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Epidemiology of schistosomiasis in school aged children in some riverine areas of Sokoto, Nigeria

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Prevalence of Schistosomiasis in primary school pupils in riverine areas of Sokoto, where most of the population is dependent on river and well water for their everyday activities, was surveyed using stool and urine samples. The stool samples were analysed using kato-katz thick faecal smear technique while the urine samples were processed by filtration technique. The overall prevalence of urinary schistosomiasis (*Schistosoma haematobium* Leiper) was 60.8% (228 positive cases in 375 samples), and for intestinal schistosomiasis (*Schistosoma mansoni* Leiper) was 2.92% (11 positive in 375 samples). Prevalence of disease vary among age and sex of pupils. Pupils of age group 9 to 12 years are highly prevalent (71.42% for urinary and 4.2% for intestinal schistosomiasis). Prevalence of disease was high among males 79.57% (187 positive in 235 samples) urinary and 3.80% (7 positive out of 189 samples) intestinal schistosomiasis in comparision to females with a prevalence rate of 29.28% (41 positive in 140 samples) and 2.15% (4 positive out of 186 samples), respectively. Prevalence in the studied area is therefore very high and of family status, sex and age dependent.

Key words: Helminth parasites, schistosomiasis, *Schistosoma mansoni, Schistosoma haematobium*, snails.

INTRODUCTION

Schistosomiasis (Bilharzia) is a water born parasitic disease caused by *Schistosoma,* the digenic treamatode found in the blood vessels of man and livestock. 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 (Bello et al., 2003). In Nigeria, the incidence of schistosomiasis is so common in some communities that young men passed 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 (Eni et al., 2008), which is the major cause of morbidity and mortality in endemic areas. Studies also suggest that HIV/AIDS is highly prevalent in the areas of parasitic worm infections, such as schistosomiasis (Bentwich et al., 1995).

In Nigeria, about five species (SPP) of the genus *Schistosoma* are pathogenic to man. These species (SPP) include *Schistosoma heamatobium, Schistosoma*

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mansoni, Schistosoma japanicum (Miyari and Suzuki), *Schistosoma intercalatum and Schistosoma Mekongi* (Theodore Bilharz) (Uko et al., 1993; Agi and Okafor, 2008). Among which three species *S. haematobium, S. mansoni* and *S. japanicum* account for more than 95% of all human cases of schistososmiasis found in the world (Mutapi et al., 2003). The disease caused by *S. haematobium* is characterized by bloody urine, lesion of bladder, kidney failure and bladder cancer in children (Butterworth, 1997) and is the major cause of female genital schistosomiasis (FGS), which is a risk factor for transmission of sexually transmitted diseases and HIV (TDR, 1996); while the *S. mansoni* infection is characterized by bleeding from gastro – oesophageal region, splenohepatomegaly, growth retardation, delayed sexual maturity and chronic dermatitis (World Health Organization (WHO), 1998).

Though the disease kills few people, its clinical effects, prevalence 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). In the present study attention has been focused on the epidemiological survey of the disease in local vulnerable population with the broader objective of control programme for schistosomiasis in the affected areas.

MATERIALS AND METHODS

Study area

Sokoto state is located in the Sudan savannah zone in the exreme North-west part of Nigeria, between longitude 4° 8'E and 6° 5' E and latitude 12° 0' N and 13° 54'N (11). 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 that area ranges between 500 and 1300 mm, while the dry season last for 7 to 8 month that is October to May (SSMIYSC, 2001). It shared common boarders with Niger Republic to the North, Kebbi state to the south-west and Zamfara state to the East. The total land area is about 32,000 square kilometers. The settlement areas in the district are mostly low lying with various types of fresh water bodies such as swamps, ponds and rivers. This area has two rivers that is, river Rima and river Sokoto. The vegetation is mainly grassland with trees. Kwalkwalawa is a rural district around the river Rima, the district has mainly farmers and fishermen. People around the area are very poor and dependent on fish and other animals for food and nutrition and they use water from the river Rima for their domestic need.

Sample collection

Urine and stool samples were collected mainly from school aged children because of their high risk of schistosomiasis infection. The infection status of this group gives a reliable reflection of the general situation of the diseases in an area (Mafiana and Adesanya, 1999). Three schools were randomly selected in Sokoto, Sokoto State. In each selected school, 125 children were randomly screened for intestinal and urinary schistosomiasis, giving a total number of 375 samples of each urine and stool in the study area. For each child examined, a questionnaire aimed to determining the age, sex and water contact activity was provided for record. Urine samples were collected between the hours of 10:00 am to 2:00 pm and stool sample were collected in the morning since egg output from infected persons reaches at peak value around this time of the day (Grist et al., 1998; Rubin and Faber, 1999). Clean labelled specimen bottles were used for the collection of urine samples, small clean plastic cups with cover were used for stool collection. All the samples (Specimen bottles and plastic cups) were numbered such that they correspond with numbers of the subject on the questionnaire. All collected samples were taken to the Parasitological laboratory, Department of Biological Sciences, Usmanu Danfodiyo University Sokoto and examined for *Schistosoma* infection. Stool samples were kept with 10% formalin solution for preservation while urine samples were preserved with 1% domestic bleach.

Urine analysis

Urine samples were analyzed according to Pugh (1978) using a standard filtration technique. A 5.5 cm whatman's filter paper was inserted in the filtration unit. After shaking the urine sample, 10 ml of it was withdrawn with the help of a syringe and injected into filtration unit. After filtration, the filter paper was carefully removed using a pair of forceps and placed on a clean sheet of paper and stained with 50% ninhydrin solution and a drop of iodine. The stained filter paper was allowed to dry for about 15 min after which it was placed on a clean glass slide and observed systematically under the microscope at ×10 magnification. All the eggs were counted and the result was recorded as parasite load and expressed as number of eggs per 10 ml (number of egg/10 ml) of urine.

Stool analysis

Stool analysis was carried out according to kato-katz thick faecal smear technique (Borda and Pellegrino, 1971). The stool samples were sieved using a plastic sieve of 0.75 mm pore size. A clean template was placed on a clean glass-slide with a spatula; the sieved stool specimen was used to fill the hole on the template. The template was removed leaving a plug of stool (about 50 mg) on the glass-slide one or two drops of 50% glycerol was added on the plug of stool and covered by cover slip, the whole preparation on the slide was then observed at lower magnification of ×10, the result was systematically recorded and expressed as number of eggs per 50 mg of stool. The data was analysed by using analysis of variance (ANOVA) and Chi-Square to find out the similarities and differences between population and frequency.

RESULTS

Prevalence of urinary schistosomiasis

Table 1 showed that out of 375 samples of urine examined for *Schistosoma heamtobium*, 228 (60.80%) were found infected with the parasite. However, the prevalence

Table 1. Prevalence of urinary schistosomiasis among the primary school's pupils in study area.

Name of school	No. Examined	No. Positive	Prevalence (%)	Parasite load
Sultan Ibrahim Dasuki Primary School	125	53.00	42.4	24.99
Malamwa Primary School	125	81.00	64.8	43.86
Basansan Model Primary School	125	94.00	75.2	45.49
Total	375	228.00	60.80	43.85

Prevalence is Calculated by No. of Positives/ No. of people examined ×100. Parasite load- mean number of eggs/10 ml of urine.

Table 2. Age related prevalence of urinary schistosomiasis in the study area.

Age group	No. Examined	No. Positive	Prevalence (%)	Parasite load
5 – 9	100	43	43.00	23.83
9 – 12	175	125	71.42	50.93
13 – above	100	60	60.00	43.86
Total	375	228	60.80	43.85

Prevalence = No. of Positives/ No. of people examined ×100. Parasite load- mean number of eggs/10 ml of urine.

Table 3. Sex related prevalence of urinary schistosomiasis in the study area.

Sex	No. Examined	No. Positive	No. Prevalence	Parasite load
Male	235	187	79.57	45.45
Female	140	41	29.28	36.58

Prevalence = No. of Positives/ No. of people examined ×100. Parasite load- mean number of eggs/10 ml of urine.

prevalence for the infection varied among the primary schools studied. Sultan Ibrahim Dasuki Primary School has the prevalence of 42.40% and parasite load with 24.99. Basansan Model Primary School and Malamawa Primary School had the highest prevalence of 75.20 and 64.80%, respectively, parasite load 45.49 and 43.86 were found in Basansan Model Primary School and Malamawa Primary School, respectively. A chi-square analysis showed significant variation ($p < 0.01$) in the prevalence of the infection among the primary schools. Table 2 shows the age specific prevalence that persons within the age range of 9 to 12 years had the highest prevalence (71.42%) and parasite load of (50.93) followed by 13 years and above with 60.00 and 43.00%, for those below 8 years had the least prevalence and lowest parasite load of 23.83. Table 3 represents sex related prevalence of schistosomiasis. A total number of 235 males and 140 females urine examined showed a high significant variation ($P < 0.01$) between the sex, when analysis of data was considered. However the highest prevalence rate and parasite load was recorded in male with (79.57%) and (45.45), respectively, compared to female with a prevalence rate of 29.28% and parasite load of 35.58.

Prevalence of intestinal schistosomiasis

Table 4 showed the prevalence of intestinal shistosomiasis among study area. Malamawa Primary School had the highest prevalence of 4.00%, followed by Basnsan Model Primary School with prevalence of 3.2%, Sultan Ibrahim Dasuki Primary School had lowest prevalence of 2.93% intestinal schistosomiasis. Table 5 showed the prevalence of *S. mansoni* in relation to age group. 9 to 12 years old pupils had the highest prevalence of 4.2% intestinal schistosomiasis, followed by 5 to 8 years age group (2.54%) and 13 – above years old had the least prevalence of 2.17% while parasite loadfound at age group of 9 to 12 years of pupil is 1.80 and at the age group of 5 to 8 years old pupils with 1.60 and lastly 13 to above years of pupil is 1.66. However, a highly significant variation ($P < 0.01$) was observed between the prevalence of the infection and age group of pupils in the study area. Table 6 shows the prevalence of

Table 4. Prevalence of intestinal schistosomiasis of pupils in the study area.

Name of school	No. Examined	No. Positive	Prevalence (%)	Parasite load
Sult. Ibr. D. Primary School	125	2.00	160	1.40
Malamawa Primary School	125	5.00	4.00	2.25
Basansan Model Primary School	125	4.00	3.20	1.15
Total	375	11	2.93	1.71

Prevalence = No. of Positives/ No. of people examined ×100. Parasite load- mean number of eggs/50 mg of stool.

Table 5. Age related prevalence of intestinal schistosomiasis of pupils in primary schools.

Age group (years)	No. Examined	No. Positive	Prevalence (%)	Parasite load
5 – 8	118	3	2.54	1.60
9 – 12	119	5	4.20	1.80
13 - above	138	3	2.17	1.66
Total	375	11	2.93	1.72

Prevalence = No. of Positives/ No. of people examined ×100. Parasite load- mean number of eggs/50 mg of stool.

Table 6. Sex related prevalence of intestinal schistosomiasis in the study area.

Sex	No. Examined	No. Positive	Prevalence (%)	Parasite load
Male	189	7	3.80	7.22
Female	186	4	2.15	1.75
Total	375	11	2.93	1.72

Prevalence = No. of Positives/ No. of people examined ×100. Parasite load- mean number of eggs/50 mg of stool.

S. mansoni infection among sex, that is, males and females in the study area. Males were found more infected with prevalence of (3.80%) and females with prevalence of (2.15%), respectively. Parasite load found in males is 1.85 while in female is 1.75. Therefore, a high significant variation ($P < 0.01$) among the sex was observed.

DISCUSSION

It is clear from the results that the study area is endemic of urinary schisotomiasis and intestinal schisotomiasis. The prevalence rate of urinary schistosomiasis is (60.80%), and for the intestinal schistosomiasis prevalence rate is (2.93%), which may be attributed to water contact activities in the area as observed elsewhere (Abolarinwa, 1999; Agi and Okafor, 2005; Pukuma and Musa, 2007). The study area is rural communities, who depend on the ponds, wells, rivers, streams, dams and boreholes for their water needs such as drinking, farming (irrigation), bathing and other domestic uses. Most of these water bodies are main transmission foci in the community and are distributed within the area. They provide a natural water sources and also serve as meeting point for the schistosome parasites. These ensure that the people continue to be infected and the re-infected since no intervention strategy has been carried out in the area. However, the variability found in the prevalence of the infection among the schools examined could be attributed to the fact that pupils living in rural area that is, Masanawa and Basansan depend on rivers, dams, pond and wells for their every day water demand, from where they got infection of disease.

The age specific prevalence of urinary schistosomiasis showed that pupils aged 9 to 12 years had the highest prevalence (71.42%), these pupils fall within the primary school age and in the villages this is the population most commonly found in prolonged water contact behaviour like swimming and playing, in bodies of water which are likely infested with infected snails. Other age groups of 13 to above years had an infection rate of 60.00% actively involved in such water contact behaviour as well as helping their parents in farming. This is in agreement with results of reductions of eggs studies in other *S. haematobium* endemic areas (Adamu et al., 2001; Abdel-Wahab et al., 2000; Agi and Okafor, 2005; Ukpai and Ezeike, 2007; Pukuma and Musa, 2007; Bello et al., 2003).

In relation to sex, the high infection rate observed in males than in females was also observed in other endemic areas as found by other authors (Abolarinwa, 1999; Uwaezuoke et al., 2007; Ekejindu et al., 2002; Pukuma and Musa, 2007). This high prevalence in males than in females may be connected with the socio-cultural setup of the people of the study area. These people are predominantly Muslims, Hausa and Fulani by tribe. Majority of the females are restricted to their houses therefore they have less contact with infested water compared to their male counterparts. Swimming and bathing in the open water bodies is also very uncommon among females in community. This is in line with the observation made by other authors (Bello et al., 2003; Agi and Okafor, 2005).

CONCLUSION AND RECOMMENDATIONS

Though the disease kills few people, its clinical effects, prevalence 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). The study therefore recommends the provision of pipe borne water in order to reduce their dependence on open water bodies for drinking and other domestic uses. The government should as a matter of policy institute a control programme in the form of hand washing campaigns, proper waste/faeces disposal and provision of pipe-borne water for schistosomiasis control in the affected areas in order to reduce its prevalence.

Conflict of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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