3%) were both recorded in the 12 – 14 years age group. Significant associations were observed between *Schistosoma mansoni* infection and factors such as history of bloody stool (Odds Ratio = 3.0), source of water from stream (Odds Ratio = 2.8), Fishing (Odds ratio = 1.4) and use of pond water (Odds ratio = 2.4). Prevalence of the disease varied among different schools. Snails of the genus *Biomphalaria* were encountered in the water bodies surveyed in the study area. Water contact activities in the area favour the transmission of the disease. Other intestinal parasites encountered in the faecal samples were Hookworm (8.3%), *Hymenolepis nana* (2.3%), *Enterobius vermicularis* (1.3%) and *Ascaris lumbricoides* (0.7%).

Keywords: Prevalence, intestinal schistosomiasis, school children, Birnin-Gwari

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INTRODUCTION

Schistosomiasis, also known as Bilharziasis or snail fever, is a snail- borne infection of humans and animals caused by flukes of the family Schistosomatidae. It is one of the most important parasitic diseases of man

occurring mostly in the tropical and subtropical regions (WHO, 1991). Schistosomiasis is the second most prevalent tropical parasitic disease next to malaria, and is a leading cause of morbidity in endemic areas of Africa, Asia and South America (WHO, 1995). .

Several environmental and socio-economic factors have been identified to be responsible for the continued persistence of intestinal parasitic infection in children. Some of these factors include poor sanitary conditions, unhygienic practices, lack of portable water supply, poor housing and poverty (WHO, 1991). In Africa, intestinal schistosomiasis is caused by *Schistosoma mansoni* which occupies the alimentary canal of man. Snails of the Family Planorbidae serve as intermediate hosts of *Schistosoma mansoni*. *Schistosoma mansoni* is transmitted by snails of the Genus *Biomphalaria* (Soulsby, 1982). Salinity, temperature, velocity of the water and presence of aquatic vegetation support the breeding of the various snail vectors of *Schistosoma*. Snail population in any water reservoir starts to build up at the onset of rainy season usually around May and become abundant between October and December (Ofoezie *et al.*, 1996; Okwuosa, 1982; Edungbola and Obi 1992). The geographical distribution of schistosomiasis in any locality depends on the distribution of the snail hosts and opportunities for infection of both the snail and human (Luka *et al.*, 2005). Emphasis on agricultural development projects has led to the introduction of new irrigation schemes in form of dams, canals and drains which provides a conducive habitat and breeding sites for the snail intermediate hosts (Okwuosa, 1982).

In Birnin-Gwari Local Government Area of Kaduna State, there are earth dams and water reservoirs. However, there is no information on the prevalence and factors responsible for distribution of the disease. This present study was carried out with the aim of investigating the prevalence of intestinal schistosomiasis in Birnin-gwari Local Government Area, in order to establish the status of the disease in the area.

MATERIALS AND METHODS

Study Area

The study was carried out in Birnin-Gwari Local Government Area, which is one of the 23 Local Government Areas of Kaduna State, Nigeria. The LGA is located in the western part of the State. It is divided into 13 districts; it covers a land area of 6,185Km^2 and a human population of 252,363. The inhabitants are predominantly farmers, traders and civil servants. The source of water includes well, river, seasonal streams and dams. Supply of tap water is periodically.

Study Population

The study population comprised of primary school children between 6–17 years old in the area. The study population was made up of 215 boys and 85 girls. Each pupil selected

for the study was given one labelled specimen bottle for stool collection. Ten primary schools were selected randomly for the study. Ethical clearance was sought and received from the Ministry of Education. Permission was sought from the district head of the study area. The Headmasters of the selected schools were visited and were briefed on the purpose of the research and dates were fixed for sample collection.

Structured questionnaires were administered to each pupil from whom stool samples were collected. Information was obtained on name of school, sex and age of the pupils, sources of water for drinking and household activities, housing sanitation, parent's occupation, types of toilets, history of bloody stool and outdoor activities of the pupil.

Collection and Laboratory Analysis of Samples

The stool samples were collected and preserved in 10% formalin; and later examined in the laboratory using the formol-ether concentration technique as described by Brown and Neva (1994). The intensity of infection was calculated by counting the total number of eggs obtained from all infected pupils divided by the number of pupils positive for *S. mansoni* divided by four i.e. the intensity was expressed as egg per gram of stool. Snails specimens (i.e., intermediate hosts of schistosomiasis) were collected from water bodies in the study area using a dip net as community ponds, dams, and other water bodies around the area may serve as habitats for the intermediate hosts of *Schistostoma*.

Parasitological Analysis

The prevalence of intestinal schistosomiasis was calculated and expressed as percentages. Chi-square test was used to determine the association between each risk factor and the prevalence of infection factor and the disease in different age groups. The odds ratio (OR), for each factor, was also calculated to determine association between risk factors prevalence. The overall age and sex specific prevalence of the disease infection were calculated and expressed as percentage (%).

RESULTS

The overall prevalence of *Schistosoma mansoni* was 20.30% (61/300) in the study population (Table 1). The prevalence varied between primary schools in the area. The prevalence and intensity of *S. mansoni* by school showed that highest prevalence of *S. mansoni* was recorded in Tashar keji primary school 43.30% (13/30), followed by 40.00% (12/30) in Kungin Gayam, 23.30%(7/30) in Sabon layi and Bagoma Model School, 20.0%(6/30) in Unguwan Fari, 13.30%(4/30) in Tudun Jega. The least prevalence of 10.0%(3/30) was recorded in Unguwan Sarkin Noma Primary school, Danzuru, Unguwan shittu and Kamfanin doka. The intensity of the infection was light, ranging from 0.10-0.75 eggs per gram of faeces (Table 1). The sex specific prevalence showed that 40 (13.30%) males and 21

(7.00%) females were infected (Table 2). There was no statistically significant difference ($p>0.05$) in prevalence rate between the two sexes. The age specific prevalence among males showed that the highest prevalence of (4.00%) was recorded in 12-14 years age group and the lowest (2.70%) was recorded in the 9-11 years age group. Among the females, the highest prevalence of (2.30%) was recorded in the 12-14 years age group while the lowest prevalence (1.30%) was recorded in the 6-8 and 15-17 years age groups (Table 2).

Other intestinal parasites encountered in the faecal samples, apart from *Schistosoma mansoni* were hookworm 8.30%(25) pupils, *Hymenolepis nana* in 2.30% (7), while *Enterobius vermicularis* was recorded in 1.30%(4), and *Ascaris lumbricoides* was recorded in 0.70%(1) of the study population (Table 3). Mixed infections were recorded in 1.30% (4) of the subjects. Mixed infections of *S. mansoni* and Hookworm was recorded in 0.67% (2) of the pupils, while mixed infections of *S. mansoni* and *Enterobius vermicularis*, S. *mansoni* and *Ascaris lumbricoides* were each recorded in 0.3% (1) of the subjects. A summary of the responses of the pupils to the questionnaires and the result of the statistical analysis showing the association between the risk factors and disease prevalence showed that odds ratio value greater than 1 indicated an association between each of the factors and prevalence of intestinal schistosomiasis (Table 4). Significant associations were observed between *Schistosoma mansoni* infection and factors such as history of bloody stool (OR = 3.0), source of water from stream (OR= 2.8), Fishing (OR= 1.4) and use of pond water (OR = 2.4). The *Biomphalaria* snail species were the abundant species of snail from the water bodies surveyed in the area.

Table 1: Prevalence and Intensity of Schistosomiasis infection per school in Birnin Gwari Local Government Area, Kaduna State, Nigeria

School / LGEA	No. examined	Number infected (%)	Intensity(eggs/g)
Kamfanindoka	30	3(10.0)	0.50
Tudun Jega	30	4(13.3)	0.19
Kungin Gayam	30	12(40.0)	0.10
Bagoma model	30	7(23.3)	0.21
Tashar Keji	30	13(43.3)	0.15
Sabon Layi	30	7(23.3)	0.25
Unguwan Sarkin Noma	30	3(10.0)	0.33
Unguwan Fari	30	6(20.0)	0.75
Danzuru	30	3(10.0)	0.50
Unguwan Shittu	30	3(10.0)	0.57
Total	300	61 (20.3)	

Table 2: Age and sex specific prevalence of *Schistosoma mansoni* infection in school children in Birni Gwari LGA, Kaduna State, Nigeria

	Male		Female	
Age group (years)	No. Examined	No. Infected (%)	No. Examined	No. Infected (%)
6-8	26	10(3.3)	20	4(1.3)
9-11	36	8(2.7)	19	6(2.0)
12-14	32	12(4.0)	18	7(2.3)
15-17	30	10(3.3)	21	4(1.3)
Total	215	40(13.3)	85	21(7.0)

Table 3: Relative Prevalence of *Schistosoma mansoni* and other intestinal parasites among school children in Birni Gwari LGA, Kaduna State, Nigeria

Parasites	No. infected	Percentage
Schistosoma mansoni	61	20.3
Hookworm	25	8.3
Hymenolepis nana	7	2.3
Enterobius vermicularis	4	1.3
Ascaris lumbricoides	1	0.7
Total	98	32.9

Table 4: Risk factors of schistosomiasis in Birnin Gwari Local Government Area, Kaduna State, Nigeria

Factor	No. of pupils infected	No. of pupils not infected	Odds ratio	95% C.I	Chi-square value	P-value
Source of water						
Pipe borne	17	10	1.4	0.83-1.54	0.28	0.60
Well	102	94	0.6	0.66-0.098	3.75	0.053
Pond	6	2	2.4	0.89-2.03	0.52	0.47
River/stream	26	8	2.8	1.14-1.77	5.43	0.02
Borehole	18	17	0.8	0.64-1.27	0.19	0.66
Water contact activities						
Swimming	41	34	0.9	0.76-1.22	0.04	0.84
Do not swim	24	16	1.2	0.82-1.42	0.11	0.74
Fishing	32	19	1.4	0.90-1.45	0.74	0.39
No fishing	33	27	0.9	0.75-1.25	0.01	0.93
Both fishing and swimming	15	16	0.7	0.58-1.23	0.56	0.45
None of the above	24	19	1.0	0.74-1.32	0.01	0.93
Type of Stool						
Blood in stool	21	6	3.0	1.14-1.80	4.63	0.03
Normal stool	33	37	0.6	0.61-1.04	2.67	0.10
Occupation (parent)						
Businessmen	66	36	1.7	1.02-1.51	0.39	3.05
Civil servants	16	20	0.6	0.52-1.12	1.83	0.18
Drivers	17	7	2.0	0.97-1.70	1.64	0.20
Fishermen	30	8	3.3	1.22-1.82	8.02	0.05
Farming	40	60	0.4	0.48-0.81	15.29	0.0001

DISCUSSION

The study on intestinal schistosomiasis in Birnin Gwari Local government Area, to the best of our knowledge, is being reported for the first time. The study has revealed that intestinal schistosomiasis is prevalent among primary school pupils in Birnin Gwari Local Government Area, with prevalence rates higher in males than females. In this study, higher prevalence rates of *S. mansoni* recorded are closely related to those reported in other areas in Nigeria (Luka *et al*., 2001; Olufemi *et al*., 2007). The prevalence of the disease in different villages and individual schools were not uniform despite the similarities of the local topography and climatic conditions. This outcome could be attributed to the closeness or distance of the communities from the ponds, streams and how long these water bodies supported transmission before drying up and the presence and abundance of the snail intermediate hosts (Luka *et al*., 2005). The prevalence was higher in males than females. This findings could be due to increased water-contact activities by male children than their female counterparts. It

could also be due to the fact that females are largely restricted to household chores whereas males are fond of moving around freely therefore becoming more susceptible to infection (Olufemi *et al.*, 2007). The overall intensity of infection was light and none was heavy. Cowper (1963) reported that maximum excretion of eggs of schistosome occurs after midday, but that period could not be utilized during this present work. This might have contributed to the low level of intensity of infection. Other intestinal parasites recorded in this study have been recorded in several surveys in Nigeria (Adewunmi *et al.*, 1991; Edungbola & Obi, 1992; Okpala *et al.*, 2004). This result could be due to the fact that some of the pupils may have the habit of eating unwashed fruits with their dirty hands and some are fond of walking with bare –feet, practices that predispose them to the intestinal parasite infection (Soulsby, 1982). Low prevalence of mixed infections recorded may be attributed to the fact that the parasite that invades the host first circulates its antigen round the body of the host which may hinder the survival or reduce the chances of invasion by other parasites (Chandler & Read, 1960).

On a general note, water contact activities of the pupils increased the prevalence of *Schistosoma* infection in the area. In this study, those that go fishing were more likely at greater risk of infection with the disease, and the same time those that use pond and stream water. It is generally believed that those that use stream and pond water are more likely to contract the disease but in this study, those that use pipe-borne water were also found to be at high risk of infection with schistosomiasis. This might be due to the fact that they may have taps in their localities but since they also have streams and ponds they often go there to swim and bath, thereby, being exposed to the intermediate-host. Secondly, people living in poor unhygienic conditions may not be aware of the disease and may not have received any health education on the Control of schistosomiasis; therefore they may likely continue to contaminate the water bodies by indiscriminate defaecation. The history of bloody stool which is a symptom commonly associated with *S. mansoni* infection were frequently recorded in infected pupils.

It is evident that water development projects such as dams and irrigation projects serve as suitable habitats for the intermediate-hosts schistosomiasis, thus, contributing to the sustenance of transmission cycle of the disease in the area. Efforts should therefore be made to reduce water contact activities of the pupils by provision of safe drinking water in order to reduce the chances of acquiring the infection (WHO, 2002; 2010). A community health eduction campaign should be organized on the Control of the disease. Since this is a predominantly childhood infection, children should be educated on the mode of transmission of the disease, the pathology due to the disease and therefore encourage them to adopt Control measures. The presence of snails in all the water bodies is an indication that the

ecological factors favourable for the survival of the snails are available in the study area.

CONCLUSION

The result of this study has shown that schistosomiasis is prevalent in Birnin-Gwari Local Government Area. The disease prevalence is higher in males than females. The snail intermediate hosts of *Schistosoma mansoni* are found in water bodies in the area, therefore, maintaining the transmission cycle of the disease.

ACKNOWLEDGEMENTS

The Authors wish to acknowledge the assistance rendered by Mal. Saleh Usman with respect to field and laboratory analysis of samples.

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