

1 **Epidemiology of Urogenital Schistosomiasis**
2 **among Primary School Children in Anam**
3 **community, Anambra State, South-Eastern**
4 **Nigeria.**

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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 (150 males, 153 females; age range 4-15 years) were randomly selected for the study from three primary schools. Three hundred and three urine samples were collected and examined for visible haematuria (macrohaematuria), tested 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 associated risk factors including the water contact activities of urogenital schistosomiasis. Prevalence and intensity were calculated. The relationship between each variable and *schistosoma* prevalence was analyzed using Chi square. Test of statistical significance 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, 53(17.5%) were found positive with *S. haematobium* egg, 16(5.3%) were positive for macrohaematuria and 40(13.2%) were positive for microhaematuria. The overall 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. 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 and its environ.

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Keywords: [Urogenital schistosomiasis, prevalence, intensity, S. haematobium, school children, Anam-Nigeria.]

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].

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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

60 penetrate the legs or other parts of humans either during swimming, bathing or carrying out
61 domestic chores in the water [1].

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

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

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

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

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

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

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

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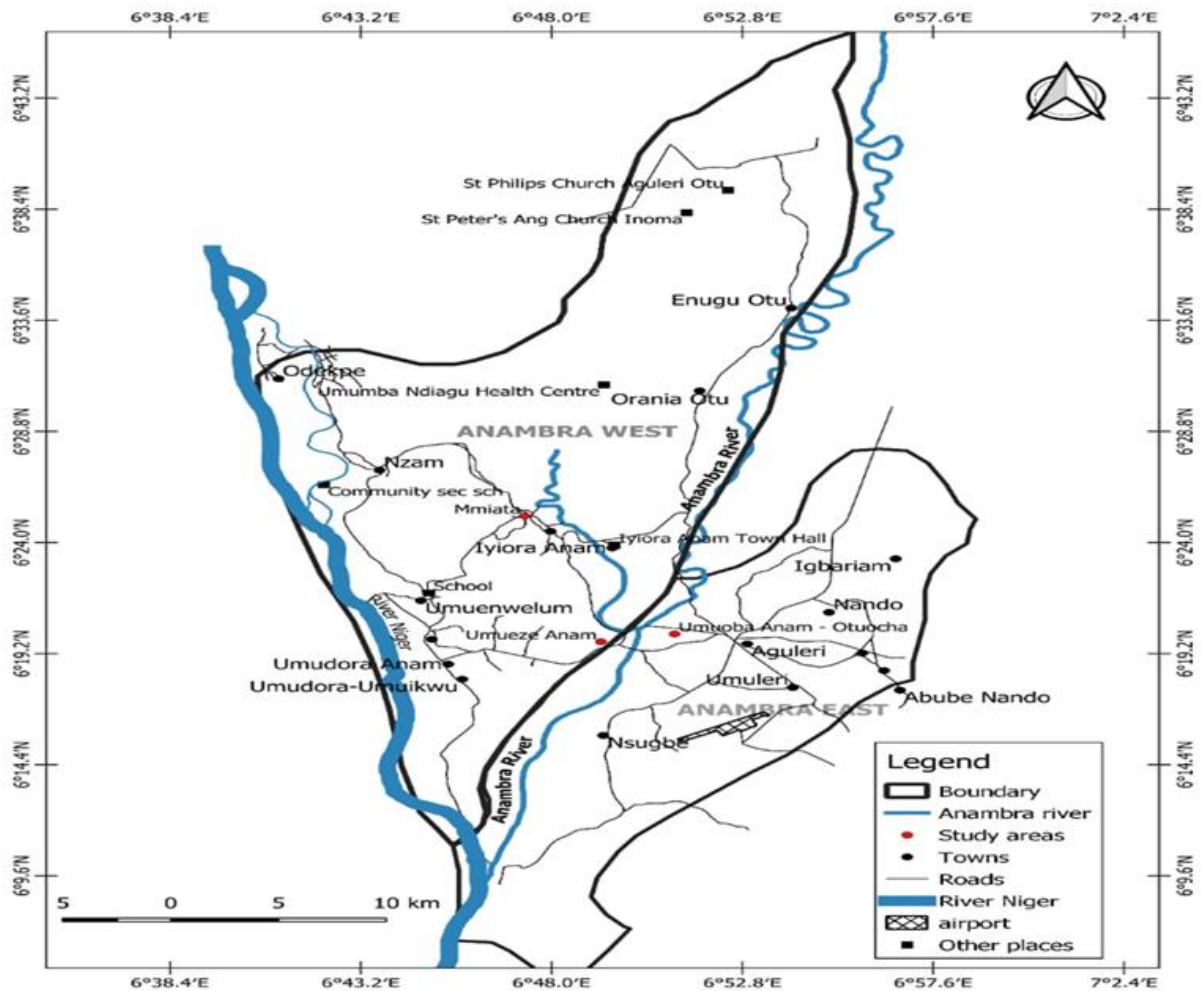
104 **2. MATERIAL AND METHODS**

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106 **2.1 Study area**

107 This study was carried out in Anam, a community that spreads into Anambra East and West
108 Local Government Area (LGAs) of Anambra State. Anambra East and West are among the
109 21 LGAs of Anambra State, South East, Nigeria. Geographic coordinates of Anam lies
110 between latitude 6°6'N and 6°45'N, longitude 6°6'E and 6°59'E, latitude 6°12'N and 6°45'N,
111 longitude 6°39'E and 6°59'E with an altitude of 147m (Fig 1). It has tropical rain forest
112 vegetation. The climate is humid and the humidity is highest between March and November.
113 The rainy season (from April till October) and dry season (from November till April) are the
114 only weather periods that recur in Anam. According to Wikipedia, the average annual rainfall
115 in Anam is around 2,000 mm. The average temperature of the area is 27.5°C. One
116 characteristic geographical feature of Anam is the presence of a historic river called
117 Omambala River. Anam has nine autonomous communities which includes Umueze,
118 Umuoba-Abegbu, Mmiata, Iyiora, Umuikwu, Umudora, Oroma-etiti, Umuenwelum and
119 Umuoba Anam Otuocha. Sources of water in this community are mainly from the Omambala
120 River and wells which dry up in dry season. Inhabitants largely depend on open dug wells and
121 the river for domestic water supply. Farming and fishing are the main occupation of those living
122 in this community. Major crops produced in Anam in large quantities includes yam, cassava,
123 rice, groundnut and potatoes.

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126 **Fig 1:** Map of Anambra East and West LGAs showing Anam Community

127 **Source:** Department of Geography and Meteorological, Nnamdi Azikiwe University Awka

128 2.2 Study Design

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

135 2.3 Study Population

136 The pupils within the age range of 4-15 years in the primary schools selected for the study
 137 constituted the study population from where the respective sample sizes were derived. A total
 138 of 1260 was recorded in the study area. Out of which three hundred and thirty-eight (338)

139 pupils were recorded from Central school Umueze Anam, five hundred and two (502) pupils
140 were recorded from Community primary school Mmiata Anam and four hundred and twenty
141 (420) pupils were recorded from Unity primary school Umuoba Anam.

142 **2.4 Sample Size Determination**

143 The sample size of this research was calculated using Yaro Yamane's, (1973) formula; $n =$
144 $N/1 + N(e^2)$ where $n =$ sample size, $N =$ Finite population, $e =$ margin error at 95% confidence
145 level and 303 was obtained as n .

146 **2.5 Sample Size**

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

151 **2.6 Urine Sample Collection**

152 A total of 303 urine samples were collected from the participants between April and October
153 2023. On each day of collection, the urine samples were collected between the hours of 10am
154 and 2pm to coincide with peak egg shedding period for *S. haematobium* [12]. Each pupil was
155 given a 20ml clean wide-mouthed sterile universal container labeled with their unique
156 identification number, age, gender and name of the school. They were asked to carefully
157 collect the urine samples to prevent faecal contamination and other sources of contamination.
158 Also, they were asked to discard the first stream of urine and produce terminal urine for the
159 analysis. To each urine specimen, 2ml (10%) formalin was added to preserve the normal
160 physiology of the egg/ova of schistosome if present. All the pupils involved were strictly
161 advised to wash their hands before going back to their classrooms. The samples were then
162 transported to the Parasitology Laboratory at the Nnamdi Azikiwe University, Awka for analysis
163 not later than two hours [12]. Urine samples were processed within two hours of its collection.

164 **2.7 Urine Sample Examination for Haematuria**

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

173 **2.8 Urine Sample Examination for *Schistosoma haematobium* Eggs**

174 The urine samples were gently shaken and 10mls of each urine sample was poured into a
175 clean well labeled test tube. The tubes were placed in the centrifuge buckets and the
176 centrifuge lid was firmly closed. The centrifugation and timing were set to three thousand
177 revolutions per minute (3000 rpm) for five minutes. The tubes were removed from the
178 centrifuge machine and the supernatant fluid was discarded, leaving only the deposits at the
179 bottom of the tubes. The sediment of the urine was remixed by gently tapping the bottom of
180 the tube. A drop of the sediment was placed on a grease-free microscope slide, gently covered
181 with a cover-slip without formation of air bubbles. The entire sediment was examined

182 microscopically for the presence of the ova of *Schistosoma haematobium* with characteristic
183 terminal spine and its ovoid shape [12], using x10 objective with the condenser iris closed
184 sufficiently to give a good contrast. The number of the eggs in each preparation was counted
185 and reported in number egg/10ml urine, to represent the intensity. With counts of 1-
186 49eggs/10ml of urine indicates light infection and >50eggs/10ml of urine indicates heavy
187 infection respectively. All the findings were recorded carefully.

188 **2.9 Risk Factors and Water Contact Activities Associated with Urogenital** 189 **Schistosomiasis Transmission**

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

194 **2.10 Data Analysis**

195 The data generated from questionnaires and laboratory analysis were collated, analyzed and
196 presented using descriptive statistics. The data was analyzed using statistical package for
197 social sciences (SPSS) version 22.0. The relationship between each variable and *schistosoma*
198 prevalence was analyzed using Chi square. Test of statistical significance was set at P value
199 of 0.05 (95%) confidence interval.

200 **3. RESULTS**

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202 **Overall prevalence of urogenital schistosomiasis among primary school children** 203 **studied in relation to gender.**

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

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211 **Overall prevalence of urogenital schistosomiasis among primary school children** 212 **studied in relation to age.**

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

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225 **Overall prevalence of urogenital schistosomiasis infection among the study population**
226 **in relation to primary school selected for the study.**

227 The result showed that prevalence of urogenital schistosomiasis infection was highest in
228 Central School Umueze Anam where a prevalence of 23.8% (24/101) was obtained, followed
229 by Community Primary School Mmiata Anam 17.8% (18/101) while the least prevalence of
230 10.9% (11/101) was recorded in Unity Primary School Umuoba Anam (Table 3). Mean
231 intensity of infection was highest in Community primary school Mmiata Anam 30.29 followed
232 by Central school 23.20 and least mean intensity was seen in Unity primary school Umuoba
233 Anam 18.9. Though there was no significant difference in the prevalence of urogenital
234 schistosomiasis in relation to school (Chi-square=5.900, df=2, P = .21).

235 **Risk factors associated with urogenital schistosomiasis transmission in the study area**
236 **including water contact activities.**

237 Based on their parents' occupation (Table 4) pupils whose parents were fishermen had the
238 highest prevalence of 30.1% followed by those whose parents were farmers (17.3%). The
239 pupils whose parents were civil servant 11.1% was recorded and least prevalence was
240 recorded among those whose parents were traders (10.3%). There was a significant difference
241 in the prevalence of urogenital schistosomiasis infection in relation to occupation (Chi-
242 square=13.197, df=3, p =.040). Similarly, the highest mean intensity of infection was recorded
243 highest among children of fishermen 28.34, followed by children of farmers with 26.24. the
244 least mean intensity of infection was recorded among pupils whose parents were civil servants
245 20.12.

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

253 In relation to the source of water (Table 4), the highest prevalence (23.7%) of urogenital
254 schistosomiasis infection was recorded among those whose source of water was Omambala
255 River, followed by who source their own from shallow well (9.7%). The least prevalence (2.4%)
256 was recorded among those whose source of water was from borehole. Those whose source
257 of water was from well and borehole all had the following mean intensity of the infection 20.22
258 and 12.38 respectively. Those who source their own from Omambala River had the highest
259 mean intensity of infection 42.14. Statistical analysis showed that there was a significant
260 difference in the prevalence of urogenital schistosomiasis in relation to water source (Chi-
261 square=19.405, df=2, p =.0010).

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272 **Table1: Overall prevalence of urogenital schistosomiasis among primary school**
 273 **studied in relation to gender.**
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275 Gender	No. Examined	No. Infected (%)	Mean intensity of infection (egg/10ml urine)	P-value
278 Male	150	36(24.0)	28.97	
279 Female	153	17(11.1)	24.52	*0.162
281 Total	303	53(17.5)	24.13	

283 $\chi^2 = 2.442, df=1, P = .16$

285 **Table 2: Overall prevalence of urogenital schistosomiasis among primary school**
 286 **children studied in relation to age.**
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288 Age (years)	No. Examined	No. Infected (%)	Mean intensity of infection (egg/10ml urine)	P-value
289 4-7	98	17(17.3)	6.84	
291 8-11	102	23(22.5)	20.13	*0.178
293 12-15	103	13(12.6)	26.52	
294 Total	303	53(17.5)	24.13	

296 $\chi^2 = 6.305, df=3, P = .18$

299 **Table 3: Overall prevalence of urogenital schistosomiasis infection among the study**
 300 **population in relation to primary school selected for the study**
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302 Schools	No. Examined	No. Infected (%)	Mean intensity of infection (egg/10ml urine)	P-value
304 Central school	101	24(23.8)	23.20	
306 Com. primary school	101	18(17.8)	30.29	*0.207
308 Unity primary school	101	11(10.5)	18.9	
310 Total	303	53(17.5)	24.13	

312 $\chi^2 = 5.900, df = 2, P = .21$

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320 **Table 4. Risk factors associated with urogenital schistosomiasis transmission in the**
 321 **study area including water contact activities.**

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

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339 $\chi^2=13.197$, $df=3$, $P = .040$, $\chi^2=17.484$, $df=2$, $P = .0080$, $\chi^2=19.405$, $df=2$, $P = .0010$

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342 **4. DISCUSSION**

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344 The present study revealed that urogenital schistosomiasis infection is present among primary
 345 school children in Anam, Anambra East and West LGAs, Anambra State, Nigeria. The result
 346 of this study showed a prevalence of 17.5% infection with *S. haematobium* among the primary
 347 school children in Anam community. The prevalence recorded in this study is in agreement
 348 with the report that in recent years there had been a drop in the incidence and prevalence of
 349 schistosomiasis in some areas and increase in others [13 14]. This observation corroborates
 350 with the findings of [15] who recorded 16.9% in two rural communities (Korede and Obada) in

351 the Ijebu East of Ogun State. The prevalence recorded in this study was however lower than
352 the 19.8% in Adim, Cross River State, Nigeria [16].

353 The high prevalence in males could be explained by considering the fact that boys are very
354 active. The zone is closer to the River Omambala and its tributaries and is mainly agrarian,
355 which may increase the high likelihood of exposure to parasite-infested water. This finding is
356 consistent with a study conducted in Senegal, which showed a higher prevalence of urogenital
357 schistosomiasis in communities living close to open water bodies [17]. Even though the males
358 are more exposed to water related contact activities in terms of frequency, intensity and
359 duration. This implies uniformity in the predisposing factors especially poverty and reliance on
360 water bodies that may be contaminated with cercaria from suitable snail host responsible for the
361 infection in the State. Again, after school hours the males engage in various activities such as
362 fishing and farming to support their parents or recreational activity like swimming, as their
363 leisure than their female counterpart. However, there were equal chances of infection with
364 *Schistosoma haematobium* for both males and females when in contact with water. The level
365 of exposure or contact with water containing cercariae of the parasite and the risk of infection
366 are linearly related. For schistosome cercariae to penetrate and infect an individual it does not
367 take cognizance of their gender difference. Nevertheless, the result of this study is similar to
368 the findings of [18] where there is no consistent pattern attributable to gender differences with
369 regard to infection in Nigeria and that the status of infection is associated with water contact
370 pattern.

371 School children aged 8-11 years, in this study were most affected, followed by the 4-7 years
372 while the least was in the 12-15 years age group. This could be associated with their prolonged
373 water activities like swimming and playing in the water-bodies and since they are no longer
374 strictly restricted by their parents on movement and contact with the freshwater habitat. School
375 children below this age-bracket are too young to be actively involved in such water activities
376 and are strictly regulated by their parents (who will not permit frequent contact with water for
377 fear of drowning). The prolonged stay in water by those in the 12-15 years age-group for any
378 of the water contact activities such as swimming and playing in the water-bodies makes them
379 contaminate the water which thus predisposes them and others to infection with schistosome
380 cercariae. This corroborates with the findings of [19] who stated that infection rate uniquely
381 cut across all the age brackets studied but was more prevalent in children between 12-15
382 years and 8-11 years age-groups because they mostly engage in water contact activities and
383 elaborated that the prevalence of the disease is not age dependent, these are in line with the
384 findings of [20-21] which reported that the prevalence and intensity of *Schistosoma*
385 *haematobium* infections did not vary significantly by age group gender. Overall, these studies
386 suggest that age and gender within age group are a significant factor in predicting the intensity
387 of urogenital Schistosomiasis infection.

388 The differences in prevalence among primary school children in these studies could be
389 attributed to the water-contact practices and poor health education. It could also be attributed
390 to the quarterly Mass Drug Administration of Praziquantel (MDA) campaign, by the State
391 Government (with support from the Carter Foundation, USAID, WHO). This is done once in
392 every three years for areas with prevalence less than 10%. This is in line with World Health
393 Assembly drafted resolution that endorsed chemotherapy as the main strategy for control of
394 Schistosomiasis [1]. Furthermore, the use of Praziquantel (PZQ) as the drug of choice as
395 recommended by physicians or through self-medication by parents/guardians may have also
396 contributed to the low prevalence. It could also be attributed to the period of the study which
397 commenced on April to October, the peak of rainfall (June/July) which reduces activities in the
398 water bodies as people have their tanks and drums filled with rain water and thereby less
399 frequenting of the river. [22] similarly reported this in their study. Any pupil with *Schistosoma*
400 *haematobium* infection in any of the three schools is a potential carrier that can equally transit

401 it anytime anywhere, all things being equal. However, the occurrence of *S. haematobium* in
402 all the selected schools in Anam with overall prevalence of 17.5% showed that this area is
403 endemic in the disease. The result revealed that the study area falls within the WHO
404 classification as low prevalence area. As WHO classifies prevalence less than 20% as low
405 prevalence area, prevalence more than 20% but less than 60% as moderate prevalence area
406 while prevalence higher than 50% is classified as high prevalence area [1]. The outcome of
407 this study correlates with the low endemic status 14.5% among primary school pupils in
408 Maiduguri [23], 14.5% among primary schools in Maiduguri Metropolitan Council [24], 15.7%
409 in Orumba North and South Local Government Area [25], 2.07% among residents of Gwong
410 and Kabong in Jos [26], 10.1% in Edo State [27], 7.8% in Ohaji Egbema, Imo state [28], in
411 Cross River State, 10.2% among pupils [29], 17.8% among rural communities in Kano State
412 [30], The high prevalence among pupils of central school Umueze Anam may be attributed to
413 the close proximity of their school to the Omambala River, involvement in farming to support
414 their parents after school hours and their visit to the River either for fishing or at their leisure
415 for recreational activities like playing and swimming. This finding is similar to the reports of
416 [31] in Agulu Lake of Aniocha Local Government, [19] in the Owukpa and Eha zones in
417 Ogadibo Local Government Area of Benue State.

418 Some occupation can predispose one to infection with schistosomiasis than others. The higher
419 prevalence of urogenital schistosomiasis among pupils whose parents were fishermen could
420 be explained in terms of their prolonged exposure to unprotected or infected sources of water.
421 This is in line with the findings of [32] who observed that children whose parents were
422 fishermen had the highest prevalence of the infection. The highest prevalence of the infection
423 using the literacy level recorded, pupils whose parent had no form of formal education had the
424 highest prevalence and it's an indication that education is a strong determinant of parasitic
425 infections. This was buttressed by the fact that no case of the infection was recorded among
426 those whose parents had tertiary education. Massive education to prevent people from getting
427 infected is advocated. It would therefore be apt to include Anam in the schistosomiasis control
428 programme to prevent further spread.

429 Infection rate was higher (23.7%) among pupils who use Omambala river as their source of
430 drinking water and domestic uses. This is consistent with the observations of [33] that those
431 who depend on river and stream water for their domestic water supply had the highest
432 prevalence of urogenital schistosomiasis. This is because, the parasite requires freshwater
433 snails as an intermediate host to complete its life cycle and the rivers and streams provide the
434 ideal conditions for freshwater snails to thrive, making them the most common sources of
435 transmission in endemic areas. In contrast, borehole and well water are less likely to harbour
436 freshwater snails, thus reducing the risk of transmission. Regular visits to the river gave room
437 for frequent water contact and contact with the breeding site of the snail intermediate host
438 where infection would usually occur. Proximity to the water bodies and snail breeding sites is
439 a key determinant in the infection with schistosomiasis is most prevalent in rural areas where
440 ponds, streams, ditches and lakes form major sources of water for domestic use [1]. In this
441 study, all the infected children had light intensity of infection. This seemed to be the trend in
442 most urinary schistosomiasis affected areas. This phenomenon has not been clearly
443 understood and explained in most studies and leaves insinuation among researchers [34].

444

445 **4. CONCLUSION**

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447 The findings of this study revealed that urogenital schistosomiasis is still prevalent and pose
448 significant public health challenges among school children in the riverine areas of Anambra
449 East and West LGAs of Anambra State, Nigeria. Also, this study clearly indicates the presence
450 of appropriate snail intermediate hosts of the *Schistosoma* parasites, in freshwater habitats

451 within the communities in the Anambra East and West LGAs, Anambra state. Therefore, it is
452 vital for the government and relevant stakeholders to take necessary steps in controlling the
453 spread of the snail by adopting measures that are environmentally friendly while promoting
454 public awareness on the risks posed by such snails to human health. Furthermore, in line with
455 global efforts towards the elimination of schistosomiasis, it is crucial to strengthen disease
456 surveillance systems aimed at identifying infected individuals and providing an appropriate
457 treatment regimen.
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CONSENT AND ETHICAL APPROVAL

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Consent was sort from the 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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