



Prevalence of Urogenital Schistosomiasis in Four Communities in Ogbia Local Government Area, Bayelsa State, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Authors JG and AEA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author JG managed the analyses of the study. Author AEA managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Schistosomiasis is one of the most important neglected tropical diseases in terms of morbidity and mortality and it is endemic in the Niger Delta region of Nigeria. The aim of this study was to determine the prevalence of urogenital schistosomiasis in four communities (Agbura, Otakeme, Otuagela and Otuokpoti) in Ogbia Local Government Area, Bayelsa State, Nigeria using Filtration and Sedimentation technique. Snails collected were identified by the shape of their outer shell. Basic statistics method and ANOVA was used to analyze the data. Out of the 276 urine samples examined, 36 (13.0%) tested positive for *Schistosoma haematobium*. The age- related infection showed that the age-group 10-14 years (26.9%) had the highest rate of infection, followed by 5-9 years 7 (19.4%). Age-group 50 years and above had a zero infection rate. Sex - related infection showed that an overall prevalence rate of 71.6% was recorded among males and 39.4% for females indicating that infection was higher in males than in females in all the communities; In Otuokpoti, males 8(33.3%) to females 5 (15.1%), In Otakeme, males had 6 (12.8%) than females 5

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(15.6%), in Otugela males had 7 (16.7%) than females 2 (8.7%) and in Agbura males had 3 (8.8%) than females 1 (9.1%). Primary school children had the highest 16 (21.9%) while retired civil servants had 0(0.0%). The difference was significant. *Bulinus globosus* was the only snail intermediate host identified in both ponds and streams. Human water contact activities observed around the water bodies were recreational activities (washing, bathing, fishing) and harvesting of freshwater snails. Variance (ANOVA) of the age- specific prevalence of urogenital schistosomiasis in the four communities showed no significant difference at $P<0.05$ ($P=0.082$) among sampled population and also no significant difference at $P<0.05$ ($P=0.55$) across the infected population in the four communities.

In conclusion, urogenital schistosomiasis is still prevalent and remains a public health challenge in Ogbia, Bayelsa state. It is strongly recommended that health education and provision of safe water should be stepped up as a control measure of the infection in the area.

Keywords: Urogenital schistosomiasis; *Schistosoma haematobium*; infection; filtration technique; prevalence; Nigeria.

1. INTRODUCTION

Urogenital schistosomiasis is caused by the fluke worm *Schistosoma haematobium*. It is an infection of the urogenital tract. It affects 44 countries in Africa and 53 countries in the eastern Meditterrean. Infection with *S. haematobium* is associated with very high morbidity up to 50-70% of infected individuals in any endemic locality. According to estimates by WHO [1], at least 220.8 million people required preventive treatment in 2017 and the treatment was to be repeated in a number of years to reduce morbidity. Schistosomiasis is considered to be of global importance because over 436 million people are at risk of the infection and 112 million people are estimated to be infected with the disease in sub-Saharan Africa alone [1].

Fresh water snails (*Bulinus globosus*) serve as intermediate host of the parasite especially in Africa. In low and middle-income countries, people who lack adequate water supply and are unable to provide proper sanitation for them are likely exposed to contaminated water bodies harbouring these infected snails [2]. Human infection occurs during normal daily routine activities such as swimming, bathing, fishing, fetching of water for domestic usage, irrigation farming and rice cultivation [3,4]. Symptoms findings include dysuria (painful urination), frequent urination, haematuria (blood in urine) or proteinuria (protein in urine) [5-8]. There is an association between urogenital schistosomiasis and a form of cancer of the bladder in some regions. This is mainly recorded among the active section of the population, most of whom are farmers [9]. First, like all helminthic infections, the distribution of worms in any community is widespread but uneven; few have heavy infections and severe disease while many

have light infections and fewer symptoms. Severe disease usually follows after many years of silent or mildly symptomatic infection and re-infection [10]. Urogenital schistosomiasis can cause pain and often chronic. In Egypt, schistosomiasis linked with cancer is the primary cause of death among men aged 20 and 44 years [11].

Schistosomiasis is of global importance and most prevalent tropical disease in its public health implications since over 52 endemic countries require treatment for moderate to high transmission and the large-scale treatment would have to be targeted at the people and communities worldwide [1]. An estimated 170 million people in sub-Saharan Africa, and a further 30 million in North Africa, Asia and South America, suffer from schistosomiasis, which is generally associated with rural poverty [12]. It affects 78 countries in Africa, Asia and Latin America and the eastern Mediterranean. The World Health Organization [3], has estimated that about 207 million people are infected and 120 million exhibit symptoms.

In Nigeria, endemic rate for urogenital schistosomiasis is high with about 25.83 million infected and 101.25 million people at risk of the infection [13]. Pockets of infections have been documented in various parts of the country [14]. Urogenital schistosomiasis is endemic in both urban and rural communities of the federation with prevalence ranging between 2% and 10% with association found among the poor and marginalized [15]. Of the parasitic diseases, unfortunately, the public health significance of schistosomiasis is often underestimated. Taking into account indirect causes of mortality due to hepatosplenic enlargement, bladder cancer and other debilitations attributed to chronic infections,

it is estimated that annual mortality rates exceed [16] and might be higher than 300,000 in sub-Saharan Africa alone [17]. Consequently, the total number of disability adjusted life years (DALY) lost due to schistosomiasis might be seriously underestimated. The annual economic loss from disability and lowered production due to schistosomiasis according to Wright [18], is about 400,000,000 pounds sterling globally. The disease also substantially affects children growth and cognitive performance. The control of urogenital schistosomiasis involves health education, the supply of safe drinking water and planning of functional health facilities, diagnosis and treatment, management of the environment and control of the intermediate hosts [19]. There is limited information on the prevalence and proper education on the impact of the infection in these communities.

This study was designed to determine the current status of the prevalence of human urogenital schistosomiasis in these riverine communities where the factors that contribute to its sustainability in these communities thrive. It is pertinent to state that in many parts of Nigeria including the south-south region the epidemiology of urogenital schistosomiasis is only partially known. In these areas, in spite of efficient control tools being available, no clear control strategy is in place, and the drug praziquantel is only minimally or not available to most endemic communities due to bureaucratic bottle-neck among policy implementers. Findings in this research will be useful for control programmes and probably the elimination of this disease.

2. MATERIALS AND METHODS

2.1 Study Areas

The study was carried out in four riverine communities with their geographical coordinates; Agbura (lat. 4°50'43"N, long. 6°16'3"E), Otakeme (4°43'8"N, 6°21'35"E), Otuagela (4°44'38"N, 6°23'35"E) and Otuokpoti (4°50'16"N, 6°16'21"E) in Ogbia Local Government Area, Bayelsa State, Nigeria. These communities are rural-setting and residences are built in clustered homesteads of mainly mud homes, enforced with bamboo sticks. The basic occupations of the inhabitants are made up of mainly farmers, fishermen, petty traders, boat drivers, a few civil servants and retired civil servants. The villages have broad coastal and plain topography with many ponds connected to

a stream. The vegetation is rain forest. There is high rainfall from April to September with its peak in August. Freshwater fishes and snails (*Bulinus* spp) are common in the area. Some of the inhabitants make use of water mainly from bore hole as major sources of drinking water, which is only available (flows) at certain period of the day; while most of the inhabitants make use of streams, rivers and ponds for all and most of their domestic activities which aids transmission or infection of the *Schistosoma* species.

2.2 Sample Collection

A total of 276 participants from the four communities who agreed to be part of the study were examined for the purpose of this study. Their bio data such ages, sexes, occupations as well as histories of their contact patterns with water bodies were all taken with the aid of structured questionnaire. The criteria needed to define and describe this population were that it included school children between ages 5 to 17 years who are the most vulnerable group, farmers, fishermen, boat drivers (transport), traders, civil servant and housewife. A total of 276 terminal urine samples were collected between 10.00 am and 2.00 pm from both sexes using a clean 50 cm wide-mouthed, screw-capped universal specimen bottles. This included 147 males and 129 females of ages 5 years and above.

2.3 Sample Analysis

Urine samples were physically examined for colour, appearance and presence of blood [20]. Haematuria and proteinuria were assayed using chemical reagent strips, Medi-test Combi 9 manufactured by Marcherey-Nagel No: PZN 618 160 0. The test was carried out according to the manufacturer's instructions and the result recorded. For the Filtration technique, 10ml urine sample was passed through a filter paper on a beaker within less than two minute. The paper was viewed under the microscope. While for the sedimentation technique another 10 ml was pipetted into test tubes of equal volume and placed in a centrifuge and allowed to spin at 2,000 (rpm) for 15 min. The test tubes were then removed from the centrifuge and the bottoms of the test tubes were slightly tapped with the fingers to agitate the parasites. With the aid of a Pasteur pipette, the sediments were collected and placed on grease free glass slide and viewed under a light microscope using x10 and

x40 objectives for the presence of spinned *S. haematobium* eggs.

Snail Identification: Snails were handpicked along the water bodies in each community for 20 mins at each site. They were identified morphologically according to their shell using a field guide to African freshwater snails.

2.4 Data Analysis

Data were analyzed using basic statistics and ANOVA for significant difference among sampled population in the four communities.

3. RESULTS

A total of 276 consented participants were examined in this study. Thirty six (36) were found to have *S. haematobium* egg in their urine with prevalence of 13.0%. The age-groups 10- 14 years (26.9%) was observed to have the highest prevalence in the study followed by 5-9 years (19.4%). 50 years and above had 0.0% in this order (Table 1). The result showed no significant difference at $P < 0.05$ ($P = 0.082$) among sampled population. Also, there was no significant difference at $P < 0.05$ ($P = 0.55$) across the infected population in the four communities. ANOVA comparing the sampled populations across the four communities showed significant difference with the infected population.

The results obtained from the four communities showed that 147 males and 129 females were examined in the study. The prevalence rate based on sex showed that more males 71.57% were infected than 39.38% females and the same was observed across the communities: In Agbura, males had 8.82% rate of infection; Otakeme, males (12.7%); Otuagela males had 16.66% and in Otuokpoti, males had 33.33% rate of infection. Among the females, Agbura had 9.09%, Otakeme (15.1%), Otuagela (8.6%) and Otuokpoti (6.45%) tested positive for *S. haematobium* infection. There was significant difference in the Gender specific prevalence males for *S. haematobium* infection between the sampled and infected population at $P < 0.05$ ($P = 0.029$) (Table 2).

The results obtained in Table 3 shows that the prevalence of urogenital schistosomiasis infection in relation to occupation was highest among the primary school children (21.91%) followed by the students (15.90%). The retired civil servants had zero rate of infection.

Bulinus globosus was the snail intermediate host seen and identified in the number of ponds and streams visited in the communities, which is responsible for the transmission of urogenital schistosomiasis (Table 4).

4. DISCUSSION

The results from the present study indicate that urogenital schistosomiasis is endemic in the four (Agbura, Otakeme, Otuagela and Otuokpoti) communities in Ogbia, Local Government Area, Bayelsa State, Nigeria with an overall prevalence of 13.0%. The prevalence in the present study is lower than that (42.2%) reported by Ukata et al. [21], in Yauri riverine area in Kebbi State, Nigeria; 45.5% reported by Rikoto and Danladi [22] among schoolchildren in Sarkawa fishing community in Yauri, Kebbi State, Nigeria; 22.1% by Anosike et al. [23] in Abeokuta; 95% by Ogbeide and Uyigüe [24] in Ondo State, South-western Nigeria; 48.5% by Nduka et al. [25] in Ishiagu, South Eastern Nigeria; 19% reported by Damen et al. [26] in Jema'a local Government Area, Kaduna State and 55.1% by Ekpo et al. [27] in Abarma village, Gusau, Zamfara State, Northern Nigeria.

Present finding could be as a result of constant water contact pattern of the inhabitants of these communities wandering through freshwater streams and ponds that serve as breeding sites to the freshwater snail intermediate host. High prevalence rate of schistosomiasis has been recorded in rural settings and communities surrounded by streams [5].

In relation to age-groups in these communities, age-group 10-14 years (26.9%) recorded the highest infection rate and was followed by 5-9 years (19.4%). These are the adolescents who are likely to be more vulnerable. Similar result was reported by Nduka et al. [28] and Hotez and Kamath [29] who concluded that human schistosomiasis infection is found to be highest among the school-aged children and adolescents. This finding could be as a result of constant water contact patterns such as bathing, washing, fishing, carrying out of daily recreational activities and also swimming in ponds, lakes and stream infested with cercariae (infective stage) of *S. haematobium*. Age-group 50 years and above had zero infection rate. This could be attributed to the reduced water contact and breeding sites of the snail intermediate host which in turn could have led to being infected. This trend was also reported by Hustling [30].

Table 1. Age-group specific prevalence of urogenital schistosomiasis infection in the study communities in Bayelsa state

Age groups in years	Agbura		Otakeme		Otuagela		Otuokpoti		Total number examined	Total number infected	Prevalence Rate (%)
	N.E	N.I	N.E	N.I	N.E	N.I	N.E	N.I			
5- 9	9	0	10	3	7	1	10	3	36	7	19.4
10- 14	5	1	15	5	17	3	15	5	52	14	26.9
15- 19	3	0	7	1	9	1	13	2	32	4	12.5
20- 24	5	1	7	0	10	0	11	1	33	2	6.1
25- 29	4	0	5	0	7	1	6	0	22	1	4.5
30- 34	2	0	11	1	6	0	9	1	28	2	9.1
35- 39	5	2	8	1	0	0	5	0	18	3	16.7
40- 44	3	0	7	0	4	2	3	0	17	2	11.8
45- 49	4	0	5	0	5	1	5	0	19	1	5.3
≥50	5	0	5	0	2	0	7	0	19	0	0.0
Total	45	4	80	11	67	9	84	12	276	36	13.0

Key: N.E- No Examined; N.I- No. Infected

Table 2. Gender specific prevalence of *S. haematobium* infection in the study communities in Bayelsa State

Communities	Gender						Prevalence in males (%)	Prevalence in females (%)	
	No. of males examined	No. of females examined	Total no. of males and females examined	No. of males infected	No. of females infected	Total no. of infected males and females			Total prevalence (%)
Agbura	34	11	45	3	1	4	1.44	8.8	9.1
Otakeme	47	33	80	6	5	11	3.98	12.8	15.2
Otuagela	42	23	65	7	2	9	3.26	16.7	8.7
Otuokpoti	24	62	86	8	4	12	4.34	33.3	6.5
Total	147	129	276	24	12	36	13.04	71.6	39.4

Table 3. Occupation specific prevalence of urogenital schistosomiasis among the communities in Bayelsa State

Occupation	Agbura		Otakeme		Otuagela		Otuokpoti		Total No. examined	Total No. infected	Prevalence rate (%)
	N.E	N.I	N.E	N.I	N.E	N.I	N.E	N.I			
Primary school children	11	2	20	5	20	4	25	5	76	16	21.1
Students	8	1	10	2	7	2	9	2	44	7	15.9
Farmers	5	1	10	1	17	2	9	2	30	3	13.3
Self employed	4	0	5	0	9	0	7	1	25	1	4.0
Traders	4	0	16	1	0	0	10	0	30	1	3.3
Civil servants	3	0	9	1	7	1	11	0	30	2	6.7
Retired civil servants	4	0	1	0	2	0	4	0	11	0	0.0
House Wife	6	1	9	1	6	1	11	3	33	6	18.2
Total	45	4	80	11	67	9	86	12	276	36	13.0

Key: N.E- No. Examined; N.I- No. Infected

Table 4. Identification of water snail in the four communities in Bayelsa State

	Number of ponds	Snail species identified	Number of streams	Snail species identified
Agbura	2	<i>Bulinus globosus</i>	1	<i>B. globosus</i>
		<i>B. globosus</i>		<i>B. globosus</i>
Otakeme	2	<i>B. globosus</i>	1	<i>B. globosus</i>
		<i>B. globosus</i>		<i>B. globosus</i>
Otuagela	2	<i>B. globosus</i>	1	<i>B. globosus</i>
		<i>B. globosus</i>		<i>B. globosus</i>
Otuokpoti	2	<i>B. globosus</i>	1	<i>B. globosus</i>
		<i>B. globosus</i>		<i>B. globosus</i>

Prevalence of infection was higher in males (71.6%) than females (39.4%) in all four communities; Agbura, males (8.8%) and females (9.1%); Otakeme, males (12.8%) than females 5(15.6%); Otuagela, males (16.7%) than females 2 (8.7%) and Otuokpoti, males had 33.3% than females (15.1%). This is in line with the study conducted by Agi and Okafor [7] which showed higher prevalence among males than females. This could be as a result of the fact males are more active and engage in water contact activities like swimming, fishing etc. and also in contact with water bodies and breeding sites of the snail intermediate hosts than females who stay often at home attending to domestic chores. This result is in agreement with the finding by Ukata et al. [21] who reported that males are more infected than females as males engage in outdoor activities in Yauri riverine community than the females who stay indoors most of the time. In these communities, more males in all the age-groups had higher schistosomiasis infections. This is supported by report of other researchers [26,31-33]. Among the different occupations, the infection was highest among the primary school children (21.1%). This was followed by the students (15.9%). This can be attributed to the fact that primary school kids and students frequent and daily visit to infected streams after school hours to swim to cool-off and occasionally bath on their way back home. These activities create contact with water bodies harbouring the fresh water snails and cercariae of the parasite which could thus lead to infection. Center for Disease Control [9] stated that human infection with cercariae is contact with infested water during normal daily routine activities such as washing, swimming, bathing, fetching water for domestic uses, fishing, rice cultivation and irrigation farming. The retired civil servant had zero (0%) rate of infection. This could be as a result of decrease and less exposure to water contacts and possible vector breeding sites, which in turn led to zero infection rate.

The snail intermediate host identified at the collection and transmission sites such as streams and ponds at the study communities exhibited a high abundance of *Bulinus globosus* responsible for the transmission of urogenital schistosomiasis. These findings agree with Udonsi [31] who identified *Bulinus* species as the intermediate host responsible for the transmission of urogenital schistosomiasis in the Igum Rivers Basin of the South-eastern part of Nigeria. These findings also support a work by Njoku [34] who identified *Bulinus* spp. as being responsible for schistosomiasis in Ebonyi State. The residents of these communities wade through the streams on their way to and from their farms, thereby being in constant contact with the source of infection.

5. CONCLUSION

The results in this study have revealed that urogenital schistosomiasis is endemic in these four (Agbura, Otakeme, Otuagela and Otuokpoti) sampled communities. Primary health care services should be strengthened so that they can bring health education closer to the inhabitants of these communities, Community-based treatment using praziquantel should be targeted at school - aged children in all the communities, the high risk group can be reached through the primary school system, in collaboration with the educational sector (Ministry of Education) in Ogbia Local Government Area and in order to enhance the effect of regular chemotherapy, long-lasting improvement in hygiene and sanitation should be promoted. This includes the provisions of safe water in sufficient amounts to cover all domestic needs, sanitation and appropriate health education in these communities.

CONSENT AND ETHICAL APPROVAL

Ethical clearance was obtained from the research ethics committee of University of Port

Harcourt. Permission was obtained from community chiefs, community elders and community development committee (CDC) before the commencement of the research. Written informed consents were obtained from the CDC and Informed consents were given by community chiefs, elders prior to the study. Prior to the study, the participants were properly enlightened on the aims, objectives, and benefits of the public health significance as well as the protocols of the study. Participants that gave their consent verbally and written were allowed to be part of the study. Assent was obtained for children less than 13 years, consent of both participants and parents of participants less than 18 was obtained from their parents and care givers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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