Assessment of Schistosoma Haematobium Infections among Pupils in Some Selected Schools in Afikpo North Local Government Area of Ebonyi State, Nigeria.

[1]Ibiam, G. A., [4]Njoku, O.O., [1]ELOM, M. O., [1]UMOH, N. O., [1]USANGA, V. O., [3]Nwoke, E. U., [2]Obi I. A. and [2]Eze, C. N.

[1]Department of Medical Laboratory Science, Ebonyi State University, Abakaliki.
[2]Department of Nursing Sciences, Ebonyi State University, Abakaliki.
[3]Department of Applied Biological Science, Ebonyi State University, Abakaliki.
[4]Department of Biological Sciences, Federal University of Technology, Owerri, Imo State, Nigeria.
Coresponding Author: Ibiam Gideon Ama lasgidex@yahoo.com

Abstract: The assessment of *Schistosoma haematobium* infections among school-age children was carried out between Septermber 2010 and June 2013 among some selected primary schools in Afikpo North Local Government Area, Ebonyi State, south-eastern Nigeria. A total of seven hundred and fifty (750) urine samples were obtained and examined for schistosome eggs, using Combi 9 test kit and microscopy methods. There was an overall prevalence of 28.4%. Amizu Community Primary School, Amamgbala had the highest infection rate of 47.3% while Presbyterian Primary School, Amichara had the least prevalence of 16.0%. The prevalence of *S. haematobium* infections in relation to age showed that school children within the age of 15 and 16 years had the highest prevalence of 40.0%.This was followed by children within the age of 13 and14 years with 38.4% while children within the age of 5 and 6 years recorded the least prevalence of 11.2%. The prevalence of the infections was significantly higher in males (33.1%) compared to that of the females [(23.7%) : $p<0.05$]. Prevalence by parental occupation indicated that children whose parents were fishermen and or farmers had the highest prevalence of 35.4% which was statistically significant ($p<0.05$) compared to those whose parents were non-farmers. Prevalence by water contact activities was 36 % in children involved in farming activities while those involved in fishing had the prevalence of 19 %.
The study revealed that lack of adequate knowledge of the disease and exposure to infested water bodies were responsible for the high prevalence of *Schistosoma haematobium* in the study area. Prompt and adequate intervention is advocated for efficient control of the infections in this area.

Key words: Prevalence, *Schistosoma haematobium*, School-age children, Afikpo, Ebonyi State.

INTRODUCTION

Schistosoma haematobium infection, is one of the major health problems in tropical and sub-tropical countries of the world (WHO, 1993). Schistosomiasis is a parasitic disease caused by a digenetic blood fluke of the genus called *Schistosoma*. The disease is the second most prevalent neglected tropical diseases after hookworm (Hottez and Kamath, 2009) and remains an important public health problem especially in the sub-Saharan Africa (Ishaleku *et al*., 2012). Urinary schistosomiasis affects the bladder and subsequently the urinary tract system of man (King, 2001). The effect of urinary schistosomiasis is due to deposition of eggs in the bladder and urethra which elicit chronic granulomatous injury. The granulomatous inflammation causes nodules, polypoid lesions and ulcerations in the lumen of the urethra and bladder which results clinically in urinary frequency, proteinuria, dysuria and terminal haematuria (Hunter, 1976). It remains the most widespread infection in the tropics which can lead to complex acute and chronic diseases with widely differing signs and symptoms. It is the most prevalent of water – borne diseases, with very great risk on the health of rural populations (WHO, 1991).

It is a disease of the poor that typically affects rural villagers, especially school- age children, farmers and fishermen who lack access to safe water and sanitation and whose daily activities bring them into direct contact with infected water sources (Odikamnoro *et al*., 2009). The disease is most commonly found in areas where the water contains numerous fresh water snails (Bulinus sp.), which may carry the parasites (WHO, 1999).

The report of WHO (2012), on the spread of *Schistosoma haematobium* infection is well documented worldwide, with the disease currently being endemic in 77 countries and territories over several continents, infecting more than 200 million people in rural and sub – urban areas.

The number of people treated generally for schistosomiasis rose from 12.4 million in 2006 to 33.5 million in 2010 and in some villages in African countries, over 90% of the children were infected by the disease (WHO, 2012). Nigeria is one of the countries known to be highly endemic for urinary schistosomiasis with estimated 101.28 million persons at risk and 25.83 million people infected, and approximately 20 million Nigerians, mostly children, need to be treated for schistosomiasis (WHO, 2012). The disease ranks high among parasitic diseases in terms of socio-economic and public health importance in tropical and subtropical areas (Clennon *et al.,* 2004).

Extreme poverty, lack of awareness of the risk, the inadequacy or total lack of public health facilities plus the unsanitary conditions in which millions of people live especially in rural areas of developing tropical countries are all factors contributing to the risk of *Schistosoma haematobium* infection (Michaud *et al.*, 2003). Young individuals are mostly infected with peak prevalence and intensity of infection in the age group 11-15 years (Biu *et al*., 2009; Sarkinfada *et al*., 2009).

The estimates for morbidity and mortality in affected populations are high with school-age children usually presenting with the highest prevalence and intensity of *S. haematobium* infection (WHO, 2003). Hence, information levels are normally highest in children and following chemotherapeutic cure, younger children are more rapidly re-infected and at higher rates than older children and adults because of their constant contact with source of infection; a feature characteristic of the majority of endemic settings (Butterworth *et al*., 1992*)*.

Schistosomiasis is endemic in Nigeria as revealed by several prevalence studies but the degree of endemicity is reducing. The proliferations of several irrigation projects all over the country has stabilized the infection especially in the northern Nigeria, while in the West, rapid urbanisation, supply of potable water and mass chemotherapy have combined to reduce its prevalence.(Ejezie, 1991). Human infection is measured by the determination of prevalence and intensity of the infection; hence the severity of the disease is related to the intensity of infection. Heavy infections can rapidly be detected by the use of urinalysis reagent strips to measure haematuria and protein levels in urine. Nodular filling defects occur early during infection, while bladder calcification comes at a later stage. Clinical trials with metrifonate and niridazole among other drugs have been

carried out with varying results but a new drug, praziquentel has been assessed and found suitable for mass use. While the severe clinical form of schistosomiasis infection may take many years to develop, there is a general agreement that targeting treatment can make a considerable impact on the development of pathology (Sturrock, 1987).

Schistosoma haematobium infection is widely distributed with a huge impact on public health and socio-economic development. In terms of economic and health effects, schistosomiasis in children can cause anaemia, stunted growth and a reduced ability to learn. Although the effects are usually reversible with treatment, chronic schistosomiasis may affect people's ability to work and in some cases, can result in death (WHO, 1993). *Schistosoma haematobium* infections, had been reported to be very serious environmental health problem in the past in Afikpo North L.G.A., with children usually being the most affected group. In view of that, this research was carried out among school-age children in Afikpo North Local Government Area, in Ebonyi State, south-eastern part of Nigeria, to determine the present prevalence of *Schistosoma haematobium* infections in the study area. Water sources, parental occupations and hygiene practice assessments were considered to determine their respective contributions if any, to the occurrence of *S. haematobium* infections in the in the study area.

Aim of the Study

The study was aimed at assessing the prevalence of *Schistosoma haematobium* infection among school-age children in some selected primary schools in Afikpo North L.G.A., Ebonyi State, Nigeria.

MATERIALS AND METHODS

Study Area

The study was conducted from September, 2012 to June, 2013 in the rural communities of Afikpo North Local Government Area of Ebonyi State, south-eastern part of Nigeria. Afikpo North L.G.A. was selected for the study due to lack of quality water supply in the area and the major occupations of the people are predominantly fishing, farming and trading which include some of the predisposing factors to schistosomiasis infestations. The reason for selecting the area was also based on previous reports from local hospitals and health centres in that area where cases of urinary schistosomiasis were recorded mainly among school children.

The total land area of Afikpo North L.G.A is 2147.301 km^2 , with a population of 314,987 (National Population Census, 2006). The predominant soil type is mainly clay soil and the topography of the land is characterized by elevated hills which are located between Latitude 05^0 53' 35.3" N and longitude 07^0 57' 31.6" E of the Greenwich meridian. The climate of the area is tropical with mean daily temperature of 30 ± 5^0C for most of the year and annual rainfall of about 1600mm. (Nigerian Agency, Metrological Enugu, 1966). The vegetation is typically savannah with two major seasons: wet and dry. The wet season lasts between April and October while the dry season takes place between November and March. Afikpo is made up of different classes of people, the high class, the average and the low class. There is a river which passes through some of the communities through Cross-River. This is also the main water body for fishing. The inhabitants are made up of fishermen and peasant farmers and they are prone to diseases such as *Schistosomiasis*, malaria, *Onchocerciasis*, *Dracunculiasis* and so on.

Several fresh water habitats such as "Onyi - ugo" stream, "Uji" stream, Bridge stream, "Ogbanali" stream, "Obuka" Stream and others intersect the villages. Some of these are man-made pools, well, streams, ponds as well as road ditches which are their main sources of water supply. During the dry season, the rate of flow of the streams and rivers slow down, hence water - activities increase in those water bodies as people converge to use the water for domestic, agricultural, recreational and religious purposes. The centre of the village is where the

middle and the high class reside. They had boreholes and wells as their major sources of water but the schools where the study was carried out were located in the most interior areas, where the low class live.

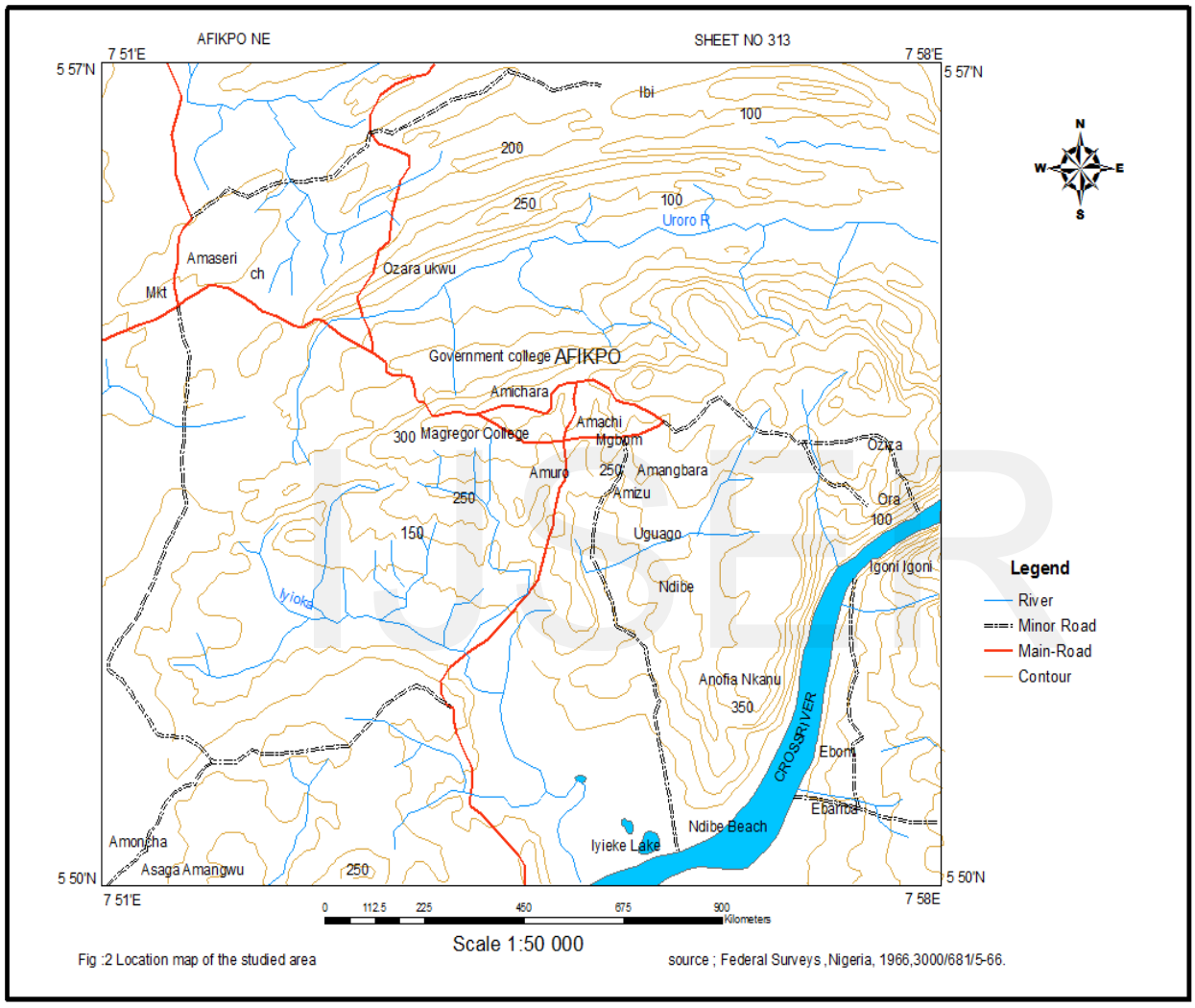

Fig :2 Location map of the studied area

source ; Federal Surveys ,Nigeria, 1966,3000/681/5-66.

Fig 1: Map of the study area. (Federal Surveys, Nigeria, 1966).

Study Population and Design

The study was carried out on primary school children drawn from five communities in Afikpo North L.G.A., Ebonyi State. The cross-sectional survey employed a convenience sampling technique in screening the pupils. This method of sampling is a non-probability sampling technique where subjects are selected based on their convenient accessibility and proximity, (Dorofeev and Grant, 2006). A total of 150 pupils were recruited from each school, giving a combined total of 750 pupils enrolled in the study.

The schools surveyed include Amizu Primary School, Amamgbala; Ngodo Primary School Amachi; Presbyterian Primary School Amichara; Amuro Community Primary School, Mgbom and Community Primary School, Ndibe.

Ethical Clearance / Informed Consent and Exclusion Criteria

Approvals were granted by the Education Secretary of Afikpo North Local Government Council, who issued letters to the various school heads of the primary schools included in the study. A pre- survey visit was made to the study areas during which time, discussions were held with the school teachers who assisted in mobilizing the pupils for the study. Informed consent was also obtained from the Parent-Teacher Association (PTA) of each school studied.

Pupils who were transferred from the school at the time of the visit were excluded from the exercise as well as those showing multiple signs of illness.

Questionnaire Administration

A structured questionnaire consisting of questions relevant to urinary schistosomiasis was issued to each child to obtain information on name, age, sex, knowledge of the disease, level of education and occupation of parents as well as water contact activities. Information in the questionnaire also included type of toilet used,

source of drinking water, whether they had taken anti-helminthic or diarrheal drugs in the past two weeks and if they wash their hands with soap and water after using the toilet.

In cases where the pupils could not understand the questionaire, the class teachers were there to guide them in filling the form appropriately.

Sample Collection

Sampling was carried out with the help of the school heads and teachers who addressed the pupils in their local language for compliance. The pupils were instructed to queue-up according to their classes from class 1 to 6. The first 25 pupils from each class that were willing to participate in the exercise were selected. After instructing the pupils on specimen collection, each of them was given a clean, dry screw-capped, wide-mouthed, leak proof, 20ml universal container containing a pinch of boric acid to preserve the ova. Ten (10) ml of the urine specimen were obtained from the children between 10:00am and 2:00pm (Bradley, 1993).

The containers were appropriately labelled with identification numbers and placed in a cold box with ice packs to protect them from direct sunlight. Then the specimens were transported to the laboratory for immediate examination within four hours of collection.

Laboratory Analysis

The urine samples were analysed at the Ultra Modern Research Laboratory in the Department of Medical Laboratory Science, Ebonyi State University Abakaliki, using two methods: the indirect and direct methods.

i. Indirect Method

The freshly-passed mid-day urine samples collected were inspected macroscopically for haematuria and visual opacity (turbidity) as well as for protienuria, with the aid of reagent strip, (Urine – 10 parameters by Cypress Diagnostics, 3201 Langdorp Belgium). This was done by dipping a reagent strip carefully into each urine sample in the universal containers for 5 seconds. The resulting change in colour of the strip was compared with the manufacturer's colour chart to estimate the amount of blood in the urine (Cheesbrough, 2006).

ii. Direct Method

This involves the use of sedimentation technique. Ten (10) ml of each urine sample was transferred into a conical centrifuge tube after shaking gently to mix the urine. The tubes were properly labelled and placed serially on the rack. Afterwards, they were centrifuged using a centrifuge machine (Model HNS// CFC 301), at 1000 revolution per minute (rpm) for 10 minutes in order to concentrate eggs of schistosomes as described by Ishaleku *et al*. (2012). Thereafter,the supernatants were discarded while the sediments were transferred to glass slide, covered with cover slip and examined microscopically with Olympus microscope (Model B045781), using x10 and x40 objective lenses respectively. (Cheesbrough, 2006).

Egg Counting

Positive urine samples were used for egg counting to determine the infection intensity. Infections were graded as light, or heavy on the basis of the number of ova per 10 ml urine. Infection is regarded as light when less than 50 ova per 10 ml urine are recovered while heavy infections means that more than 50 ova per 10 ml of urine were counted (WHO, 2004).

Statistical Analysis

The data generated were analysed using both descriptive and inferential statistics. Differences in proportions were evaluated using chi-squared analysis at 5% level of significance.

RESULTS

A total of 750 pupils were screened from five selected primary schools in Afikpo North Local Government Area of Ebonyi State, Nigeria. Out of the total number examined, 375 were males, while 375 were females. A total of 213 pupils were infected with *Schistosoma haematobium*, giving an overall prevalence of 28.4%. (Table 1).

The results in table 1 also show that the prevalence varied among the five primary schools. It was highest in Amizu Primary School, Amamgbala, with a total prevalence of 47.3% while least prevalence of 16.0% was recorded at Presbyterian Primary School Amichara. There was however, a statistically significant difference in prevalence between the different schools examined ($P<0.05$).

Table 1: Prevalence of *S. haematobium* infections among pupils in selected schools in Afikpo North L.G.A. , Ebonyi State, Nigeria

	Males			Females			Total		
Schools	Number examined	No infected	(%) infected	Number examined	No infected	(%) infected	No examined	No infected	(%) infected
Comm. Primary Sch. Ndibe	75	36	48.0	75	23	30.7	150	59	39.3
Ngodo Primary Sch. Amachi	75	14	18.7	75	17	22.7	150	31	20.7
Amuro Comm. Primary Sch. Mgbom	75	15	20.0	75	13	17.3	150	28	18.7
Amizu Comm. Primary Sch. Amamgbala	75	44	58.7	75	27	36.0	150	71	47.3
Presbyterian Primary Sch. Amichara	75	15	20.0	75	9	12.0	150	24	16.0
Total	375	124	33.1	375	89	23.7	750	213	28.4

The results in table 2 show age-related prevalence of *Schistosoma haematobium* infections among pupils in the selected primary schools in Afikpo North Local Government Area. Highest prevalence of the infections was recorded in age group 15-16 years with a value of 40.0 % while the least prevalence was recorded in age group 5-6 years with a value of 11.2%.

Table 2: Age - related prevalence of *S. haematobium* infections among pupils in selected schools in Afikpo North L.G.A., Ebonyi State, Nigeria

		Males	Females	Total	
Age groups (years)	Number examined	Number infected	Number infected	Total number infected	% infected
5-6	125	9	5	14	11.2
7-8	125	8	11	19	15.2
9-10	125	21	18	39	31.2
11-12	125	27	16	43	34.4
13-14	125	29	19	48	38.4
15-16	125	30	20	50	40.0
Total	750	124	89	213	28.4

Table 3 depicts sex-related prevalence of *Schistosoma haematobium* infections among pupils enrolled for this study in the selected primary schools in Afikpo North L.G.A. of Ebonyi State. Out of the 375 male samples examined, 33.1% were infected while 23.7% females out of the examined 375 were also infected by *Schistosoma haematobium*. There was a statistically significant difference in the prevalence of infection between males and females, (p<0.05).

Table 3: **Sex-related prevalence of *S. haematobium* infection among pupils in selected schools in Afikpo North L.G.A., Ebonyi State, Nigeria**

	Males			Females			Total	
Class	Number examined	Number infected	% infected	Number examined	Number infected	% infected	Number infected	% infected
Primary 1	63	9	14.3	64	5	7.8	14	11.0
Primary 2	61	8	13.1	59	11	18.6	19	15.8
Primary 3	63	21	33.3	62	18	29.0	39	31.0
Primary 4	60	27	45.0	63	16	25.4	43	35.0
Primary 5	63	29	46.0	64	19	29.7	48	37.8
Primary 6	65	30	46.2	63	20	31.7	50	39.4
Total	375	124	33**.1**	375	89	23.7	213	28**.4**

Pupils whose parents were farmers and fishermen had highest prevalence of 35.4% while those whose parents were civil servants were least infected with a prevalence of 17.0%.(Table 4).

Table 4: **Prevalence of *S. haematobium* infections by parental occupations**

Occupations	Number examined	Number infected	% infected
Traders	270	66	24.4
Farmers/Fishermen	356	126c	35.4
Civil Servants	124	21	17.0
Total	750	213	28.4

Children that engaged in farming activity had the highest prevalence of urinary schistosomiasis with 36%. This was followed by those who went to the river for bathing and swimming as well as those who went to the river to fetch water with prevalence of 31%, 30% and 28% respectively. Low prevalence was observed in children who went to the water bodies for washing (27%), while those that went for fishing had the least prevalence of 19% (Table 5). Statistical analysis showed significant differences (p<0.05) through the water contact activities.

Table 5: **Prevalence of *Schistosoma haematobium* infection by water contact activities**

Water contact activity	Number examined	Number infected	% infected
Fetching	116	32	28
Bathing	112	35	31
Swimming	128	38	30
Washing	109	29	27
Fishing	137	26	19
Farming	148	53	36
Total	750	213	28.4

DISCUSSION

In the present study, a total of 750 pupils were screened from five selected primary schools in Afikpo North Local Government Area of Ebonyi State, Nigeria, out of which 213 pupils were infected. The results of the study indicate that *Schistosoma haematobium* infection is present in the study area with a total prevalence of 28.4% among the school-age children. This result is higher than the 9.8% prevalence recorded earlier in Afikpo North Local Government Area by Nworie *et al*. (2012). It is also higher than the 22.1% prevalence recorded by Anosike *et al*., (2006) in Ezza farmers in the South Western border of Ebonyi State but less than 47.9 % and 79.4% observed by Uneke *et al*. (2007, 2010) in their different studies in Ezza-North Local Government Area of Ebonyi State. However, the results obtained in the present study is less than 31.9% obtained in Enugu by Korve (2002), 42.3% prevalence recorded in North Central Zone of Abia State by Anosike *et al*. (2001) and 45.7% observed in Ogbadibo Local Government Area of Benue State, Nigeria by Mbata (2008).

Likewise, the results obtained in this study is far lesser than 50.8% reported in four schools of Ilobu and Erin-Osun communities in Osun State, Nigeria (Ugbomoiko *et al*., 2009) and 58.1% observed among school children in Ilewo-Orile, a rural community near Abeokuta, Nigeria by Anosike *et al*. (2001). These differences in prevalence among all the previous studies cited could be as a result of different predominant ecological and social-economic factors in the areas as well as the type of water bodies and water contact behaviours of the children in the study areas.

Statistical analysis showed no significant differences in the trends of prevalence, ($p > 0.05$) between the schools investigated. However, the degree of inter-community disparity in infection rate is considerable. This disparity is attributed to variations in the degree of exposure to infections, which is influenced by village location, and the occupation of the inhabitants.

In this study, the prevalence of *Schistosoma haematobium* infection varied according to the age groups of the populations. There were great variations in prevalence of infections across the different age groups, with

pupils within 15-16 years having the highest prevalence. The variations could be attributed to behavioural patterns of different age groups with respect to water contact activities. The pupils in age group (15-16) were older and often got in contact with the infected water bodies through swimming, fetching, washing of clothes, fishing and farming.

Lower prevalence was recorded among age groups 5- 6 and 7-8. This could be because pupils of those age groups were young and were prevented from going to water bodies to avoid being drowned. This finding agrees with the report of Ogbonna and Okoronkwo (2000) which showed that children infected with *Schistosoma haematobium* were found to be more between the ages of 11-16 years.

The prevalence pattern in relation to age is similar to the characteristic pattern of urinary schistosomiasis infections as reported previously by Woolhouse (1998). However, Edington *et al.* (1976) reported that there is usually a drop in load of infection with increase in age due to development of immunity.

Males were more infected by *Schistosoma haematobium* than females. This could be attributed to the fact that males are more actively involved in water related activities such as fishing and farming than the females. This is in line with the observations of Anosike *et al*. (2006) in Ebonyi State, Nigeria and Biu *et al*. (2009), that the prevalence of urinary schistosomiasis is higher among the males than the females. The findings of this study also agrees with those of Anigbo and Nwaorgu, 1990; Agi 1995; Nduka *et al.* (1995); Akufongwe *et al.* (1996); Okoli and Odaibo (1999) and Mafiana *et al.* (2003).

Children whose parents were farmers and fishermen had the highest prevalence of 35.4%. This could be attributed to the fact that those children assist their parents in farm works after school hours or during the holidays, thereby exposing them to infections as they spend long periods working in water logged areas that were probably infected with the parasites. Moreover, additional time spent in bathing in the nearby streams and ponds after work could have sometimes corresponded to the periods of peak cercariae emission by snails (Wright, 1972), which could have increased their risk of getting infected. This is similar with observations of Udonsi (1990) and Akinboye *et al.* (2011), who reported that water contact activities and traditional agricultural practices are factors which contribute to the transmission of the disease.

The prevalence of *S. haematobium* infections in this study is significant and could be regarded as a public health problem in the study area.

Ignorance, poverty and occupation are responsible for maintaining significant levels of transmission of the disease in the area.

Creation of public health awareness, provision of basic infrastructures, monitored mass deworming and frequent and monitored molluscicide are highly advocated measures for effective control of the disease in the study area.

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