

Evidences of Endemic *Schistosoma haematobium* Infection among School Children in Shonga Community, Edu Local Government Area, Kwara State, Nigeria.

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Abstract

A study was carried to determine the presence, level of endemicity and the intensity of human *Schistosoma haematobium* infection in Shonga community of Edu Local Government Area in Kwara State, Nigeria. For permission and maximum cooperation, intensive advocacy and mobilization of the community leaders, school authorities and the pupils preceded the collection of urine specimens which were preserved in 10% alcohol. Microscopic examinations were carried out on the urine specimens. Conclusive diagnosis was based on the characteristic terminal spined egg of *S. haematobium*. Altogether, 1,479 pupils (60.0% boys and 40.0% girls), aged between 4-20 years, were examined in the over sixteen schools in and around the community, selected by convenience. Of all the pupils examined, 1,144 (77.4%) had the characteristic eggs of *S. haematobium* in their urine samples. Infection rate for boys was 516 (45.1%) while it was 296 (25.9%) for girls. Thus, boys were significantly more infected than girls ($P<0.05$). Children between 11-13 years of age had the highest prevalence of infection (47.2%) while those between 4-7 years of age had the least prevalence (30.0%). The overall mean egg-count for the 1,144 infected pupils was $1,598.0 \pm 49.32$, while the mean egg-counts for boys and girls were $1,213.0 \pm 25.6$ and 685.0 ± 18.3 respectively. The difference in the intensity of infection between boys and girls was also significant ($p<0.05$). Of the 1,144 pupils who were infected with *S. haematobium* 195 (17.0%) had egg-count range of 1-1000, 758 (66.3%) had egg-count range of 1001-5000 while 191 (16.7%) had egg-count range of ≥ 5001 . The prevalence of haematuria was also significantly higher among boys than girls ($p<0.05$). This study reveals that human *Schistosoma haematobium* infection is endemic in Shonga community.

The awareness about the impact, transmission and prevention of this infection was relatively poor. Research on vaccine development to support the existing chemotherapy for the control and possible elimination of this dreaded but highly neglected parasitic infection should be the priority. Therefore, advocacy, health education chemotherapy and vaccine must be adopted concurrently as the best intervention strategy/approach to eradicate Schistosomiasis.

Key words: *Schistosoma haematobium*, prevalence, infection, endemicity, intensity.

Introduction

Schistosomiasis (Bilharziasis) is a chronic granulomatous parasitic disease which is not immediately fatal but constitutes a major medical, public health and socio-economic problems. Thus, the disease is ranked second only to malaria among WHO/TDR targeted disease for global control and eradication. The disease is also highly ranked among the most important Neglected Tropical Disease. Currently, more than 300 million people are infected world-wide with schistosomiasis; 120 million show symptoms of the disease; 20 million suffer from severe illness, while over 400 million are at risk of becoming infected^{1,2}.

Schistosomiasis is increasing in distribution, intensity, including: inevitable association of human water contact for food production; construction of dams; generation of hydroelectric power; occurrence of animal reservoir host; the propensity of snail intermediate host; the phenomenon of parasite polyembryony; lack of effective vaccine or an ideal drug; lack of adequate epidemiological data to plan control measures; poor accessibility of several endemic rural community; ignorance and taboos and lack of political will to prioritize schistosomiasis for interventions. Schistosomiasis is a water-associated disease, and major occupational diseases, which is acquired through water contact (washing, bathing, fishing and recreation). Schistosomiasis is caused by infection with species of the trematodes of the genus *schistosoma*.

Two species of schistosome of considerable medical importance exist in Nigeria. The urinary form,

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Schistosoma haematobium and the intestinal form, *Schistosoma mansoni*. Pathological effects of schistosomiasis include: calcification of the urinary bladder; enlargement of the liver; the spleen and lymph nodes etc³. Failure to implement early control and intervention can lead to death. In Africa, the burden of schistosomiasis is increasingly noted and recognised as a significant public health problem among the poor population as a result of their increased water contact activities, poor hygiene practice and behaviour to water body^{4,5}. Most inhabitants in endemic villages are often infected with schistosomiasis, most especially *S. haematobium*, and if it is left untreated and undetected can lead to the calcification of the urinary bladder in the human host.

The epidemiological distribution and impact of the disease remain poorly documented in Kwara State, Nigeria and other African nations, but the disease is increasing in epidemiology, intensity and importance due to multiple factors which collectively make it difficult for the Nigeria Schistosomiasis Control Initiatives to implement any effective nation-wide control programme.

Shonga community of Edu Local Government Area (LGA) in Kwara State has never been surveyed for schistosomiasis before. Edu LGA enjoys good drainage of River Niger and its tributaries. The drainages encourage extensive human water-contact activities, such as fishing, agriculture, extensive irrigation during the dry and raining seasons. Edu Local Government Areas is vulnerable to schistosomiasis transmission while Shonga community in the LGA was specifically targeted because it is located close to / on Shonga stream which appears to harbour the snail intermediate hosts. The study is carried out to determine the endemicity of *S. haematobium* infection among school children in Shonga community.

Methodology

Edu Local Government Area in Kwara State, lies on latitude 9.8°N and longitude 5.7°E. The community is located about 120km to Ilorin, Kwara State capital. Shonga Community is drained by River Niger, and its tributaries that passed through the whole Shonga town. Unlike the other neighbouring towns, drainage of water from River Niger to Shonga town encourages accumulation of alluvial soil and improved soil fertility. The soil type in Shonga is loamy, which favoured agricultural activities such as rice cultivation, sugarcane plantation, and fishing. These are activities that ordinarily present high risk of schistosomiasis transmission.

Climate, Occupation, Population and Vegetation

The climate is of the humid tropical guinea type, it is marked by an alternating dry season period (November- March) and wet seasonal period (April-October). Annual rainfall ranges between 1000mm and 1500mm. And the mean temperature ranges from 30°C-35°

The predominant occupation in this community is farming. They engage in various agricultural practices such as rice cultivation, rearing of animal and sugarcane plantation, this led to the construction of dams and ponds for irrigation purposes.

Shonga community has an estimated population of about 6,871, and 4,795 of males and females respectively, with both sexes amounting to 11,666 as at 1991 population census, with a projection of about 15,459 in 1996.

The vegetation is mainly of the derived Guinea Savannah type, which is characterised by trees, shrubs, and grasses.

Study Design

In observance of the research ethics involving the participation of human subjects and also to secure permission and maximum cooperation, intense advocacy and community Mobilization was carried out, prior to collection of data. Thus, officials of the State and Local Government Areas, community leaders including the Emirs, his Chiefs, women leaders and religious leaders, local educational authorities, the Teachers and the Pupils, were properly briefed about the purpose, time, their role, benefit, importance, usefulness and procedures involved in the study. It was emphasized that participation was voluntary, but all were encouraged to do so, because of the associated benefits derivable from the study. School headmasters, mistresses, NYSC Corp members and the teachers were also contacted and enlightened about the disease, and for their maximum support and co-operation regarding the purpose and benefit of the study to the entire community.

Questionnaire Design

Questionnaire to collect relevant pupils' data for both urine and stool specimen was designed, pre-tested, standardized and mass produced, subject to the sample size. With the help of the teacher in each class, questionnaire was used to obtain each pupil's name, sex, home town, their parent occupation, duration of stay in the community, source of water for bathing, history of haematuria and complaints of stomach pain. Questions were also asked if the child wear shoe to school, about treatment for schistosomiasis. Measurement of the weight and height of each pupil was also carried out.

Sample size;

Sample size was calculated to be 1,479 pupils using Fisher's formula for population above 10,000 as described by Araoye⁶.

Collection of Urine

Urine specimens were collected between the hours of 11:00am till 1:00pm. Students were asked to run about 200 yards to facilitate egg excretion. Only one student was attended to at a time to avoid error and wrong labelling of specimen, school teachers also assisted in following pupils to the toilet in order to prevent sharing of urine by those pupils who could not give urine sample immediately.

Urine Microscopy

Examination of urine for the presence of eggs was carried out a day to three days after sample collection⁷. Each urine sample was thoroughly mixed to ensure even distribution of the contents, before a 10ml urine sample was taken with 10ml disposable syringes. Each 10ml urine sample was filtered through a wire mesh (No. 325), which was conically folded into a glass funnel⁸. In order to prevent transfer of eggs and other urine materials from one pupil to another, a beaker was not re-used until it had been washed thoroughly and left for 30 minute in running water. Thereafter, the filter was washed into a cross-hatched glass Petri dish with flat bottom (7.5cm diameter) and examined for the presence of *schistosoma* eggs, red blood cells, urinary cast, and crystals under x10 objective microscope. The total number of eggs present in each 10ml of filtered urine was counted with a talley hand counter. Repeated examination of urine filtrate showed that no eggs escaped into the filtrates. Each sample was counted in turn by the three independent observers, and the average of the three (3) counts was taken.

Data Analysis

Data Analysis was carried out using the Statistical Packages for Social Sciences (SPSS version 18.0). Statistical significance was determined at a P-value less

than 0.05.

Results

Results of the findings from this study are presented in both figures and tables. Figures 1 shows the water-contact activities in Shonga stream, and figure 2 shows, a well containing ova of *Schistosoma haematobium* from an infected pupil was show to demonstrate the intensity of the infection.

Prevalence of *Schistosoma haematobium* Infections by Age.

The prevalence of *S. haematobium* infection by age is presented in table 1 below. Age group 16-18 had the lowest prevalence (9.2%) and the age group of 10-12years had the highest prevalence of 22.6%. The general prevalence of the infection was 77.4%.

Mean Intensity of *Schistosoma haematobium* Infections Based on Egg-counts by Age and Gender

The egg-count/ 10ml urine sample ranged from 04 in a girl aged 20 years to a maximum of 5,511(in a 10 year old boy).

The overall mean egg-count for the 1,144 infected pupils was $1,598.0 \pm 49.32/10\text{ml}$ urine sample. The mean egg-count among the 744 infected male pupils was $1,213.0 \pm 25.6/10\text{ml}$ urine sample and $685.0 \pm 18.3/10\text{ml}$ urine specimen (Table 2). Thus, the mean egg-count for boys was significantly higher than for girls ($P < 0.05$).

Of 1,144 pupils whose urine were positive for eggs of *S. Haematobium* 195 (17.0%) had egg-count range of 1-1000, 758 (66.3%) had egg-count range of 1001–5000 while 191 (16.7%) had egg-count range of ≥ 5001 per 10ml of urine (Table 3).

Prevalence of Haematuric urine by gender and by Age

The prevalence of terminal haematuria by age group and sex is shown in Table 4. The age group 10-12 had the highest prevalence of terminal haematuria (40.3%) and followed by age group 7-9 years with a

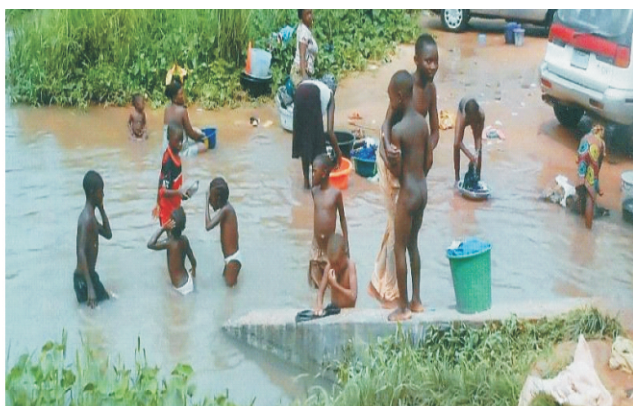


Fig. 1 Water- contact activities in Shonga stream, where transmission occurs.

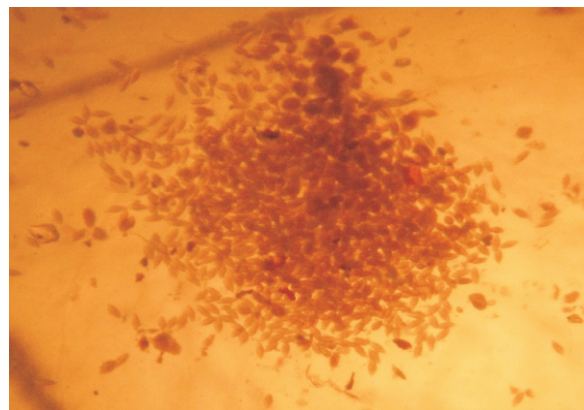


Fig. 2: A well containing ova of *Schistosoma haematobium* from an infected pupil.

TABLE 1: Prevalence of *Schistosoma haematobium* Infections by Age-Group (N=1,479)

AGE GROUP (Years)	No. EXAMINED	NO. INFECTED		
		BOYS (%)	GIRLS (%)	TOTAL (%)
4-6	276	128 (17.2)	75 (18.8)	203 (17.7)
7-9	286	125 (16.8)	83 (20.8)	208 (18.2)
10-12	331	163 (21.9)	96 (24.0)	259 (22.6)
13-15	236	118 (15.9)	77 (19.3)	195 (17.0)
16-18	174	105 (14.1)	0 (0.0)	105 (9.2)
= 19	176	105 (14.1)	69 (17.3)	174 (15.2)
Total	1,479	744(50.3)	400(27.1)	1,144(77.4)

P<0.05

TABLE 2: Mean Egg -Count of *Schistosoma haematobium* Infections (Eggs/10ml urine) by Age and Gender

Age-Group (Years)	MEAN EGG COUNT					
	BOYS		GIRLS		TOTAL	
	No. Infected	Mean Egg- Counts±Sd	No. Infected	Mean Egg- Counts±Sd	No. Infected	Mean Egg- Counts±Sd
4-6	128	886.0±32	75	672.0±19	203	779.0±27.01
7-9	125	1,369.0±71	83	679.0±18	208	1,024.0±48.1
10-12	163	1,276.0±68	96	960.0±21	259	1,118.0±44.0
13-15	118	1,358.0±66	77	830.0±17	195	1094.0±38.2
16-18	105	223.0±28	0	0.0±0	105	223.0±28.0
= 19	105	264.0±22	69	167.0±9	174	215.5±15.01
Total	744	1,213.0±25.6	400	685.0±18.3	1,144	1598.0±94.3

prevalence of 30.4%. Of 1,479 urine specimens examined, 632 (42.7%) were positive for macroscopic haematuria. Among 632 pupils with macroscopic haematuria, 544 (36.8%) were boys while 88 (5.9%) were girls. Thus, the prevalence of haematuria was significantly higher among boys than among girls ($p < 0.05$). When the intensity of haematuria was grouped into light (+), moderate (++) and heavy (+++), 285(45.1%), 212(33.5) and 135(21.4%) of the 632 haematuric urine were light, moderate and heavy respectively.

Prevalence of *Schistosoma haematobium* Infections by Parental Occupation

Of 1,479 pupils who completed and returned the questionnaire, occupational relation of parents were farmers, fishermen, traders, civil servants and others were presented in **Table 5**. The children whose parents were farmers had the highest prevalence of *S.haematobium* infection (40.0%) while pupils whose parental occupation was civil servant had the lowest prevalence (2.0%).

Discussion

The result of this study showed that of the 1,479 pupils examined, the prevalence of the infection was (77.4%). The prevalence recorded in this study appears relatively higher when compared with some results of the previous studies in this State and in other parts of

Nigeria. Ekundayo⁷ reported 46.6% in Eastern side of Kainji Lake in Nigeria. Edugbola *et al.*⁸ recorded 45.4% in Borgu Local Government Areas of Kwara State. Abdullahi and Saidu⁹ reported 40.0% prevalence in the neighbouring Niger State. Adeyeba and Ojeaga¹⁰ recorded 57.5% prevalence in Ibadan (Oyo State) while Mafiana *et al.*,¹¹ reported 71.8% prevalence in Ogun State. However, low prevalence of urinary schistosomiasis among school pupils had been reported elsewhere. Thus, Okpala *et al.*¹² recorded 0.13% prevalence in Plateau State, Uneke¹³ reported 26.8% in Ebonyi, and Biu *et al*¹⁴ reported 24.3% in Northern Eastern Nigeria.

The disparity in prevalence of urinary schistosomiasis in different studies and in different parts of the country could be attributed to multiple factors, including: non-uniformity in the methods used by various researchers¹, variation in the intensity, water contact behaviours and prior treatment or other interventions before reported studies were conducted. In primary schools in the Kainji Basin Areas where Pupils had been treated and Health Education given prior to her study, Nmorsi,¹⁵ reported lower prevalence of urinary schistosomiasis than the adjacent schools where no interventions had been launched like Shonga. In this study, boys had higher prevalence of urinary schistosomiasis than girls. Higher prevalence among boys than among girls had been reported by Dunah *et al.*,¹⁶ in Adamawa State. In contrast, Edungbola *et al*⁸

TABLE 3: Range of Egg- count by Age-Group among the 1,144 Infected Pupils

AGE GROUP (Years)	No. EXAMINED	No. INFECTED	NO AND PERCENTAGE OF PUPILS WITH THEIR EGG-COUNTS RANGE		
			(1-1000 eggs/10ml urine)	(1001-5000 eggs/10ml urine)	(=5001 eggs/10ml urine)
4-6	276	203	32 (16.4)	113 (14.9)	27 (14.1)
7-9	286	208	41 (21.0)	117 (15.4)	31 (16.2)
10-12	331	259	63 (32.3)	216 (28.5)	61 (31.9)
13-15	236	195	24 (12.3)	118 (15.6)	42 (22.0)
16-18	174	105	19 (9.7)	101 (13.3)	19 (9.9)
= 19	176	105	16 (8.2)	92 (12.1)	12 (6.3)
Total	1,479	1,144	195	758	191

Table 4: Grades of the Intensity of Terminal Haematuria by Gender and by Age-Group

Age-Group (years)	NO.(%) Infected	Haematuria by gender		Total haematuria (%)	No.(%) in grade of terminal haematuria		
		Boys (%)	Girls (%)		Light (+)	Moderate (++)	Heavy (+++)
4-6	203	120	19	139(22.0)	49	58	32
7-9	208	164	28	192(30.4)	80	64	48
10-12	259	223	32	255(40.3)	127	76	52
13-15	195	27	8	35(5.5)	20	12	3
16-18	105	6	1	7(1.1)	5	2	0
=19	105	4	0	4(0.7)	4	0	0
Total	1,144	544(36.3)	88(5.9)	632(100)	285(45.1)	212(33.5)	135(21.4)

TABLE 5: Prevalence of *Schistosoma haematobium* infection by Parental Occupation

PARENTAL OCCUPATION	NO.(%) OF PUPILS WHO COMPLETED AND RETURNED QUESTIONNAIRE	NO. (%) OF PUPILS INFECTED
FARMER	896 (59.9)	458 (40.0)
FISHERMAN	311 (20.8)	709 (62.0)
TRADER	103 (6.9)	214 (18.7)
CIVIL SERVANT	127 (8.5)	97 (8.5)
OTHERS	42 (2.8)	103 (9.0)
TOTAL	1,479	21 (1.8)

df=5 P<0.05

reported that girls were more infected than boys in the Babana study. Differences in gender prevalence in different studies could be related to disparity in water contact activities between boys and girls, attributable to physical, cultural, social and behavioural factors rather than gender immunity. Boys are physically stronger, more adventurous and more playful. Thus, they are more exposed to infection than girls. Girls, reaching adolescence faster, are more timid to expose their bodies in public while swimming. Girls also participate more in domestic work and are more restricted to home environment by their parents than boys.

The highest prevalence of *S. haematobium* infection (47.2%) was found among the age-group of 11-13 years. This corresponds to some reported works where the highest prevalence of urinary

schistosomiasis fall within the same age group^{17,18,19}. This could be due to longer cumulative years of active exposures to contaminated streams and infection than the younger and older age-groups particularly in most rural areas like in Shonga.

In this study the mean egg-count was significantly higher for boys than for girls ($p < 0.05$). Nduka *et al.*,²⁶ reported similar findings but Ejima and Odaibo²⁷ reported higher mean egg-count for girls than for boys. These variations are likely to be associated with the prevalence and intensity of infection as dictated by degree of exposure for physical, cultural, social, behavioural and environmental factors.

This study reveals a relationship between the level of schistosomal endemicity and the intensity of infection by age-groups. Age-group 11-13 years with

the highest prevalence, also had the highest overall mean egg-count. This finding is contrary to the report of Ejima and Odaibo²⁷ where more pupils in the age group 4-10 years had the highest range of egg-count. The disparities are most likely related to variation in the onset of exposure to infection. Besides, the disparity in age determination in communities where there is no birth certificate could account for the differences.

Of 1,479 Pupils whose urine samples were macroscopically examined, (29.2%) had visible terminal haematuria. The prevalence of haematuria seen in this study was higher than what Huldah *et al.*,²⁰ reported (21.8%). Correspondingly the prevalence and intensity of infection were higher in this study. Terminal haematuria was higher among boys (67.1%) than among girls (32.9%). Similar observations were made where the prevalence of terminal haematuria was higher among boys than among girls^{20,21,22,23}. In their own study, Huldah *et al.*,²⁰ reported a higher prevalence of terminal haematuria among girls (44.5%) than among boys (31.1%). The higher prevalence of terminal haematuria is largely a reflection of higher prevalence and intensity of the infection. Caution should be exercised in interpreting terminal haematuria among females in their adolescent years for their monthly menstrual period can be easily misinterpreted to terminal haematuria for Urinary Schistosomiasis. The highest prevalence of haematuric urine in this study (42.7%) was reported among the age group 11-13 years. In his study, Amali,²⁴ reported a higher prevalence (51.1%) of haematuric urine among age-group 10-15 years also. In contrast, higher prevalence of haematuric urine was recorded among pupils whose age ranges from 4-7 years in a study conducted by Ladan *et al.*,²⁵. The higher prevalence of haematuric urine seen among age-group 11-13 years in this study is a reflection of higher prevalence and intensity of infection found among this age-group and could be due to variation in infection rates as well as longer cumulative years of active exposures to contaminated streams and infection of this age-group than the younger and older age-group.

We also showed that water-related occupational activities carry greatest risk of schistosomal infection. Thus, children of fishermen and food-producing farmers were the most affected. Steinmann *et al*²⁸ and Mafiana *et al*¹¹ similarly reported that water-associated occupations carry higher risk of water-related infections.

Conclusions And Recommendations

Up till this moment, the ecological settings of most communities in and around Kwara State has created excellent sites favourable for the breeding of both the snail intermediate host and the Schistosome parasites, creating a good synergy for schistosomiasis endemicity. This study revealed that schistosomiasis

haematobium infection is endemic in Shonga community. The relatively high prevalence of terminal haematuria encountered (42.7%) was a reflection of heavy intensity of *S. haematobium* infection among the pupils in this locality. The awareness about the mode of transmission, the socio-economic impact, the public health implications and other associated harmful effects as well as control measures about this parasitic infection are very pauc. Therefore, that it is most desirable to conduct similar studies like this within and outside this geographical areas and appropriate interventions, in form of health education, chemotherapy and the provision of basic amenities (safe water supply and sanitation facilities) should be launched. General awareness, personal hygiene and relevant health education messages should be built into the Primary School curriculum; it will go a long way for the control efforts of the disease.

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