Prevalence of *Schistosomiasis* in a neglected community, South western Nigeria at two points in time, spaced three years apart

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Abstract

Background: In recent years, the prevalence of *schistosomiasis*, a neglected tropical infection, has increased in underprivileged rural communities characterized by poverty.

Objective: This cross-sectional community-based study was carried out to determine the prevalence of urinary *schistosomiasis* in a neglected community of Apojola community, South-Western Nigeria at two points in time, spaced three years apart

Method and results: A total of 145 participants were screened and 44.1% were diagnosed to have urinary *Schistosoma haematobium* infection after sedimentation and microscopy. The prevalence of *schistosomiasis* among females was higher (45.3%) than that among males (42.4%) but not significantly different (0.723). The prevalence of participants with light infection (26%) was significantly higher than those with heavy infection (11.0%). The predisposing factors with statistically significant association with *Schistosoma haematobium* infection were age (0.000), level of education (0.002), eating/selling of snails (0.037), occupation (0.000), drinking water (0.001), swimming (0.008), and washing in a river (0.019).

Conclusion: These findings indicate that the study area is still endemic to urinary *schistosomiasis* after three years of research and school-age children and teenagers are the populations at risk of urinary *schistosomiasis*. Community health education on the cause, mode of transmission, prevention, and prompt treatment of schistosomiasis is recommended.

Keywords: Urinary *Schistosomiasis*, neglected community, Nigeria.

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Introduction

Schistosoma haematobium infection is known worldwide as an important chronic and debilitating disease mainly affecting underprivileged rural Communities characterized by poverty, poor sanitation and hygiene[1,2].

Schistosomiasis is one of the occupational associated infection that can be transmitted to a susceptible host or through recreation that involves contact with water infested with the free living *cercariae* that penetrate the skin and develops to maturity in the human[3,4]. Other probable factors that influence transmission include environmental factors, water development schemes and people migration[3].

Schistosomiasis has been effectively controlled in many countries but its burden remains high especially in sub Saharan Africa including Nigeria.[4,5,3]

In Nigeria, the burden of *Schistosomiasis* is enormous with an estimate of 101.3 million people at risk[6-9]. The huge burden has been associated with water resources and development schemes such as irrigation projects, rice/fish farming and dams[10,11].

Chemotherapy, water, sanitation and hygiene, education and behaviour change programs; and occasionally, snail control has been suggested as an important aspect of *schistosomiasis* control programmes[12]. However, a better understanding of prevalence and risk factors for *schisto-*

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somiasis is important in controlling the disease. The high prevalence of urinary *schistosomiasis* obtained from Apojola community 3 years ago justified the need to assess the extent of control measures. As at the time of visit, Apojola still lack basic amenities such as sanitation facilities, a non-functional water borehole, good roads, health centre and electric power distribution. The present study was designed to determine the prevalence of *schistosomiasis* in a neglected community of Apojola, south-western Nigeria at two points in time, spaced three years apart

Study area

This study was 'conducted between May and July 2017 in Apojola community located around Oyan dam reservoir in Abeokuta North local Government Area, Ogun State, Nigeria. Oyan river is located 07° 58'N and 03° 02'E with a catchments area of 1610km^2. The reservoir has a length of 27km with a maximum width of 67km.and was primarily built to provide hydroelectric power and provide water for domestic and industrial uses. It also meant to supply water for an irrigated project of about 3,000 ha as well as provide fishing ground for the adjoining communities. Inhabitants are immigrant fishermen, a mixture of Moslem Hausas and Christian Idomas (figure 1)

Ethical, recruitment, enrolment and sample collection

Before the beginning of the study, the objectives and plan were explained to the village authorities to get their

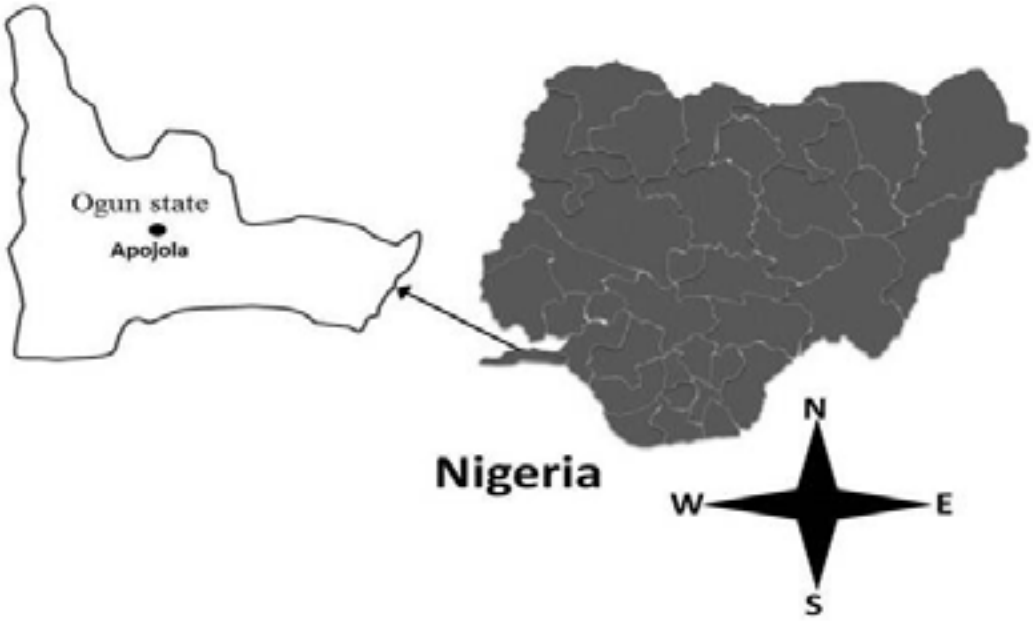

Figure 1: Map showing the sampling sites in South-western Nigeria

cooperation and permission to conduct the survey. The heads informed all the residents to gather at the village square where they received explanation about the objectives of the survey, benefits and their involvement. A total of 181 participants gathered at the village square and only 145 adults who agreed voluntarily to participate and children with parental consent were included in the study. They received labelled containers and were instructed to bring urine samples. Structured questionnaire was administered to each participant to obtain socio-demographic, sanitation and water hygiene information which was then analysed to determine associated risk factors to *Schistosoma* infection. The protocol for this study followed ethical procedures/guidelines and was approved by the Olabisi Onabanjo University Teaching Hospital, Sagamu (OOUTH) research ethics committee with protocol no OOUTH/HREC/57/2016.

Parasitological procedures

Urine samples were stored in closed containers using ice park and transported to the laboratory to determine the prevalence and intensity of *S. haematobium* infection. In

the laboratory, 10ml of each urine sample was centrifuged at 5000 rpm for 5 min. The supernatant was discarded to leave the sediment, which was placed on aclean glass slide and covered with a coverslip. These slides were observed microscopically using x40 objective lens for the presence of terminal-spined ova of eggs of *S. haematobium*. A positive sample was indicated by the presence of ova of *S. haematobium* and expressed as number of eggs/10ml of urine[13], and the intensity of infection was graded as heavy (> 50 EP10 mL), moderate (10-49 EP10mL) and light (1-9 EP10 mL). A negative sample was indicated by the absence of parasite eggs[13].

Data analysis

Data entry and analysis were carried out using SPSS version 18.0 (SPSS Inc., Chicago, IL, USA). Appropriate univariate and bivariate statistics were employed. Frequency tables and percentages were used to display categorical data. The Chi square was used to compare categorical data. Statistical significance was determined at the level of $p < 0.05$.

Sociodemographic characteristics of study participants

A total of 145 urine samples were collected and analysed for urinary *Schistosomiasis*. The characteristics of the study participants are shown in Table 1. The age range of the study participants was (5–59 years). Of the 145 participants, 59.3% (86/145) were female and 40.7% (59/145) were male, giving a gender ratio of 1.46: 1 (females: males). The majority (55.2%) of the participants were of the age range 5–15years (figure 2). 68.3% of the study participants had primary school education and 58.6% of the participants are students (Table 1)

Prevalence of *schistosoma haematobium*

The overall prevalence of *Schistosoma haematobium* infection in the study population is 44.1%. Urinary *schistosomiasis* was more prevalent among females (45.3%; 39/86)

Table 1: Socio-demographic characteristics of participants in a neglected community, Nigeria

Variables	Frequency	%
Age (years)		
5-15	80	55.2
16-26	16	11.0
27-37	20	13.8
38-48	16	11.0
49-59	13	8.9
Gender		
Male	59	40.7
Female	86	59.3
Education		
None	19	13.1
Primary	99	68.3
Secondary	25	17.2
Graduate	2	1.4
Occupation		
Farming	35	24.1
Housewife	11	7.6
Student	85	58.6
Trading	14	9.7

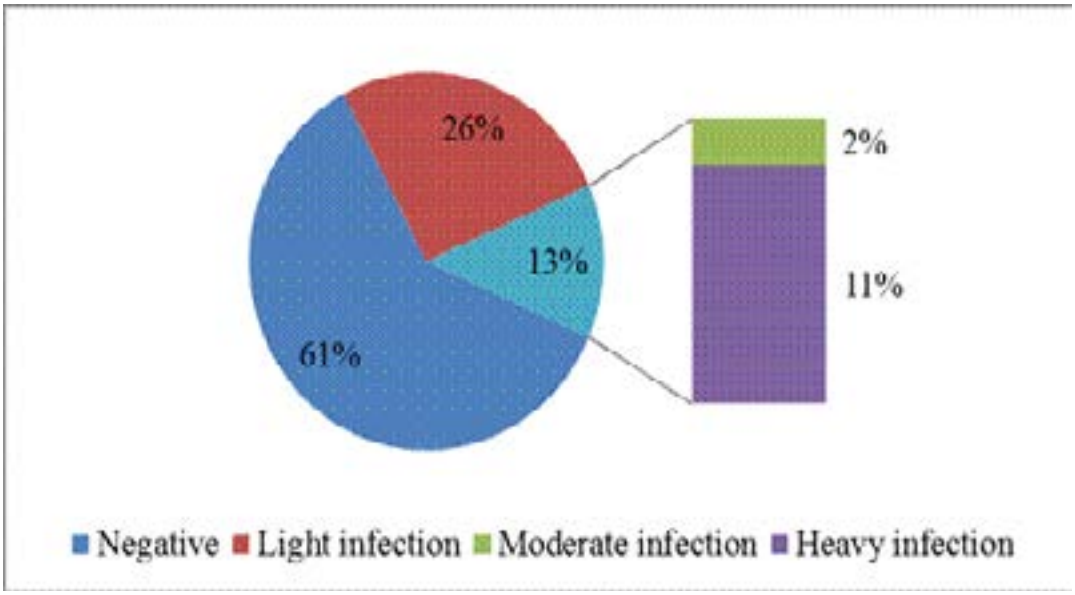

Figure 2: intensity of *Schistosoma haematobium* infection among participants

than in males (42.4%; 25/59). However, there was no significant different between *Schistosomiasis* and gender (0.723). There was an association between *Schistosoma haematobium* infection and variable such as age (0.000), level of education (0.002), eating/selling of snails (0.037), occupation (0.000), drinking water (0.001), swimming (0.008), and washing in river (0.019) (Table 2)

Intensity of *Schistosoma haematobium*

The intensity of infection of participants is shown in Figure 2. Light, moderate and heavy infections were detected in the study using centrifugation method for the egg

Table 2: Factors influencing *Schistosoma haematobium* infection in a neglected community, Nigeria

Factor	Subcategory	*S. haematobium* Status No. negative	No. Positive	*p* value
Gender	Male	34	25 (42.4)	**0.723**
	Female	47	39(45.3)	
Age	5-15	28	52(65.0)	**0.000**
	16-26	12	4(25.0)	
	27-37	16	4(20.0)	
	38-48	14	2(12.5)	
	49-59	11	2(15.4)	
Level of education	None	16	3(15.8)	**0.002**
	Primary	45	54(54.5)	
	Secondary	18	7(28.0)	
	Graduate	2	0(0.0)	
Occupation	Farming	28	7(20.0)	**0.000**
	Housewife	10	1(9.1)	
	Student	30	55(64.7)	
	Trading	13	1(7.1)	
Sell/eating of snail	Yes	39	34(53.9)	**0.037**
	No	52	30(36.6)	
Drinking water	Sachet	2	2(50.0)	**0.001**
	Stream	64	62(49.2)	
	Well	15	0(0.0)	
Swimming	Yes	61	59(49.1)	**0.008**
	No	20	5(20.0)	
Washing in river	Yes	65	60(48.0)	**0.019**
	No	16	4(20.0)	

count. Of the 145 persons examined for urinary *Schistosomiasis* in the study area, 61% (n=88) were found to be negative for the presence of *Schistosoma haematobium* egg, 2% (n=3) were excreting between 1-9eggs/10ml, 26% (n=38) were excreting between 10-49eggs/10ml urine, while 11.0% (n=16) were excreting above 50 eggs/10ml urine.

Discussion

The study showed a high prevalence of *Schistosoma haematobium* infection among resident of Apojola community, Nigeria. Previous studies in Nigeria[14-17] and other countries like Ghana[18] and Cameroon[19], reported a comparable prevalence of *Schistosoma haematobium* infection. However, data from various parts of Nigeria[20-22], showed lower prevalence than that obtained in the present study. Factors including poverty, ignorance, poor living conditions, inadequate sanitation and water supplies as well as deplorable personal and environmental hygiene characteristic of many rural communities have been suggested as reasons for variation in prevalence of infection[23].

The frequency of infection was higher among the female participants compared to the male counterpart, although there was no statistical significance in the association. A study carried out in Nigeria found similar results[24] while others reported the opposite[25,26]. The fact that fetching water and washing clothes are seen as female responsibilities in Nigeria, suggests the likely reason for Schistosoma

haematobium infection preponderance among females.
In the present study, prevalence was higher among school-aged participants and the association was statistically significant. Previous studies reported higher infections among younger age group in Nigeria[27], Malawi[28] Cameroon[29] and Cote d'Ivoire[30]. The higher prevalence among younger age group is not surprising. This is because this same group are the most commonly found in persistent and unrestrained water contact activities such as bathing and swimming. In addition, participants' levels of education and occupation showed a statistical association with urinary *schistosomiasis*. This is supported by the findings of some previous study that associated higher infections with different level of education and occupation[31,32]. The higher prevalence may be suggestive of their frequency of going to the river. In addition, the high illiteracy and neglect levels of the parents, observed in the study area, can lead to the non-education of preventive measures to their children, therefore influencing transmission pattern

Eating/selling of snails, using the stream as a source of drinking water, swimming, and washing in a river were significantly associated with *Schistosoma haematobium* infection. In accordance with our findings, previous studies reported similar observations[9,33,28]. Water contact activities and traditional agricultural practices such as washing, fishing, bathing, and farming may influence the transmission of the disease in many parts of Nigeria.
Furthermore, the prevalence of participants with light infection was significantly higher than those with heavy infection. The higher prevalence of light infection reported here was in accordance with findings of Uneke et al.,[34] an indication that the distribution of *schistosomiasis* in endemic communities fits a negative binomial curve, with most infected individuals harbouring low worm burdens and only a small proportion having heavy infections[35]. However, according to Secor et al.,[36], the aggregation of worm load in a small percentage of infected individuals may have various explanations including genetic vulnerability and the implication of these epidemiologic results are important to our understanding of the dynamics of the *Schistosoma haematobium* infection and its control in the populations studied.
We acknowledge some limitations of our methodology. This study had to rely on sedimentation method instead of the ideal filtration technique. In addition, our study was conducted on a smaller scale instead of the ideal larger scale. Thus, the prevalence rates *of schistosomiasis* are likely to be underestimated

Conclusion

The prevalence of 62%[37] obtained 3 years ago compared with present 44.1% prevalence obtained in the study area shows that participants in Apojola community and its environ are still plagued with urinary *Schistosomiasis*. It seems that adequate control measures had not been deployed to this endemic zone of *schistosomiasis*. Therefore, there is an urgent need for Government to mount successful control interventions such as the provision of safe water supply, development of recreational water bodies to avoid contact with present infested water, control of snail vector, public awareness and education regarding urinary *schistosomiasis* in the area.

Also, the report from our study is an indication that the school age children and teenagers are the population at risk of *schistosomiasis*. Control measures should, therefore, be targeted more on this at-risk group in the study area.

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Competing interests

The authors declare that they have no competing interests.

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