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PREVALENCE AND RISK FACTORS OF SCHISTOSOMA HAEMATOBIUM INFECTIONS AMONG PRIMARY SCHOOL CHILDREN IN YOLA NORTH LOCAL GOVERNMENT, ADAMAWA STATE, NIGERIA

[1]Daniel, J.L., [2]Vandi, P., [2]Chessed, G., [2]Augustine, L.M., [3]Pindar, W. and [2]William, E.

[1]Department of Science Laboratory Technology, Gombe State Polytechnic, P.M.B. 0190, Bajoga, Gombe State

[2]Department of Zoology, School of Life Sciences, Modibbo Adama University of Technology, P.M.B. 2076, Yola, Nigeria.

[3]Department of Integrated Science Federal College of Education, (Technical), Gombe, Gombe State

joicedaniellawiye@gmail.com
vandiphilips@yahoo.com
chessedg@yahoo.com
lindaamindala@gmail.com
watiemma2018@gmail.com
debiiwills@yahoo.com[1]

*Vandi Philips: email: vandiphilips@yahoo.com

Abstract

Schistosomiasis, also known as snail fever and bilharzia, is a disease caused by parasitic flatworms called Schistosomes. The disease is spread by contact with fresh water contaminated with these schistosomes. This study was conducted to determine the prevalence, in relation to gender, age and risk factors associated with *Schistosoma haematobium* infections among primary school children in Jimeta-Yola. Each child was administered a semi-structured questionnaire to collect socio-demographic data. Urine samples were collected from 150 pupils for microscopic analysis for the detection of *S. haematobium* eggs. The prevalence of *S. haematobium* eggs in Yelwa Primary School, showed that females had the highest prevalence rate with 12 (40.0%) infection while male had a prevalence rate of 8 (17.78%) infection. The infection in relation to age showed that the age range 8-10 years had the highest infection with 11 (44.0%), the age range 14> years had the least prevalence with 2 (10.00%). The prevalence in Limawa Primary School, showed that males had a prevalence rate of 9 (19.15%) infection while female had a prevalence rate of 7 (25.00%) infection. The infection in relation to age showed that the age range <8 years had the highest infection with 7 (28.00%), while nothing was recorded in the age 14 > years. In general, the prevalence rate of urinary schistosomiasis infection among primary school children in jimeta-yola, adamawa state is fairly low with a prevalence of 24.0 % among active school children. No significant difference was found between gender, age, source of water, and urinary schistosomiasis

Keywords: *Schistosoma haematobium*; Prevalence; Gender; Age; Risk factors; Yol.a;

Introduction

Communities around water bodies have high risk of parasitic infections, water plays an important role in the life cycle of parasites, and humans cannot live without water. Schistosomiasis, also known as snail fever and bilharzia, is a disease caused by parasitic flatworms called Schistosomes (WHO, 2014). These worms are released by snails. The disease is spread by contact with fresh water fresh water contaminated with these schistosomes. Schistosomiasis is one of the most widespread of all human parasitic diseases, it ranks second only to malaria in terms of its socioeconomic and public health importance in tropical and subtropical areas (Chitsulo, 2000). Schistosomiasis is a major public health problem affecting over 200 million people worldwide (WHO, 2011).

As a mainly rural, often occupational disease, schistosomiasis principally affects people who are unable to avoid contact with natural water sources, either because of their profession (agriculture, fishing) or because of lack of reliable water for drinking, washing and bathing (Ekpo *et al.*, 2010).

Irrigation farmers and fishermen are among those that are more prone to the infection. There are repeated cases of these parasites in humans, especially children. (Tetteh-Quarcoo *et al.*, 2013), since children frequently have contact with water either for domestic purpose or for fun.

Increased population movement seems to enhance the spread of the disease, and schistosomiasis is now occurring increasingly in periurban areas (Oliveira, 2004). Infection with schistosomes does not always result in clinical manifestation of disease and many infections are asymptomatic (Uneke and Egede, 2009). Over time as the cercariae, and later adult worms and their eggs, migrate through the body the manifestation varies. *Schistosoma haematobium* infection however could cause anaemia, haematuria, dysuria, nutritional deficiencies, lesion of the bladder, kidney failure, an elevated risk of bladder cancer and in children growth retardation (Uneke and Egede, 2009). Haematuria is caused when *S. haemabium* migrate to the bladder and ureters, which often gives painful sensation during urination.

Studies in Nigeria among school aged children in various parts of the country and in both rural and urban environments have shown that *S. haematobium* is clearly a problem, particularly among children. Prevalence among school aged children ranges from 20-40 % in typical communities (Okoli and Iwuala, 2004). The lack of pipe-borne water, bore-holes or proper water management plays an important factor in this problem. The prevalence can be as high as 50-70 % in areas where environmental changes occur due to constructions such as human-made dams and quarries (Nduka *et al.*, 2006), because such water bodies provides a suitable habitat for freshwater snails to thrive.

The lack of proper discipline in public primary schools tend to make the pupils leave school early or during class hour, often these pupils are seen around water bodies playing and due to the socioeconomic standard of most family or the area; these water bodies provide the only alternative. Therefore this study was conducted to determine the current prevalence, influence of age, and gender distribution on the intensity of the disease burden. Also, risk factors associated with *S. haematobium* infections among primary school children in Jimeta-yola were also evaluated.

Materials and Methods

Ethical clearance

The study protocol was approved by the Ministry of Health, Adamawa State, Nigeria. Written consent and approval was obtained from the Department of Zoology, Modibbo Adama University of Technology, Yola, Adamawa State, and the Head Masters of both Limawa and Yelwa Primary schools. Verbal consent was obtained from the pupils before the study commenced.

Study area

The study was carried out in two public primary schools; Limawa Primary School, Jimeta-Yola and Yelwa Primary School, Jimeta-Yola. There was bias in picking these schools, the researcher wanted a public school close to River Benue, Yola area and another afar off, balloting was used in picking Limawa primary school, which is close to River Benue Yola area and Yelwa primary school, which is far off.

Questionnaire Administration and Sample collection

Each child was administered a simple health semi-structured questionnaire to collect socio-demographic data of the pupils. Information on age, sex, sources of water supply and parental/guardian occupation were obtained. The class teachers administered the questionnaire to the children in the language (Hausa or English) he / she understand best. A total of 150 pupils; (75 pupils from each schools) were enrolled into the study. The two schools were visited for the purpose of sample collection once in a week between March and May, 2017. Only the pupils in primary 3-6 were selected as study population according to the recommendation of Arionla, (1991), as cited by Adeyeba and Ojeaga, (2002), since pupils in lower classes are usually under aged and would be difficult to manage.

The pupils in the study population were assigned for sample collection with the active support of the staff of the two schools. The pupils were selected by balloting, this was done to reduce bias in the sample collection. Dark (black) labelled sterile bottles of about 20ml were given to the pupils to collect urine samples. This was done between the hours of 9.00 to 11.00 am. Terminal urine samples were collected into the bottles from the pupils from the two schools. The information on gender, age, source of water and parental occupation was taken from each pupil.

Parasitological examination of urine samples

Urine samples were immediately transported to the laboratory of Department of Zoology, Modibbo Adama University of Technology, Yola. Microscopic examination, 10ml of a duly labelled urine sample was poured into a centrifuge tube and spun at 5000 rpm for five minutes in a centrifuge. The supernatant was decanted and the deposit at the bottom of the tube was viewed under the compound microscope. A drop of the deposit was observed on the slides by adding a drop of lugol's iodine before covering with a cover slip. *S. haematobium* eggs were identified and counted under x 10 and x 40 magnification and recorded as eggs/10ml of urine. Intensity was reported as the number of ova / 10 ml of urine and was categorized as mild (≤ 50 ova / 10 ml of urine) and heavy (≥ 50 ova / 10 ml of urine) (Samie *et al.,* 2010). A few drops of saponin solution were added to samples with visible haematuria to enhance clarity in microscopy (Cheesbrough, 1998)

Data analysis

SPSS version 20.0 (SPSS) statistical software was used to obtain frequencies. Chi-square tests was used for comparing infection and determining the relationship between infection pattern, and gender, age, source of water and parental occupation of the primary school pupils at 95% confidence intervals (95%-CI) were calculated for the prevalence.

Results

The prevalence of *S. haematobium* eggs in Yelwa Primary School, Jimeta-Yola, showed that females had the highest prevalence rate with 12 (40.0%) infection while male had a prevalence rate of 8 (17.78%) infection, there is no significant difference in the rate of infection in relation to the gender of the pupils. The infection in relation to age showed that the age range 8-10 years had the highest infection with 11 (44.0%), followed by the age ranges <8 years with 7 (35.0%) prevalence rate, the age range 14> years had the least prevalence with 2 (10.00%), there is no significant difference in the rate of infection in relation to the age of the pupils. The distribution of infection in relation to sources of water showed that, those that make use of stream/river has the highest infection with 13 (76.47%) prevalence rate, followed by those that uses bore-hole and well with a prevalence rate of 5 (20.0%) and 2 (11.11%) respectively, there is no significant difference in the rate of infection in relation to the water source of the pupils.

The prevalence of *S. haematobium* eggs in Limawa Primary School, Jimeta-Yola, showed that males had the highest prevalence rate with 9 (19.15%) infection while female had a prevalence rate of 7 (25.00%) infection, there is no significant difference in the rate of infection in relation to the gender of the pupils. The infection in relation to age showed that the age range <8 years had the highest infection with 7 (28.00%), followed by the age ranges 11-13 years with 5 (33.33%) prevalence rate, the age range 8-10 years had 4 (20.00%) while nothing was recorded in the age 14 > years, there is no significant difference in the rate of infection in relation to the age of the pupils. The distribution of infection in relation to sources of water in Limawa Primary School showed that, those that make use of stream/river has the highest infection with 7 (46.67%) prevalence rate, followed by those that uses bore-hole with 4 (19.05%) prevalence rate, and those that uses well as their source of water had a prevalence rate of 3 (18.75%) while, the least prevalence rate was recorded in those that uses pipe-borne water with only 2 (8.70%), there is no significant difference in the rate of infection in relation to the water source of the pupils. The intensity of infections and risk factors in Yelwa Primary School, showed that among those with heavy infections, male had 3 infected pupils while females had only 2, female pupil had the highest in those with mild infections with 10 pupils, while male had 5 pupils (Table 3). The intensity of infections and risk factors in Limawa Primary School, showed that among those with heavy infections, male had 5 infected pupils while females had only 4. Male pupils had the highest in those with mild infections with 4 pupils, while female had 3 pupils (Table 4).

Table 1. Prevalence of *Schistosoma haematobium* eggs in Yelwa primary school

	No examined	No. infected
Gender		
Male	45	8 (17.78%)
Female	30	12 (40.00%)
Total	75	20 (26.67%)
χ^2_{cal} =0.0832, Tab= 7.879 df = 1, p > 0.05		
Age		
<8	20	7 (35.00%)
8-10	25	11 (44.00%)
11-13	10	0
14>	20	2 (10.00%)
Total	75	20 (14.67%)
χ^2_{cal} =0.0965, Tab= 12.838, df = 3, p > 0.05		
Source of water		
Bore hole	25	5 (20.00%)
Pipe borne water	15	0
Well	18	2 (11.11%)
Stream/river	17	13 (76.47%)
Total	75	20 (14.67%)
χ^2_{cal} =0.3875, Tab= 12.838, df = 3, p > 0.05		

Table 2. Prevalence of *Schistosoma haematobium* eggs in Limawa primary school

	No examined	No. infected
Gender		
Male	47	9 (19.15%)
Female	28	7 (25.00%)
Total	75	16 (21.33%)
χ^2_{cal} = 0.0282, Tab= 7.879 df = 1, p > 0.05		
Age		
<8	25	7 (28.00%)
8-10	20	4 (20.00%)
11-13	15	5 (33.33%)
14>	15	0
Total	75	16 (21.33%)
χ^2_{cal} = 0.4530, Tab= 12.838, df = 3, p > 0.05		
Source of water		
Bore hole	21	4 (19.05%)
Pipe borne water	23	2 (8.70%)
Well	16	3 (18.75%)
Stream/river	15	7 (46.67%)
total	75	16 (21.33%)
χ^2_{cal} = 0.6650, Tab= 12.838, df = 3, p > 0.05		

Table 3: Intensity and risk factors of *Schistosoma haematobium* infection in Yelwa primary school

			Risk factors			
Infection Status Prevalence	Sex	frequency	1	2	3	4
+ve Heavy	M	3	-	2	1	-
	F	2	-	-	-	2
+ve Mild	M	5	2	1	2	-
	F	10	1	2	5	2
-ve (Negative)	M	37	8	12	11	6
	F	18	1	3	8	8
	Total	75	12	20	27	18

Keys:

Risk factors

1 Fishing

2 Swimming / Drinking

3 Playing / bathing in river

4 Washing of Clothes in streams

Table 4: Intensity and risk factors of *Schistosoma haematobium* infection in Limawa primary school

			Risk factors			
Infection Status Prevalence	Sex	frequency	1	2	3	4
+ve Heavy	M	5	3	1	1	-
	F	4	-	1	1	2
+ve Mild	M	4	2	1	1	-
	F	3	-	-	1	2
-ve (Negative)	M	38	11	15	10	2
	F	21	8	6	5	2
	Total	75	24	24	19	8

Keys:

Risk factors

1 Fishing

2 Swimming / Drinking

3 Playing / bathing in river

4 Washing of Clothes in streams

Discussion

The prevalence rate of infection in the present study is lower than the report of Sam-Wobo *et al.* (2011), who carried out a parasitological examinations of the urine samples among children and teenagers, the egg counts of the urine samples showed an overall prevalence of 71.7 % this is because Abule Sikiru, Ibaro-Oyan and Abule Titun are among the lakeside communities at the Oyan reservoir in Abeokuta. Schistosomiasis is mainly rural and often occupational disease, principally affects people who are unable to avoid contact with natural water sources, either because of their profession (agriculture, fishing) or because of lack of reliable water for drinking, washing and bathing (Ekpo *et al.*, 2010). From the present study, Yelwa Primary School had a higher prevalence rate than Limawa Primary School, this is because of the proximity of the schools to the water body, this agrees with the report of Patience *et al.* (2013), who analyzed the demographic data in part of the Ghanaian capital city and reported that 17.5% of schistosomiasis infected children lived closely to the water source (locally called "dam") and the prevalence dropped as the distance from the water source increases. In a similar study among School Children in Blantyre, Malawi, Kapito-Tembo *et al.* (2009), reported that, household proximity from open water source was found as a factor associated with urinary schistosomiasis.

The degree of the problem posed by schistosomiasis is very high in Nigeria especially among school children. This study confirm the reports of Adeyeba and Ojeaga, (2002), who reported 57.5% of school children in Ibadan are infected with *S. haematobium*. Adewumi *et al* (1991) also reported higher prevalence rate of 66.4% in three contiguous communities in South West Nigeria. Even though the sampling was randomly done, the sample population consisted of an uneven distribution of males and females pupils. This did not minimizes any bias introduced by a particular gender (male or female), the region is still struggling with the girl-child right to education, as such, this is different from study conducted by El Katsha *et al.* (2002), to access the possible effect of gender on schistosomiasis infection in Egypt, a comparable number of females and males were selected for this same reason. The age ranges with the highest frequencies of infections in the present study less than 11 years, this agrees with the report of Olalubi, *et al.* (2013), who recorded infections in age range 8-11 years with a frequencies 53%, and Adeyeba and Ojeaga, (2002), reported 78.1 % prevalence in age range 10-12 years among School Children in Metropolitan Ibadan, Nigeria. This is because children at this age range, plays in or

around water a lot, and not all can swim very well, thereby making them more vulnerable to infections.

The school children within 10-12 years age-range had that highest prevalence active and adventurous. The pupils in this age group were seen to be engaged in activities, which necessitate more contact with stream water. These children sometimes urinate or even defaecate into the stream thereby spreading the infection. Bello and Edungbola, (1992), also made this observation in Kwara State, Nigeria. The rate of prevalence in the present study is less than 21%, this is a significant low rate when compared to reports like that of Uneke and Egede (2009), who reported a prevalence rate of 78% of urinary schistosomiasis among primary school pupils of Igbokuta Village in Ikorodu Local Government Area of Lagos State, Nigeria. This report does not report does not support earlier studies that have indicated that *S. haematobium* is endemic in many parts of Nigeria particularly among school children (Attah *et al.,* 2002; Mafe *et al.,* 2005; Uneke *et al.,* 2006). It also does not satisfies the WHO classification as endemic (WHO, 2002).

The rate of infection in relation to gender, the report of Yelwa primary school is Similar to that of Olalubi, *et al.* (2013), who reported that Female pupils were more prone to *S. haematobium* infection compare to their male counterpart. The frequency of infection they reported was higher among the female pupils (61%) compared to the male counterpart (39 %). This may be due to the fact that most chores like washing of dishes and fetching water from streams are usually done by the females, this gave the more contact with water than the males. But this does not negate the fact that mostly boys of primary school age love playing water. This may be why male pupils are more infected than the female pupils in Limawa Primary School. And Adeyeba and Ojeaga, (2002), reported more males than females were infected with *S. haematobium* in their study. This they said, considering the fact that boys are very active. As such, interaction with stream water appears more in males than female students, and the boys often engage in unbridled swimming play especially after school hours. Which exposes the boys more to risk of infection.

Those children that uses stream as their water source had the highest prevalence rate, as compared to others. The risk factors that predisposes the children to the source of infection in the present study agrees with the report of Adeyeba and Ojeaga, (2002), who reported that the prevalence of schistosomiasis in relation to water contact, showed that for Swimming in Stream; male had 98.8% while female had 39.7%, for Fetching Stream Water; female had 100% prevalence while male 98.4%, and for Washing in Stream; female had 100% prevalence while,

male had 98.31%. Olalubi *et al.* (2013), also reported that in relation to water contact, those children engaged in Swimming / Drinking contaminated water had 26% prevalence rate of infection, while, those that wash clothes in streams had a prevalence rate of 20% and those fond of playing / bathing in river had 16%.

In general, the prevalence rate of urinary schistosomiasis infection among primary school children in jimeta-yola, adamawa state is fairly low with a prevalence of 24.0 % among active school children. No significant difference was found between gender, age, source of water and urinary schistosomiasis, however, infection is high in children whose school and to some degree houses are close to the water source (River Benue, Yola Area). There is therefore need for large scale public health interventions in these areas where the schools are located. The provision of basic amenities such as motorised boreholes and efficient waste disposal facilities by the government and Non-Governmental Organisation would certainly contribute to a reduction of human activities at the river and its contamination with human waste.

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