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**Prevalence of *Schistosoma Haematobium* Amongst Secondary School Children in Ovia North East Local Government Area, Edo State.**Okungbowa, M.A.O.<sup>1\*</sup> and Adeyemi, E.<sup>2</sup>Department of Medical Laboratory Science, School of Basic Medical Sciences, College of Medical Sciences, University of Benin, Benin City, Nigeria<sup>1</sup>, Department of Histopathology and Morbid Anatomy, University of Benin Teaching Hospital, Benin City, Nigeria<sup>2</sup>.\*Author for Correspondence: [mikeawo2002@yahoo.com](mailto:mikeawo2002@yahoo.com) / +234-805-248-5105**Abstract**

*Schistosomiasis is a disease caused by infection with parasitic blood flukes. It is also known as bilharziasis. Schistosomiasis has been a menace or scourge of ages causing global health challenges in the practice of medicine. Schistosoma haematobium is endemic in Nigeria and continues to pose a threat and challenge especially to inhabitants of rural communities. The aim of this study is to determine the prevalence of Schistosoma haematobium among Secondary School pupils in Ovia North East, Edo state, a geographically homogeneous region. Two hundred and fourteen (214) randomly selected urine samples were collected for the study. Direct wet preparation technique was used to determine the presence of Schistosoma haematobium ova in the urine samples. Questionnaires were also administered to parents of children to collect information on socio-demographic and water contact activities. An overall prevalence of 19.2% was observed among age 10-12 (39.0%) followed by 7-9 (29.2%). There was significant ( $p=0.0001$ ) association in the prevalence of Schistosoma haematobium infection in relation to activity in water bodies. The effect of gender and age were not significant statistically ( $p=0.5661$ ) and ( $p=0.9978$ ) respectively. Males had a higher prevalence rate 58.5% compared to females 41.5%. There was a statistically significant difference in the prevalence of Schistosoma haematobium based on the source of water supply ( $p=0.001$ ). Infection can be controlled through public education campaign programmes, eliminating the snail host, provision of portable water and the use of schistosomicides.*

**Key words:** Prevalence, *Schistosoma haematobium*, Secondary School, Children, Edo State.

**Introduction**

Health is a topic of concern to all citizens of Nigeria. It is inextricably linked within all aspects of daily living and is a prerequisite for a productive and satisfying life. A major goal of any health care delivery system today is to reserve and maximize human capital by offering health preserving and social practices that result in the avoidance of disease and by offering diagnosis, treatment and rehabilitation services for existing diseases (Engels and Savioli, 2000). In spite of major changes and approaches to the health care delivery system, there are many diseases and health problems that still exist and cause problems to society.

These many diseases and health problems are being attributed primarily to personal behavior and environmental factors. One of these diseases is schistosomiasis (also known as bilharzias) which is still prominent in some countries including Nigeria and particularly prevalent in some states including Edo State.

Schistosomiasis is a disease caused by a parasitic worm or fluke, a trematode, which completes its life cycle partly in humans and partly in snails. The pathophysiology results from the reaction of human tissue to the eggs and the fibrotic scarring of the bladder, urethra, ureter and/or the descending colon, depending on the type of organism (Bruijning, 2003). Schistosomiasis is caused by several different *Schistosoma species*, each requiring a different approach to treatment

and control. The species are *Schistosoma haematobium* and *Schistosoma mansoni* (Gilles 2003).

The *Schistosoma haematobium* species causes urinary schistosomiasis and its intermediate host species are *Bulinus* snails, while *Schistosoma mansoni* causes intestinal schistosomiasis and its intermediate host species are the *Biomphalaria* snails. The incubation period of these organisms is about 4-6 weeks after contamination and the reservoir is man (Chin, 2000).

Schistosomiasis is closely associated with water, as fresh water snails carry the parasite. Thus, all infected humans have been in close contact with water. Unfortunately, water forms the basic requirement for daily living, forcing humans to maintain close contact with available water resources. It is mostly common in the tropical areas of the globe especially the rural areas where only the surface water bodies are the sources of water supply. The infection is reported to have plagued humans since ancient times. (El Harvey *et. al.*, 2000).

Factors which favor the transmission of the disease in endemic areas are the presence of snails which are the intermediate hosts of the parasite and human contact with infected water body. (Ejezie, 1991). Also, in addition to indiscriminate passing of urine containing *S. haematobium* eggs into water supplies containing the snail host (Southgate, 1987).

World health organization reported that over 200 million estimated people are infected worldwide mainly in rural agricultural lands and semi urban areas. About 20 million of infected people suffer severe consequences from the disease and 120 million are symptomatic.

The symptoms of infection range from fever, headache and lethargy to severe cases such as hepatomegaly, ascites, proteinuria, micturia, haematuria and even death. The form of schistosomiasis affecting the urinary tract involves *Schistosoma haematobium*. The other forms; *S. japonicum*, *S. mansoni* and *S. mekongi* affect the gastrointestinal tract.

The species causing the urinary Schistosomiasis, *S. haematobium* is noted to be more prevalent in Nigeria than the other species that cause intestinal infections, due to wider distribution of its snail host *Bulinus* species (Ejezie, 1991). According to (Jordan, 2000), the other species which are the causative agents of intestinal schistosomiasis is transmitted by aquatic snails of the genus *Biomphalaria* which thrive in irrigation canals and along lake shores.

Southgate and Rollison, (1987) gave some of the control measures against schistosomiasis which are directed at eliminating the intermediate host snails *Bulinus* and *Biomphalaria* by chemical, environment management and biological control and possibly avoiding contact with cercariae – infected water.

The major anti-schistosomal drug that has been in use against infection with this trematode are metrifonate, oxamniquine and praziquantel. All the three are included in the World Health Organization list of essential drugs (Cioli, 1993).

### Research Hypothesis

Null hypothesis ( $H_0$ ). *Schistosoma haematobium* is independent on gender in Ovia Southwest Local Government.

Alternate hypothesis ( $H_A$ ). *Schistosoma haematobium* is not dependent on gender in Ovia South West Local Government.

### Significance of The Study

The significance of the study is to provide data that will contribute to a more multi prolonged approach to health service provision, prevention and control of schistosomiasis. The findings of this study will significantly contribute to improving the health of learners in the Ovia Southwest Local Government Area. Thus, after implementation of the recommendation of the study, it is expected that schistosomiasis cases will be minimized, if not eradicated.

### Aim and Specific Objectives

The purpose of this study is to determine the epidemiological and clinical aspects of *Schistosoma haematobium* infection rate in school age children in Ovia Southwest Local

Government Area of Edo State Nigeria. In order to implement appropriate preventive strategies.

## Materials and Methods

### Study Area

Edo State lies roughly between longitude 06° 04' E and latitude 05° 44'N and 07° 34' N. It is bounded in the south by Delta, in the west by Ondo State, in the north by Kogi State and in the east by Kogi and Anambra states. It occupies a land mass area of about 17,802 sq km, and has a population of 3,265,947. The state comprises of 18 local government Areas, grouped into three senatorial districts, with Benin City as its capital. The wet season occur between April and October, with a break in August and an average rainfall ranging from 150cm in the extreme north of the state to 250cm in the south. The dry season last from November to April with cold harmattan spell between December and January. The temperature averages about 25 °C (77 °F) in the rainy season and about 28°C (82°F) in the dry season. The climate is humid tropical in the south and sub-humid in the north.

The study was carried out in Ovia South West local government area in Edo State the headquarter is in the town of Iguobazuwa. It has an area of 2,803 km and a population of 135,365 as at the 2006 census. The people of the area are involved mainly in farming as their occupational activities but also involve in private business and trading. The topography of the area is sloppy and hilly and with water bodies.

### Sample Size

The sample size for this study was obtained using the formula (Naing *et al.*,2006).

$$N = Z^2P(1-P)/D^2$$

Where

N=required sample size

Z=confidence level at 95% standard value =1.95

P=estimated prevalence of genitourinary parasites in pupil was reported as 10% i.e 0.1

D =desired level of significance or precision chosen for the study is 0.05

$$\begin{aligned} \text{Hence required sample s } N &= 1.95^2 \times 0.1(1-0.1) \\ &= \frac{3.8025 \times 0.09}{0.0025} \\ &= 136.89 \end{aligned}$$

Therefore, the least sample size require for the study is 137.

### Sample Collection

The study population was made up of two hundred and fourteen (214) randomly selected school children of varying ages (5 to 16 years) and gender. The children were selected from - Siluko Primary School, Obobaifo Primary School and Aise Primary School in Ovia South West Local Government Area in Edo State. Written informed consent was obtained from the school heads before the sample collection. Each pupil was given a clean transparent corked labeled container to pass in fresh terminal urine on the day of collection.

The pupils were taught on how to collect the clean terminal urine with the aid of their teachers. Epidemiological questionnaires with socio-demographic information such as age, gender, and water supply were correctly filled. The samples were received from the pupils with the student name age and gender recorded on the record book serially and the number were also written on the container. When the urine samples were not examined early, they were preserved with 0.1 g of boric acid. The acid preserved and prevents the ova of *S. haematobium* from hatching during transportation to the laboratory. The sample was processed in the teaching laboratory in the Department of Medical Laboratory Science, University of Benin, Benin City, Nigeria.

### Methodology

#### Macroscopic Examination of The Urine Samples

The urine sample were examined macroscopically for color, blood, cloudy or turbidity of sample. Indirect morbidity was assessed as the presence of haematuria and proteinuria using reagent strips. A reagent strip (Medi-Test Combi-9) was carefully dipped into the dark sterile bottle containing the urine for 5 seconds. The resulting change in colour of the strip was compared with manufacturer's colour chart to estimate the amount of blood, protein, billirubin, pH and specific gravity of the urine. The chemical strips registered urinary blood as negatives or positives (+, ++, +++). This can



serve as guide to whether the egg of the parasite is likely to be present (Cheesbrough, 2006).

### Microscopic Examination of Samples

The method used for the microscopic examination is the direct wet preparation. Microscopic examination of the urine samples was performed using sedimentation technique. The sample was well mixed and poured in to clean centrifuge tube labeled according to the number of pupil on the form. The tube was filled up to 10 ml marked cap and placed in the centrifuge. The sample was centrifuged at 1000rpm for 5 minutes. The centrifugation was done slowly to avoid the eggs from hatching. The supernatant was discarded completely. The deposit was tapped to dislodge gently then placed on clean slide then a drop of eosin red was added and covered with cover glass. Then the preparation was examined under the light microscope using 10x and 40x objective for the presence of parasite ova. The method used was based on sedimentation method describe in Cheesbrough (Cheesbrough, 2006). The result was recorded as positive for urine sample containing egg of *S. haematobium* and negative for sample without.

### Statistical Analysis

The results were statistically analyzed using chi-square analysis by means of statistical software “INSTAT” to determine the statistical prevalence of *Schistosoma hematobium* ova seen between age, sex, and water supply. The result was consider statistically significant  $p < 0.05$  and  $p > 0.05$  not statistically significant.

### Results

A total of 214 urine samples from pupils Siluko, Aise, and Obobaifo Primary School in Ovia-

South Local Government Area, were examined for the presence of ova of *Schistosoma haematobium*.

The bio-data of these pupil showed that 110 pupils were female while 104 were male. Some of the infected male pupil were in age 7-9 years age group. Most of the infected subjects were of (Bini) ethnic group. Some of the infected pupils acknowledge the use of pit toilet in their home and frequent contact with community water bodies. Out of the two hundred and fourteen sample examined, 110(51.4%) were female and 104 (48.6%) were male. Seventeen (17) female subjects were infected compared to twenty-four (24) male subjects. The overall number of infected subjects was forty-one (41) representing a prevalence of 19.2%. The rate of infection in males (58.54%) was higher compared to female subjects (41.46%).

Furthermore, from the table 1 it is evidently clear that the pupil of the age group 10-12 years had a higher prevalence. In relation to source of drinking water, the result showed that there is no positive case among subjects whose source of water supply was tap/borehole (0%), while well and stream showed positive result in 2 subjects and 39 subjects respectively.

Table 1 shows the distribution of *Schistosoma haematobium* infection in relation to the age of the pupils. The highest prevalence was observed in 10-12 years followed by 7-9 years age group. the chi-square test value for the two-nominal variable (age of pupils and number infected) as well as the p-value. There was no statistically significant difference in the prevalence of *Schistosoma haematobium* based on age ( $p=0.9978$ ).

**Table 1: Prevalence of *S. haematobium* in Relation to Age.**

Age group (years)	No examined	No infected (%)	Non-Infected
4-6	37	8 (19.5)	29 (16.7)
7 -9	62	12(29.2)	50 (28.9)
10-12	80	16 (39.0)	64(36.9)
13-15	32	4 (9.7)	28 (16.2)
16 and above	3	1 (2.4)	2 (1.2)
Total	214	41 (100%)	173 (100%)

$X^2 = 1.408$ ;  $DF = 4$ ;  $p - value = 0.9978$



**Table 2: Prevalence of *Schistosoma haematobium* in Relation to Gender**

Gender	Number Examined	Number infected	Number of non-infected
Female	110	17 (41.5)	93 (53.8%)
Male	104	24 (58.5)	80 (46.2%)
Total	214	41 (100%)	173 (100%)

$\chi^2 = 2.030; Df = 1; p\text{-value} = 0.5661.$

The frequency distribution of *Schistosoma haematobium* in relation to gender of pupils is shown in table 2. Which reflect the chi-square value for the two nominal variables (gender of the pupils and the number infected) as well as the p- value. There was no statistically significant difference in the prevalence of *Schistosoma haematobium* based on gender ( $p=0.5661$ ).

**Table 3. Frequency of Water Activities of Female at Water Bodies.**

Type of activities	Number of activities by age group (years)					Total
	4- 6	7-9	10-12	13- 15	..	
Washing cloth, utensil	0	0	3	6	8	17
Wash arms and legs	0	0	4	6	8	18
Collecting water	0	2	5	7	11	25
Mixed (bathing playing and swimming)	2	3	5	7	7	24
Defecating/urinating in water body	0	2	4	6	8	20

**Table 4. Frequency of Water Activities of Male at Water Bodies**

Type of activities	Number of activities by age group (years)					Total
	4-6	7-9	10-12	13-15	≥16	
Washing clothes, utensil	0	2	7	9	9	27
Washing arms and legs	0	1	8	6	9	24
Collecting water	0	2	7	9	9	27
Mixed (bathing swimming playing)	2	2	8	5	7	24
Defecating/urinating in water bodies	0	5	15	14	12	45

**Table 5. Prevalence of *Schistosoma Haematobium* In Relation to Source of Water Supply.**

Source of water	Number examined	Number infected	Non-infected
Tap/borehole	53	0 (0.0)	53 (30%)
Well	103	2 (4.9%)	101 (58.4%)
Stream	58	39 (95.1%)	19 (10.9%)
<b>Total</b>	<b>214</b>	<b>41 (100%)</b>	<b>173 (100%)</b>

$\chi^2 = 119.0.19$ ;  $df = 2$ ;  $p$ -value = 0.0001.

Table 5. Prevalence of *Schistosoma Haematobium* In Relation to Source of Water Supply. A total of 2 and 39 positive result were obtained among pupils who get their water source from well and stream for domestic use. This represent a prevalence of 4.9% and 95.1% respectively. There was a statistically significant difference in the prevalence of *Schistosoma haematobium* based on the source of water supply ( $p=0.001$ ).

### Discussion

The public health significance of schistosomiasis is often underestimated. This reason for this is that like other helminth infection, its distribution is usually widespread with few individuals having heavy infection and severe disease while majority are asymptomatic with lighter infection (WHO, 1993).

From the result obtained, it shows that out of 214 pupils screened for urinary schistosomiasis, 41 (19.2 %) were infected with urinary schistosomiasis. This present study supports a number of previous reports (Adeyeba and Ojeaga, 2002; Edungbola *et al.*, 1998; Adewumi *et al.*, 1990) which have consistently shown that *S. haematobium* endemicity in Nigeria is on the increase, particularly the rural areas with school age children at greatest risk.

The result of this study showed a relatively low prevalence of urinary schistosomiasis (19.2%) in Ovia South West Local Government Area of Edo State, Nigeria and therefore falls into the World Health Organization classification as endemic (WHO, 2002). This prevalence is however lower than the 66.4% and 76.2% reported by (Adewumi *et al.*, 1990) in two communities in South West Nigeria. Adeyeba and Ojeaga (2002) also reported a close infection rate of 57.5% among school children in Ibadan, Nigeria. Edungbola *et al.* (1998) recorded a similar infection rate among school children in Babana district in Kwara State, Nigeria. The major factors that may be responsible for the

endemicity of urinary schistosomiasis infection in these study areas are low literacy level, lack of basic amenities, the inadequate and indiscriminate disposal of human sewage and high-water contact activity with snails infested well, and streams.

There was no statistically significant difference in the prevalence of *Schistosoma haematobium* based on gender ( $p=0.5661$ ). Our finding is consistent with previous report (Mbata *et al.*, 2009) which observed no difference between the prevalence rate of the infection between males (23.13%) and the females (22.53%) subjects. Our finding is however at variance with that obtained by Agi *et al.* (2005) which indicated that males had a prevalence rate of 84.9% while the females had (80.9%). Similarly, a previous report by Okoli and Odaibo (1999) on the prevalence of schistosomiasis among school children in Ibadan indicated that males are more infected. The reason for the male gender predisposition to *Schistosoma haematobium* may be due to the fact that males are more involved in activities that has to do with water bodies (swimming, washing, padding of canoes and irrigation). Similarly, Raja (2000) observed a higher infection rate in male than female. Our finding is at variance with a previous report by Olalubi and Olukunle (2013) which reported a higher prevalence of *Schistosoma haematobium* among female pupils (61 %) compared to male pupils (39 %)

There was no statistically significant difference

in the prevalence of *Schistosoma haematobium* based on age ( $p=0.9978$ ). The result obtained in this study is consistent to the finding of Uneke *et al.* (2006). Our finding is however at variance with a previous report by Anyim *et al.* (2012).

There was a statistically significant difference in the prevalence of *Schistosoma haematobium* based on the source of water supply ( $p=0.001$ ). In relation to sources of water supply, no case of infection was found among the pupils using borehole or tap water. This because the quality of pipe borne water meet the minimum standard of the World Health Organization. Two (2), and ten (29) cases of infection were found among the pupils using well, and stream water, respectively, giving the prevalence of 4.9%, and 95.1% respectively. Thirty-nine (39) cases of infection were found among the pupils using stream water with the prevalence of 95.1%. The observation showed that the infection depends on sources of water supply. Okpala *et al.*, (2004) states that the transmission of schistosomiasis takes place in the place where fresh water snail vector is present and where there is contact between the population and infected water. The result obtained from this study is similar to the finding obtain by (Anyim *et al.*, 2012). The recorded cases of infection among pupils using well, pond and stream water may be as a result of contamination of wells, ponds and streams in the area with cercariae. Generally, the observed prevalence of urinary schistosomiasis in the study area is high because of low literacy level, lack of basic amenities, inadequate and indiscriminate disposal of human waste, high water contact activity with snail infested wells, ponds, and streams as well as deplorable personal and environmental hygiene in the area. Although positive cases in the present study were identified and confirmed by the presence of ova in urine, the actual overall prevalence may be underestimated because of the possibility that some infected individuals may not have been shedding eggs during the limited period when their urine samples were obtained, or they may present with microhaematuria, which may not have been detected in the present study.

In Argentina, a study has shown that *Schistosoma* infection frequency detected in

various socio-cultural areas were related to contaminated water source as well as insufficient health conditions (Sousa-Figueiredo *et al.*, 2012). Report by Ostan (2007) also revealed that student who drink tap water were found to have higher level of parasite than those who drink commercial drinking water. Rubaihayo (2008) in a study in Western Uganda reported that 36.7 % of the pupil studied used Crater Lake water as their main source of domestic water and that 61.5% of these lakes were infective with over 50% of their user infected. The same study revealed that prevalence was generally higher in children who used crater water at low attitude than those of higher altitude.

In a different study in Mexico no correlation was observed between the reliable drinking water and the parasite (Quihui, 2006). And this could be due lack of parasite snail host in the study area. Analysis of water activities frequency with water bodies of the study population confirmed that swimming, washing clothes and bathing in the river was significantly associated with *S haematobium* infection. The result is in agreement the observation of studies conducted in Kenya and Malawi (Handzel, 2003). The main reason for this association could be the proximity of school (community) to the infected water bodies with the parasite intermediate host snail. The frequency of visit to water bodies was also seen to be significant. Those who always visit the water bodies had the highest number of infection as compared to those that often and seldom visit the water bodies. This constant visitation may be due to the various activities engaged in by the studied population. *Schistosoma haematobium* was also seen to be significant in relation to urinating in water bodies. Those who urinate in had higher prevalence of infection as compared to those who do not urinate in water bodies. This might be due to lack of adequate toilet facility in the studied area and also the unhygienic behavior of the people in the area.

Provision of adequate pit toilet is often is considered important in *Schistosoma haematobium* control (Jordan, 1970)

### **Conclusion and Recommendations**

Based on the findings in this study, it is evident



from the result that the study area (Ovia Southwest Local Government Area) is endemic (19.2%) for *Schistosoma haematobium*. *Schistosoma haematobium*. Infection is not related to the gender and age of the pupils. However, infection was more in pupils whose source of water supply is stream.

We recommend that schistosomiasis control program in the state should be embarked upon to provide intensive and sustainable health education about the disease aetiology and transmission particularly among children. There is need to educate the populace on risk factors that predispose one to urinary schistosomiasis. The government should provide proper system of waste collection and disposal in place to help make the environment more hygienic. The State government should also provide toilet facilities at certain junctions in the area and in the market found within the area as well as provision of pipe borne water to rural areas to reduce the observed rate of infection with *S. haematobium* in the study area. Mass screening to identify the infected individuals and drug should also be provided to treat them in order to reduce the transmission of the infection. General and mass deworming should also be carried out. Control of the vector snail host can also play a huge role toward the control of the parasite disease.

**Conflict of interest:** There is no conflict of interest associated with this work.

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