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(RESEARCH ARTICLE)

Prevalence of urogenital schistosomiasis among reproductive women and children in Yenagoa Metropolis, Bayelsa State, Nigeria

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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. This study was conducted between March and November, 2021 to determine the prevalence of *urogenital schistosomiasis* among reproductive women in three (3) communities (Biseni, Okordia and Zarama) in Yenagoa metropolis, Bayelsa State, Nigeria. A total of two hundred (200; Biseni 70, Okordia 70 Zarama 60) Mid Stream Urine (MSU) samples collected were immediately taken to Medical Microbiology Laboratory unit, Niger Delta University and analyzed 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 200 urine samples examined, 50(25.0%) were tested positive for *Schistosoma haematobium*. The age- related infection showed that the age-group 19-30 years had relatively the highest (18, 36.0%) rate of infection, followed by 12-18 years 16 (32.0%), age-group (31-40)(6, 12%) and age group (41-50) years had (10, 20.0%) infection rate while the most infected community was Zarama with percentage prevalence of 40.0, followed by Okordia 36.0 and the least was Biseni 24.0. Observation showed that farmers had the highest prevalence of 30.6%, house wives 29.7%, Traders 24.5%, Students 22.9% and the least was Civil servants 14.7%. *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, and fishing) and harvesting of freshwater snails. Variance (ANOVA) of the age- specific prevalence of *urogenital schistosomiasis* in the three communities showed no significant difference among the study population at $P<0.05$ and also across the infected population in the three communities. In conclusion, this study has revealed the existence of *urogenital schistosomiasis* in these three (3) study communities in Bayelsa state, hence health education and provision of safe water should be stepped up as a control measure of the infection in the area.

Keywords: Schistosomiasis; *Schistosoma haematobium;* Prevalence*;* Women*;* Children Urine sample

1. Introduction

Schistosomiasis or *bilharziasis* is a disease caused by parasitic worms or parasites named *Schistosoma haematobium* that lives in freshwater snails of the species *Bulinus africanus*, *Bulinus trancatus*, *Bulinus glabosus* and *Bulinus forskalii*. In the life cycle of the parasite, the miracidia stage is formed inside the snail and migrate out to form cercaria which then penetrate man and establish infection. The disease is considered a Neglected Tropical Disease (NTD) and mainly affects developing countries where water resources are poor and inadequate, also in areas where sanitation is poor to allow growth and infection of snails. Over 200 million people had suffered from this infection '*Schistosomiasis*', with death of many recorded annually according to World Health Organization. This is a common disease in Sub Saharan region of Africa including Nigeria (Bayelsa State) due to bad supply of portable water and the nature of occupation especially the fishermen who have contact with river water; this exposes about 436 million people to risk of being infected with Schistosoma haematobium. Morbidity of schistosomiasis is low with high infection rate in endemic regions due to poor nutritional status, cognitive processes and sometimes complications that require surgical operations. Children of school

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age, women of child bearing age, fishermen, farmers and other occupations; rice field workers, car washers, people in irrigation canals that have contacts with water are at higher risk of this infection. Schistosomiasis in women may affect the reproductive health resulting into a condition known as Female genital schistosomiasis, a clinical attribute of schistosomiasis characterized by the existence of schistosome eggs and worms in the genital organs; this may present with a range of signs and symptoms including lesions of the cervix and vagina, vaginal bleeding, pain during sexual intercourse and nodules in the vulva. These lesions may render the person susceptible to HIV. [1] (WHO)'s working group reported biological plausibility of a possible link between female genital schistosomiasis and HIV acquisition in women; the condition that could lead to defect in pathological blood vessels resulting into decrease fertility, abortion, abnormal discharge and bleeding. The disease can come up with sign of haematuria (macro and micro) accompanied by underlying fibrosis of the bladder and ureter, burning sensation in micturition, associated suprapubic discomfort or pains [2]. The first known case of infection was discovered in 2014, belonging to a child who lived 6200 years ago [3], Silver, a Brazilian parasitologist was the first to describe the entire disease cycle in 1908 [3, 4]. The female worms lay the eggs which are discharged in urine and the cycle continues [5]. Studies by Ekpo and his research group [6] and [7] Biu reported high prevalence in a community near Abeokuta and Kondaga local government area in North eastern respectively, while a study done by [8] in Gwong and Kabong Jos North local government area in plateau state reported a low prevalence and stated that geographic spread continues because of water resource engineering issues in developing countries and the migration of infected populations [9].A majority of the Nigeria (Bayelsa state) population both in urban and rural areas are exposed to the parasite due to lack of clean water for to carry out their daily activities and for a proper counseling on Neglected Tropical Diseases control program to include other at-risk groups such as women of reproductive age in endemic areas in mass treatment programs, or to look for alternative control measures, there is a need to obtain accurate and adequate information on the disease distribution in these other population groups. This study aims to determine the prevalence of Schistosoma haematobium infection in women of reproductive age in the villages across the irrigation areas of Biseni, Okordia, and Zarama in Yenagoa metropolis Bayelsa state, (Nigeria).

2. Material and methods

2.1. Study Area

A cross sectional study was carried out in three different communities in Yenagoa metropolis, Bayelsa state, Nigeria amongst women of reproductive age, from (Biseni, Okordia and Zarama) Biseni (Oluorua, Afa, Okusuoba, Piyun, Zaio), Okordia (Sam, Azari, Oyeli, Kpaikpi, Odiodi), and Zarama (Yowou, Kaladunu, Poie and Sabebe). These communities are surrounded by lakes where the inhabitants exhibit linear settlements from their daily domestic, socio-economic, fishing and agricultural activities. This study was carried out in different selected occupational areas (lakes) amongst women of reproductive age in Yenagoa metropolis which lies geographically in the central regions in Bayelsa state, Nigeria. The lakes in Okordia village lies about (25-45) mm distance from the village, Biseni lakes lies about (20-50) mm distance away from the village, Zarama lakes lie about (20- 35) mm distance away from the village. The population of women of reproductive age in each area (called camp) is about 30% and total figure of 200. The major sources of water in these areas are the lakes which are used for domestic, occupational and recreational purposes such as drinking, bathing, farming and swimming.

2.2. Methods

2.2.1 Sampling and Sampling Techniques

Two hundred (200) samples were collected from all the camp (lakes) include Biseni 70 (35%), Okordia 70 (35%) and Zarama 60(30%) .The required sample size was determined using a single population proportion formula and assuming a 58.1%proportion of urinary *schistosomiasis* from previous study by (6).

One-way ANOVA test statistics formula:

$$F = MST/MSE$$

$MST = SST/p - 1$
$MSE = SSE/N-p$
$SSE = \Sigma (n - 1) s2$
Where
F = ANOVA Coefficient
MSB = Mean sum of squares between the groups
MSW = Mean sum of squares within the groups
MSE = Mean sum of squares due to error

SST = Total sum of squares
p = Total number of populations
n = The total number of samples in a population
SSW = Sum of Squares within the group
SSB = Sum of squares between the groups
SSE = Sum of squares due to error
s = Standard deviation of the samples
N = Total number of observations

Therefore with 5% attrition rate, two hundred (200) women of reproductive age ranges from 12-50 years, mid steam urine samples collected were examined from the three different communities (Biseni, Okordia and Zarama) in this study.

2.3. Sample Collection

A total of 200 participants' Mid-Stream Urine (MSU) samples collected from the three communities who agreed to be part of the study were examined for the presence of *Schistosoma heamatobium* ova. 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 study population (farmers, fishermen, civil servant and housewife and students) who are between ages of 12 and 50 years.

2.4. Sample Analysis

Urine samples were macroscopically examined for colour, appearance and presence of blood. 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 minutes. 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 terminal spine *Schistosoma haematobium* eggs.

2.5. Snail Identification

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

2.6. Data Analysis

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

3. Results and discussion

A total of 200 consented participants were examined in this study. Fifty (50, 25%) were found to have *Schistosoma haematobium* infection in their urine with prevalence of 25%. The age-groups 19-30years (18, 36.0%) was observed to have the highest prevalence in the study followed by 12 - 18years (16, 32.0%). 31 - 40 years (6, 12.0%) and 41-50years had 10 (20.0%). (Table 4.1) The result showed no significant difference at $P<0.05$ ($P=0.082$) among study population. Also, there was no significant difference at $P<0.05$ ($P=0.55$) across the infected population in the three [3] communities. ANOVA comparing the sampled populations across the Three (3) communities showed significant difference with the infected population. (Table 4.2). The prevalence rate show that the age group (19-30) years tested positive for *Schistosomiasis* haematobium had the highest infection rate than the other age groups in this study. There was significant difference in the specific prevalence *Schistosomiasis haematobium* infection between the study and infected subjects at $P< 0.05$ ($P=0.029$).

(Table 3.) The results obtained shows that the prevalence of urogenital *schistosomiasis* infection in relation to occupation was highest among farmers (30.6%) followed by house wives (29.7%); Traders (24.5%); Students (22.9%) and the least was Civil servants 14.7%. (Table 4.4) *Bulinus globosus* was the snail intermediate host seen and identified in the number of ponds and steams visited in the three communities, which is responsible for the transmission of

urogenital schistosomiasis Figure 4.0: Bar Chart showing percentage prevalence of the study communities (Biseni, Okordia, and Zarama) based on their age range.

Table 1 Age group specific prevalence of *UnogenitalSchistosomiasis* Infection in the three communities (Biseni, Okordia and Zarama) among reproductive women in Yenagoa metropolis of Bayelsa state, Nigeria

S/N	Age Group In years	Besini		Okordia		Zarama		Total No. Examined	Total No. Infected	Prevalence Rate in (%)
		N. E	N. I	N. E	N. I	N. E	N. I			
1	12 – 15	8	0	9	3	8	1	25	4	16.0
2	16 – 19	8	3	14	6	11	7	33	16	48.5
3	20 – 23	15	3	11	3	10	6	36	12	33.3
4	24 – 27	11	3	12	1	8	1	30	5	16.7
5	28– 31	5	0	7	3	3	1	15	4	26.7
6	32 – 35	8	0	3	1	2	1	13	2	15.3
7	36 - 39	3	2	5	0	4	1	12	3	25.0
8	40 - 44	6	1	2	1	4	2	12	4	33.3
9	45 - 48	2	0	1	0	5	0	8	0	0.0
10	49 - 51	4	0	6	0	5	0	16	0	0.0
	Total	70	12	70	18	60	20	200	50	25.0

Key: N.E = Number Examined; N.I = Number Infected

Table 2 Occupational Specific Prevalence of UrogenitalShistosormasis among reproductive women in the three communities (Biseni, Okordia and Zarama) in Yenagoa metropolis, Bayelsa State

S/N	Occupation	Besini		Okordia		Zarama		Total No. Examined	Total No. Infected	Prevalence Rate in (%)
		N. E	N. I	N. E	N. I	N. E	N. I			
1	Farmer	16	4	15	5	18	6	49	15	30.6%
2	Trader	15	2	15	4	15	5	45	11	24.5%
3	Student	10	2	14	3	11	3	35	8	22.9%
4	House wife	15	3	12	4	10	4	37	11	29.7%
5	Civil Servant	14	1	14	2	6	2	34	5	14.7%
6	Total	70	12	70	18	60	20	200	50	25.0%

Table 3 Different Community Specific Prevalence of *UrogentialSchistosomiasis* Infection among reproductive women based on age

Total Age Range Infected (%)							
S/N		No. of Sample	12 – 18	19 – 30	31 – 40	41 – 50	Total Prevalence Rate %
1	Biseni	70	8 (11.4)	8 (11.4)	2 (2.9)	5 (7.1)	65.1
2	Okordia	70	5 (7.1)	5 (7.1)	2 (2.9)	3(4.2)	56.5
3	Zarama	60	3 (5.0)	5 (8.3)	2 (3.3)	2(3.3)	33.0
	Total	200	16 (8.0)	18 (9.0)	6 (3.0)	10 (5)	25.0

Table 4 Identification of water snail in the three (3) different study communities in Yenagoa metropolis, Bayelsa state

S/N	Communities	No. of Ponds/ Lakes	Snail Species Identified	No. of Streams	Snail Species Identified
1	Besini	5	*Bulinusglobusus*	2	*Bulinusglobusus*
2	Okordia	5	*Bulinusglobusus*	2	*Bulinusglobusus*
3	Zarama	4	*Bulinusglobusus*	2	*Bulinusglobusus*

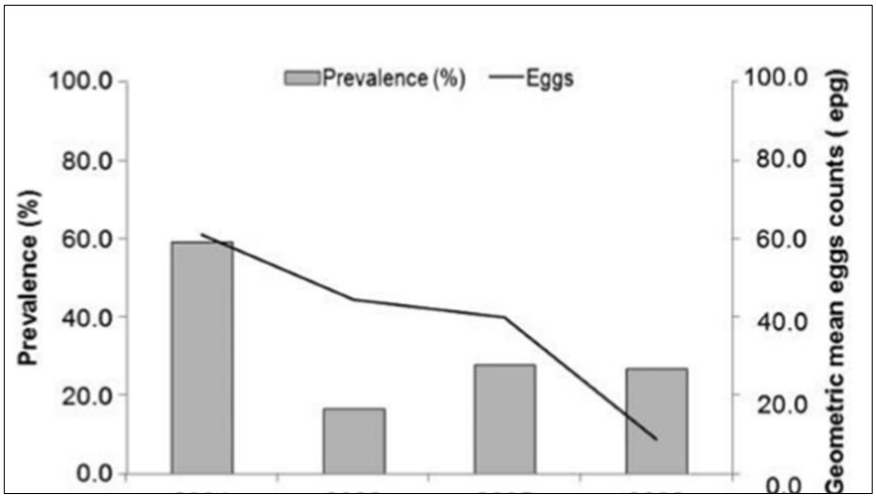

Figure 1 The Study was done in Yenagoa Metropolis, (Biseni, Okordia and Zarama) Bayelsa state among women of reproductive age from the age of (12 – 50) years. As urine samples were collected from them, the result shows that schistosoma infection was relatively high among the age group of (19 – 30) years than the other age groups

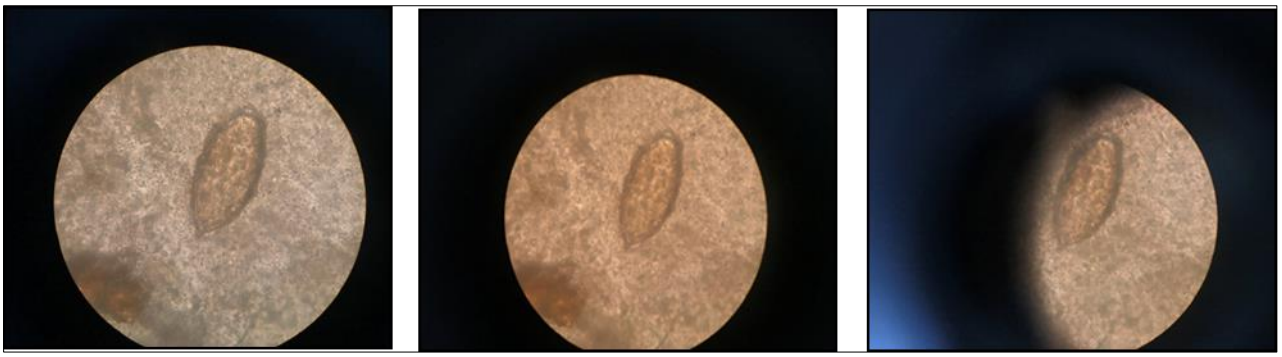

Figure 2 Samples of Microscopic slides showing the ova of *schistosomiasis haematobium* from the study population

4. Discussion

The results from this study indicate that *urogenitalschistosomiasis* is endemic in the three [3] (Biseni, Okordia and Zarama) communities in Yenagoa metropolis Bayelsa State, Nigeria with an overall prevalence of (25%) which is lower than that (42.2%) reported by [10] in Yauri riverine area in Kebbi State, Nigeria; 45.5% reported by (11) among school children in Sarkawa fishing community in Yauri, Kebbi State, Nigeria; and 55.5% by [12] in Abarma village, Gusau, Zanfara State, Northern Nigeria. The finding in this study also shows the higher percentage prevalent of (25%) when compared with the work done by [13] in Abeokuta [14] which reported the percentage prevalence of 22.1% and 19% respectively. Present finding could be as a result of constant contact with polluted water by the inhabitants while

carrying out their daily activities which involve wandering through freshwater streams and ponds that serve as breeding sites for the freshwater snail intermediate host. High prevalence rate of schistosomiasis has been recorded in rural settings and communities surrounded by streams. The infected individuals are likely to be more vulnerable to HIV infection, intramenstral bleeding, and cancer of the bladder. Similar result was reported by [15] and *[16*] who concluded that human *schistosomiasis* infection is found to be the highest among the school-aged children, adolescents and farmers. 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 *Schistosoma 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. Prevalence of infection was higher (18.0%) in age group (19-30) years in all three communities; (Biseni, 12, 24.0%; Okordia18, 36.0% and Zarama, 20, 40.0%) with Zarama preponderance over Biseni and Okordia; this is in line with the study conducted by [17] which showed higher prevalence (20%) among reproductive women in Yenagoa metropolis and state constant contact with polluted water bodies (which serve as breeding sites for the snail intermediate host) triggers schistosomiasis more in some women who engaged in water related activities than the house wives who stay indoors most of the time. With reference to occupation, farmers had the highest prevalence of 30.6% followed by house wives 29.7%, Traders 24.5%, Students 22.9% and the least was Civil Servant 14.7%; this could be as a result of their regular activities with water bodies such as washing, swimming, fishing and defaecating. Center for Disease Control [18] tated 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.

5. Conclusion

The results in this study have revealed that *urogenital schistosomiasis* is endemic in these three communities in Yenagoa metropolis Bayelsa state Nigeria (Biseni, Okordia and Zarama). Primary health care services should be strengthened so that they can bring health education closer to the inhabitants of these communities.

Recommendation

The inhabitants of these communities should be discouraged from using the stagnated water like ponds, and lakes for their domestic activities, instead a clean pipe- borne water should be provided. Campaign on personal hygiene, in collaboration with the educational sector (Ministry of Education) in Bayelsa state, Nigeria 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, and more so there should be a transmission cut off between the intermediate host and the definitive host. Mass campaign should be made to sensitize risk population. Mass treatment with or without diagnosis should be done especially in endemic areas. Sample sent for urinary tract infections analysis should also be invested for the presence of *Schistosoma haematobium* eggs, especially when patients show signs and complain of similar to that *urogenital schistosomiasis*.

Prevention

Preventive measures include

- Curbing the pollution of water with human urine.
- Eradication of the molluscs host in the endemic areas.
- Avoidance of wading, swimming, bathing or washing in infected water.

Effective treatment of infected persons and people at risk to lessen the likelihood of water population and prevalence. (Arora et al., 2010).

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No Conflict of Interest declared

Statement of ethical approval

Ethical approval was sought from study individuals and the general chief of the study communities.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study. This is not a case study, but an experimental work where only urine samples were obtained from the study individuals

Authors' contributions

OAO & BKE designed and conducted the experiment; OMO analyzed the data and vetted the overall results.

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