Asian Journal of Advances in Research

4(1): 46-51, 2021

UROGENITAL SCHISTOSOMIASIS AMONG PRIMARY SCHOOL PUPILS IN AMAGUNZE, ENUGU STATE, SOUTHEAST NIGERIA

VICTOR S. NJOM[1*]

[1]Department of Applied Biology and Biotechnology, Enugu State University of Science and Technology, P. M. B. 1660 Enugu, Nigeria.

AUTHOR'S CONTRIBUTION

Author VSN designed various parts of this study, carried out the experiments and wrote the manuscript.

Received: 05 November 2020
Accepted: 13 January 2021
Published: 10 February 2021

Original Research Article

ABSTRACT

Urogenital schistosomiasis has consistently provoked attention due to its consequences on the infected population. The prevalence and infection status in endemic rural areas needs constant updating. Therefore, this study investigated the current prevalence of urogenital schistosomiasis among school pupils in a schistosomiasis endemic community. Urine samples were microscopically examined for eggs of *Schistosoma haematobium* while reagent strips were used to determined hematuria. Over all population prevalence was 14.18% (n=19). Prevalence was age and sex dependent. Prevalence of infection was significantly ($P<0.05$) higher in pupils within the age group of 10-14 years with 10.45%(14) while those within 5-9 years old had a prevalence of 3.73%. Male pupils were more ($P<0.05$) infected (8.9%, n=12) than females (5.22%, n=7). Cases of hematuria were not significantly different ($P>0.05$) between sexes though males had 2.23% while females had 1.49%. Prevalence of schistosomiasis in Amagunze increased when compared to previous reports. Renewed education and treatment are needed to control and eliminate the infection.

Keywords: Schistosomiasis; hematuria; cercariae; neoplasia; malignancy.

1. INTRODUCTION

Schistosomiasis is a water-borne parasitic disease caused by a trematode of the genus *Schistosoma* [1] with species that either infect the urinary bladder or the intestines of their human host [1, 2]. The adult worms usually lay eggs in their host; the continuous accumulation of parasite eggs in the liver of the host causes hepatomegaly and liver failure [3]. In the bladder, deposited eggs results in the rupturing of blood vessels and mixing of blood with urine-hematuria [4].

Schistosomiasis rank second to malaria in terms of public health importance and has been shown to affect mainly school-aged children in the sub-tropical and tropical countries. Women and children are the most affected due to their usual contact with infected water [5, 6]. Unfortunately, school children carry the heaviest burden of morbidity due to schistosomiasis infection [7-9], with serious negative impacts on the overall health status and physical fitness of the children [7, 10]. Apart from the morbidity associated with acute infections, they affect nutritional status and growth [11] cognitive performance and school attendance [12] of these children.

The global distribution has not changed with reported cases in 78 countries [1, 13, 14]. An estimated population of about 780 million people are at risk of

**Corresponding author: Email: victor.njom@esut.edu.ng, njomvic@yahoo.co.uk;*

infection while about 240 million are infected worldwide [1, 15]. Global fatality has been estimated to be about 280,000 cases annually [14, 16].

The greatest prevalence occurs in sub-Sahara Africa where more than 90% of the infected population live [9].

In Nigeria, urogenital schistosomiasis is the most common and is endemic in many communities where there are rivers and streams that last more than a year and serve as a source of social and economic activities like swimming, fishing, commercial sand excavation, irrigation, domestic washing etc. [17, 18]. The presence of appropriate snail species that serve as intermediate hosts to *Schistosoma* [19, 20] and frequenting of both infected and non-infected population to these streams and rivers have sustained the endemicity and new cases of urogenital schistosomiasis in many of these communities despite many control and preventive interventions by both government and non-governmental agencies in the past [21, 22]. One of the factors suggested to be responsible for re-occurrence of diseases is lack of follow up screening of the population, proper surveillance and awareness education to catalyze community reawakening [23, 24]. One of the urogenital schistosomiasis endemic communities is Amagunze in Nkanu East Local Government area of Enugu state south east Nigeria and several reports have in the past highlighted the effects of urogenital schistosomiasis amongst school children in Amagunze [25, 26]. The current infection status in some of the endemic rural areas such as Amagunze is not known. This study therefore was aimed at investigating the current prevalence of urogenital schistosomiasis among primary school pupils in the community with the view to providing scientific information that would be required to monitor treatment program, and control measures.

2. MATERIALS AND METHODS

2.1 Study Area

Amagunze community is the headquarters of Nkanu East Local Government Area Enugu State, south east Nigeria. Its geographical coordinates are 6º, 20′, 0″ North and 7º, 20′ and 0″ East. Amagunze community is about a distance of 65 km from the Enugu State capital – Enugu. The community has a tropical rain forest setting with two prominent weather conditions: rainy (between April and October) and dry (November to March) seasons. There are rivers and streams that serve as sources of domestic and economic activities as well as for drinking. The people are agrarian in occupation; mainly subsistent crop farmers; wine tappers, and fishers while few are civil servants. There are many primary schools. Some of these schools were located near or along a popular river known as '*Atavu'* which is frequented by the local population for washing of clothes, excavation of sands, fishing, etc. The community also has four functional health centers.

2.2 Study Population

The study was conducted in three (3) primary schools namely: Community Primary School Isienu, Central Primary School Umunevo, Ajima Primary School, Ukwokani. The study population comprised of children between the ages of five and fourteen (5 - 14) years old. A total of 160 pupils from elementary classes 1 – 6 were randomly selected by picking "IN or OUT" ballots. Thereafter letters were given out through them to their parents and guardians seeking their consents to allow their child or children to participate in the research; only 134 parents consented while 16 declined. The one hundred and thirty-four (134) recruited for the study comprised of 70 males and 64 females.

2.3 Sample Collection

The urine samples of pupils were collected in clean, wide mouthed sterile universal urine bottles between 11 am and 12.30 noon daily in each school. Sample collection was after a short vigorous physical exercise by the pupils to dislodge eggs from bladder walls and potentiate maximum egg yield. Each pupil was instructed to pass mid-stream of his or her urine into the urine bottles and cover with the bottle cap immediately. They were given water and soap to wash their hands after submission of samples. The collected samples were labeled according to the sex and age of the pupil to avoid mistaking one sample for another. The urine samples were immediately transported to the laboratory in dark container to stop hatching of matured eggs and later analyzed.

2.4 Urine Macroscopy

The colour appearance of the urine samples was noted and described either as cloudy, pure amber, red blood or orange. Every colour observation was recorded. Further analysis was done to detect blood in the urine by dipping combi 9 strips (Machery Hagel Duran, Germany) into freshly voided urine and matched against the colour field at the back of the combi 9 containers. Hematuria was qualified as either negative or positive irrespective of low, medium or high quantification.

2.5 Urine Microscopy for Detection of *Schistosoma haematobium* Eggs

Ten ml (10 ml) of urine sample was poured into a test tube and spun at 5000 rpm for 2 min using a centrifuge (Fisher Scientific, UK). The supernatant was decanted and the sediment pipetted on an oil free slide and was thereafter examined under a microscope with x10 and x20 objectives for the detection of *Schistosoma haematobium* eggs. All the urine samples of the 134 pupils were examined for the presence or absence of *Schistosoma* eggs, while other cellular observations were also noted. The presence of at least single egg of *Schistosoma haematobium* in urine sample from any child qualifies infection.

2.6 Data Analysis

Graph pad prism version 7.0 for windows was used for analysis. Age of children was grouped into two: 5-9 and 10-14 years old. Chi square test was used to determine significant differences in prevalence of infection and hematuria cases among age groups and gender while prevalence was based on egg demonstration per 10 ml of urine sample and expressed in Percent.

3. RESULTS

A survey of urogenital schistosomiasis was carried out to determine the prevalence of the infection among pupils in Amagunze Nkanu East Local Government, Enugu State Nigeria. A total of 134 urine samples were examined. Over all prevalence of urogenital schistosomiasis was 14.18% (n=19) (Table 1). Prevalence was significantly higher ($P<0.05$) in males (8.96%, n=12) than in females (5.22%, n=7). Those within the age group of 10-14 years old had a prevalence of 10.45%, (n=14) while 5-9 years age group had 3.73%, (n=5). Within the age groups, number of male pupils between 5-9 years of age with *Schistosoma* eggs was 3 (4.29%) out of the 29 pupils sampled, while females were 2 (3.13%). Group of 10-14 years old had 9 (12.86%) males and 5 (7.81%) females infected.

A total of 5(3.73%) pupils had hematuria (Table 2). The number was made up of 3 (2.23%) male and 2 (1.49%) females.

Four (2.99%) pupils within 10-14 years of age had blood in their urine while only 1 (0.75%) pupil in 5-9 age group presented blood in urine.

4. DISCUSSION

This study showed a high population prevalence of 14.18% for schistosomiasis among primary school pupils in Amagunze. Comparatively, the results of this study indicates a prevalence which was a little below previous reports [7, 25], but above the reports of [26]. The prevalence of schistosomiasis in Amagunze seems to be fluctuating indicating that the infection has not been totally eliminated probably because of resurgence and reinfection [21]. Unfortunately long time protection against schistosomes seems to develop slowly with children in endemic areas who are prone to repeated re-infection [27]. To keep infection low there should be repeated treatment regimens for an indefinite time period [28, 29].

Our study also found that prevalence was age related. Pupils below 9 years of age had low infection (3.73%) whereas the highest prevalence was observed amongst pupils above 10 years (10.45%), and there was a statistically significant difference between the numbers that were infected in the two age groups ($P<0.05$). The finding of this study is in agreement with reports of [26]. High prevalence among older pupils may be attributed to disposition of older pupils (10-14 years) to factors that favor infection such as urinating while swimming, washing of cloths, fetching water for domestic use, fishing in cercariae infested water etc. Apart from dug wells, the other main source of water in Amagunze is the “Atavu” river which has been reported to have the snail intermediate host [25]. The low prevalence recorded among pupils below 9 years old could be attributed to the fact that many adults especially mothers usually don’t allow their kids below 9 years to fetch water, swim or wash clothes alone. However, some of them are reported to accompany their mother to the river during washing of clothes and swimming thereby getting exposed to infection. This probably accounted for the 3.73% infection observed among pupils less than 9 years of age.

Regarding gender distribution, our study also found that prevalence among males (8.96%) was significantly higher ($P<0.05$) than that of females (5.22%). Our finding was in agreement with previous studies [26]. Culturally, the males are at liberty to move around, fetch water, hunt, fish and swim unlike the females who are culturally restricted to kitchen/domestic work at home and sometimes fetching of water. These behavioral activities are epidemiologically important in the transmission of schistosomiasis [3, 11, 19] and might be responsible for the higher prevalence observed amongst the males.

Our study also indicated that hematuria cases were more in males (2.23%) than females (1.49%) though statistically there was no significant difference ($P<0.05$) between infections in the two sex groups. Also hematuria was more in pupils above 9 years of

Table 1. Prevalence of *Schistosoma haematobium* infection among primary school pupils according to sex and age group

Sex		**No examined**	**No infected (%)**	
Male		70	12 (8.96%)	
Female		64	7 (5.2%%)	
			19 (14.18%)	
Age group				Over all age group
5-9	Male	29	3 (4.2%)	5 (3.73%)
	Female	28	2 (3.13%)	
10-14	Male	41	9 (12.86%)	14 (10.45%)
	Female	36	5 (7.81%)	
Total		**134**		**19 (14.18%)**

Table 2. Distribution of hematuria according to sex and age group

Sex	**No examined**	**Hematuria positive (%)**
Male	70	3 (2.23%)
Female	64	2 (1.49%)
		5(3.73%)
Age group		
5-9	57	1(0.75%)
10-14	77	4(2.99%)
Total	**134**	**5(3.73%)**

age. Duration of infection and worm load are possible factors that increases pathological consequences such as rupturing of veins surrounding the bladder which results in leakage of blood into the bladder. Urogenital schistosomiasis is usually accompanied by micro and macro-hematuria as well as bladder lesions [3, 30] Urogenital schistosomiasis have been reported to increase the risk of Female Genital Schistosomiasis (FGS) with symptoms such as cervical inflammation, intraepithelial neoplasia, post-coital bleeding and genital ulceration [31, 27]. This has been identified as a risk factor in Human Immuno-deficient Virus (HIV) transmission to women [6, 28]. In males, genital schistosomiasis induces pathology of the seminal vesicles and the prostate with irreversible long-term consequences that may culminate in bladder cancer, urethral fibrosis and hydronephrosis [32].

5. CONCLUSION

Urogenital schistosomiasis prevalence in Amagunze increased above previous reports. Infection is sex and age related. Some infected individuals had hematuria. Those infected in our study were primary school children who are active and full of activities. Infected active primary school pupils would probably serve as source of eggs that will infest streams and ponds thereby making total elimination impossible. There is therefore need for continued treatment, monitoring and public health education to catalyze community reawakening. Also government should provide alternative source of water to reduce incidence of contact with infested water.

ACKNOWLEDGEMENTS

We are grateful to Headmasters and mistress of all the primary schools involved in this study. Also we wish to thank all the pupils and parents for their willingness to participate in the research.

ETHICAL APPROVAL AND CONSENT

Permission for this study was obtained from all the necessary authorities: Enugu State Universal Basic Education Board (ENSUBEB), the Local Council Education Secretary of Nkanu East, and the Headmaster/Mistress of the various schools. The community health center was also notified though they provided no assistance. Pupils' parent and guardian informed consents were obtained through letters one week before sample collection. Details and status of each pupil were treated with confidentiality and used for the purpose of this research only.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Colley DG, Bustinduy AL, Secor WE, King CH. Human schistosomiasis. The Lancet. 2014;383(9936):2253-64.
2. Jamieson BG. *Schistosoma*: Biology, pathology and control: CRC Press; 2017.

3. Gryseels B, Polman K, Clerinx J, Kestens L. Human schistosomiasis. The Lancet. 2006;368(9541):1106-18.
4. Chen M-G. Assessment of morbidity due to *Schistosoma japonicum* infection in China. Infect Dis Poverty. 2014;3(1):6-.
5. WHO. Technical documents and guidelines 2013. Report of an informal consultation on schistosomiasis control. World Health Organization; 2011.
6. Salawu OT, Odaibo AB. Schistosomiasis among pregnant women in rural communities in Nigeria. International Journal of Gynecology & Obstetrics. 2013;122(1):1-4.
7. Nwaorgu OC, Okeibunor J, Madu E, Amazigo U, Onyegegbu N, Evans D. A school-based schistosomiasis and intestinal helminthiasis control programme in Nigeria: acceptability to community members. Tropical Medicine & International Health. 1998;3(10):842-9.
8. Mafe M, Von Stamm T, Utzinger J, N'goran E. Control of urinary schistosomiasis: an investigation into the effective use of questionnaires to identify high-risk communities and individuals in Niger State, Nigeria. Tropical Medicine & International Health. 2000;5(1):53-63.
9. Singh K, Muddasiru D, Singh J. Current status of schistosomiasis in Sokoto, Nigeria. Parasite epidemiology and control. 2016;1(3):239-44.
10. Mwinzi PN, Muchiri G, Wiegand RE, Omedo M, Abudho B, Karanja DM, et al. Predictive value of school-aged Children's schistosomiasis prevalence and egg intensity for other age groups in western Kenya. The American Journal of Tropical Medicine and Hygiene. 2015;93(6):1311-7.
11. Donohue R, Mashoto K, Mubyazi G, Madon S, Malecela M, Michael E. Biosocial determinants of persistent schistosomiasis among schoolchildren in Tanzania despite repeated treatment. Tropical Medicine and Infectious Disease. 2017;2(4):61.
12. Ezeamama AE, McGarvey ST, Hogan J, Lapane KL, Bellinger DC, Acosta LP, et al. Treatment for *Schistosoma japonicum*, reduction of intestinal parasite load, and cognitive test score improvements in school-aged children. PLoS Neglected Tropical Diseases. 2012;6(5):e1634.
13. Greenberg RM. New approaches for understanding mechanisms of drug resistance in schistosomes. Parasitology. 2013;140(Special Issue 12):1534-46.
14. Hajissa K, Muhajir AEMA, Eshag HA, Alfadel A, Nahied E, Dahab R, et al. Prevalence of schistosomiasis and associated risk factors among school children in Um-Asher Area, Khartoum, Sudan. BMC Res Notes. 2018;11(1):779.
15. Gryseels B. The relevance of schistosomiasis for public health. Tropical medicine and parasitology: official organ of Deutsche Tropenmedizinische Gesellschaft and of Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ). 1989;40(2):134-42.
16. Van der Werf MJ, de Vlas SJ, Brooker S, Looman CW, Nagelkerke NJ, Habbema JDF, et al. Quantification of clinical morbidity associated with schistosome infection in sub-Saharan Africa. Acta tropica. 2003;86(2-3):125-39.
17. Ekwunife C, Ukaga C, Okafor F. Urinary schistosomiasis in Anambra State, Nigeria. Nigerian Journal of Parasitology. 2004;25(1):127-31.
18. Anosike JC, Oguwuike UT, Nwoke BE, Asor JE, Ikpeama CA, Nwosu DC, et al. Studies on vesical schistosomiasis among rural Ezza farmers in the southwestern border of Ebonyi State, Nigeria. Annals of Agricultural and Environmental Medicine. 2006;13(1):13.
19. Udonsi J. Human community ecology of urinary schistosomiasis in relation to snail vector bionomics in the Igwun River Basin of Nigeria. Tropical medicine and parasitology: official organ of Deutsche Tropenmedizinische Gesellschaft and of Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ). 1990;41(2):131-5.
20. Okafor FC, Ngang I. Freshwater Snails of Niger–cem, Nkalagu Eastern Nigeria, Observations on some Demographic aspects of the Schistosome-transmitting Bulinids. Animal Research International. 2004;1(2):120-4.
21. Mitchell KM, Mutapi F, Mduluza T, Midzi N, Savill NJ, Woolhouse ME. Predicted impact of mass drug administration on the development of protective immunity against Schistosoma haematobium. PLoS neglected tropical diseases. 2014;8(7):e3059.
22. Mutapi F, Maizels R, Fenwick A, Woolhouse M. Human schistosomiasis in the post mass drug administration era. The Lancet Infectious Diseases. 2017;17(2):e42-e8.
23. Evans DS, King JD, Eigege A, Umaru J, Adamani W, Alphonsus K, et al. Assessing the WHO 50% prevalence threshold in school-aged children as indication for treatment of urogenital schistosomiasis in

adults in central Nigeria. The American journal of tropical medicine and hygiene. 2013;88(3):441-5.
24. Amuta E, Houmsou R. Prevalence, intensity of infection and risk factors of urinary schistosomiasis in pre-school and school aged children in Guma Local Government Area, Nigeria. Asian Pacific Journal of Tropical Medicine. 2014;7(1):34-9.
25. Ozumba N, Christensen N, Nwosu A, Nwaorgu O. Endemicity, focality and seasonality of transmission of human schistosomiasis in Amagunze village, eastern Nigeria. Journal of Helminthology. 1989;63(3):206-12.
26. Ezeadila JO, Okoli I, Agomuo M, Aneke FC, Egbuche CM. Prevalence of urinary schistosomiasis among community primary school pupils in Amagunze, Enugu State, Nigeria. World Rural Observations. 2015;7(3):46-51.
27. Etard J-F, Audibert M, Dabo A. Age-acquired resistance and predisposition to reinfection with Schistosoma haematobium after treatment with praziquantel in Mali. The American journal of tropical medicine and hygiene. 1995;52(6):549-58.
28. Chan M, Nsowah-Nuamah N, Adjei S, Wen S, Hall A, Bundy D. Predicting the impact of school-based treatment for urinary schistosomiasis given by the Ghana Partnership for Child Development. Transactions of the Royal Society of Tropical Medicine and Hygiene. 1998;92(4):386-9.
29. Wang X, Gurarie D, Mungai PL, Muchiri EM, Kitron U, King CH. Projecting the long-term impact of school-or community-based mass-treatment interventions for control of Schistosoma infection. PLoS neglected tropical diseases. 2012;6(11):e1903.
30. Salawu OT, Odaibo AB. Urogenital schistosomiasis and urological assessment of hematuria in preschool-aged children in rural communities of Nigeria. Journal of pediatric urology. 2014;10(1):88-93.
31. WHO. Female genital schistosomiasis: a pocket atlas for clinical health-care professionals. World Health Organization; 2015. Report No.: 9241509295.
32. Atalabi TE, Adoh SD, Eze KM. The current epidemiological status of urogenital schistosomiasis among primary school pupils in Katsina State, Nigeria: An imperative for a scale up of water and sanitation initiative and mass administration of medicines with Praziquantel. PLoS neglected tropical diseases. 2018;12(7):e0006636.

© Copyright MB International Media and Publishing House. All rights reserved.