

Prevalence of urinary schistosomiasis among community primary school pupils in Amagunze, Enugu State, Nigeria

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Abstract: This study was conducted to determine the prevalence of urinary schistosomiasis among pupils (aged 6-13 years) of Community Primary School, Amagunze in Nkanu East LGA, Enugu State, Nigeria. A total of two hundred (200) urine samples were randomly collected from the pupils (87 males and 113 females). The urine samples were collected in the month of August, 2013 into sterile urine containers and were examined microscopically in the laboratory using string sedimentation technique. Hematuria was assessed using chemical reagent strip (medi-test combi-9 sticks). The overall prevalence of *Schistosoma haematobium* infection was 11 (5.5%); with 7 (8.0%) cases for males and 4 (3.5%) for females but the difference was not statistically significant ($P > 0.05$). Prevalence rate was also observed to be higher among age group of 10-13 years with 4 (6.5%) compared to age group of 6-9 years with 7 (5.1%), but the differences were not statistically significant ($P > 0.05$). There was a statistically significant difference ($P < 0.05$) between the pupils who were positive for schistosomiasis (11) and those who presented with hematuria (21). However, there was no close association between hematuria and the presence of eggs of *S. haematobium* in the urine. Hematuria gave a sensitivity of 64% and a specificity of 93% when compared to microscopy. The results of the findings show that the disease is endemic in the area under study. It is thus, recommended that control programs be organized in the state that would be geared towards creating awareness amongst the people and reducing the rate of infection.

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1. Introduction

Schistosomiasis (biharziasis or snail fever) is a chronic and enervating illness caused by digenetic Trematode flatworms (flukes) of the genus *Schistosoma* (Noble and Glem, 1982). Urinary schistosomiasis is a common cause of hematuria in tropical regions, where it most often affects teenage boys (Sheehan et al., 1984). Most human infections are caused by *Schistosoma mansoni*, *Schistosoma haematobium*, or *Schistosoma japonicum*.

Schistosomiasis is the third most devastating tropical disease in the world, after malaria and intestinal helminthiasis, being a major source of morbidity and mortality for developing countries in Africa, South America, the Caribbean, the Middle East, and Asia (WHO, 2010). Schistosomiasis appears to be a neglected tropical disease, but owing to irrigation programs and hydroelectric power development, the incidence of infections is increasing in endemic areas of Africa and the near east, and the risk of infection is highest amongst those who lived near lakes or rivers (Gigase, 1992; Kabatereine et al., 2004a; Kabatereine et al., 2004b). More than 207 million people are infected worldwide, with 85% of them living in Africa alone (WHO, 2010). Recent estimates from

sub-Saharan Africa have indicated that approximately 280,000 deaths each year can be attributed to schistosomiasis (Van der Werf et al., 2003).

The blood flukes (schistosomes) usually inhabit the vascular system, the mesenteric and vesical veins within their definitive host. Within the blood vessels the male and female adult schistosomes lie bound together, often for many years. Within this period they produce 300 to 3000 eggs per day. Some of the eggs pass out of the veins and through the tissues of the intestine or urinary bladder; others pass through the lumen to the outside environment. Some of the eggs reach water where they hatch, and miracidia emerge and penetrate the soft tissues of a specific intermediate snail host. *Bulinus* snails are mainly intermediate host for *S. haematobium* (Okoli, 1984). Inside this intermediate host, the organism then multiplies by several thousand folds. After several weeks cercariae are formed and emerge; they swim about and penetrate human skin if they come in contact with it (Bala et al., 2012; Mahmoud, 1984).

Chronic disease due to *S. haematobium* infection predominantly affects the genitourinary system. The reason being that the eggs are deposited in the interstitial tissues, and granulomas form around them,

with subsequent fibrosis. The severity of the disease is directly proportional to the number of eggs deposited. Terminal hematuria and dysuria are frequent initial symptoms (Lehman et al., 1973). One of the serious consequences of schistosomiasis is obstructive uropathy due to more or less irreversible ureteral lesions (WHO, 2010).

1.1 Objective of the study

Following a preliminary survey, in this work we have sought to investigate the occurrence of *S. haematobium* infection amongst primary school children in Amagunze, a village located in Enugu State, Nigeria. We hope that the findings in this work will help guide control programs in the State, with a view to curbing further transmission of the infection.

2. Methodology

2.1 Study area

The study was conducted in Community Primary School Amagunze in Nkanu East LGA, Enugu State. Nkanu East is located in the South East region of Nigeria and covers an area between latitude 6° 28' 13" N, and 7° 43' 29" E. The local government area has an area of 307 km² and a population of 9,598 at 2006 census. Amagunze has streams and rivers. There are many activities going on around this area especially at the river banks, activities such as swimming, washing of cloths, fishing, wine tapping and other festive activities. The occupation of the residents includes subsistent farming in root crops, trading, wine tapping, fishing and civil service. Functional health care is also in existence. The rivers and streams around this area were also found to

harbor the snail *Bulinus globosus* (intermediary host of the parasite, *Schistosoma haematobium*) as people in this area also harvest snails alongside fishing in water. There are two main seasons (the rainy and dry seasons). The rainy season takes place between April and October, while the dry season occurs from November to March.

2.2 Study population

The study population comprised children who were five to thirteen years old and attending Community Primary School, Amagunze in Nkanu East LGA, Enugu State. This school is located near streams and rivers. Two hundred 200 urine samples were randomly collected from pupils in classes 1- 6. The subjects comprised 87 males and 113 females.

2.3 Ethical consideration

Consent for this study was obtained from the headmaster of the primary school after a letter of approval was presented to him from the chairperson of the Local Government Area in question. The anonymity of each pupil was treated with confidentiality and for the purpose of this research.

2.4 Sample Collection

Urine sample of each pupil was collected between 11am and 1pm following a short physical exercise to potentiate maximum egg yield using sample bottles. Clean and sterile universal urine containers were given to each of these pupils who were instructed to collect the mid-stream of the urine sample. The samples were labeled according to the name, sex and age of the pupil to avoid mistaking one sample for another.

2.5 Laboratory examination

Urine samples were examined to detect the presence of egg as soon as possible using string sedimentation technique as previously described (Cheesbrough, 2002). Each sample was centrifuged at 3000 rpm for 5 minutes and the supernatants were discarded leaving the sediments. A drop of the sediment was placed on a clean microscope slide and was stained using Lugol's iodine and left for 15 seconds for the stain to penetrate the egg and viewed under the microscope at low power (X10 and X40). Ova of *S. haematobium* were identified by the possession of terminal-spined eggs. Urine samples positive for ova of *S. haematobium* and those negative were recorded accordingly.

2.6 Detection of hematuria

All urine samples of the 200 pupils examined were screened for blood hematuria except those whose blood presence was visible. Hematuria was assessed using chemical reagent strip (medi-test combi-9 sticks by Uriscreen). The test was performed by dipping the strip into fresh urine sample for approximately two seconds. It was removed and the strip tapped lightly on the edge of the urine container to remove excess urine. The strip was then matched and compared with the colour chart on the label (Cheesbrough, 2002). The results of the colour changes that took place within two seconds were recorded. The principle of the test is based on pseudoperoxide activity of haemoglobin and myoglobin which catalyze the oxidation of an indicator by an organic hydroxide producing a green color. Urine with blood was recorded variously as positive (+++, ++ or +) for hematuria when the color changes from yellow to light, deep or very deep green respectively. No color change was recorded as negative.

2.7 Data Analysis

The data obtained were analyzed using Chi-Square statistics while the association between hematuria and presence of ova of *S. haematobium* was determined using Wilcoxon Signed rank test. Statistical significance was considered when P-value was less than 0.05.

3. Results and discussion

Following a preliminary survey, this research

work was designed to determine the prevalence of urinary schistosomiasis among Community Primary School pupils in Amagunze in Nkanu East LGA, Enugu State, Nigeria. A total number of 200 urine samples were collected from 200 pupils (87 males and 133 females) with age ranging from 6-13 years (Table 1). It shows that the infection is still present in the community. Out of 200 pupils whose urine samples were examined, 11 were found to be excreting eggs of *Schistosoma haematobium* in their urine, thus were infected with this fluke, while the remaining 189 pupils were uninfected giving a total prevalence rate of 5.5% as shown in Table 2.

Table 3 shows prevalence by sex. From the table it can be seen that there was a higher prevalence among the males (8%) than among the females (3.5%). However, there was statistically no significant difference in the prevalence of infection between the males and females. Prevalence of infection with respect to age is represented in Table 4. A higher prevalence of urinary schistosomiasis was observed among pupils within the age group of 10-13 years (6.5%) than those within the age group of 6-9 years, though the difference was statistically not significant.

Male pupils within the age group of 6-9 years had a higher prevalence (9.8%) of *Schistosoma haematobium* infection than their female counterparts (1.3%) within the same age group. On the other hand, a higher prevalence (8.3%) of infection was observed among the female pupils within the age group of 10-13 than among their male counterparts within the same age group (Tables 5 and 6).

Out of the 200 pupils examined, 21 (10.5%) tested positive for hematuria. Positive cases of hematuria was seen to be higher (16.1%) among the

pupils within the age group of 10-13 years than among those within the 6-9 age group (7.8%) (Table 7). As presented in Table 8, it was observed that the number of positive cases of hematuria was higher (12.4%) among the females than among the males (8.1%). However, the difference was not statistically significant ($P>0.05$). The total number of pupils who tested positive for hematuria with no schistosomiasis was 14 (7%). Also the overall prevalence of *S. haematobium* infection in pupils with negative hematuria gave 4 (2%). The overall prevalence of *S. haematobium* infection in pupils who tested positive for hematuria was 7 (3.5%) (Table 9).

Several studies had been previously undertaken in an attempt to determine the prevalence of schistosomiasis in different states of the country (Agi and Okafor, 2005; Babatunde et al., 2013; Sam-Wobo et al., 2011; Sarkinfada et al., 2009). The prevalence is low when compared to those reported in other parts of Nigeria, but still we advocate a strategic more robust intervention program. The lower prevalence in this study suggests a positive outcome of the recent health intervention measures against this infection taken by that State's Government.

As represented in Table 4, pupils within the ages of 6-9 recorded a prevalence of 5.1%, which translates to 7 positive cases. Pupils between 10-13 years had prevalence rate of 6.5% and represents 4 positive cases of schistosomiasis of the 62 pupils that were sampled within this age bracket. Generally it can be seen that pupils between 6-9 years are mostly infected and are more likely to engage in several outdoor activities like swimming, fishing, washing and fetching of water which increase chances of contracting the infection.

Table 1. Distribution of sample population according to age group and sex

Age Group (in Years)	Total no. examined	No. of males examined	No. of females examined
6-9	138	61	77
10-13	62	26	36
Total	200	87	113

Table 2. Prevalence in the overall sample population

Age Group (in Years)	Total no. examined	No. of males examined	No. of females examined	Total no. infected	% infected	No. infected
6-9	138	61	77	7	3.5	
10-13	62	26	36	4	2.0	
Total	200	87	113	11	5.5	

Table 3. Prevalence of *S. haematobium* infection among the pupils according to sex

Sex	No. of samples	No. infected	No. uninfected	% infected
Male	87	7	80	8.1
Female	113	4	109	3.5
Total	200	11	189	11.6

Table 4. Prevalence of *S. haematobium* infection among the pupils according to age group

Age Group (in years)	No. of samples	No. infected	No. uninfected	% infected
6-9	138	7	131	5.1
10-13	62	4	58	6.5
Total	200	11	189	11.6

Table 5. Prevalence of *S. haematobium* infection among the male pupils according to age group

Age Group	No. of samples	No. infected	No. uninfected	% Infected
6-9	61	6	55	9.8
10-13	26	1	25	3.9
Total	87	7	80	13.7

Table 6. Prevalence of *S. haematobium* infection among the female pupils according to age group

Age Group (in years)	No. of samples	No. infected	No. uninfected	% infected
6-9	77	1	76	1.3
10-13	36	3	33	8.3
Total	113	4	109	9.6

Table 7. Prevalence of hematuria according to age group among the pupils

Age Group (In years)	No. of samples	Hematuria status n (%)	
		Positive	Negative
6-9	138	11 (7.8)	127
10-13	62	10 (16.1)	52
Total	200	21	179

$X^2 = 3.03, P > 0.05$

Table 8. Prevalence of Hematuria in Relation to Sex Among the Pupils

Sex	No. of samples	Positive cases	Negative cases	% Positive cases
Male	87	7	80	8.1
Female	113	14	99	12.4
Total	200	21	179	20.5

$X^2 = 1.57, P > 0.05$

Table 9: Prevalence of *Schistosoma haematobium* infection and hematuria in the overall pupil population

<i>Schistosoma haematobium</i> infection	Hematuria status n (%)		Total
	Positive	Negative	
Positive	7 (63.6)	4 (36.4)	11
Negative	14 (7.4)	175 (92.6)	189
Total	21	179	200

$Z = -21357, P < 0.05$

Sensitivity of hematuria compared to microscopy = 64%

Specificity of hematuria compared to microscopy = 93%.

Similar observations have been made in previous works (Arinola, 1995; Bello and Eddungbola, 1992; Ekanem et al., 1994). The lower prevalence in age group 10-13 (4 cases) can be attributed to less outdoor activities that could expose them to infection and modification in behavior. However, this is contrary to observations made in Uganda, which in different studies indicated a higher prevalence in age groups 12-14 years (Rubaihayo et al., 2008) and 10-12 years (Kabatereine et al., 2004a) respectively.

Table 3 shows the rate of infection by sex where infection was observed to be slightly higher in males. Male pupils show 7(8.1%) positive cases while their female counterparts show 4 (3.5%) positive cases. There was no significant difference in the prevalence of urinary schistosomiasis between the male and female pupils. This is an indication that both genders were at risk of infection in that Community. However, literature indicates a higher prevalence in males than females (Raja'a et al., 2000; Rubaihayo et al., 2008).

Tables 5 and 6 show respectively, the prevalence of *S. haematobium* infection among the male and female pupils taken separately according to age groups. Within the males, the ages of 6-9 years recorded higher prevalence of 6 (9.8%) than their female counterparts with 1 (1.3%) prevalence. Within the females, ages of 10-13 years of ages had higher prevalence rate of 3 (8.3%) than their male counterparts who had 1 (3.9%). Males of 6-9 years are seen to be more active than females of the same age group, and are exposed to several activities like swimming in the stream, making them more liable to the infection. Females between 10–13 years of age can be more active than females of 6-9 years, for examples engaging more in activities like fetching domestic water from the rivers and washing clothes in such areas too, thus exposing them more to the infection. It is worthy of note that, this study was only concentrated on primary school pupils; there are also private institutions, both primary and secondary schools in the area, and children who are out of school. This set of people could possibly be infected and also contribute to further dissemination of the infection.

The overall prevalence of hematuria showed no significant difference amongst age groups and gender in Tables 7 and 8. There was a close association between hematuria and the presence of *S. haematobium*. Data indicate that those who tested positive to urinary schistosomiasis were at greater risk of hematuria as compared to those who tested negative. The result further indicated 64% sensitivity and specificity of 93%, thus confirming that the hematuria test may be very useful as diagnostic tool for the detection of urinary schistosomiasis as previously reported (Vander Werf et al., 2003).

4. Conclusion and policy implication

Though schistosomiasis now appears to be a neglected tropical disease, this work aims to bring to light that the infection is still endemic in some area parts of Nigeria. We hope that our findings will inform control managers on the status of the infection in the study area.

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