IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 5 Issue 2, February 2018
ISSN (Online) 2348 – 7968
www.ijiset.com

Prevalence and Intensity Of *Schistosoma Haematobium* Among School Children In Some Parts Of Owerri,Imo State,Nigeria.

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ABSTRACT
This study was conducted to determine Prevalence and Intensity of Urinary *Schistosomiasis* in School age Children of 7-15 years old in some parts of Owerri, Imo State was carried out between May 2014 and September 2016, data on Socio-demographic characteristics and risk factors were collected on interview based questionnaire. Out of two thousand two hundred and fifty (2250) pupils that were randomly selected for the study, 1125 were males and 1125 were females. The samples were analyzed in the laboratory using test strip/centrifugative technique. The Prevalence Infection of *S.haematobium* in the area was 132(5.9%) out of which 75(6.7%) were recorded for males and 57(5.1%) was recorded for females. (<0.05) there was a significant difference in the infection in the age groups. Eggs count among infected children showed that 68.9% and 3.1% were excreting _>50 eggs/10ml of urine and _< 50 eggs/10ml of urine. The highest prevalent rate of *S.haematobium* was observed in age bracket 10-12years 73 (7.3%) and at the least infection 18 (3.4%) in those 7-9 years. Highest prevalence of infection was recorded in Okigwe L.G.A 32(12.8%) was in Ikeduru and Nwangele. Statistical analysis revealed significant difference in the infection in the local government area studied. The result showed that children who identified river, stream or lake as their principal means of water source recorded the highest rate of 92(7.6%) the least was recorded among children whose principal means of domestic water was borehole water 11(3.1%). Advancement in parent education reduced the rate of infection with children whose parents had no formal education recording the highest infection of 63(47.7%) prevalence of infection was observed to be dependent on parents occupation with children of farmers and civil servants having the highest and least infection rates of 43(32.6%) and 12(9.1%) respectively. Furthermore, principal source of water of children influenced their rate of infection. The result has revealed the endemicity of Urinary Schistosomiasis in some parts of Imo State. This study recommends adequate implementation of water, sanitation and hygiene policy to reduce exposure and consequent infection.

Key Words: Schistosoma Haematobium, Prevalence Intensity in some parts of Imo State.

INTRODUCTION

Human schistosomiasis also known as bilharziasis due to *Schistosoma haematobium* is widespread ranking second to malaria in terms of socio-economic and public health significance in tropical and sub-tropical areas (Reuben *et al*., 2013). It is the most prevalent of the water-borne diseases, according to Biu *et al*. (2000). The disease affects more than 200 million people worldwide and as many as 500-600 million people have been exposed to schistosomiasis of all kind with the disease been more common in Africa, Asia and South America (Robert *et al.* 2002). Recent reports of the World Health Organization (WHO) estimated that about 779 million people in 76 tropical and subtropical countries are at risk of schistosomiasis (Steinmann *et al*., 2006). Further report by Steinmann *et al.* (2006) also revealed that over 207 million people in tropical and subtropical countries are infected, of these, according to Steinmann *et al.* (2006); 120 million are symptomatic with 20 million having severe clinical disease. However, in sub-Sahara Africa, Hotez and Kamath (2009) revealed that 192 million are estimated to be infected with the two forms of schistosomiasis i.e. intestinal and urinary and Nigeria recording the largest number of infection with about 29 million cases. Surveillance for urinary schistosomiasis is very important in estimating endemicity and in the planning of control operations (Okanla *et al*. 2003). This is important since factors that encourage the transmission of this disease are common. In independent studies by Ofoezie (2002) and Hunter (2003), it was found that there were increased rates of infection due to exposure patterns associated with bathing or washing, farming along rivers and canals harboring infected snails hosts.

The highest prevalence and intensities of human schistosomiasis occur in school-age children, adolescents and young adults who also suffer from the highest morbidity and mortality (Hotez and kamah, 2009). According to Bello *et al*. (1992) schistosomiasis is a neglected common parasitic disease of childhood. The health of school age children in developing countries is a concern that has received increasing attention over the last few years (Bello *et al.*, 1992). Although death rate among this age group is low compared with other age groups, it has recently been estimated that school-age children experience a considerable burden of disease which may have both immediate and long-term consequences on their health, growth and education (Banji *et al.*, 2011). School children are particularly vulnerable to this disease because of their habit of playing in water, where they may contract the infection (Engels *et al*. (2006). Similarly Kabatereine *et al.* (2004) reported that due to their playing habits and hygiene, children are particularly at risk of infection. With each passing year, a child's risk for infection increases, peaking between the ages of 10-20years (Kabatereine *et al*., 2004). However the intensity of their infection, as measured by quantitative egg count of urine, shows the heaviest burden in the youngest age group (Duwa *et al*., 2009). As a result of this Gryseeles *et al.* (2006) reported that children are the ideal target group to investigate the prevalence of schistosomiasis and the data collected from this age group can be used to assess not only whether schistosomiasis threatens the health of school children, but can also be used as reference for evaluating the need for community intervention (Gryseels *et al.,* 2006)
In Nigeria, urinary schistosomiasis is known to have existed from time immemorial and the low resource communities are mostly plague by the disease (Rueben 2013). With approximately 20% of the population of sub-Sahara Africa, Nigeria is or once was the most highly affected country in Africa for urinary schistosomiasis (Njepuome *et al*. 2009). Young individuals are mostly infected with peak prevalence and intensity of infection in the age group 11-15 years (Biu *et al*., 2009; Sarkin Fada *et al*. 2009). Report have established that both natural (McManus *et al*., 2011) and artificial water bodies (Duwa and Oyeyi, 2009).

MATERIALS AND METHODS

Study Area

Imo State is one of the thirty-six states of the Federal Republic of Nigeria. It is specifically in South Eastern Nigeria. It lies between geographic co-ordinates of latitude $4^0 45'$ and $7^0 15'$ N and longitude of $6^0 50'$E with an area of about 5,100sq km (Imo State Government, 2010). The state has a common boundary with Abia state on the East, Anambra state on the North, Rivers state on the South (Fig.1).

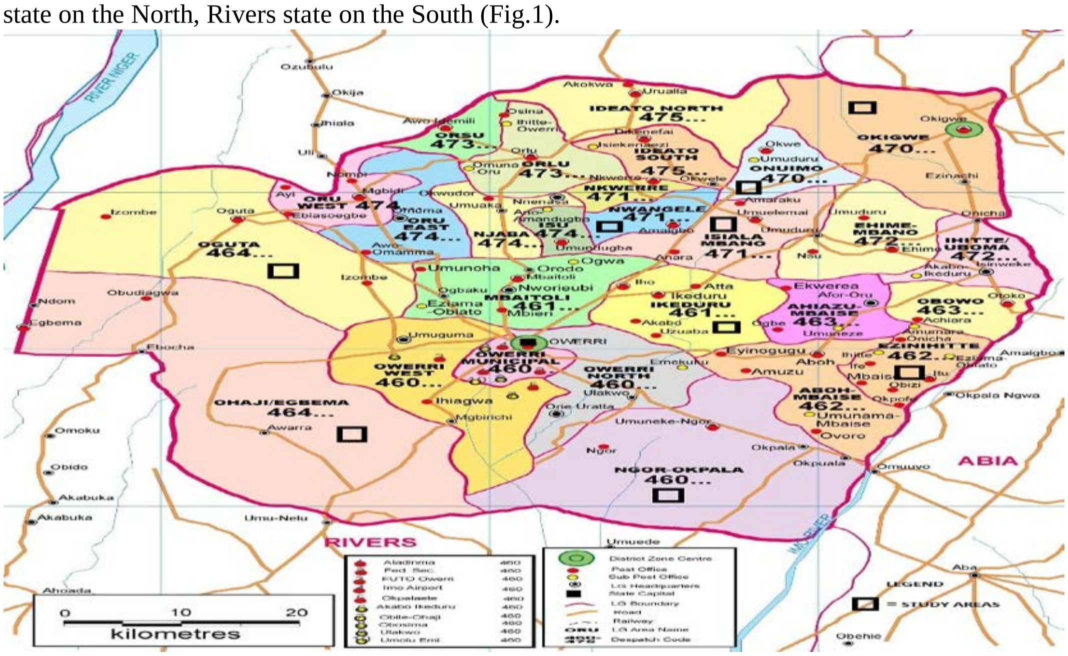

FIG.1: MAP OF IMO STATE SHOWING STUDY AREAS.
SOURCE: IMSG, 2010

The State is divided into three zones, namely; Owerri zone, Orlu zone and Okigwe zone made up of 27 Local Government Areas.The state has a common boundary with Abia state on the East, Anambra state on the North, Rivers state on the South (Fig.1). There are lots of streams amd rivers transvering through the villages and communities. In some communities there are ponds and water filled quaries created during road and building construction which serve for their domestic needs. People of Imo State are mostly of igbo ethnic extraction , public and civil servants, some are into agriculture while a good number are petty traders and casual workers. The people are are serviced by several health establishment in the communities.

Study Population

Nine Local Government Areas, three from each zone were selected for the study, namely; Oguta, Nwangele and Ohaji-Egbema Local Government Areas were selected from Orlu zone. In Owerri zone, Ikeduru, Ngor-Okpala and Ezinihitte Local Government Area were selected. However in Okigwe zone, Isiala Mbano, Onuimo and Okigwe Local Government Areas were selected. In each Local Government, five schools located in five different autonomous communities were visited. These Local Governments were considered based on the low level of social amenities e.g., portable water in such Local Government Areas. Additionally, level of agricultural and fishing activities and presence of either natural or man-made water bodies were also considered. Communities and villages in these Local Government Areas sampled were also selected based on their perceived proximity to known endemic foci of the disease (Anosike *et al*., 2001). Two thousand, two hundred and fifty children between the age bracket of seven to fifteen years were examined for the study. Out of this number examined, two hundred and fifty children were examined from each Local Government Area and out of this number examined from each Local Government; fifty children were examined from each school located in each autonomous community visited.

Ethical Approval and Informed Consent

The study was approved by the Post Graduate Board of the Department of Animal and Environmental Biology, Imo State University Owerri. With introduction letter from supervisors to State Ministry of Health and authority letters from the Ministry of Health and State Universal Basic Education Board to Local Government Health Units and subsequent authority letter from Local Government Health Units to Head Teacher of school visited, a pre-survey visit was made to the study area using the approach of Hassan *et al*. (2012). During the pre-survey visit, there was discussion with community heads, traditional rulers, local government health centers, headmasters and teachers of different schools in the villages and communities of the local government areas selected for the study. Additionally, villages and communities were educated on the significance of the study.

Questionnaire Administration

A questionnaire containing questions relevant to urinary schistosomiasis was issued to each child examined. It was aimed at obtaining information on; sex, age, community, Local Government Area, name of school, Knowledge of signs and symptoms of schistosomiasis, awareness of schistosomiasis and its mode of transmission, levels of parental education and occupation. Additional information on the risk factors where sought which includes; source of water for domestic use, such as well, pipe born water/mono pump, bore hole and river/stream/lake. Type of water contact activities such as swimming, fishing, washing, playing/bathing, collection of snail, fetching water, rice farming was also determined. Each questionnaire was accompanied by a corresponding urine specimen (Rine *et al*. 2013). The questionnaire was administered with the help of trained field assistants. In all, there were thirty trained field assistants made up of teachers, volunteers from communities and undergraduate students. They were initially trained to enable them understand methods of sample and data collection, objective of the study, need to remain secretive. During questionnaire administration, class teachers and trained field assistants mainly those from communities translated some of the questions and communicated to respondents from lower classes in the local language for better understanding, while those in higher classes were directed to appropriately fill the form.

Sample Collection

This work was carried out between May, 2014 to July, 2016. Method of Olaubi and Olukunle (2013) was adopted. Clean catch urine samples were collected between 10.00am and 2.00pm. Each subject was given a sterile, clean dry screw-capped universal bottle carrying specific identification number. In addition, they were instructed on how to collect the urine samples; equally, they were advised to include the last few drops of the urine passed.

This is necessary, since according to Cheesbrough (1987), these drops often contain highest number of eggs of *Schistosoma haematobium*. Enquiry was made from female subjects to ascertain those in their monthly period. Such subjects were noted and excluded from visible haematuria counts. This, according to Anosike *et al*. (2001) is important to avoid false positive results. Each urine sample was labeled with identification number and placed in cold dark boxes to avoid hatching of eggs. The samples were then transported immediately to the laboratory within three hours for analysis.

ANALYSIS OF URINE SAMPLES

Urinalysis

Method of Cheesbrough (1987) was adapted. Urine samples were microscopically examined for colour, macrohaematuria and turbidity. Reagent strip urinalysis was carried out using a reagent strip (Medi-Test Combi-9). The strip was used to analyze urine for the presence of blood, glucose, protein, pH, nitrate, urobilinogen, bilirubin, ketone and ascorbic acid. The test was performed by dipping the strip into the urine sample for about 5 seconds, according to (Olalubi and Olukunle, 2013). After this time, the strip was removed and then compared with the colour scale on the container of the strip. Similarly in colour on the strip and that on the container indicates positive result, while dissimilarity indicates negative result.

Microscopic Examination of Urine

The method of Anosike (2001) was adopted. After shaking the urine container, to resuspend urine deposits and other particulate contents, 10ml of the urine sample was transferred to a centrifuge tube using a sterile disposable 10ml syringe. This was followed by centrifugation at 1500rpm for 5minutes. After decanting the supernatant, the test tube was tapped gently to resuspend urine deposit. With a Pasteur pipette, two drops of the resuspended deposit were transferred to a clean grease free glass slide and then covered with a cover slide. The preparation was examined under the microscope using x40 objective lens with iris diaphragm closed sufficiently to get good contrast. Red blood cells (RBC), White blood cells (WBC), cast yeast cells and eggs with terminal spine were recorded.

Use of Test Strip Method for Diagnosis of *Schistosoma Haematobium*

This was carried out following the standard operating procedure according to the manufacturer.

The procedure is as follows; A fresh urine specimen was collected in clean plastic containers. A strip is then removed from its bottle and then labeled with the respondent's identification. Reagent area of the strip was completely immersed into the urine specimen for a minute. After this time, the strip was removed from the urine, while removing the strip; its edge was run against the rim of the container to remove any excess urine. The strip was then placed horizontally on the table so that the chemicals will not mix. Result was taken between 1 to 2 minutes of dipping the strip into the urine sample. This is done by matching the colour of the strip with the colour chart on the bottle label.

Use of Filtration Method

Stages involved are; The filter holder was unscrewed followed by the insertion of a nucleopore filter between the two parts of the filter holder. This was followed by thorough shaking of the urine specimen for proper mixing, after which 10ml of the specimen was drawn using a 10ml plastic syringe. The plunger of the syringe was pressed down to push all the urine through the filter and out into a bucket. The syringe was then detached carefully from the filter unit followed by drawing of air into the syringe. The syringe was reattached to the filter unit holder to expel any air present. Step D above is important since it helps to remove any excess urine and equally ensures that eggs are firmly attached to the filter. Filter holder was unscrewed, and then with a forceps, filter was removed and placed in an inverted position onto a microscope slide already labelled with respondent's identification number. The top side of the filter where the eggs were captured was placed face-up on the slide. A drop of Lugol's iodine was added and allowed for 15seconds for the stain to penetrate the eggs. This made the eggs more visible. This was then examined under the microscope using x40 objective; total number of eggs seen were also recorded. Eggs of *Schistosoma haematobium* if present will stain orange.

OVERALL PATTERN OF DISTRIBUTION OF *Schistosoma Haematobium* INFECTION AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA

The overall pattern of distribution of *Schistosoma haematobium* infection among school age children in the study area is shown in Table 1. *Schistosoma haematobium* eggs were found in school age children in all the local government areas (L.G.As) sampled with an overall prevalence of 5.9% of the 2,250 children sampled. Okigwe recorded the highest occurrence 32(12.8%) of urinary schistosomiasis while the least 2(0.8%) was observed in Nwangele and Ikeduru

L.G.As. The result revealed that 23 (9.2%) children were infected in Isiala Mbano, 27 (10.8%) in Onuimo, 15 (6.0%) in Ngor Okpalla and 8 (3.2%) in Ezinihitte L.G.A. Furthermore, 6.8% and 2.4% prevalence of infection were recorded in Oguta and Ohali Egbema respectively. Statistical analysis revealed significant difference in the infection of urinary schistosomiasis in the local government areas studied (x^2= 30.3, P value is < 0.00001 at P≤ 0.05).

TABLE 1: OVER ALL PATTERN OF DISTRIBUTION OF Schistosoma haematobium INFECTION AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA

Local Government Area	No. Examined	No. (%) infected with *S. haematobium*	No. (%) uninfected with *S .haematobium*
Isiala-Mbano	250	23 (9.2)	227 (90.8)
Onuimo	250	27 (10.8)	223 (89.2)
Okigwe	250	32 (12.8)	218 (87.2)
Ngor-Okpalla	250	15 (6.0)	235 (94.0)
Ikeduru	250	2 (0.8)	248 (99.2)
Ezinihitte-Mbaise	250	8 (3.2)	242 (96.8)
Oguta	250	17(6.8)	233 (93.2)
Nwangele	250	2 (0.8)	248 (99.2)
Ohaji-Egbema	250	6 (2.4)	244 (97.6)
Total	2,250	132 (5.9)	2,118 (94.1)

OVERALL SEX-RELATED PATTREN OF *Schistosoma haematobium* INFECTION AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA.

Table 2: shows the overall sex related infection of *S. haematobium* among the school age children in the study area. The result showed more males 75(6.7%) were infected than females 57(5.1%). However, the sex related occurrence of urinary schistosomiasis was not significant statistically (x^2=3.74 df=9 P=0.05). The sex related prevalence in the specific Local Government Area revealed that more females were infected in Ngor Okpalla (7.2% v 4.8%) and Ikeduru (1.6% v 0.0%) L.G.As. The same prevalence of infections were observed in Ezinihitte Mbaise 4(3.2%) and Nwangele 1(0.8%).

TABLE 2: OVERALL SEX-RELATED PATTREN OF *Schistosoma haematobium* INFECTION AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA.

	MALES			FEMALES		
Local Government Area	No. Examined	No. (%) infected with *S. haematobium*	No. (%) uninfected with *S. haematobium*	No. Examined	No. (%) infected with *S. haematobium*	No. (%) uninfected with *S. haematobium*
Isiala-Mbnao	125	15 (12.0)	110 (88.0)	125	8 (6.4	117 (93.6)
Onuimo	125	16 (12.8)	109 (87.2)	125	11 (8.8)	114 (91.2)
Okigwe	125	19 (15.2)	106 (84.8)	125	13 (10.4)	112 (89.6)
Ngor Okpalla	125	6 (4.8)	119 (95.2)	125	9 (7.2)	116 (92.8)
Ikeduru	125	0 (0.0)	125 (100)	125	2 (1.6)	123 (98.4)
Ezinihitte-Mbaise	125	4 (3.2)	121 (96.8)	125	4 (3.2)	121 (96.8)
Oguta	125	10 (8.0)	115 (92.0)	125	7 (5.6)	118 (94.4)
Nwangele	125	1 (0.8)	124 (99.2)	125	1 (0.8)	124 (99.2)
Ohaji Egbema	125	4 (3.2)	121 (96.8)	125	2 (1.6)	123 (98.4)
Total	1125	75 (6.7)	1050 (93.3)	1125	57 (5.1)	1068 (94.9)

ISSN (Online) 2348 – 7968
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OVERALL SEX-AGE PATTERN OF *Schistosoma haematobium* INFECTION AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA.

Table 3: shows the overall sex related prevalence of infection among the sex-age groups of school children examined in the study area. The result showed that the infection of the sexes was dependent on their age. The highest infection was recorded among males and females of 10-12 years age group while the least was observed among female of 7-9 years age group.

TABLE 3: OVERALL SEX-AGE PATTERN OF *Schistosoma haematobium* INFECTION AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA.

	MALE			FEMALE		
Age Group (Years)	No Examined	No(%) infected with *S. haematobium*	No(%) uninfected with *S. haematobium*	No Examined	No(%) infected with *S. haematobium*	No(%) uninfected with *S. haematobium*
7-9	300	11(3.7)	289(96.3)	228	7(3.1)	221(96.9)
10-12	506	40(7.9)	466(92.1)	496	33(6.7)	463(93.3)
13-15	319	24(7.5)	295(92.5)	401	17(4.2)	384(95.8)
Total	1125	75(6.7)	1050(93.3)	1125	57(5.1)	1068(94.9)

OVER ALL AGE-RELATED PATTERN OF *Schistosoma haematobium* INFECTION AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA.

The age related pattern of *S. haematobium* infection among school age children examined is shown in Table 4. The age related prevalence of urinary schistosomiasis in the study area showed the highest infection 73(7.3%) in children within 10-12 years age group while children of 7-9 years age bracket had the least infection 18(3.4%). 41 children 41(5.7%) within 13-15 years were infected. There was a significant difference in the infection in the age groups (x^2 P value is <0.00001 at $P < 0.05$).

TABLE 4: OVER ALL AGE-RELATED PATTERN OF *Schistosoma haematobium* INFECTION AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA.

Age group (years)	No. of children examined	No (%) children infected	No (%) children uninfected
7-9	528	18 (3.4)	510 (96.6)
10-12	1002	73 (7.3)	927 (92.7)
13-15	720	41(5.7)	679 (94.3)
TOTAL	2250	132 (5.9)	2118 (94.1)

OVERALL SEX-RELATED EGG COUNTS AMONG SCHOOL AGE CHILDREN INFECTED WITH *Schistosoma haematobium* IN THE STUDY AREA.

The overall sex related *S. haematobium* egg count among the school age children is illustrated in Table 5. The result showed that more of the 132 infected children had egg count of equal or more than fifty per ten milliliter of urine 39(68.9%, heavy infections) than those with egg counts of less than fifty 18(31.1%, light infection). More heavy infections were observed in males (69.3% v 68.4%), while females recorded more light infections (31.6% v 30.7%). Statistical analysis revealed that the intensity of infection was not dependent on sex (x^2=0.2817, P-value is 0.5955 at $P<0.05$).

TABLE 5: OVERALL SEX-RELATED EGG COUNT AMONG SCHOOL AGE CHILDREN INFECTED WITH *Schistosoma haematobium* IN THE STUDY AREA.

Egg/10ml of urine	No. (%) of Males infected	No. (%) of Female infected	Total (%) M + F
<50	23(30.7)	18(31.6)	41(31.1)
$\geq$50	52(69.3)	39(68.4)	91(68.9)
Total	75(56.3)	57(43.2)	132(100.0)

RELATIONSHIP BETWEEN WATER SOURCE AND PREVALENCE OF *Schistosoma haematobium* AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA

The children response on their principle water source and associated prevalence of *S. haematobium* is illustrated in Table 6. The result showed that children who identified river, stream or lake as their principal means of water source recorded the highest infection rate of 92(7.6%). The least was recorded among children whose principal mean of domestic water was borhole water 11(3.1%).

TABLE 6: RELATIONSHIP BETWEEN WATER SOURCE AND PREVALENCE OF *Schistosoma haematobium* AMONG SCHOOL AGE CHILDREN IN THE STUDY AREA

Water Source	No of children involved	No(%) infected with *S. haematobium*
Well water	450 (20.0)	21(4.6)
Pipe borne water /mono pump	248 (11.0)	8(3.2)
Bore hole	352 (15.6)	11(3.1)
River/Stream/Lake	1200 (53.3)	92 (7.6)
Total	2250	132 (5.9)

PREVALENCE OF URINARY SCHISTOSOMIASIS IN RELATION TO THE LEVEL OF PARENTAL EDUCATION OF SCHOOL AGE CHILDREN EXAMINED.

The prevalence of urinary schistosomiasis in relation to the level of parental education is illustrated in Table 7. It was observed that children whose parents had no formal education recorded the highest infection 63(47.7%), while the least was observed in students whose parents had post secondary education 11(8.3%). However, Chi-square analysis showed infection of the student was not dependent on parents level of education (x^2=5.4, α=0.05, df=10).

TABLE 7: PREVALENCE OF URINARY SCHISTOSOMIASIS IN RELATION TO THE LEVEL OF PARENTAL EDUCATION OF SCHOOL AGE CHILDREN EXAMINED.

	Father			Mother			
Level of education	No examined	No (%) infected	No (%) uninfected	No examined	No (%) infected	No (%) uninfected	Total No (%) infected
No formal education	382	28(7.3)	354(92.7)	504	35(6.9)	469(93.1)	63(47.7)
Primary education	250	18(7.2)	232(92.8)	324	16(4.9)	308(95.1)	34(25.8)
Secondary education	223	10(4.5)	213(95.5)	283	14(4.9)	269(95.1)	24(18.2)
Post-Secondary education	149	6(4.0)	143(96.0)	135	5(3.7)	130(96.3)	11(8.3)
Total	1004	62(6.2)	942(93.8)	1246	70(5.6)	1176(94.4)	132(5.9)

EFFECT OF PARENTAL OCCUPATION ON THE PREVALENCE OF URINARY SCHISTOSOMIASIS AMONG SCHOOL AGE CHILDREN EXAMINED.

The effect of parental occupation on the prevalence of urinary schistosomiasis among the school age children examined is shown in table 8. The highest infection rate was observed among children of farmers 43(32.6%) and the least among those of civil servants 12(9.1%). Children from parents of other occupation recorded different prevalence like traders 20(15.2%), Fishers 22(16.7%), and Artisans 35(26.5%). The prevalence of infection is dependent on parents' occupation (x^2=5.4, α=0.05, df=10).

TABLE 8: EFFECT OF PARENTAL OCCUPATION ON THE PREVALENCE OF URINARY SCHISTOSOMIASIS AMONG SCHOOL AGE CHILDREN EXAMINED.

Occupation	Father			Mother			Total No (%) infected
	No examined	No(%)Infected	No (%) uninfected	No examined	No(%) infected	No (%) uninfected	
Artisans	275	15(5.5)	260(94.5)	282	20(7.1)	262(92.9)	35(26.5)
Farming	245	18(7.3)	227(92.7)	352	25(7.1)	327(92.9)	43(32.6)
Fishing	202	8(4.0)	194(96.0)	409	14(3.4)	395(96.6)	22(16.7)
Civil servants	160	5(3.1)	157(96.9)	148	7(4.7)	141(95.3)	12(9.1)
Trading	120	12(10.0)	108(90.0)	55	8(14.5)	47(85.5)	20(15.2)
Total	1004	58(5.8)	946(94.2)	1246	74(5.9)	1172(94.1)	132(5.9)

DISCUSSION

Overall Pattern of Distribution of Urinary Schistosomiasis in the Study Area

The overall prevalence of 5.9% of urinary schistosomiasis was obtained from school age children in the study area. The low prevalence of 5.9% of *Schistosoma haematobium* observed in this study is in agreement with the 5.5% reported by Akinboye *et al*. (2011) among schools in Ibadan, Benwat *et al*. (2011) in Langai community, Mangu L.G.A of Plateau State (6.4%), Okpala *et al*. (2004) among pupils in Apata and Laranto areas in Jos, Nigeria (0.33%), Dawet *et al*. (2012) in Gwong and Kabong in Jos North Local Government Area, Plateau State (2.07%), Okere and Ubachukwu (2013) in Urban and Semi-Urban Communities in South-Eastern Nigeria (4.64%), Ogbonna *et al*. (2012) in Obollo-Eke, Enugu State, Nigeria (18.0%). Other studies also reported prevalence of urinary billharziasis that is comparable or even lower than the findings of this study. For example, prevalence rates of 4.5% and 11.3% were reported in Abini community in Cross River and Ohaji/Egbema in Imo State, respectively by Okoli *et al*. (2006).

The low prevalence of *S. haematobium* observed in this study is not consistent with observation made by Ekpo *et al.* (2010) who reported 58.1% prevalence among preschool children in a community near Abeokuta. Similarly, Ugbomoiko *et al*. (2010) reported a prevalence of 62.0% in two peri-urban communities in South-Western Nigeria. Biu *et al*. (2009) reported a prevalence of 24.3% infection among school children in Konduga L.G.A, North-Eastern Nigeria. Furthermore, Babatunde *et al*. (2013) reported a prevalence of 48.2% among pre-school and school age children in two peri-urban communities in South-West Nigeria. Kiran and Muddasiru (2014) reported prevalence of 60.8% among school age children in some riverine areas of Sokoto, Nigeria while Balla and Jabbo (2013) reported prevalence in the rural communities of Mayo-Belwa local government area of Adamawa State, Nigeria. Other studies with results that are not in agreement with the present study include that by Ossai *et al*. (2014) who reported prevalence of 34.1% among primary school children in rural communities in Enugu State Nigeria.

Results from this study indicate that the study area is endemic for urinary schistomiasis. Though an endemic area for urinary schistosomiasis prevalence of 5.9% is still considered to be low; this is because 5.9% is below prevalence of 25.0% which is the maximum prevalence limit of urinary schistosomiasis as recommended by World Health Organization (WHO, 1985). Though low prevalence level of urinary schistosomiasis was observed in this study, the disease is still a serious health challenge that requires attention by Health Care Providers. Its presence no matter how low could be attributed to factors such as ignorance, poor living condition, inadequate sanitation, level of water contact activity with snail infected rivers, streams and ponds (WHO, 2003).

The low prevalence of *Schistosoma haematobium* observed in this study could further be attributed to reduction in water contact activities (Dawet *et al*. 2012). The low prevalence may also be an indication of the level of awareness about the disease in the study area. This is obvious since according to Jamda *et al*. (2007), health education is a very effective means of improving knowledge about urinary schistosomiasis and has the potential to reduce the prevalence of the disease. Additionally, it is possible that government agencies may have embarked on routine and regular distribution of drugs effective for controlling the disease.

Results of this study also revealed that urinary schistosomiasis is endemic in the nine local government area sampled (Table 1). Level of infection however varied with some local governments having higher level of infection than others. This difference in the prevalence rate may be influenced by peculiar ecological characteristics, the degree of exposure of people to water bodies through some indigenous water contact activities and presence of intermediate snail hosts in local rivers (Bolaji *et al*. 2015). No matter the level of infection, so long as there is infection, it is still a serious health issue that requires urgent attention. This trend of results is not unconnected to the fact that most of these local government areas have rural village and community arrangements. Furthermore, the prevalence reported in the present study may be an indication of the rate of *S. haematobium* transmission in these communities. Rivers are the main transmission foci in these local government areas. People depend on these rivers for their fishing occupation, bathing, swimming and other domestic needs. Infection foci may also be traced to their farms. It is possible that these provide avenue for infection transmission and re-infection (Bolaji *et al*. 2015). A close look at the prevalence of *S. haematobium* infection in the nine local government areas studied show that Okigwe had the highest prevalence of 12.8%. Infection rate for *S. haematobium* among school age children in the five different primary schools sampled within Okigwe L.G.A. ranges between 2.0% to 36.0%. The prevalence recorded in this local government is closely in agreement with observation made by Okoli *et al*. (2006) who recorded prevalence of 11.3% in Ohaji/Egbema L.G.A of Imo State. On the other hand, the prevalence level is slightly below 18.7% recorded in Niger-Benue basin of Kogi State by Ejima and Odaibo (2010). Main factors that may be responsible for higher prevalence of urinary schistosomiasis among school aged children in Okigwe L.G.A compared with other local government areas studied may include lower literacy, presence of infected water bodies like streams, ponds where daily activities like washing, fetching of water for domestic purposes, fishing, bathing and swimming take place (Houmson *et al*. 2012). Possible higher level of these predisposing factors may have put school age children at higher risk of infection compared with school age children from other local government areas. Furthermore, the increase in Okigwe may due to the topography and hydrology of Okigwe. The activities of the quarry companies create quarries which are filled with water serving as foci for infection. Also there are several collection of water from the several spring water sources in the area which serve for recreation purposes and for domestic use. Lastly, Okigwe has a large population of cattle rearers from Northern parts of the country which are known to present high infection rates (Balla and Jabbo, 2013).

Sex-Related Prevalence of *Schistosoma haematobium* infection Among School Age Children in the Study Area.

Males recorded higher prevalence rate of 6.7% than females 5.1%, there was no statistically significant difference in prevalence between male and female ($p<0.05$). The higher infection level of males over females as observed in this study is in accord with observation of Houmsou *et al*. (2012) (45.2% vs 37.2%) in two local government areas of Benue State Nigeria, Bolaji *et al*. (2015) (62.0% vs 54.9%)in Ajase-Ipo, Kwara State, Nigeria, Reuben *et al*. (2013) (18.7% vs 8.1%)in Lafia, Nasarawa State, Nigeria, Adeyeba and Ojeaga (2002) (63.0% vs 50.0%), Okolie (2008) (6.4% vs 3.6%) among the Abriba people of Abia State, South-Eastern Nigeria. The observed in significant higher prevalence of *S. haematobium* in males and females is in variance with report by Ekpo *et al.* (2010) and Nkegbe (2010) who separately reported a significant higher prevalence in female than male. Other researchers such as Alaku (2013) also observed higher infection rate of 55.5% in females than 35.48% in males, Balla and Jabbo (2013) who reported prevalence of 32.5% and 32.3% in females and males, respectively in Adamawa State.

The observed higher prevalence of *S. haematobium* infection in males than females could be attributed to the fact that boys engage more in swimming, fishing and irrigation especially after school hours more than their female counterpart. This practice exposes the boys more to risk of infection, since level of exposure or contact with water containing cercariae of the parasite and the risk of infection are linearly related (Abdullahi *et al*. 2011). Although the female could engage in water fetching and washing beside stream often in the company of their parents or guardians. Their exposure is not as long as those of the boys who may also assist in fetching water (Adeyeba and Ojeaga, 2002)

Age-Related pattern of *Schistosoma haematobium* Infection among School Age Children in the Study Area.

Prevalence of *Schistosoma haematobium* infection within the study area was observed to be age dependent. Infection with *S. haematobium* was found to be higher among pupils of the age group 10-12 that had prevalence rate of 7.3%. This was followed by those in age group 13-15 with 5.7% and finally those in age group 7-9 with infection level of 3.4%. There was a statistical significant difference of infection in the age groups at $p<0.05$. The observed higher prevalence of infection in 10-12 age group is similar to the findings of Abdullahi *et al*. (2011) where age group of 9-12 had the highest prevalence rate of 20.0%. Also Bello and Edungbola (1992) recorded high prevalence rate among this age group. The prevalence rate of 7.3% found in the 10-12 years in this study also contrast findings of Agi and Awi-Waadu (2008) and Ugbomoiko *et al.* (2010) who found high prevalence rates in a similar age group. Subjects of this age group are very adventurous and often engage in activities that necessitate more contact with water, as a result are always zealous to engage in activities such as fishing, swimming and irrigation than those in of the lower age group. Slightly lower prevalence of 5.7% among children between 13-15years is obvious because this group also engage in water activity but possibly are more aware of the disease and some precautionary measures that could be taken to avoid contracting the disease while those between 7-9 years that had least infection level of 3.4% may not always indulge in water contact activities due to their younger age.

Relationship between Water Source and Prevalence of *Schistosoma haematobium* among School Age Children in the Study Area

Children who identified river, stream or lake as their principal means of water source recorded the highest infection rate of 7.6%, followed by those whose water source is well water (4.6%). This observation is in agreement with Okpala *et al*. (2004) who reported 2.23% and 0.52% infection among school pupils who had their water from river/stream and well, respectively. This rather contradicts Olusegun *et al*. (2011) who observed that highest percentage of patients (0.33%) who were infected with urinary schistosomiasis had their water from borehole. The high prevalence among those that use river/stream/lake and well could be attributed to the openness of this water to sources of contamination. Some of the well was not always covered and children often fetch water from these points without standard hygiene (Dawet *et al*. 2012).

Prevalence of Urinary Schistosomiasis in Relation to the Level of Parental Education of School Age Children Examined

Statistical analysis revealed that infection does not depend on parents' level of education though children whose parents had no formal education recorded the highest infection (47.7%). This trend of result is in agreement with Houmson *et al*. (2012). Also the fact that educational backwardness has a great impact on the distribution of schistosomiasis in rural communities has been reported in Cross River State, Nigeria (Etim, 1995). This could be due to lack of proper knowledge of the disease which leads to inability to properly educate their children about the preventive measures against the disease. Children of parents with primary education had higher infection level of 25.8%, followed by those from parents with secondary education 18.2% while the least level of infection was observed from children whose parents had post secondary education. This trend could be attributed to the fact that higher the level of education, more and properly the children are educated about the possible cause and factors that can lead to contraction of the disease.

Effect of Parental Occupation on the Prevalence of Urinary Schistosomiasis among School Age Children Examined

Prevalence of urinary schistosomiasis was found to depend on parent's occupation. Children from parents with different occupation recorded different prevalence levels, but higher infection rate was observed among children of farmers (32.6%) while least in children of civil servants. The finding is in accord with that of Uwaezuoke *et al*., (2008) who observed from a study in Ebonyi State that children of farmers had the highest infection rate of 53.5% compared to children from parents of other occupational groups. This finding however opposed Olusegun *et al*. (2011), who reported highest prevalence of 0.7% in children of artisans. Highest prevalence of infection among the children of farmers is because these children often go to the farm with their parents and as such are unavoidably in contact with infected water due to the nature of their duty. Some of them are hired labourers in swampy rice fields. Their occupation predisposes them to infection (Anosike *et al*. 2002).

CONCLUSION

S.haematobium is one of the neglected tropical diseases with increasing incidence and prevalence. However there should be constant surveillance of the disease to reduce it, not possible to completely eliminate it. Government should provide adequate pipe-borne water or treated boreholes in the community, and recreational activities should be provided in communities to reduce the rate of contact with infected water. Health education should be carried out in schools, community and other public gathering to englihten those that have not known and remind those that might have forgothen about the epidemiology of the disease and based treatment programs (using praziquantel as the drug of choice) be organized in school, market places and community halls.

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