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Preliminary Studies on Urinary Schistosomiasis in Selected Communities in Itu Local Government Area, Akwa Ibom State, Nigeria.

*Ebong, N.E., and Abah, A.E.
Department of Animal and Environmental Biology; Parasitology Unit, Faculty of Science, University of Port Harcourt PMB 5323, Rivers State, Nigeria.
Corresponding Author: Ebong, N.E.

Abstract: *Preliminary study on urinary schistosomiasis was carried out in five selected communities of Itu Local Government Area- Akwa Ibom State. A total of 400 urine samples were collected and analyzed by microscopy using sedimentation method to concentrate the eggs in urine. Structured questionnaire was used to determine the level of awareness about the disease by the residents of the communities, and was analysed using the Chi-square. Out of all the urine samples examined, 8(2.00%) were positive to Schistosoma haematobium. Although more females (2.51%) were infected than the males (1.49%), the difference was not statistically significant (P> 0.05). There were differences in prevalence rate in the communities; Odiok (0.00%), Mbiabong (0.25%), Ntak Inyang (0.38%), Ibiaku (0.38%), and Ayadehe (0.00%), it was not significant (P > 0.05). A total of 190 snail vectors comprising of Bulinus species (13.68%), Biomphalaria species (33.12%) and Lymnaea species (53.12%) were obtained. None of the vectors of schistosomiasis was infected, but Lymnaea species (45.54%) was infected. The physico-chemical parameters of the water bodies included pH (5.7-6.1), DO (3.0mg/L-7.0mg/L), Temperature (31.3^{o}C-31.6^{o}C), BOD (1.8mgO_2/L-5.8mgO_2/L), Salinity (0.02o/oo-0.03o/oo), Conductivity (39µS/cm-59µS/cm), Turbidity (0.8NTU-4.9NTU) and Total Dissolved Solids (28mg/L-42mg/L). The water quality played a major role in snail abundance and infectivity. All other parameters were within the acceptable limits for snail abundance, except temperature and dissolved oxygen and therefore influenced the survival of the vectors. This study has therefore revealed that temperature and dissolved oxygen significantly plays a part in the abundance and infectivity of the vectors of schistosomiasis, which invariably influences the infection rate. From the results, urinary schistosomiasis has a low prevalent rate in these communities.*

Key Words*: Schistosomiasis, Epidemiology, Vector.*

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I. Introduction

Schistosomiasis is one of the Neglected Tropical Diseases and is rated second to malaria infection (WHO, 1993). Urinary schistosomiasis is a global problem and its long term effect can be life threatening. Therefore, it requires the cooperation of the health care givers, policy makers and the entire public to mitigate against the problem. World Health Organization's report on Neglected Tropical Disease has it that the disease has been eradicated in few countries, while many more are still striving hard to attain the same goal. Nigeria records the highest number of about 29 million people with urinary schistosomiasis (Hotez and Kamah, 2009). However, despite the fact that several researches have been done in many aspects of the disease, schistosomiasis as a public health problem is yet to be recognized either because of defective data or insufficient recognition at grassroot level. Thus, it is believed that the rate of spread in Nigeria is far much more than the official estimates (Akogun, 1996). The disease transmission occur as a result of the interplay between parasites, snails and humans and also as a result of environmental, biological, socio-economic and cultural factors (Barbosa,1998). About two-thirds of schistosomiasis infection is caused by Schistosoma haematobium, which results in severe urinary tract infections (VanderWerf *et al.*,2003).. Not much work has been done concerning this disease in the Local Government Area, therefore this work is aimed at determining the epidemiological parameters that brings the disease to play in the communities.

II. Materials and Methods

Ethical Approval

Preceding the start of the research, consent was sought for and obtained from the state's Ministry of Health and Itu Local Government Area Primary Health Care Unit. Official permission was likewise obtained

from the village heads of the communities visited and the Heads of the school where samples were obtained. Five communities were visited; Odiok, Mbiabong, Ibiaku, Ntak Inyang and Ayadehe.

Study area

The research was carried out in five riverine communities in Itu Local Government Area of Akwa Ibom State. The local government has a landmass of approximately 606.10square kilometers. Its population is made up of approximately 127,033 inhabitants- comprising of 67,566 males and 59,467, females with their occupation mainly of fishing and farming. The choice of study area was based on factors such as report of the infection from some primary health care facilities in the area, preliminary field survey of water contact points used by the inhabitants for various activities such as washing clothes, bathing, swimming, sand harvesting activities and prevalent low literacy rate among the populace. The areas are surrounded with several water bodies which serves as a preferred choice of water used by the inhabitants for washing of clothes, bathing, playing, fishing, crop watering etc. The choice of streams visited was based on the frequent use by the people.

Epidemiological consideration

A structured questionnaire was used to obtain information on the socio-demographic characteristics from the respondents. Oral interview was also carried out among the school children, with the assistance of the teachers using the local language, for ease of understanding especially for those who were not able to fill appropriately.

Urine Sample Collection and Analysis

Urine samples were obtained from the consented participants between the hours of 10am-2pm, being the time for maximal egg output (Cheesbrough, 2005). The samples were obtained into wide-mouthed, dry, clean bottles and examined for micro-haematuria using Medi-Test Combi 9 stips. The samples were thereafter taken to the laboratory for microscopic examination using sedimentation technique described by Cheesbrough (2005).

Snail Survey and Analysis

The water bodies in the various study sites were surveyed for the snail hosts. Snail sampling was done using scooping net and rain boat was worn, to avoid being infected. Manual search for the snails was also carried out, and where applicable, it was hand-picked with gloves being worn. It was thereafter, taken to the laboratory for examination. The keys described by Brown and Christensen (1993) coupled with the assistance of the laboratory technologist in charge of malacology, were used in identifying the snail samples. On arrival at the laboratory, the snails were placed in a container and water was added to it, exposed to sunlight for about thirty minutes, to facilitate cercarial shedding. Thereafter, the water was examined under the microscope for cercariae.

Physico-chemical Parameters of the Water Body

Water samples were obtained from each of the study site into a plastic bottle and properly labeled. The samples were then taken to the laboratory for analysis of parameters. In-situ analysis for temperature was carried out using calibrated thermometer.

Data analysis

The data obtained from this research was analyzed using the descriptive statistics comprising of mean, frequencies, percentage, standard deviation using the Statistical Package for Social Science, version 20,after which the result was presented using tables, graphs and charts.

III. Results

Parasitological Surveys

Result of infected individuals

Out of the total samples obtained, only 8(2.00%) were positive to *Schistosoma haematobium* (Table 1). Odiok and Ayadehe communities were negative to the infection. The females were infected more than the males (Table 2).

Table 1: Rate of infection from each community

Community	No. Examined	No Infected	% Positive	P	χ^2
Odiok	76	0	0.00		
Mbiabong	82	2	0.25		
Ntak inyang	72	3	0.38		
Ibiaku	74	3	0.38		

Ayadehe	96	0	0.00		
Total	400	8	2.00	0.141	6.908

Table 2: Rate of infection by age and sex

Age/Sex	**Male**		**Female**			
	No. Examined	**No. Infected (%)**	**No. Examined**	**No. Infected (%)**	**P**	**χ^2**
≤10yrs	39	0(0.00)	36	0(0.00)		
11-15 yrs	64	1(1.56)	60	0(0.00)		
16-20yrs	50	2(4.00)	53	2(3.77)		
21-25yrs	40	0(0.00)	37	3(8.10)		
≥26yrs	8	0(0.00)	13	0(0.00)	0.315	4.738
Total	201	3(1.49)	199	5(2.51)		
P	0.466					
χ^2	0.531					

Urine Clinical Chemical Tests among Participants

Macroscopically, the samples ranged from clear, cloudy and pale to dark yellow in colour and tested chemically, using the standard test strip (Combi-9). Result of analysis showed reaction to pH (8.50%), followed by protein (7.75%) and other constituents (Table 3).

Table 3: Result of urine chemical tests

	Communities					
Pathological indicators	**Odiok**	**Mbiabong**	**Ntak Inyang**	**Ibiaku**	**Ayadehe**	**Total**
Proteinuria	0(0.00)	4(4.88)	7(9.72)	4(5.40)	16(16.66)	31(7.75)
Haematuria	5(6.57)	6(7.32)	0(0.00)	2(2.70)	4(4.17)	17(4.25)
Ketone	0(0.00)	0(0.00)	1(1.38)	0(0.00)	0(0.00)	1(0.25)
Ascorbic acid	1(1.32)	0(0.00)	2(2.77)	0(0.00)	1(1.04)	4(1.00)
pH	6(7.89)	4(4.88)	10(13.84)	8(10.81)	6(6.25)	34(8.50)
Urobilinogen	0(0.00)	2(2.44)	4(5.55)	0(0.00)	0(0.00)	6(1.50)
Nitrite	0(0.00)	0(0.00)	2(2.78)	2(2.70)	3(3.13)	7(1.75)
Total	12	16	26	16	30	100

Predisposing Factors Associated With the Disease

The questionnaire approach, gave an idea on the possible causes of the infection and also the level of awareness about the infection in these communities. The major toilet facility available to all the communities is the pit toilet except Ntak Inyang where open defecation is mainly practiced (Figure 1). Most of the inhabitants have their source of drinking water from the stream, (Figure 2) and water contact is mainly for washing purpose, followed by bathing and playing (Figure 3).

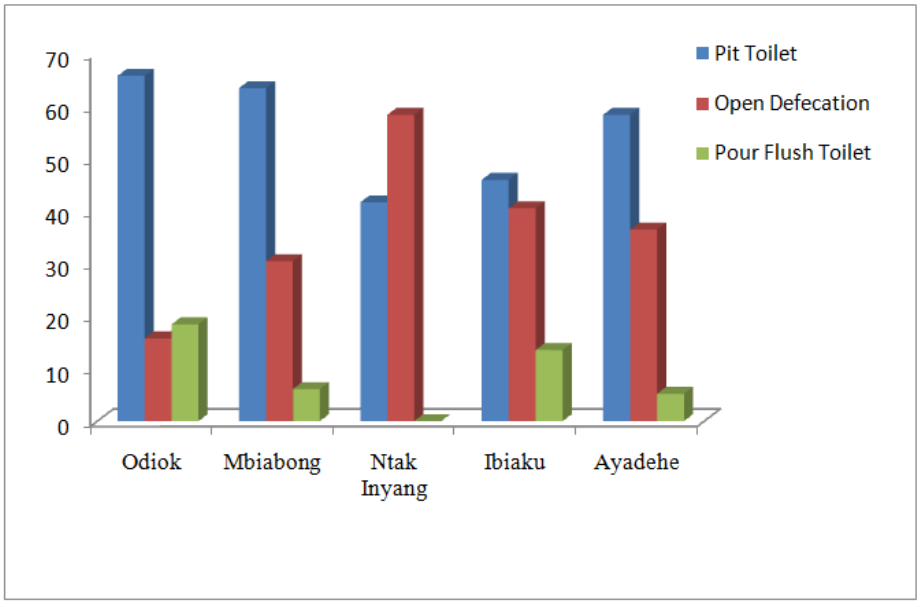

Figure 1: Toilet type used in the communities

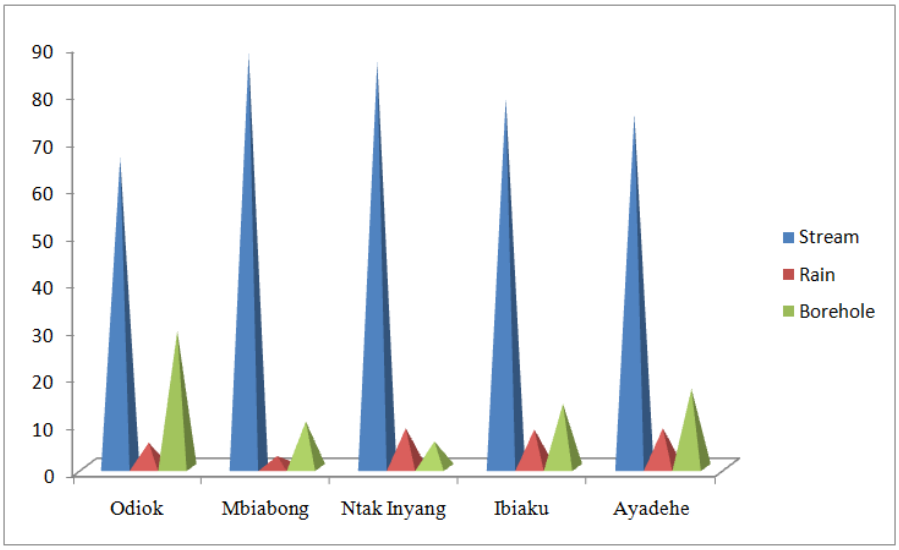

Figure 2: Sources of drinking water

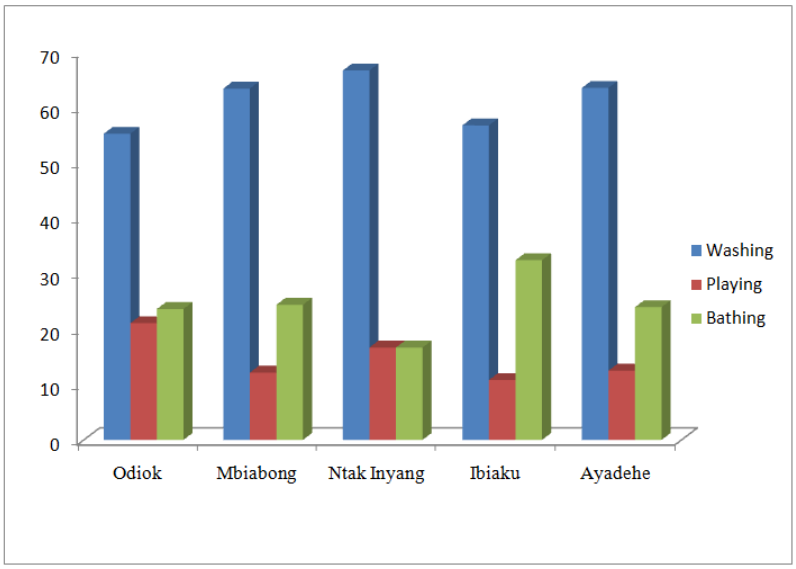

Figure 3: Water contact activities

Snails Collected

A total of 213 snails were collected from this study from January-June. The snails were 26 *Bulinus species*, 63 *Biomphalaria species*, 101 *Lymnaea species* and 23 *Pila ovata*. In the dry season of (January-March), 20 snails were collected comprising of 13 *Biomphalaria species* and *7Pila species*; while 26 *Bulinus species*, 50 *Biomphalaria species*, 101 *Lymnaea species* and 16 *Pila ovata* were obtained during the wet season of April-June (Table 4). *Pila ovata* though a freshwater snail, is not a vector of any helminthic infection and thus, was not considered. These snails were mostly found attached to the river banks and on the underneath of leaves. This vegetation serves as a source of nourishment to the snails as well as shelter from the prevailing environmental condition.

Table 4: Snails Collection from the Study Area

Months	**Odiok**				**Mbiabong**				**Ibiaku**				**Ntak Inyang**				**Ayadehe**				**Total**
	Bu	Bi	Ly	Pi	Bu	Bi	Ly	Pi	Bu	Bi	Ly	Pi	Bu	Bi	Ly	Pi	Bu	Bi	Ly	Pi	
Jan-March	0	11	0	0	0	2	0	0	0	0	0	5	0	0	0	0	0	0	0	2	20
April-June	0	13	0	5	16	22	7	7	10	8	12	0	0	0	82	0	0	7	0	4	193

Total	0	24	0	5	16	24	7	7	10	8	12	5	0	0	82	0	0	7	0	6	213

Key: Bu= *Bulinus species*
Bi= *Biomphalaria species*
Ly= *Lymnaea species*
Pi= *Pila ovata*

Physico-Chemical Parameters

Relationship between water quality and number of snails collected

The pH values for the streams surveyed ranged from 5.7 to 6.1 within the communities; Dissolved Oxygen (DO) ranged from 3.0 to 7.0; BOD was very low in Ntak Inyang community and high in Mbiabong community. The values for other parameters are presented in Table 5.Each of these parameters contributed in the increase and decrease of the snail vectors encountered in this study. *Lymnaea species* being the vector of fascioliasis was the most abundant of the snails found, followed by *Biomphalaria species* and *Bulinus species* was least abundant.

Table 5: **Relationship between snails collected and water quality**

Community	No of snails	water quality values							
	Collected	pH	DO (mg/l)	BOD_5 (mg O_2/l)	Salinity (o/oo)	Temp (°C)	Conduct. (µS/cm)	Turb (NTU)	TDS (mg/l)
Odiok	24	6.1	6.7	4.9	0.02	31.3	49	3.7	34
Mbiabong	47	5.7	7.0	5.8	0.03	31.5	59	0.8	42
Ibiaku	30	6.0	6.7	3.3	0.02	31.5	53	1.2	36
Ntak Inyang	82	6.1	3.0	1.8	0.02	31.5	39	2.5	28
Ayadehe	7	6.1	6.1	3.7	0.02	31.6	40	4.9	28

Snail infectivity during the study

Out of the 190 trematode snails found, 26(13.68%) were *Bulinus species*, 63(33.12%) *Biomphalaria species* and a greater number of 101(53.12%) were *Lymnaea species* (Table 6). The vectors of schistosomiasis did not harbour the infective stage of the parasite, but Lymnaea species were infected with flatworms.

Table 6: Infection rate of snail species

Species	**Number Collected (%)**	**Number Infected (%)**
Bulinus species	26(13.68)	0(0.00)
Biomphalaria species	63(33.12)	0(0.00)
Lymnaea species	101(53.12)	46(45.54)
Total	190	46(24.21)

IV. Discussion

The discrepancy in male and female infection may reflect the extent of sensitization and host response to the invading parasite and also the level of the worm burden in the individual subjects. Studies of Etim (1998) on water contact activities and schistosomiasis among women in a rural community indicates that women are more severely infected than men, due to educational and economic backwardness.

Abnormality in urine ranging from macroscopic study to clinical chemistry tests could be an outcome of factors such as abnormal constituent, UTI in which the urine becomes cloudy due to pus cells, parasite. Several abnormal constituents observed in the urine of participants included blood, protein, urobilinogen, nitrite, pH, ketone. Jane (2014) recorded similar constituents in patients tested both positive /negative to schistosomiasis. Proteinuria and haematuria are important indicators often used for the rapid evaluaton of schistosomiasis in epidemiological findings (Nnoruka, 2000). Incidence of negative egg count among proteinuria and/or haematuria positive persons may have resulted from ova being absent due to periodic schistosome egg output which peaks about midday.

From this study, although most of the communities suffered from factors which could fast track the infection such as (low literacy rate, improper sewage disposal, lack of awareness, lack of potable water), yet there was a low prevalent rate of the disease. This work agrees with that reported by Ojurongbe *et al*., (2014), Okpala *et al.*, who recorded low prevalence of 0.6% and 0.67% in Osun state and Plateau states respectively. However, it differs from other researchers view who reported higher prevalence rate in their study; Okpala, Nwobu and Chukwubike (2002), Okpala, Nwobu, Agba and Akor (2003), Mordi and Ngwodo (2007). The low prevalence in this study may be owed to the gradual move from a typical rural setting into embracing a transformation in lifestyle in terms of development. Here, although the inhabitants visit the stream, there is an improvement in their source of water supply. Similarly, the snail vectors were not harbouring the infective form of the parasite, and so the people who had contact with the water were not infected. This is alike with the findings of Herbert (2010).

The temperature contrasted to the accepted limits and thus greatly affected the survival of the vectors. Physico-chemical parameters of a water body and biological factor such as predator-prey interaction, food availability, have been strongly identified to affect any biotope of a freshwater habitat. The best temperature for the continued existence of aquatic snail is 22-26^{o}C and at higher temperature, hatching and survival decreases (Madsen, 1985). The temperature range of this study was 31.3^{o}C-31.6^{o}C and is far much higher than the standard range. Madsen, 1985 also stated that temperature above 30^{o}C reduces egg production in the snail vectors of schistosomiasis, due to pathological changes in its reproductive system. Similarly, Hofkins *et al*., 1991 also affirmed that high temperature causes thermal stress on vectors of schistosomiasis. *Lymnaea species* was mostly abundant and could probably be due to the reason given by Njoku-Tony (2007), stating that *Lymnaea species* tolerates a high temperature medium in comparison to the vectors of schistosomiasis.

The disparity in connection between snail abundance and pH values is so far not really known. Kahigi (2000) reported that pH may not actually be a determinant in snail abundance. The pH value was from 5.7 to 6.1. This value is related to that obtained by Ayodeji (2017). The DO value was lower in Ntak Inyang (3.0mg/L) and spanned from 6.1mg/L to 7.0mg/L in other communities. This shows why no vector of schistosomiasis was found in that community, rather only *Lymnaea species*. Conversely, DO values in other communities were to some extent higher than the WHO standard of 5.0mg/L, and this could have led to the low abundance of the vectors. This study has showed that temperature and DO significantly play a role in snail abundance and infectivity, even though other parameters fall within the acceptable range for snail reproduction.

Effect of the physico-chemical parameters of the water, might be one of the reasons why the snails did not shed cercariae and thus decreasing the rate of infection in the area. *Bulinus* and *Biomphalaria species* were not infective, but some of the *Lymnaea species* were infected. This is similar with work done by Isabwe (2012) and Ibrahim (2007). However, this work is different from that conducted in Bauchi and Kaduna states, by Usman *et al* (2017) and Ayanda (2009) respectively, who recorded larger numbers of schistosome snails, with *Bulinus species* as the abundant and infective.

V. Conclusion

This study has revealed the occurrence of snail hosts of schistosomiasis and fascioliasis in the study areas, the effect of physico-chemical parameters of the water body and other biological factor in the transmission of the disease as well as the reason for the low prevalence rate of this snail borne disease in these communities. With the poor level of awareness of this disease and the sanitary conditions in these communities, it could give rise to other parasitic infections. Hence, there is need for a combined intervention- vector control, health education programmes (to improve knowledge and enhance health- care seeking behaviours), provision of good water supply, which will be most cost effective.

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