ejpmr, 2018, 5(11), 499-506

SJIF Impact Factor 4.897

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

PREVALENCE AND RISK FACTORS OF URINARY SCHISTOSOMIASIS AMONG SCHOOL CHILDREN IN KATSINA-ALA LOCAL GOVERNMENT AREA OF BENUE STATE, NIGERIA

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Article Received on 20/09/2018 **Article Revised on 10/10/2018** **Article Accepted on 31/10/2018**

ABSTRACT

Schistosomiasis remains one of the most prevalent neglected tropical diseases especially in Nigeria which has the greatest number of infected people worldwide. A cross-sectional study was conducted to determine the prevalence and risk factors of urinary Schistosomiasis among school children in Katsina-Ala Local Government Area of Benue State, North Central Nigeria. Urine samples were collected from 385 school children and examined using sedimentation/filtration techniques to determine the presence of *Schistosoma haematobium* eggs. Demographic, socioeconomic and environmental information was collected using a pre-validated questionnaire. The overall prevalence of schistosomiasis was 16.4% of the 385 children examined. Islamia Quranic School Tor Donga had the highest prevalence 18/73 (24.2%) while Fidel Primary School recorded the lowest prevalence of 5/58 (08.6%). No significant difference was observed in the prevalence of urinary Schistosomiasis between the different schools (χ^2=10.192; *P*=0.070). When sex was considered, Males recorded higher prevalence (20.1 %) than females (12.9%) and no significant difference was observed in the prevalence between them (χ^2=3.612; *p*=0.057). There was also no significant variation between prevalence and age groups (χ^2=1.677; *P*=0.0642), age group ≥18 years had the highest prevalence of (20.2%) while the lowest prevalence (12.1 %) was observed in the 3-7 years age group. Children that swim and fish in water bodies had the highest rate of urinary Schistosomiasis 29.0% while the lowest infection was among irrigated rice farmers with a prevalence of 13.7% (χ^2=42.66; *P*= 0.000). Children who Bathe/Play in infected water bodies are at risk with urinary Schistosomiasis odd ratio (0.38-1.09; 0.38-1.20). Children whose parents are farmer recorded the highest prevalence of 18.1% while the lowest prevalence was observed among children whose parents were traders (08.2%), (χ^2=1.96; *P*=0.312). In addition, children whose parents had no formal education recorded the highest prevalence of 26.8% while the lowest infection rate was observed among children whose parents had tertiary education. (χ^2= 9.00; *P*=0.000). The overall prevalence of infection as measured by filtration was 63/385 (16.4%). Eighty one percent (81.0%) of the subject's recorded Light intensity of infection while 19.1% recorded heavy intensity of infection with a significant difference (***t*=** 23.100; P=0.000). In relation to sex, no significant difference was observed in egg excretion between sex in both light 23 and 28 (75.73% - 88.5%) and heavy 9 and 3(11.3% - 24.3%) intensities of infection (χ^2=3.612; *p*=0.057). In conclusion, this study revealed that schistosomiasis is still prevalent in Katsina-Ala dispite the mass drug administration. Continuous mass drug administration, health education and community mobilization are imperative strategies to significantly reduce the prevalence of schistosomiasis in the Local Government Area.

KEYWORDS: Urinary schistosomiasis, Prevalence, Risk factors, School -children, Katsina-Ala Nigeria.

INTRODUCTION

Schistosoma haematobium is the only known agent of urinary schistosomiasis.[1, 2] Estimates show that at least 206.4 million people required preventive treatment in 2016. It is prevalent in tropical and subtropical areas, especially in poor communities without access to safe drinking water and adequate sanitation. It is estimated that at least 91.4% of those requiring treatment for schistosomiasis live in Africa.[1]

The disease is endemic to at least 78 tropical and sub-tropical countries, with estimation that at least 200 million people are currently infected with Schistosomiasis and another 700 million are at risk of infection.[2, 4] Estimate also suggests that 85% of all Schistosomiasis cases are now in Sub-saharan Africa.[5, 6]

It is the second most prevalent tropical disease in Africa after malaria and is of great public health and socio-economic importance in the developing world.[7] About

252 million individuals might be affected with the disease worldwide.[8]

The disease caused by *S. haematobium* is characterized by bloody urine, lesions and calcification of bladder, kidney failure and bladder cancer in children.[9] Early signs of morbidity common to the infection and which manifest in school age children are anaemia, impaired growth, and development, poor cognition and sub-standard school performance.[10, 11] The late and life threatening consequences of schistosomiasis include bladder cancer or serious kidney malfunction caused by *S. haematobium*, and severe complications of the liver and spleen in the case of intestinal schistosomiasis.[12] Transmission of infection begins when human urine containing parasite eggs reach fresh water bodies and hatched larvae infect susceptible snail hosts. Parasites undergo asexual multiplication in snails and another larval stage, infective to humans, is released into water. People are infected during domestic, occupational and recreational water contact.[13] The distribution of schistosomiasis is focal, as transmission depends on specific snail hosts and particular human activities, with endemicity continuously changing as a result of environmental alteration, water development schemes, migration, control interventions and snail host distribution.[13]

Preventive treatment, which should be repeated over a number of years, will reduce and prevent morbidity. Schistosomiasis transmission has been reported from 78 countries. However, preventive chemotherapy for schistosomiasis, where people and communities are targeted for large-scale treatment, is only required in 52 endemic countries with moderate-to-high transmission.[3]

MATERIALS AND METHODS

Study Area

The study was conducted in Katsina-Ala Local Government Area of Benue State Nigeria. It has an area of 2,402 km² and a population of 224,718 at the 2006 census.[14] The Local Government Area lies on the banks of the Katsina- Ala river, a major tributary of the Benue River is mainly occupied by the Tiv people. Katsina-ala was selected for the study based on previous reports from health facilities where cases of urinary schistosomiasis were common especially among school children.[15] The area has a monthly temperature ranging from 27°-38ºC. The area receives about 900-1000 mm of rain fall annually with two distinct seasons: the dry season, which usually begins in late October and ends in March, while rainy season extends from mid-April to early October. This is the period of intensive agricultural activities, bathing, swimming and washing in the streams are common. The area is drained by tributaries, streams and rivers among which river Katsina-Ala is the biggest.

Ethical Permission

Before the commencement of the study, ethical permission was sought from the Benue State Ministry of Health, Makurdi, while permission to carryout study was obtained from Local Government Education Authorities and School heads. Informed consents to collect urine samples of children were obtained from parents or guardians of the school children before sample collection.

Study Design and Sample size Determination

The study was cross sectional in design and was conducted from January to June 2018. A systematic random sampling was used to select six schools that were traversed and drained by rivers or streams in the Katsina-Ala Local Government Area of Benue State. A total of 385 school children were sampled as determined by Raosoft Calculator.[16]

Study Population and Sampling Techniques

The study size was determined using Raosoft (2004) calculator.

$$S = \frac{N}{1+N\,(e)}$$

$$S = \frac{6000}{1+15}$$

Where: S= Sample size, N=Population size, E= Error margin (0.05).

An estimated 6000 school children between the ages of 3-19 years from 6 schools were selected for the study. By subjecting these population estimate to the above formula a total sample size of 385 school children was arrived at.

Questionnaire administration

A questionnaire was issued to each individual to obtain information on socio-demographic data such as age, sex, level of education, occupation and occupational and recreational factors such as water contact activities of the individual in the area.

Data Collection

three hundred and eighty five (85) sterile sample bottles were given to the subjects from six schools who were instructed not to contaminate the samples. Each Sterile sample bottle had provisions for number, sex, age and school of each subjects. Information on self reported haematuria, water supply and water contact activities of children was collected using questionnaires. Using the form, primary school pupils in lower classes (primary 1-4) were interviewed individually. Some of the questions were translated and communicated to them in the local language for better understanding, while those in higher classes (primary 5-6 and those in secondary schools) were grouped in the respective classes and were directed to fill the form. Urine samples were therefore collected from each subject in a 20 ml sterile universal bottle by the children themselves following provided instructions. All collections were done between 10:00 am and 2:00 pm within the premises of each school. Samples were immediately moved to General Hospital, Katsina-Ala for analysis.

Microscopic examination and classification of *schistosomes* eggs

Each sample was mixed and the standard parasitological method, the filtration technique using a 10 ml syringe, swinnex filter holder (13mm diameter) and polycarbonate membrane filters (13µm porosity and 13mm diameter) as described by Houmsou *et al*.[16] were employed to recover *S. haematobium* eggs in the laboratory. Examination was done under the 10x and 40x objectives of a microscope for the shape, size and spine characteristics of the *Schistosoma haematobium* eggs, as described by the International Agency for Research on Cancer.[17] The number of the eggs per 10ml of the urine were recorded as light intensity of infection (1-49 eggs/ 10ml) and heavy intensity of infection (> 50 eggs/10ml of urine).[18]

Statistical Analysis

Microsoft Excel, SPSS Graph pad prism 5.01 was used to perform data analysis. Frequency distribution table, percentages, prevalence of infection attributed to schistosomiasis was calculated. Chi-square test was used to compare the differences in prevalence of infection between socio-demographic factors. T-test was used to compare intensity of infection all at 0.05 level of significance.

RESULTS

Prevalence of infection varied between the different schools visited in the Local Government Area; Islamia Quranic School Tor Donga having the highest prevalence 18/73 (24.2%), followed by LGEA Primary School which recorded a prevalence of 14/65 (21.5%) and Fidel Primary School with the lowest [5/58 (08.6%)]. No significant difference was observed in the prevalence of urinary Schistosomiasis between the different schools (χ^2=10.192; *P*=0.070).

Table 1: Prevalence of *Schistosoma haematobium* infection rate in the various Schools Sampled.

Schools sampled in Katsina-Ala	Number examined	Number infected	Prevalence %
Islamia Quranic school Tor Donga	73	18	24.2
Nomadic Primary School	69	11	15.9
Universal Basic Education (UBE) Central School	53	09	16.9
Fidel Primary School	58	05	08.6
LGEA Primary School	65	14	21.5
Verem Model Nursery/Primary	67	06	08.9
Total	**385**	**63**	**16.4**

Table 2 presents the pattern of Schistosomiasis among school-aged children in relation to sex and age in the Local Government Area. Males recorded higher prevalence (20.1 %) than females (12.9%). There was no statistically significant difference in the prevalence between males and females (χ^2= 3.612**;** *P*=0.057). Considering age groups, age group ≥18 years had the highest prevalence of 20.2% while the lowest prevalence of 12.1 % was observed in the 3-7 years age group. A significant variation was not established in the prevalence between age group (χ^2=1.677; *P*=0.064).

Table 2: *Schistosoma haematobium* infection rate based on Sex and Age

Categories	Number examined	Number Infected	Prevalence (%)	P-value
Sex				
Male	184	37	20.1	P<0.05
Female	201	26	12.9	
Total	385	63	16.4	
Age				
3 – 7	91	11	12.1	P<0.05
8 – 12	101	17	16.8	
13 –17	104	19	18.3	
>18	79	16	20.3	
Total	385	63	16.4	

Water Contact activities in Relation to *S. haematobium* infection.

Table 3 showed the prevalence of urinary Schistosomiasis in relation to the various water contact activities of the children in the Local Government Area. Children that swim and fish in these water bodies had the highest rate of urinary Schistosomiasis (29.0%) followed by children that washed in water bodies while the lowest infection was irrigated rice farmers with a prevalence of 13.7%. Children who Bath/Play in infected water bodies are at risk with urinary Schistosomiasis (χ^2=3.612; *p*=0.057).

Table 3: Infection rate of subjects based on water contact activities

Risk factors	Response	Number Examined	Number negative	Number infected (%)	OR (odd ratio)	(C.L), 95%	P-value
Swimming	Yes	193	154	34(17.6)			
	No	207	178	29(14.0)	0.64	0.38-1.09	2.719
Fishing	Yes	106	85	21(19.8)			
	No	294	252	42(14.3)	0.67	0.38-1.20	1.793
Swimming/fishing	Yes	163	114	49(29.0)			
	No	237	223	14(05.9)	1.46	0.08-0.28	42.660
Bathing/Playing	Yes	303	244	59(19.5)			
	No	97	93	04(04.2)	0.18	0.06-0.50	13.044
Washing	Yes	218	172	46(21.1)			
	No	182	165	17(09.3)	0.36	0.21-0.70	10.338
Fetching water	Yes	291	240	51(17.5)			
	No	119	107	12(10.1)	0.66	0.38-1.18	2.913
Irrigation/Rice Farming	Yes	139	120	19(13.7)			
	No	261	217	44(16.9)	1.28	0.72-2.23	0.697

Occupation and level of Education in Relation to *S. haematobium* Infection

Prevalence of *S. haematobium* in relation to the occupation of the parents showed that children whose parents were farmer recorded the highest prevalence of 18.1%, followed by children whose parents were Civil Servant 16.9% while the least prevalence was observed among children whose parents were Traders (08.2%). A statistically significant difference was observed in prevalence between the different occupation of the parents of the children (χ^2=1.96; *P*=0.000). In regards to education, children whose parents had no formal education recorded the highest prevalence of 26.8% this was followed by children whose parents had primary education 11.7% while the lowest infection rate was observed among children whose parents had tertiary education. However, there was no significant difference between prevalence and educational level of the parents of the children (χ^2=9.00; *P*=0.312).

Table 4: Infection rate of subjects based on parents occupation and Level of Education

Parameters	Number examined	Number infected	(%)	P-value
Occupation				
Civil Servant	53	09	16.9	P>0.05
Farmer	271	49	18.1	
Trader	49	04	08.2	
Not specific	12	01	08.3	
Total	385	63	16.4	
Level of Education				
No formal education	153	41	26.8	P<0.05
Primary education	94	11	11.7	
Secondary	83	07	08.4	
Tertiary	55	04	07.3	
Total	385	63	16.4	

Table 5 presents the intensity of urinary Schistosomiasis among school age children in the L.G.A. The overall prevalence of infection as measured by urine sedimentation was 63/385 (16.4%). Eighty one percent (81.0%) of the subject's recorded Light intensity of infection while 19.1% recorded heavy intensity of infection with a significant difference (***t*=** 23.100; P=0.000). In relation to sex, no significant difference was observed in egg excretion between sex in both light 23 and 28 (75.73% - 88.5%) and heavy 9 and 3(11.3% - 24.3%) intensities of infection.

Table 5: Intensity of urinary Schistosomiasis among school aged children in Katsina-Ala L.G.A.

category	Number infected	(Prevalence, %)	*t*-test	P-value
	Light intensity	Heavy intensity		
Over all	51 (81.0)	12 (19.1)	23.100	
Sex				P >0.05
Male	28(75.7)	9 (24.3)		
Female	23(88.5)	3 (11.5)		

Light intensity infection, 1-49 eggs/10ml of urine; Heavy intensity of infection, ≥50/10ml of urine

Out of the 385 respondents, subjects who didn't participate in the community base drug distribution had a higher prevalence (52.1%) while those who took the drug had a lower prevalence (4.8%). [(Fig.1) (χ^2=116.229; *P*=0.000)].

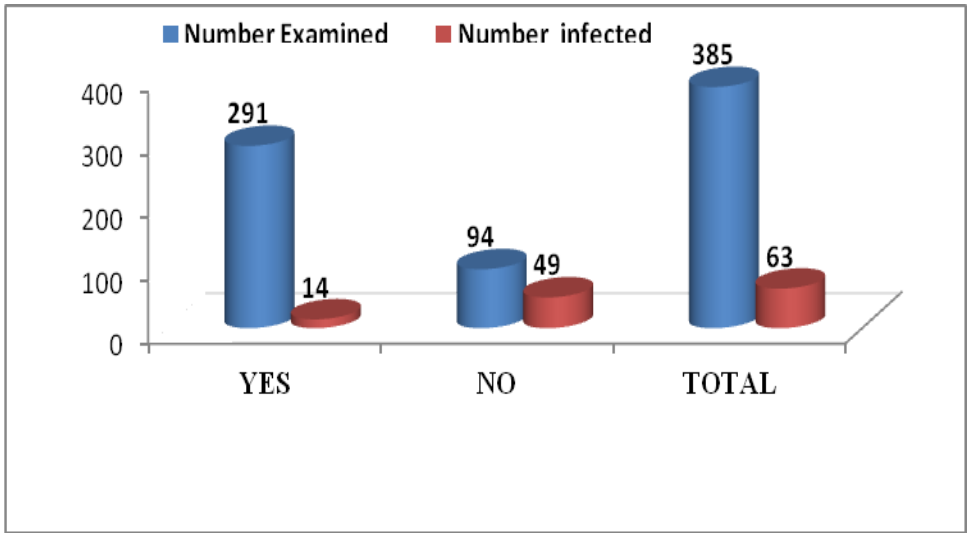

Figure 1: Prevalence based on drug compliant.

DISCUSSION

Despite the community based treatments (Mass Drug Administration of praziquantel) in Katsina-Ala Local Government area of Benue State infection rate in the local government is moderate as the study recorded an overall prevalence of infection as measured by urine sedimentation was 63/385 (16.4%). The result from this study area falls within the World Health Organization classification of moderate infection.[19] The moderate infection level in Benue State Nigeria could be attributed to the mass drug administration of the preventive chemotherapy in using praziquantel in children of various schools in some part of the state in the past four years. Health and education officials in the study area acknowledged the efforts made by the neglected tropical disease official in the some part of the state.

The prevalence 16.4% is in accordance with prevalence reported by previous studies; 11.5% in Adamawa State, 15.3% in Ebonyi State, 17.4% in Oyo State and 18.7% in Plateau and Nasarawa states of Nigeria, 15.5% reported in the neighboring Bali LGA.[20, 21, 22, 23, 24] This rate could be attributed to the community based treatments in all the state of the federation.

The overall prevalence (16.4.%) is lower than 75.2% and 27.1% reported in communities near Zobe Dam Dutsin-Ma, Katsina State, Nigeria and Kassena-Nankana District of Northern Ghana, respectively.[25, 26] 27 reported (18.9%), 55.0% in Guma, Benue State, 75% in ogbesi, Ekiti State, 52 % in Ogun State, 43.5 % in North Central Nigeria, 42.2 % in North Central Nigeria, 44.3 % in North Central Nigeria.[28, 29, 30, 31, 32]

In most studies, a higher prevalence and intensity rate were recorded among males than females.[16,30, 33, 34, 35, 36, 37, 38, 39, 40] In contrast however, recent studies in Northern Nigeria reported significant gender differences in urinary schistosomiasis among children examined in Gusau Local Government Area of Zamfara State[41] and LGAs in Kano State[42] where overall prevalence of urinary schistosomiasis were 63.5 % and 42.7 % respectively. The variations in the infection pattern may be attributed to the differences in geographic distributions and environmental settings or in cultural and religious beliefs of the people.

Children who live in endemic areas are at risk of Schistosomiasis as they tend to swim and bath in water channels and get exposed to the infective cercariae, it is therefore not unexpected that, the age group <18 years had the highest prevalence rate. The high prevalence of this age group may be attributed to their care-free attitudes towards swimming, fishing, bathing and playing

in infested water bodies which encourage infection[43] children between the ages of 3-10 year may be well guarded towards their activities on water contact.

The study has indicated similar prevalence in the under 18 years. This shows similar behavioural habits of exposure of these children to infested water bodies in Benue and also children within the ages of 10 to 18 usually engage in many outdoor activities including swimming and fishing due to the youthful exuberance. From other parts of Nigeria peak prevalence of *S. haematobium* was reported from children aged 10-20 years.[44, 45]

Higher prevalence observed in the 12-18 years corroborates with the findings of[46, 47] in Nigeria also[48] who reported similar prevalence rates in the same age groups among subjects in Cape coast Region of Ghana and Kumba in the South west Region of Cameroon respectively. Older children (>12 years) tend to be more infected than the younger ones. This finding is also consistent with[28, 42, 49, 50, 51] in Bauchi, Niger, Minjibir, Konduga and Danjarima, respectively. The low prevalence observed in age 3-7 groups and older group could be attributed to the fact that at early age children always accompany their older ones to the water bodies but are not actively involved in activities that take place at the water contact sites because of their age and fear of drowning as observed by.[52] Most children had light intensity of infection, but this was higher among females and children equally, a fewer portion of the children carried the burden of heavy intensity of infection in the area with male school children mostly affected. This seems to be the trend in most urinary schistosomiasis affected areas.

CONCLUSION

This study has shown 16.4 % prevalence as against the 44.5% prevalence of *S. haematobium* in the same study area. Higher prevalence of 20.3 % among ages >18 is an indication that this age are highly exposed to schistosomiasis and may form a public health problem in the local government area. Continuous mass drug administration, health education and community mobilization should be encouraged to reduce the spread of infection.

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