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Epidemiology of Urogenital Schistosomiasis among Primary School Children in Anam Community, Anambra State, South Eastern Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The study was aimed at investigating the prevalence, intensity and risk factors associated with urogenital schistosomiasis transmission among primary school children.
Study Design: This study is a cross-sectional, school-based, descriptive study.
Place and Duration of Study: Central school Umueze Anam, Community primary school Mmiata Anam and Unity primary school Umuoba Anam Otuocha, between April and October 2023.
Methodology: A total of 303 primary school children(4-15years) 150(49.5%) males, 153(50.5%) females were randomly selected for the study from three primary schools. Three hundred and three fresh urine samples were collected and examined for microhaematuria using reagent strips Meditest Combi-9 and examined for *S. haematobium* egg using sedimentation technique by centrifugation and microscopy. Structured pre-tested questionnaires were used to determine the socio-demographic

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and risk factors associated with urogenital schistosomiasis. Prevalence and intensity were calculated. The relationship between each variable and *schistosoma* prevalence was analyzed using Chi square. Test of statistical significance was set at *P*-value of 0.05 (95%) confidence interval.

Results: Of the 303 school children 150(49.5%) males and 153(50.5%) females examined microscopically, an overall prevalence of 53(17.5%) urogenital schistosomiasis was observed. The observed prevalence was higher in males 36(24.0%) than females 17(11.1%), males had the highest mean egg intensity of 28.97 than the females 24.52 per 10ml of urine, though they all had light intensity of infection. School children between 8-11 years old had the highest prevalence of the infection 23(22.5%) followed by those in age group 4-7 years old 17(17.3%). Age group 12-15 years old had the highest mean egg intensity of 26.52 followed by age group 8-11years old with 20.23 per 10ml of urine. When the prevalence associated with risk factors was assessed; with regard to parental occupation, pupils whose parents were fishermen had the highest prevalence of the infection 22(30.1%), followed by those whose parents were farmers 17(17.3%). Mean egg intensity was highest among pupils whose parents were fishermen 28.34 per 10ml of urine. With regard to literacy level, Pupils whose parents had no form of formal education had significantly highest prevalence (39.1%). With regard to source of water for the household, those who source their water from the river statistically had the highest prevalence of urogenital schistosomiasis 45(23.7%).

Conclusion: The study revealed that urogenital schistosomiasis affects primary school children in Anam, Anambra State. There is need for more school-based chemotherapy; health education programme and intervention in the form of sinking boreholes and pipe- borne water that will help reduce the risk of urogenital schistosomiasis in Anam community.

Keywords: Urogential schistosomiasis; prevalence; intensity; S. haematobium; schoolchildren; anam-Nigeria; urine samples; water-borne infection.

1. INTRODUCTION

"Schistosomiasis, also known as bilharziasis is a water-borne infection. It is one of the most common parasitic diseases in the world that is of global public health importance" [1]. "Schistosomiasis is the second most devastating tropical disease in the world, causing mortality and morbidity for developing countries" [2]. "It is estimated that 779 million people are at risk of infection, and about 250 million people are currently infected" [3]. "Schistosomiasis is particularly abundant among people living in rural or deprived urban or peri-urban settings" [1]. "These populations typically have low socio-economic status with limited access to clean water and with inadequate sanitation provision" [4]. "More than 207 million (85%) people, who live in Africa are infected with schistosomiasis and an estimated 400 million people are at risk of infection in 76 countries where the disease is considered endemic, as their agricultural work, domestic chores and recreational activities expose them to infested water" [1]. "The Global Burden of Disease study of 2010 attributed some 3.31 million disability-adjusted life years (DALYs), while globally, 200,000 deaths are attributed to schistosomiasis annually" [1]. "Five species of the genus *Schistosoma* pathogenic to man are *S. haematobium*, *S. mansoni, S. japonicum, S. intercalatum* and *S. mekongi"* [1]. "*Schistosoma haematobium* is found in the venule surrounding the bladder and urether causing urogenital schistosomiasis which is characterized by bloody urine, lesion of bladder, kidney failure and bladder cancer in children" [1].

Urogenital schistosomiasis Infection occurs when humans come in contact with fresh water that contains free swimming larval forms (cercariae) of the parasite. The availability of surface water enhances the development of high snail (Bulinus spp) population and the availability of a suitable intermediate host and contaminated urine from humans determines the endemicity of the species of schistosomes [5]. The parasite is mostly transmitted during bathing, swimming, washing clothes, fishing, agriculture, domestic and private works in contaminated water [1]. Following infection, the cercariae transform into schistosomulae which travel through the blood stream for several days before they differentiate into male and female worms and unite. Adult worms reside in the vesicle plexus and veins of the ureter and oviposition commences and continues until the worms die. Some eggs are passed into the bladder and excreted in urine while others are trapped in the tissues surrounding the worms. This gives rise to acute granulomatous responses which is the primary cause of morbidity. When the eggs passed out in the urine reaches a freshwater body, they hatch

and release tiny miracidia that infect suitable aquatic snail intermediate hosts. The miracidium swims ceaselessly for one to two hours in suitable conditions. When the miracidium enters the snail host, it sheds its epithelium and begins development into a sporocyst. There is no redial generation. The sporocysts mature into cercariae and are shed by the snails into the water from where they penetrate the legs or other parts of humans either during swimming, bathing or carrying out domestic chores in the water [1].

Statement of problem: Urogenital schistosomiasis is a devastating disease with heaviest impact on the health of school children. Some urinary tract abnormalities associated with *S. haematobium* infections include the presence of blood in the urine and presence of protein in urine. The early signs of morbidity common to *S. haematobium* infection and which manifest in school age children are anaemia, impaired growth, poor cognition and substandard school performance.

Justification of the study: primary school children are highly vulnerable to urogenital schistosomiasis infection because they are at a critical stage where they are more likely to engage in water related activities, increasing their risk of schistosomiasis infection. Anam town is a rural and riverine community where poverty, ignorance, suitable snail intermediate host thrive in their waters, as well as inadequate sanitary conditions and lack of functional health facilities abound. It is an agrarian and fishing community that regularly expose the people to infested waters and subsequent cercarial infestations. Their major source of water for drinking and domestic purposes is the unprotected Omambala river and its tributaries.

Diagnosis: The diagnostic method for urogenital schistosomiasis is the microscopic detection of the parasite eggs in urine [6]. “However, parasitological diagnosis of urinary schistosomiasis in adults is difficult, particularly among persons who have chronic infections and pass only small numbers of eggs” [6]. “This fact has resulted in clinicians resorting to rectal biopsy for diagnosis of *Schistosoma mansoni* and *Schistosoma haematobium* infections. A variety of diagnostic procedures to detect urinary schistosome infection have been compared. These procedures include tests for circulating antigens, specific antibody testing, egg detection, haematuria, and ultrasound scans of the urinary tract. However, the diagnostic performances of these techniques are variable and it is difficult to set anything like a “gold” standard in areas with variable *S. haematobium* prevalence. Recently, polymerase chain reaction (PCR) assays have shown potential as an effective method for the detection of parasite DNA in saliva and urine” [7].

Treatment: Praziquantel, a pyrazino-isoquinoline derivative has been shown in randomized controlled trials to be a very safe oral drug for treatment of schistosomiasis caused by the various schistosome species [8]. It is mainly available as 600mg crystalline tablets, but the generally recommended dosage is 40mg/kg body weight in a single dose [9]. Also, 600m/5ml syrup is available for small children [10]. Praziquantel is still the best drug for combating infections from all five species of schistosomes afflicting humans with a cure rate of 60%-90% in various epidemiological settings [11].

Prevention and control: The control of urogenital schistosomiasis is based on large-scale treatment of the risk population groups, access to safe water, improved sanitation, hygiene education and behaviour change, and snail control and environmental management [1].

Objectives of the study: The specific objectives of the study were to determine;

- The prevalence and intensity of urogenital schistosomiasis among the primary school children in Anam community.
- The risk factors associated with urogenital schistosomiasis transmission in the study area including water contact activities.

2. MATERIALS AND METHODS

2.1 Study Area

This study was carried out in Anam, a community that spreads into Anambra East and West Local Government Area (LGAs) of Anambra State. Anambra East and West are among the 21 LGAs of Anambra State, South East, Nigeria. Geographic coordinates of Anam lies between latitude 6o6’N and 6o45’N, longitude 6o6’E and 6o59’E, latitude6o12’N and 6o45’N, longitude 6o39’E and 6o59’E with an altitude of 147m (Fig. 1). It has tropical rain forest vegetation. The climate is humid and the humidity is highest between March and November. The rainy season (from April till October) and dry season (from November till April) are the only weather

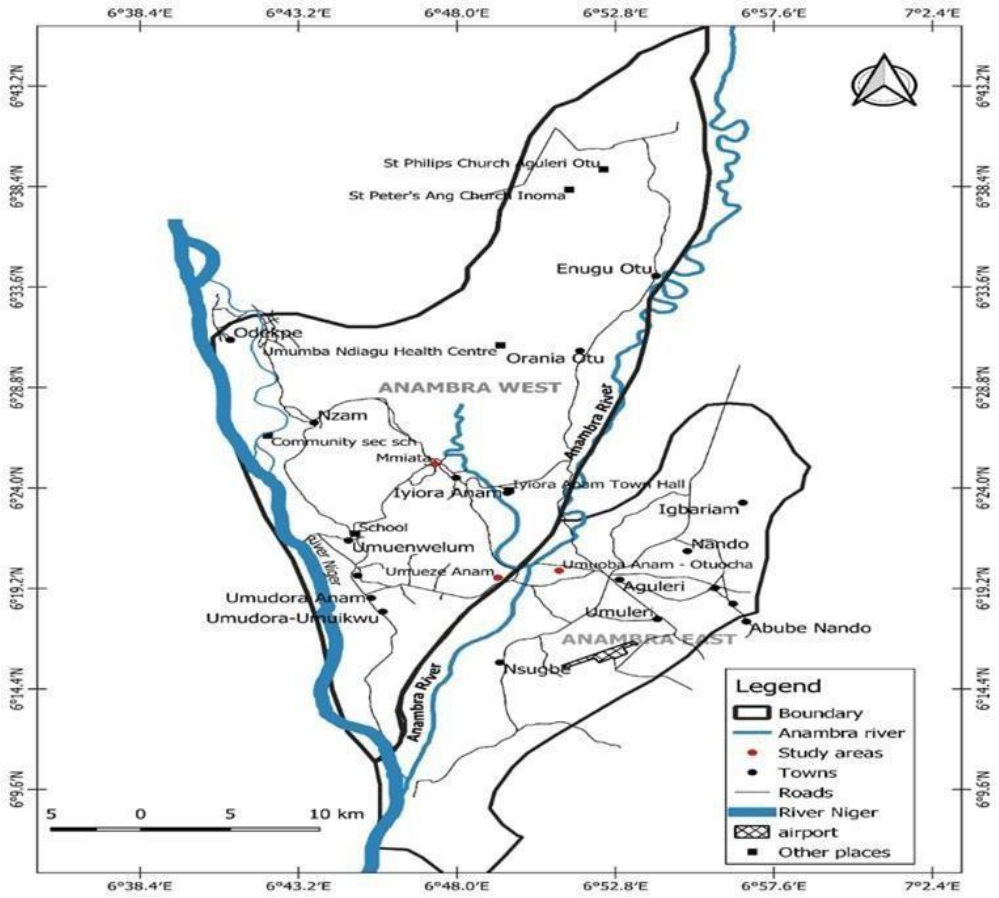

Fig. 1. Map of Anambra East and West LGAs showing Anam Community
Source: Department of Geography and Meteorological, Nnamdi Azikiwe University Awka

periods that recur in Anam. According to Wikipedia, the average annual rainfall in Anam is around 2,000 mm. The average temperature of the area is 27.5oC. One characteristic geographical feature of Anam is the presence of a historic river called Omambala River. Anam has nine autonomous communities which includes Umueze, Umuoba-Abegbu, Mmiata, Iyiora, Umuikwu, Umudora, Oroma-etiti, Umuenwelum and Umuoba Anam Otuocha. Sources of water in this community are mainly from the Omambala River and wells which dry up in dry season. Inhabitants largely depend on open dug wells and the river for domestic water supply. Farming and fishing are the main occupation of those living in this community. Major crops produced in Anam in large quantities includes yam, cassava, rice, groundnut and potatoes.

2.2 Study Design

A cross-sectional study of 303 primary school children was carried out in three (3) primary schools that were randomly selected by balloting. Out of which Central school Umueze Anam and Community Primary school Mmiata Anam were selected from Anambra West while Unity primary school Umuoba Anam Otuocha was selected from Anambra East. One hundred and one (101) pupils were randomly selected from each school which involved both males and females aged between four (4) - fifteen (15) years old that cut across from primary one to six.

2.3 Study Population

The pupils within the age range of 4-15 years in the primary schools selected for the study constituted the study population from where the respective sample sizes were derived. A total of 1260 was recorded in the study area. Out of which three hundred and thirty-eight (338) pupils were recorded from Central school Umueze Anam, five hundred and two (502) pupils were recorded from Community primary school Mmiata Anam and four hundred and twenty (420) pupils were recorded from Unity primary school Umuoba Anam.

2.4 Sample Size Determination

The sample size of this research was calculated using Yaro Yamane's, (1973) formula; n = N/1+ N(e2) where n = sample size, N = Finite population, 1 = constant, e = margin error at 95% confidence level and 303 was obtained as n.

2.5 Sample Size

A total of 303 pupils were selected from the three primary schools. The schools selected were: Central primary school Umueze Anam, Community primary school Mmiata Anam and Unity primary school Umuoba Anam Otuocha. A total of 101 pupils were randomly selected from each school.

2.6 Urine Sample Collection

A total of 303 fresh urine samples were collected from the enrolled participants between April and October 2023. On each day of collection, the urine samples were collected between the hours of 10am and 2pm to coincide with peak egg shedding period for *S. haematobium* [12]. "Each pupil was given a 20ml clean wide-mouthed sterile universal container labeled with their unique identification number, age, gender and name of the school. They were asked to carefully collect the urine samples to prevent faecal contamination and other sources of contamination. Also, they were asked to discard the first stream of urine and produce terminal urine for the analysis. To each urine specimen, 2ml (10%) formalin was added to preserve the normal physiology of the egg/ova of schistosome if present. All the pupils involved were strictly advised to wash their hands before going back to their classrooms. The samples were then transported to the Parasitology Laboratory at the Nnamdi Azikiwe University, Awka for analysis not later than two hours" [12]. Urine samples were processed within two hours of its collection.

2.7 Urine Sample Examination for Haematuria

Each urine sample was observed for any visible evidence of turbidity and haematuria. The appearance and colour of the urine samples were each taken down. During the Laboratory investigation, the following steps were followed [12]. Urinalysis was done with reagent strip Meditest Combi-9 manufactured by Machery-Nagel. The manufacture's test instructions were strictly followed to detect haematuria in the urine sample. The strip was gently removed from its container and there was a directional arrow marked on the strip. The strip was dipped into the urine sample and allowed to get wet. The strip was read by comparing with the standard on the back of the container within 2 minutes and was reported.

2.8 Urine Sample Examination for *Schistosoma haematobium* Eggs

"The urine samples were gently shaken and 10mls of each urine sample was poured into a clean well labeled test tube. The tubes were placed in the centrifuge buckets and the centrifuge lid was firmly closed. The centrifugation and timing were set to three thousand revolutions per minute (3000 rpm) for five minutes. The tubes were removed from the centrifuge machine and the supernatant fluid was discarded, leaving only the deposits at the bottom of the tubes. The sediment of the urine was remixed by gently tapping the bottom of the tube. A drop of the sediment was placed on a grease-free microscope slide, gently covered with a cover-slip without formation of air bubbles". [13] The entire sediment was examined microscopically for the presence of the ova of *Schistosoma haematobium* with characteristic terminal spine and its ovoid shape [12], using x10 objective with the condenser iris closed sufficiently to give a good contrast. The number of the eggs in each preparation was counted and reported in number egg/10ml urine, to represent the intensity. With counts of 1-49eggs/10ml of urine indicates light infection and >50eggs/10ml of urine indicates heavy infection respectively. All the findings were recorded carefully.

2.9 Risk Factors Associated with Urogenital Schistosomiasis Transmission

A structured pre-tested questionnaire was given to all participants to obtain information on their biodata (name, age, sex, and class) and risk factors such as occupation of parents, literacy level of the parents and source of water supply associated urogenital schistosomiasis. The questionnaires were numbered to correspond with the universal containers.

2.10 Data Analysis

The data generated from questionnaires and laboratory analysis were collated, analyzed and presented using descriptive statistics. The data was analyzed using statistical package for social

sciences (SPSS) version 22.0. The relationship between each variable and *schistosoma* prevalence was analyzed using Chi square. Test of statistical significance was set at P value of 0.05 (95%) confidence interval.

3. RESULTS

3.1 Overall Prevalence of Urogenital Schistosomiasis among Primary School Children Studied in Relation to Gender in the study community

Result showed that the overall prevalence and intensity of urogenital schistosomiasis infection in relation to gender was as shown in Table 1. The prevalence of the infection was higher in males 24.0% (36/150) than in females 11.1% (17/153). The mean intensity of *S. haematobium* infection was also higher in males 28.97 than in females 24.52. Though there was no significant difference in the prevalence of urogenital schistosomiasis in relation to gender of the pupils (Chi-square=2.442, df=1, p =.16). 210.

3.2 Overall Prevalence of Urogenital Schistosomiasis among Primary School Children Studied in Relation to Age in the study community

The prevalence and intensity of urogenital schistosomiasis was as shown in Table 2. The highest prevalence of 22.5% (23/102) was recorded among those in the age group 8-11 years old, followed by those in the age group 4-7 years old where a prevalence of 17.3% (17/98) was obtained. The least prevalence was recorded among those that are between 12-15 years old with a prevalence of 12.6% (13/103) was recorded. There was no significant difference in the prevalence of urogenital schistosomiasis in relation to age of the pupils (Chi-square=6.305, df=3, p = .18). Similarly, mean intensity increased with increase in age. The highest mean intensity 26.52 was recorded among those in the age group 12-15 years old, followed by those in age group 8-11 years old 20.13. Those in age group 4-7 years old had the least mean intensity of 6.4.

3.3 Overall Prevalence of Urogenital Schistosomiasis Infection among the Study Population in Relation to Primary School Selected for the Study

The result showed that prevalence of urogenital schistosomiasis infection was highest in Central School Umueze Anam where a prevalence of 23.8% (24/101) was obtained, followed by Community Primary School Mmiata Anam 17.8% (18/101) while the least prevalence of 10.9% (11/101) was recorded in Unity Primary School Umuoba Anam (Table 3). Mean intensity of infection was highest in Community primary school Mmiata Anam 30.29 followed by Central school 23.20 and least mean intensity was seen in Unity primary school Umuoba Anam 18.9. Though there was no significant difference in the prevalence of urogenital schistosomiasis in relation to schools (Chi-square=5.900, df=2, P = .21).

3.4 Risk Factors Associated with Urogenital Schistosomiasis Transmission in the Study Area

Based on their parents' occupation (Table 4) pupils whose parents were fishermen had the highest prevalence of 30.1% followed by those whose parents were farmers (17.3%). The pupils whose parents were civil servant 11.1% was recorded and least prevalence was recorded among those whose parents were traders (10.3%). There was a significant difference in the prevalence of urogenital schistosomiasis infection in relation to occupation (Chi-square=13.197, df=3, p =.040). Similarly, the highest mean intensity of infection was recorded () among children of fishermen 28.34, followed by children of farmers with 26.24. the least mean intensity of infection was recorded among pupils whose parents were civil servants 20.12.

On the level of literacy level of the parents of the pupils studied (Table 4), the highest prevalence of urogenital schistosomiasis infection was recorded among pupils whose parents had no form of formal education (39.1%). This was followed by those whose parent had primary school education (22.2%). The least prevalence of (8.7%) was observed among those whose parents had tertiary education. Though that there was a significant difference in the prevalence of urogenital schistosomiasis and literacy level of parent of pupils studied (Chi-square=17.484, 253 df=2, p = .0080).

In relation to the source of water (Table 4), the highest prevalence (23.7%) of urogenital schistosomiasis infection was recorded among those whose source of water was Omambala River, followed by those who source their water from shallow well (9.7%). The least prevalence (2.4%) was recorded among those whose source

Table 1. Overall prevalence of urogenital schistosomiasis among primary school children studied in relation to gender in the study community

Gender	No. Examined	No. Infected (%)	Mean intensity of infection (egg/10ml urine)	*P*-value
Male	150	36(24.0)	28.97	
Female	153	17(11.1)	24.52	0.162
Total	**303**	**53(17.5)**	**24.13**	

X2 =2.442, df=1, P = .16

Table 2. Overall prevalence of urogenital schistosomiasis among primary school children studied in relation to age in the study community

Age (years)	No. Examined	No. Infected (%)	Mean intensity of infection (egg/10ml urine)	*P*-value
4-7	98	17(17.3)	6.84	
8-11	102	23(22.5)	20.13	0.178
12-15	103	13(12.6)	26.52	
Total	**303**	**53(17.5)**	**24.13**	

X2 =6.305, df=3, P = .18

Table 3. Overall prevalence of urogenital schistosomiasis infection among the study population in relation to primary school selected for the study

Schools	No. Examined	No. Infected (%)	Mean intensity of infection (egg/10ml urine)	*P*-value
Central school	101	24(23.8)	23.20	
Com. primary school	101	18(17.8)	30.29	0.207
Unity primary school	101	11(10.5)	18.9	
Total	**303**	**53(17.5)**	**24.13**	

X2=5.900, df = 2, P = .21

Table 4. Risk factors associated with urogenital schistosomiasis transmission in the study area

Occupation of parents	No. Infection (%)	Mean intensity of infection (egg/10ml urine)	*P*-value
Farming	17(17.3)	24.20	
Fishing	22(30.1)	28.34	0.040
Trading	9(10.1)	24.91	
Civil service	5(11.1)	20.12	
Total	**53(17.5)**	**24.13**	
		Literacy level	
Non-formal	9(39.1)	18.33	
Primary	22(22.2)	20.55	0.008
Secondary	21(15.6)	24.10	
Tertiary	4(8.7)	18.20	
Total	**53(17.5)**	**24.13**	
		Source of water	
River	45(23.7)	42.14	
Well	7(9.7)	20.22	0.001
Borehole	1(2.4)	12.38	
Total	**53(17.5)**	**24.13**	

X2=13.197, df=3, P = .040, X2=17.484, df=2, P = .0080, X2=19.405, df=2, P = .0010

of water was from borehole. Those whose source of water was from well and borehole all had the following mean intensity of the infection 20.22 and 12.38 respectively. Those who source their water from Omambala River had the highest mean intensity of infection 42.14. Statistical analysis showed that there was a significant difference in the prevalence of urogenital schistosomiasis in relation to water source (Chi-square=19.405, df=2, p =.0010).

4. DISCUSSION

The present study revealed that urogenital schistosomiasis infection is present among primary school children in Anam, Anambra East and West LGAs, Anambra State, Nigeria. The result of this study showed an overall prevalence of 17.5% urogenital schistosomiasis among the primary school children in Anam community. The prevalence recorded in this study is in agreement with the report that in recent years there had been a drop in the incidence and prevalence of schistosomiasis in some areas and increase in others [14,15]. This observation corroborates with the findings of [16] who recorded 16.9% in two rural communities (Korede and Obada) in the Ijebu East of Ogun State. The prevalence recorded in this study was however lower than the 19.8% in Adim, Cross River State, Nigeria [17].

The high prevalence in males could be explained by considering the fact that boys are very active. The zone is closer to the River Omambala and its tributaries and is mainly agrarian, which may increase the high likelihood of exposure to parasite-infested water. This finding is consistent with a study conducted in Senegal, which showed a higher prevalence of urogenital schistosomiasis in communities living close to open water bodies [18]. Even though the males are more exposed to water related contact activities in terms of frequency, intensity and duration. This implies uniformity in the predisposing factors especially poverty and reliance on water bodies that may contaminated with cercaria from suitable snail host responsible for the infection in the State. Again, after school hours the males engage in various activities such as fishing and farming to support their parents or recreational activity like swimming at their leisure than their female counterpart. However, there were equal chances of infection with *Schistosoma haematobium* for both males and females when in contact with water. The level of exposure or contact with water containing cercariae of the parasite and the risk of infection are linearly related. For schistosome cercariae to penetrate and infect an individual it does not take cognizance of their gender difference. Nevertheless, the result of this study is similar to the findings of [19] where there is no consistent pattern attributable to gender differences with regard to infection in Nigeria and that the status of infection is associated with water contact pattern.

School children aged 8-11 years, in this study were most affected, followed by the 4-7 years while the least was in the 12-15 years age group. This could be associated with their prolonged water activities like swimming and playing in the water-bodies and since they are no longer strictly restricted by their parents on movement and contact with the freshwater habitat. School children below this age-bracket are too young to be actively involved in such water activities and are strictly regulated by their parents (who will not permit frequent contact with water for fear of drowning). The prolonged stay in water by those in the 12-15years age-group for any of the water contact activities such as swimming and playing in the water-bodies makes them contaminate the water which thus predispose them and others to infection with schistosome cercariae. This corroborates with the findings of [20] who stated that infection rate uniquely cut across all the age brackets studied but was more prevalent in children between 12-15 years and 8-11 years age-groups because they mostly engage in water contact activities and elaborated that the prevalence of the disease is not age dependent, these are in line with the findings of [21,22] which reported that the prevalence and intensity of *Schistosoma haematobium* infections did not vary significantly by age group gender. Overall, these studies suggest that age and gender within age group are a significant factor in predicting the intensity of urogenital Schistosomiasis infection.

The differences in prevalence among primary school children in these schools could be attributed to the water-contact practices and poor health education. It could also be attributed to the quarterly Mass Drug Administration of Praziquantel (MDA) campaign, by the State Government (with support from the Carter Foundation, USAID, WHO). This is done once in every three years for areas with prevalence less than 10%. This is in line with World Health Assembly drafted resolution that endorsed chemotherapy as the main strategy for control of

Schistosomiasis [1]. Furthermore, the use of Praziquantel (PZQ) as the drug of choice as recommended by physicians or through self-medication by parents/guardians may have also contributed to the low prevalence. It could also be attributed to the period of the study which commenced on April to October, the peak of rainfall (June/July) which reduces activities in the water bodies as people have their tanks and drums filled with rain water and thereby less frequenting of the river. [23] similarly reported this in their study. Any pupil with *Schistosoma haematobium* infection in any of the three schools is a potential carrier that can equally transit it anytime anywhere, all things being equal. However, the occurrence of *S. haematobium* in all the selected schools in Anam with overall prevalence of 17.5% showed that this area is endemic for the disease. The result revealed that the study area falls within the WHO classification as low prevalence area. As WHO classifies prevalence less than 20% as low prevalence area, prevalence more than 20% but less than 50% as moderate prevalence area while prevalence higher than 50% is classified as high prevalence area [1]. The outcome of this study correlates with the low endemic status 14.5% among primary school pupils in Maiduguri [24], 14.5% among primary schools in Maiduguri Metropolitan Council [25], 15.7% in Orumba North and South Local Government Area [26], 2.07% among residents of Gwong and Kabong in Jos [27], 10.1% in Edo State [28], 7.8% in Ohaji Egbema, Imo state [29], in Cross River State, 10.2% among pupils [30], 17.8% among rural communities in Kano State [31], The high prevalence among pupils of central school Umueze Anam may be attributed to the close proximity of their school to the Omambala River, involvement in farming to support their parents after school hours and their visit to the River either for fishing or at their leisure for recreational activities like playing and swimming. This finding is similar to the reports of [32] in Agulu Lake of Aniocha Local Government, [20] in the Owukpa and Eha zones in Ogadibo Local Government Area of Benue State.

Some occupation can predispose one to infection with schistosomiasis than others. The higher prevalence of urogenital schistosomiasis among pupils whose parents were fishermen could be explained in terms of their prolonged exposure to unprotected or infected sources of water. This is in line with the findings of [33] who observed that children whose parents were fishermen had the highest prevalence of the infection. The highest prevalence of the infection using the literacy level recorded, pupils whose parent had no form of formal education had the highest prevalence and it's an indication that education is a strong determinant of parasitic infections. This was buttressed by the fact that no case of the infection was recorded among those whose parents had tertiary education. Massive education to prevent people from getting infected is advocated. It would therefore be apt to include Anam in the schistosomiasis control programme to prevent further spread.

Infection rate was higher (23.7%) among pupils who use Omambala river as their source of drinking water and domestic uses. This is consistent with the observations of [34] that those who depend on river and stream water for their domestic water supply had the highest prevalence of urogenital schistosomiasis. This is because, the parasite requires freshwater snails as an intermediate host to complete its life cycle and the rivers and streams provide the ideal conditions for freshwater snails to thrive, making them the most common sources of transmission in endemic areas. In contrast, borehole and well water are less likely to harbour freshwater snails, thus reducing the risk of transmission. Regular visits to the river gave room for frequent water contact and contact with the breeding site of the snail intermediate host where infection would usually occur. Proximity to the water bodies and snail breeding sites is a key determinant in the infection with schistosomiasis is most prevalent in rural areas where ponds, streams, ditches and lakes form major sources of water for domestic use [1]. In this study, all the infected children had light intensity of infection. This seemed to be the trend in most urinary schistosomiasis affected areas. This phenomenon has not been clearly understood and explained in most studies and leaves insinuation among researchers [35].

4. CONCLUSION

The findings of this study revealed that urogenital schistosomiasis is still prevalent and pose significant public health challenges among school children in the riverine areas of Anambra East and West LGAs of Anambra State, Nigeria. Also, this study clearly indicates the presence of appropriate snail intermediate hosts of the Schistosome parasites, in freshwater habitats within the communities in the Anambra East and West LGAs, Anambra state. Therefore, it is vital for the government and relevant stakeholders to take necessary steps in controlling the spread of

the snail by adopting measures that are environmentally friendly while promoting public awareness on the risks posed by such snails to human health. Furthermore, in line with global efforts towards the elimination of schistosomiasis, it is crucial to strengthen disease surveillance systems aimed at identifying infected individuals and providing an appropriate treatment regimen.

CONSENT AND ETHICAL APPROVAL

Consent was sort from the parents/guardians of participants after a proper explanation of the study had been given to them. They were equally told that the data generated from the study will be kept confidential and used for academic purposes and their identity will not be disclosed for whatsoever reason. The ethical approval was gotten from Chukwuemeka Odumegwu Ojukwu Teaching Hospital, Amaku, Awka (COOUTH/ETH.C/VOL1/FN: 04/234)

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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