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Prevalence of Schistosoma Haematobium and its Intermediate Hosts in Abini, Biase Local Government Area, Cross River State

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ABSTRACT

This study was carried out to investigate and give an update record of the prevalence and intensity of *schistosoma* infections and also to identify the snail host that can exacerbate the risk of *schistosoma* infections in Abini, Biase Local Government Area of Cross River state. Urine samples of school children were examined microscopically for *Schistosoma haematobium* eggs. Water contact sites were also identified and sampled for snail intermediate hosts. The overall prevalence of urinary schistosomiasis in school – aged children was 9.3% (n=14). The mean intensity of infection was 2.35 ± 8.65 eggs /10ml urine. Prevalence and intensity of *Schistosoma haematobium* infection was insignificantly higher in males than females. The youngest age group, 3 – 6 years, had the lowest infection. Urine biochemical for haematuria of *Schistosoma haematobium* shows that 3.15% subjects had micro haematuria. Potential intermediate host of human Schistosome collected were: *Bulinus truncatus, Bulinus globosus* and *Lymnaea natalensis*. *L.natalensis* shedded the highest number of cercariae while the least was recorded for *B. globosus.* The result revealed that urinary schistosomiasis is prevalent together with the suitable snail intermediate host.

Keywords: prevalence, *Schistosoma,* Snail, haematuria, Cross River

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INTRODUCTION

Schistosomiasis is a parasitic disease affecting about 200 million people and poses a serious threat to 500 to 600 million people in more than 76 countries in Asia, Africa, the Caribbean and Latin America [1]. Schistosomiasis is one of the most prevalent parasitic infections in the tropical and subtropical regions of the world and also has significant economic and public health implications in these regions [2] [3].

Schistosomiasis is the second most important tropical disease after malaria and also one of the main occupational hazards encountered in rural farming populations [4]. It is the most prevalent among water-based parasitic infections [4].

Nigeria is one of the most severely affected countries in Africa with an estimated 101.28 million people at risk of infection while 25.83million are infected with *Schistosoma haematobium, Schistosoma mansoni* and *Schistosoma intercalatum* [3]. Studies on the prevalence of human schistosomiasis in Nigeria have shown that *S. mansoni* and *S. haematobium* are the prevalent parasites that cause schistosomiasis in Nigeria [5].

Schistosomiasis is mainly transmitted by different species of aquatic snails which serve as the intermediate host of the disease. Snail of the genus *Bulinus* and *Biomphalaria* serve as the intermediate host in the transmission of Schistosomiasis [6]. Typically schistosoma eggs in urine or stool reaching fresh water hatch to give miracidia that infect the appropriate snail [6]. Cerceriae emerge from the snails in water to infect human. The miracidia is the free-swimming larvae stage [7]. Humans contract the disease when the cercariae penetrate the human skin through water contact [8].

A study by [9] showed a prevalence of 35% and since then no record has been revealed about the current state of Urinary schistosomiasis in the study area. This study therefore seeks to investigate and give an update record of the prevalence and intensity of *schistosoma* infections. There is also a need to identify snail host that can exacerbate the risk of *schistosoma* infections in Abini, Biase Local Government Area of Cross River state.

MATERIALS AND METHODS

Study area

This study was carried out in Biase Local Government Area of Cross River State which has an area of 1,310km^2 and a population of 169, 183.The area is located around latitude 5^{o}45’N and 5^{o}50’N and longitude 8^{o}03’E and 8^{o}08’E [10]. Trading, timber logging and farming are the main occupation of the inhabitants. This area is also used extensively by rural dwellers for transportation of both goods and services from one location to another [10].

Study population and subject selection

The study was conducted from October to December 2016. Samples for this study were obtained from children who agreed to participate following the granting of written informed consent by their parents. Samples were collected following ethical clearance from the Cross River State Ministry of Health. Participants were recruited randomly from a public primary school in the study community. The school aged pupils were classified into three age groups, 3- 6 years, 7-10 years and ≥11 years.

Sample collection and analysis

Ten to fifteen milliliters (10- 15ml) of urine specimens were collected, using clean and sterile, screw-cap plastic containers between the hours of 10 a.m. and 2 p.m. according to WHO recommendation. This coincides with the period when excretion of *haematobium* eggs is highest [11].

The specimens was then transported to the Laboratory within 4 hours of collection to sustain the viability of the eggs, processed using the sedimentation technique and examined microscopically for schistosomes eggs. The urine samples collected were examined for *Schistosoma haematobium* eggs using the Urine Sedimentation method. 10ml sample was drawn from each individual's urine specimen and centrifuged at 4,000rpm for 4mins. The supernatant was then discarded and one drop of the sediment placed on the microscope slide and covered with a cover-slip and then observed under the x10 magnification. Urine samples showing elliptical eggs with terminal spine indicated positive results for *S. haematobium* infection. Individuals excreting *S. haematobium* eggs was quantified as light (<50eggs/10ml urine) and heavy (≥50 eggs/ 10ml urine) infections [12].

Snail sampling

Water bodies in close proximity to the school were sampled. Snail samples were collected using the method of scooping nets and hand picking as described in [13]. Snail samples were also handpicked with polyethylene gloves to avoid direct contact with infected water. All snails collected were kept in pre-labelled containers against each water station. The containers were covered with perforated lids to avoid undue stress on the animals. The plants were collected alongside the live snails and mud in open-mouthed container and conveyed to the laboratory for identification. The snail samples collected were identified according to identification keys provided by [14].

The collected samples were shared into plastic containers of about 12cm wide. Two hundred (200) ml of the water collected from the sample site was poured to cover the snails in respective containers.

Snail specimens were exposed to sunlight for 10 – 17 hours daily or to a fluorescent lamp whenever there was any atmospheric weather condition change. This technique enabled the

snail to shed cercariae rapidly and swim to the surface of the water in the container. The numbers of snails shedding cercariae were identified and classified using the protocol outline in [15] and [16].

Data analysis

Differences in the prevalence of infection by age and gender were tested using chi-square (X^2) test. Also, differences in mean egg count between age groups and gender were tested using one-way analysis of variance (ANOVA). All statistical analysis was done using SPSS for windows software version 17.0. Significant levels were tested at $P < 0.05$.

RESULTS AND DISCUSSION

Parasitological findings

A total of 150 school aged children were randomly sampled from in Abini, Biase Local Government Area for the prevalence and intensity of *S. haematobium* infection and associated biochemical variables of the infected urine. The overall mean age and weight were 11.4 years and 29.0kg respectively. Children 3 – 6 years of age were 19 (12.67%) while those 7 – 10 and ≥11years were 36 (24.00%) and 95 (63.33%) respectively.

Overall prevalence of urinary schistosomiasis was 9.3% (n=14). It was observed that males (11.6%) were more infected than females (7.4%) (Table 1). Chi-square analysis showed no significant difference between infection status in males and females ($\chi 2 = 0.859$, $P = 617$). The highest prevalence 10.5% (n=10) was observed among the ≥11years age groups while the prevalence of the infection in those 3 – 6 and 7 – 10 years was 5.2% (n=1) and 8.3% (n=3) respectively (Table 1). The difference in prevalence in age groups was also not significant ($\chi 2=0.834$, $P = 0.727$).

Table 1: Prevalence and intensity of *S. haematobium* infection among school children classified by gender and age

	No. examined	No. Positive(%)	Intensity n (%)		
Gender			Mean egg/10ml (SD)	Heavy Infection	Light Infection
Males	69	8 (11.6)	1.21 (5.62)	2 (2.89)	6 (8.69)
Females	81	6 (7.4)	1.04 (5.44)	1 (1.23)	5 (6.17)
Age Group					
3 – 6	19	1 (5.2)	0.32 (1.38)	0 (0)	1 (5.26)
7 – 10	36	3 (8.3)	2.25 (9.08)	1 (2.78)	2 (5.56)
≥11	95	10 (10.5)	2.90 (10.95)	4 (4.21)	6 (6.32)
Total	150	14 (9.3)	2.35 (8.65)	5 (3.33)	9 (6.00)

The mean egg count of school children was 2.35 ± 8.65 eggs/ 10ml urine. The mean ova count of males (1.21 ± 5.62 eggs/10ml urine) was more than that of the females (1.04 5.44 eggs/10ml urine) but there was no significant difference ($P = 0.76$) in their mean ova count. Children ≥11

years had higher mean ova count than those 3 – 6 years and 7 – 10 years. However, no difference in mean ova count was observed statistically (P = 0.69). The proportion of school children with light infections was 6% and only 3.3% of the school children were heavily infected. Males (8.69%) had light infections than females (6.17%). Also, heavy infections were more prevalent in males (2.89%) than in females (1.23%). In the age groups, those ≥11years had more heavy infection than those 7 – 10years. The same result was observed with light infections (Table 1).

Urine biochemical for haematuria of *Schistosoma haematobium* shows that 3.15% subjects had micro haematuria. Chi square analysis showed significant difference between the level of haematuria and the age groups. For proteinuria, 13.89% of the subjects among the 7-10years age group had moderate level (+1). It was also observed that 4.2% had a +2 level of proteinuria among the >11yrs age groups. Urine pH from this study revealed no abnormality among 73.68% of the subjects while 3.15% had high pH. Specific gravity results revealed 77.7% and 68.42% normalcy among subjects of 7-10 years and >11years age groups respectively.

Snail sampling

Six freshwater bodies were identified and labeled A to F. Evaoke was labeled A, Enoni was labeled B, Ibietroma was labeled C, Ibiegong was labeled D, Ibieoke was labeled E, while Efukpaba was labeled F. The sampling of freshwater snails in the study area (Abini community) revealed the presence of *Bulinus truncatus* with a total number of 132 individuals and percentage prevalence of 37.18%, *Bulinus globosus* recorded 94 (26.48%), and *Lymnaea natalensis* 129 (36.34%) (Table 2).

Bulinus truncatus and *Bulinus globosus* occurred alongside each other in all the sampling stations. *B. truncatus* was observed to be the most abundant snail species found in the study area. The total number of snail species collected from each station revealed that Enoni (site B) and Ibiegong (site D) had the highest number of snails (70 and 69 respectively).

Table 2: The distribution of snail species in various sampling sites in Abini community

Sampled streams	Species of snails collected			Total no. of individuals
	Lymnaea natalensis	*Bulinus truncatus*	*Bulinus globosus*	
A (Evaoke)	10 (18.52%)	23 (42.59%)	21 (38.89%)	54(100%)
B (Enoni)	32 (45.71%)	17 (24.29%)	21 (30.00%)	70(100%)
C (Ibietroma)	11(26.19%)	16 (38.10%)	15 (35.71)	42(100%)
D (Ibiegong)	24 (34.78%)	33 (47.83%)	12 (17.39%)	69(100%)
E (Ibieoke)	22 (34.92%)	27 (42.86%)	14 (22.22%)	63(100%)
F (Efukpaba)	30 (52.63%)	16(28.07)	11 (19.30%)	57(100%)
Total no. (%) of snail species	129(36.34%)	132(37.18%)	94 (26.48%)	355(100%)

In the month of October, number of snails in the streams ranged from 20 to 29 for Ibietroma and Enoni respectively, 13 to 22 in November for Ibietroma and Ibiegong respectively, 9 to 20

in December for Ibietroma and Enoni respectively. There was a significant difference ($p<0.05$) in the monthly and spatial distribution of snails in the sampled streams (Fig. 1).

The examination of the snail species for cercariae revealed that a total of 97 (27.32%) snails shedded cercariae; *L. natalensis* shedded 36 (27.91%), *B. truncates* shedded 34 (25.76%) and *B. globosus* shedded 27 (28.72%). *L. natalensis* shedded the highest numbers of cercariae while the least was recorded for *B. globosus* (Table 3).

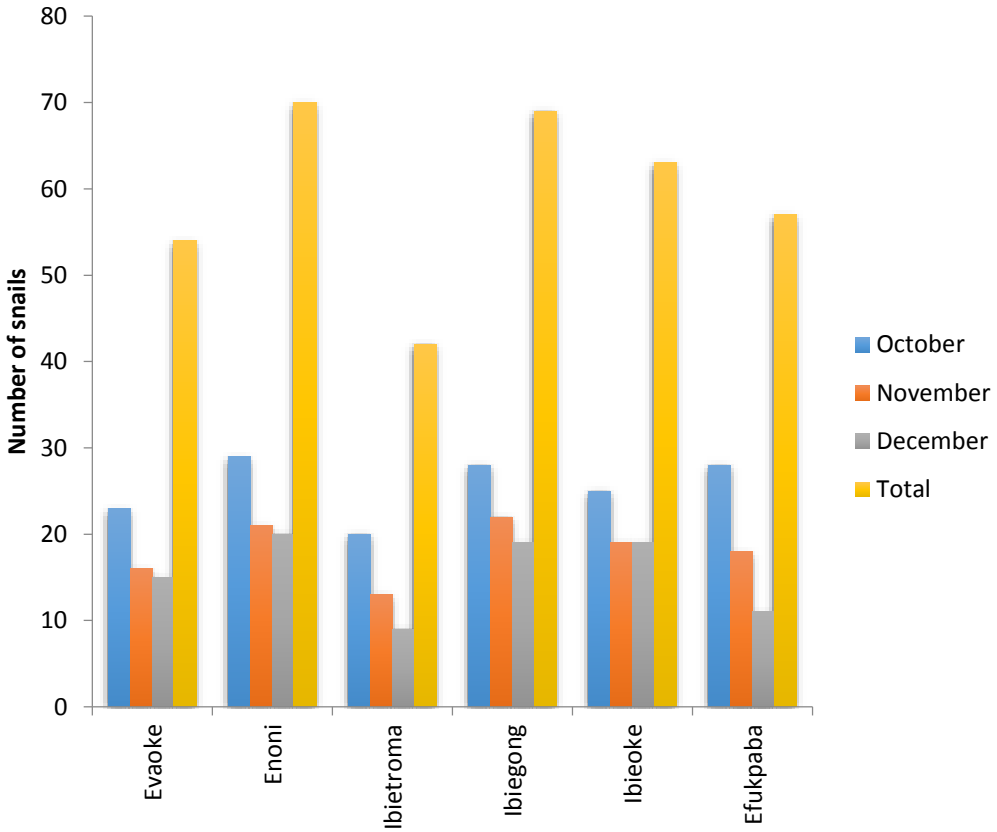

Figure 1: Distribution of snails in sampled streams at Abini community

Table 3: The cercariae shedding potential of the freshwater snails recovered from the various habitats

Species	No. examined	No (%) shedding cercariae	No. of snails shedding cercariae in the various habitats					
			Evaoke	Enoni	Ibietroma	Ibiegong	Ibioke	Efukpaba
Lymnaea natalensis	129	36 (27.91)	4 (40)	6 (19)	8 (73)	5 (21)	7 (32)	6 (20)
Bulinus truncatus	132	34 (25.76)	6 (26)	5 (29)	5 (31)	6 (17)	8 (30)	4 (25)
Bulinus globosus	94	27 (28.72)	3 (14)	9 (43)	2 (13)	5 (42)	2 (17)	6 (55)
Total	355	97 (27.32)	13 (13.40)	20 (20.62)	15 (15.46)	16 (16.49)	17 (17.53)	16 (16.49)

The prevalence rate of 9.3% reveals a high rate of infection and this can be associated with the frequent visit to the water body in this community which happens to be the only means of water supply. This result is however higher than 1.5% and 1.8% observed among school children in

Nkarasi and Edor, rural communities in Ikom LGA of Cross River State [17] and 11.3% from a settlement near the study community [10]. A study from a neighbouring state by [18] also reported a lower prevalence rate of 7.9%.

Though insignificant higher prevalence and intensity of infection in males than females may be attributed to higher cercarial exposure in males as opposed to any kind of sex differences in biological mechanism of resistance or egg output [19]. Males also harboured more eggs than females and this is suggestive that males carry a greater worm burden than females. Similar findings have been reported in previous studies by [20] and [21]. The low prevalence found in school-children 3 – 6 yrs. could be attributed to the fact that this age group are not actively involved in activities that take place at the water contact sites because of their age and inability to swim. The observed increased prevalence with increased age may be attributed to an age dependent increase in activities which increases chances of contact with infection foci. Factors which determine infection prevalence within the community may also cultivate the intensity of infection. The community urinary egg output may also be determined by the infection rate of the snail intermediate host.

The study revealed the presence of three species of snails namely: *B. truncatus*, *B. globosus* and *L. natalensis*. This supports that of [10] who reported widespread occurrence of these snails as intermediate hosts of urinary schistosomiasis in Biase and Yakurr Local Government Areas of Cross River State, Nigeria. *B. truncatus* and *B. globosus* were often found associated with each other in their habitats which had large accumulation of decaying organic matter. This conforms to the previous work of Idris and [22] who reported the co-existence of these snails in their sampling sites and suggested the presence of certain amount of organic pollutants (such as faeces and urine) which favored the abundance of these snails. Also, all the species of snail sampled in the study area were observed to shed brevifurcated cercariae where *L. natalensis* shedded the highest numbers of cercariae while the least was recorded for *B. globosus*. This finding is in line with the findings of [23], [24] and [25] who were of the opinion that shedding of brevifurcated cercariae by snails makes them vectors of pathogens.

CONCLUSION

Urinary schistosomiasis is prevalent in Abini community, Biase Local Government Area, Cross River State. The persistent human water contact activities by the population and the inability to embark on sustainable control measures may further contribute to increase in *S. haematobium* infection and subsequent resurgence of urinary schistosomiasis in the studied community.

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CONFLICT OF INTEREST

There is no conflict of interest.

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