CORRELATION ANALYSIS BETWEEN THE PREVALENCE OF SCHISTOSOMA HAEMATOBUIM AND WATER CONDITIONS: A Case Study among the School Pupils in Southwestern Nigeria

Sowole Ayodele Risikat* & Adegbite Afeez Ayoade**
* Department of Medical Laboratory Techniques,
**Department of Water Resource Management & Sanitation,
Ogun State College of Health Technology, Ilese-Ijebu, Nigeria
**E-mail: aagbite@yahoo.co.uk

ABSTRACT

The study was carried out to assess the prevalence of Schistosoma haematobium and distribution of the infections among the school pupils of Ijoun, Yewa North Local Government Area Ogun State Southwestern Nigeria. Then, the water conditions of the community where the pupils reside and consequently to establish the degree of correlation between the prevalence and water conditions. A total 268 pupils randomly selected for the study, and then statistical technique of correlation analysis was used to establish the degree of relationship between the water usage and prevalence of the infection. Of these pupils examined 221 were positive for the Schistosoma haematobium ova. There is slight difference between the rate of infection among sex; 86.4 % female and 76.8% male. The Coefficient of Determination value of 0.773, between numbers of infected females and the number that take bath in the river/stream/pond indicating the high positive correlation between two variables, a value of 0.939 was obtained for the correlation between the number of infected females and the number that wash clothes in water bodies. The highest correlation (0.958) was between the number of infected and the number that participate in fishing/farming. There is need for health/ hygiene education in the rural areas, designed to discourage the pupils contact with surface water sources and provision of portable water supply.

Keywords*: Schistosoma haematobium, Water, Correlation, Environment, Ogun State, Prevalence, Pupils*

1. INTRODUCTION

Schistosomiasis is a prevalent parasitic infection; with an estimated 200 million people worldwide affected (Schmitt, 2006). Schmitt (2006) stressed that while the distribution of infection has changed, 80-85% of current disease is now found in sub-Saharan Africa, and the number of people infected is not decreasing. Unfortunately, the impact of schistosomiasis has long been under-estimated compared to that of malaria and tuberculosis for example (Bergquist, 2002).

Schistosomiasis is a parasitic infection caused by blood flukes (tremadode).It was first described in 1851 by Theodor Bilharz, after whom the disease was initially named (bilharzias) (Ross et al., 2002). According to Schmitt (2006), five species have been identified: Schistosoma mansoni, s.japonium, s.haematobium are most common. S. mansoni is the most widespread, s. haemotobium is concentrated in Africa and the Middle East, while s. japonica is primarily found in Asia. The first two cause chronic hepatic and intestinal fibrosis. The last, s.haematobium, affects the urinary tract and kidneys, as well as the reproductive systems (Schmitt, 2000).

On the other hand, the World Health Organization (WHO) (1989) identified four species of schistosomiasis: intestinal schistosomiasis caused by Schistosoma mansoni, Schistosoma japonium, Schistosoma intercalation and Schistosoma haematobium responsible for urinary schistosomiasis. Other Schistosoma of veterinary importance include Schistosoma bovis, Schistosoma mathei, Schistosoma hippopotami, Schistosoma spinadalis and Schistosoma rohhanini (Nobles, 1992).

Schistosoma haematobium, the focus of the study is a very serious environmental health problem in many tropical and subtropical countries, with school age children usually being the most affected group (Saathott et al., 2004). The disease is endemic in Nigeria (Ogbee & Ogunsekan, 1989), water contact activities and traditional agricultural practices are reported as factors responsible for the distribution of the disease and its snail vectors (Udonsi, 1990).

World Health Organization (WHO, 2003) estimated that worldwide 180 million people live in endemic areas and 90 million are infected with the parasites, most of these live in sub-Saharan Africa. Roughly 70 million people suffer from hydronephrosis (an accumulation of urine in kidney due to obstruction of ureter). It is also estimated that 150,000 people die each year from resultant renal failure and an unknown significant number from bladder and other genital urinary cancers (WHO, 2003).

In many places, there is higher incidence of infection in young boys and girls, this is as result of increase and frequent contact with water bodies compared to other population groups in culture where girls and women typically

fetch water for household use and young boys often play in stagnant or moving water. Conversely, some other part where men primarily fetch water, engage in fishing and irrigation activities do have higher rates of schistosomiasis, these differential rates of transmission depend on cultural practices (Lucas et al., 2003)

Prior to the recent studies on urinary Schistosomiasis by Okolo and Iwuala (2001 and 2004 respectively) the report of Oldenburg (1942) on the endemic disease in Owerri area of Imo state Eastern Nigeria in literature has created the awareness of the parasitic disease in Nigeria. Recent studies revealed the disease to be endemic among individuals in our rural areas in most states.

In the light of the above, prevalence study of Schistosomiasis haematobium was carried out among pupils in Yewa North Local Government primary School in Southwestern Nigeria and water source, sanitation and hygiene practice assessment was done to determine any correlation between the occurrence of the schistosomiasis and water and sanitation conditions. The assessment is due to the fact that risk of infection from water-related diseases is strongly linked to lack of adequate sanitation, poor personal and domestic hygiene and unsafe drinking water.

1.1 OBJECTIVES OF THE STUDY

The purpose of the study is to highlight the current status of the urinary schistosomiasis occurrence among the school pupils of Yewa North Local Government Primary School and determine the potential causes of the disease.

1.1.1 THE SPECIFIC OBJECTIVES:

- To determine the prevalence rate of the infection;
- To evaluate the distribution of infection in terms of age and gender;
- To evaluate the water and sanitation conditions and accessibility of the study area;
- To determine the relationship between infection prevalence and water-related activities.

2. BRIEF DESCRIPTION OF THE STUDY AREA

The study was carried but in a public primary school of Yewa North Local Government in Ijoun Community in Ogun State Southwestern Nigeria. It is a community under Ayetoro town (Lat.7^0, 13' N and Long. 3^0 02' E) the Headquarters of Yewa North Local Government Areas in Ogun state. The community share boundary between Republic of Benin and Nigeria. It has an estimated population of 300,000 according to 2006 population census. The study area has one public primary school and one primary health centre, the people predominant occupation are farming, fishing and trading. Their sources of water are rivers, streams and ponds.

3. MATERIALS AND METHODS

The standard examination and urine microscopy methods for detection of Schistosoma haematobium, (standard microbiology sample collection, preservation and analysis were maintained) and matrix method were simultaneously employed.

(a) Macroscopic examination

All urine samples were macroscopically examined for their appearance (i.e. whether bloody and cloudy)

(b) Microscopic examination

The urine were screened for the presence of eggs using wet preparation method and concentration technique (Monica, 2004)

(c) Urine microscopy

The procedures for the urine examination are as follows:

1. The urine specimens were thoroughly agitated, 10ml of each sample taken, centrifuge at 3,5000rpm for 5minutes;
2. The supernatant was discarded and the whole sediment was transferred to a clean slide and covered with cover glass;
3. The entire sediment was examined under the microscope using x10 objective lens with the condenser iris closed sufficiently to give good contrast;
4. The results were analyzed as egg/10ml urine according to age and sex of pupil;
5. The results were interpreted according to Cheesbrough (2001), any urine sample containing more than 50eggs in 10ml of urine indicates a heavy infection of Schistosoma haematobium.

(d) Matrix mapping (adapted from WHO and IRC)

A matrix is prepared on piece of paper with common source of water in any community against how the people use the water. The researchers were asking the pupils to make tick: "Where does the water you drink come from? Where the water you wash your body with come from? Where does the water you wash your clothes with come from? Where does the water you garden with come from?

For the analysis of the results, the urine samples were coded with 1a for boys and 1b for girls. Also, the matrix given to boys and girls coded in similar ways. Then the results of the urine analysis were combined with that of the matrix mapping using the coefficients of determination R^2. The coefficient *of* determination, R^2, is useful because it gives the proportion of the variance (fluctuation) of one variable that is predictable from the other variable. It is a measure that allows us to determine how certain one can be in making predictions from a certain model/graph (Mathbits.com, 2000). From the combination, the causes of the infection and prevalence can be established.

4. RESULTS AND DISCUSSION

A total number of 268 samples were examined for this study. Out of the 125 male samples examined, 96 were infected by Schistosoma haematobium with the highest prevalence rate (>90%) in Primary Five (see Table 1). Among the 143 female samples examined 125 female students were infected with 87% prevalence rate of infection.

Primary one male and female pupil had least infection rate (50.0%), primary two male and female (78.9%), primary three male and female (81.3%), primary four male and female (89.6%) , primary five male and female (91.8%) and primary six male and female (89.1%).

From the Table 2, age group of 11-12, 13-14 and 15-16 were the most infected with the percentage infective rate of 16.79%, 16.79% and 17.54% respectively. Lower prevalence rate was recorded in the age group 5-6, 7-8, 9-10. The prevalence rates were 5.60%, 11.19% and 14.55% respectively.

The high prevalence rate of 221 (82.5) observed, is higher in comparison to 2.4 % in some primary school at Abattoir area, Jos, Central Nigeria and 49.9 % in Faringaida and student area, all in Plateau State Central part of Nigeria as reported by Akunfongwe et.al (1995). This may be due to the absence of safe and non-functional pipe-borne water in the study area, (the infested water body is the major source of water in the community) the farming, fishing occupation, belief and low level of education and awareness of the inhabitants on the disease compare to Jos a more developed areas.

High populations (90%) like any other rural dwellers are subsistence farmers and fishermen, many of the school pupils help their parents in farming and fishing after school, in weekends and holidays. This will likely predispose higher population to the risk of infection of coming in contact with the infected water bodies and consequently getting infected. Female are more frequent in these water bodies when fetching. This is probably this reason for the high proportion of infected females (87.4%) compared with infected males (76.8).

Table 1: Sex Prevalence of Schistosoma haematobium in Yewa North Local Government Primary school, Ijoun Southwestern Nigeria

	MALE			**FEMALE**			***TOTAL**	
Class	Number Examined[1]	Number Infected	% Infected	Number examined[2]	Number Infected	% Infected	Number Infected[3]	% Infected
Primary 1	20	8	40.0	10	7	70.0	15	50.0
Primary 2	18	11	61.1	20	19	95.0	30	78.9
Primary 3	20	17	85.0	28	22	78.6	39	81.3
Primary 4	20	18	90.0	28	25	89.3	43	89.6
Primary 5	22	20	90.9	27	25	92.6	45	91.8
Primary 6	25	22	88.0	30	27	90.0	49	89.1
Total	**125**	**96**	**76.8**	**143**	**125**	**87.4**	**221**	**82.5***

(*Total % infected=number of infected [3]/ (number of male examined[1] +number of female examined[2])

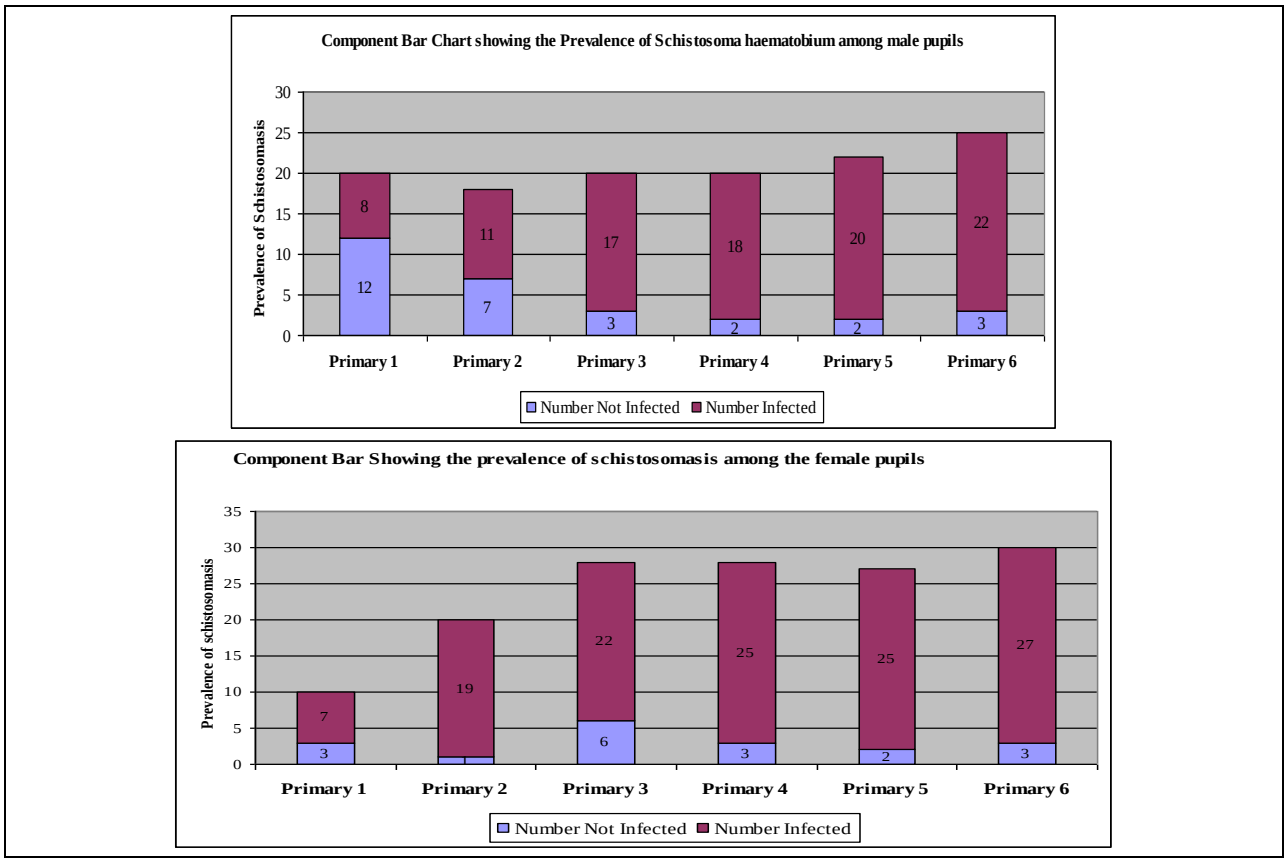

Figure 1: Component Bar chart showing prevalence of schistosomasis among the male and female pupils

Two probable factors can be responsible for this, unfortunately, the majority of the inhabitants are illiterate and believe that haematuria is a normal stage in the process of maturation and that is often passed from one generation to the other (hereditary) (Adomeh, 1998), therefore they refuse to seek medical attention. On the other hand, the high prevalence similar to the findings of Ogbiede (1999), may be due to the fact that females often become infected with Schistosoma haematobium during washing of clothes in the stream, involving prolonged contact with contaminated water. Young children normally accompany their mother to the river in which they play and so may be exposed to the infection due to prolonged water contact. This finding is contrary to the report of Gendy et al. (1999) and Rudge et al. (2000) which shows that males had more water contact compared to females because they are more adventurous and so play more in water bodies. And some studies such as Satayanhum (2006) and Opara (2001) have reported no association between Schistosoma haematobium and gender.

Table 2: Showing Age related prevalence of urinary schistosoma haematobium

Age Groups	Number examined	Number Infected	% Infected	Number not Infected	% Not infected
5-6	30	15	50.0	15	50.0
7-8	38	30	78.9	8	21.1
9-10	48	39	81.3	9	18.7
11-12	48	43	89.6	5	10.4
13-14	49	45	91.8	4	8.2
15-16	55	49	89.1	6	10.9
Total	268	221	82.5	47	17.5

A high prevalence rate was observed in age groups 11-12, 13-14, 15-16. The prevalence rates were 89.6%, 91.8% and 89.1% respectively. The variation has been attributed to behavioural patterns attributable to age with respect to water contact. The pupils in this age group were a bit older and get more often in contact with the infected water through swimming, fetching, washing clothes, fishing and farming. Lower prevalence was recorded in age group 5-6, 7-8 and 9-10. This is because pupils of these groups were young and are

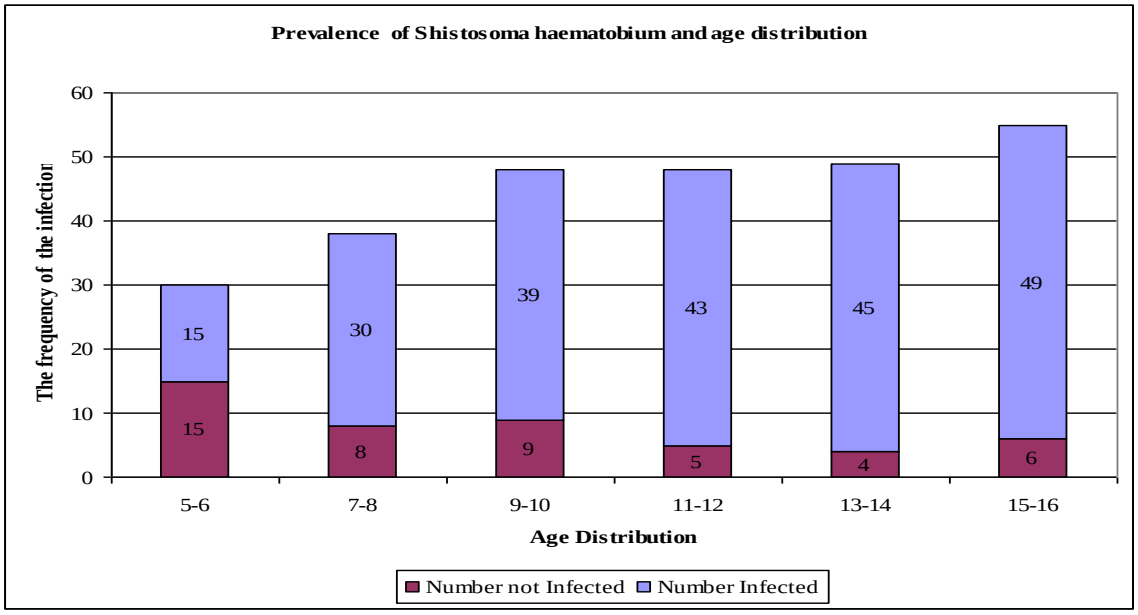

Figure 2: showing prevalence of shistosoma haematobium and age distribution

prevented from going to water bodies such as rivers, streams and ponds. This agrees with the report of Ogbonna and Okoronkwo (2000) which shows that children infected with the parasite were found to be more between the ages of 11-16years.

Table 3: Matrix mapping showing water source and uses

Source / Use	Well					River/Stream/Pond				
	T	M	F	A	B	T	M	F	A	B
Drink	100	45	55	13	35	168	30	138	8	112
Wash Body	5	3	2	4	1	255	55	200	6	150
Wash Clothe	10	6	4	-	4	260	20	240	3	200
Fishing/Farm	1	1	-	-	-	267	240	27	-	200

T=Total, M=Male, M=Female, A=age group 5-6, B= age group 11-12 above

The Table 3 above contains the number pupils of different age groups that use water sources for different purposes. The table simply indicated that more female get much in contact with water as result of washing, fetching and bathing compared with male except in fishing and farming where male are more active. 138, 200, 240 and 27 female pupils ticked river/stream/pond for drinking, bathing, laundry and fishing/farming respectively. However, 30, 55, 20, 240 male pupils fetch rivers/stream/pond for drinking, use the water sources for bathing, washing and fishing/farming activities respectively with the highest number of male pupils visit the river/stream/pond for fishing/farming. Furthermore, the table shows that pupils in age group of 5-6 do not get much near water compare to the age-group of 11-12 above.

With the simple Microsoft excel calculation of coefficient of determination R^2 between numbers of infected females and the number that wash in the river/stream/pond indicated a value of 0.773, indicating the high positive correlation between two variables; the number of infected females and the number washing clothes in the water bodies gave a correlation coefficient of 0.939. On the hands, coefficients of determination of infected males and the number that do fishing or use the river/stream/pond for farming activities indicated a value of 0.958 also indicating high positive correlation. The results indicated the presence of non-functional and inadequate boreholes and water supply from the state water corporation: the females use alternative available water source for domestic activities while the males visit the water source for means of livelihoods Therefore, the inhabitants made more contact with streams in the study areas.

5. CONCLUSIONS

Conclusively, the study has helped to identify the prevalence rate of Schistosomiasis among the pupils as health problem. It has also provided valuable insight into the endemic disease in the community. Due to unimproved water source, means of livelihoods and culture and beliefs of the inhabitants, the infection has been prevalent.

There is need for health and hygiene education in the rural areas, designed to discourage the contact of pupils with water source with different messages for the boys and girls and provision of laundry facilities, though it may not be effective since the community lacks boreholes and loves swimming or bathing inside water bodies.

Based on the results of the study a number of possible policy recommendations that would enhance the preventives and control measure of Schistosoma haematobium can be made to the community and relevant stakeholders. Provision of good and quality safe water source for the pupils and community, destruction of intermediate hosts-snail vectors by experts should be done at the commencement of raining season, pupils and households should practice good environment health and sanitation, the government should embark on routine treatment of infected patients both at schools and community level and screening of migrants from neighboring boarder town should be encouraged before allowing them to settle down.

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