Urinary Schistosomiasis Among School Children in Aramoko-Ekiti, Ekiti State, Nigeria

OGUNREMI Temitope Tosin* ADEWOLE, S.O.
Department of Zoology, Ekiti State University, P.M.B. 5363, Ado-Ekiti, Ekiti State, Nigeria

Abstract
The prevalence of urinary schistosomiasis in school children in Aramoko-Ekiti was investigated. Terminal urine samples were collected between the 9:00-12:00 hours, into wide mouthed, sterile sampling bottles containing few drops of physiological saline (as preservative), tightly covered and transported to the laboratory for examination. The urine samples were examined to detect the presence of eggs using sedimentation technique as described by (Cheesbrough, 2002). Structured questionnaire was also administered to 2000 primary school children to obtain relevant information. Overall prevalence of 68% was observed in this study. The males were observed to have higher prevalence of 72.5% than their female counterparts who had the prevalence of 62.7%. The highest prevalence of 71.75% was found in Glory Nursery and Primary School. The age group between 6-10 years had the highest prevalence of 89.5%. Children who were exposed to river as a source of water supply had the highest prevalence of 73.3%, while those exposed to tap water where found to be free from the infection. The results showed that there is high prevalence of urinary schistosomiasis in the study area.
Keywords: Schistosomiasis, *Schistosoma haematobium,* prevalence, endemic, sedimentation techniques, school children

1. Introduction

Schistosomiasis, also known as Bilharzia is a parasitic disease caused by trematodes from the genus Schistosoma. There are four different species of Schistosoma that can infect human. They are: *Schistosoma mansoni, S. japonicum, S. intercalatum*, which all cause intestinal schistosomiasis and *S. haematobium,* which causes urinary schistosomiasis (Gideon, 2004). The snail host of *S. haematobium* are species of the Bulinus and Planorbidae, which act as the intermediate host where the miracidium develops (Ezeamama, *et al*., 2005). In *S. haematobium* infection, the adult schistosomes preferentially localize to the veins of the kidneys, urethras and bladder. During infection, the parasites deposits terminal spine eggs, which clog the venous plexus, impeding blood flow, this burst the veins, allowing blood and eggs to enter the urinary bladder, resulting in the characteristic symptom of blood in urine (Goodhead and Dirisu, 2016). The World Health Organization (WHO, 2012) has recently identified schistosomiasis as the second most important human parasitic disease in the world after malaria, estimated that about 85% of all schistosomiasis cases are in Africa. Report of United States Agency for International Developments Neglected Tropical Disease Program (USAID, 2016) established that Schistosomiasis is a public health problem and second only to malaria as the most devastating disease in the tropical countries in Africa, East Asia and South America. Furthermore, about 76 countries are affected worldwide with the global estimates of 200 million people suffering from the disease and 600 million people at risk of the infection (Ali, *et al*., 2016). Dawaki, *et al*. (2016) observed that schistosomiasis prevalence and morbidity is highest among school children, adolescents and young adults. Thus, the negative impacts on school performance and the debilitation caused by untreated infections demoralize both social and economic development in endemic areas. Schistosomiasis infection is usually acquired in childhood due to water activities carried out at that stage of life (when children tend to spend time swimming or bathing in water containing the larval form of the parasite). This is a grave concern because of the increasing prevalence and intensity of infection with age (peaking in the 5 to 14 years age group), and the fact that children also suffer the most side effects of the disease, especially poor growth and impaired cognitive development (Yunusa *et al*., 2016). The disease also contributes to malnutrition and disrupts school attendance (USAID, 2016).

Factors such as water contact occupations, rapid urbanization, poor sanitation, population increase, account for the endemicity of urinary schistosomiasis in Nigeria (Ofoezie *et al.*, 1998). Oladejo and Ofoezie (2006) reported that urinary schistosomiasis is highly endemic in Nigerian communities and that about 95% of the population lack any knowledge of the mode of transmission of the parasite or how transmission could be prevented. Steinmann (2006), observed a high prevalence of urinary schistosomiasis in areas where water development projects were constructed. Opara, *et al*. (2007) also reported that in Nigeria, urinary schistosomiasis is widespread in both rural and urban communities; with prevalence ranging between 2% and 90% and the vast majority of cases occurring among the poor and marginalized. Yunusa, *et al*. (2016) reiterated that in areas endemic for the disease, it disproportionately affects poor and rural communities without access to safe drinking water and adequate sanitation, particularly agricultural and fishing populations, because people suffering from the disease contaminate freshwater sources with their urine and excreta containing parasites' eggs, which hatch in water and then enter freshwater snails to develop into infective larva form of the parasite. Despite the heavy impact of Schistosomiasis infection on human populations in Nigeria, there are limited control measures and programmes. Thus, the impact of local health personnel with knowledge in the prevention, control and treatment of urinary schistosomiasis cannot be underestimated (Awosolu, 2016). In view of the public health concern and economic importance of schistosomiasis, this study was carried out to assess the social and economic impact of urinary schistosomiasis in school children in Aramoko-Ekiti, to provide information required for monitoring socio-economic impacts, treatment programs and prevention measures in rural communities.

2. Methodology

2.1 Study Area

Ekiti west has an area of 366km^2 and a population of 179,892 at the 2006 census. Its headquarters is in the town of Aramoko. It is an ancient town with access roads to all parts of Ekiti and Osun states. It is approximately 26 km away from Ado-Ekiti the state capital, 15 km to Ijero-Ekiti, 15 km from Ikogosi warm spring and about 42 km to Ilesa in Osun State. The main river that runs through the town is known as Omi Areti in which some little rivers run into such as Omi Elegboo and Omi Abami. The dry season is from October-February and the rainy season from March-September.

2.2 Sample collection

Prior to the commencement of the study, the village heads were intimated on the objectives of the study and their consents were obtained. The schools' managements were also intimated; PTA meetings were held in which the parents were informed and their consents obtained. This research was a cross-sectional study designed to determine the prevalence and impact of the transmission of *Schistosoma heamatobium* in the study population. A convenience sampling technique was used for the study. We purposively selected six primary schools for this study: St. Stephen primary School, St. Andrews Primary School, C. A. C Nursery/Primary School, Glory Nursery/Primary School, Gospel Nursery/Primary School, Victory Nursery/Primary School and First-class Nursery/Primary School. All pupils attending the primary schools in Aramoko during the time of study were eligible to participate in the study. The number of pupils examined in each school were 280, 300, 350, 400, 150, 200 and 320 for St. Stephen primary School, St. Andrews Primary School, C.A.C. Nursery/Primary School, Glory Nursery/Primary School, Gospel Nursery/Primary School, Victory Nursery/Primary School and First-class Nursery/Primary School, respectively. In all, a total of 2000 pupils were considered our study. Terminal urine samples were collected between the 9:00-12:00 hours, into wide mouthed, sterile sampling bottles containing few drops of physiological saline (as preservative), tightly covered and transported to Zoology laboratory of Ekiti State University for analysis. The sample bottles were labelled using the identification numbers given to the participants. As well, structured questionnaire was administered to each participant with the aid of their teachers to collect the socio-demographic data including age, sex and major source of water.

2.3 Laboratory analysis

Urine samples were examined to detect the presence of eggs using sedimentation technique as described by (Cheesbrough, 2002). Each urine sample was thoroughly shaken and 10 ml was decanted into a test-tube and centrifuged at 3000 rpm for 5 min, the supernatant was discarded leaving the sediments. A drop of the sediment was placed on a clean microscope slide on which a clean cover slip was gently placed to avoid air bubbles and overloading; it was stained using Lugols iodine, left for 15 seconds for the stain to penetrate the eggs and viewed under microscope at low power (x10 and x40). Ova of *S. heamatobium* were identified by the possession of terminal spine. The number of eggs were counted and recorded as eggs/10mL of urine (Cheesbrough, 2002). We analysed the data obtained using simple percentage(s), descriptive statistics as well as student-t-test, in relation to males and females' prevalence.

3. Results

A total of 2000 urine samples were examined with a prevalence rate of 68%. In table 1, it was observed that the highest prevalence of 89.5% was found in age group 6 -10 years while the least prevalence 27.8% was found in age group 1-5 years.

Table 1. *Schistosoma haematobium* infection in respect to age

Age group	Number examined	Number infected	Prevalence (%)
1-5	470	131	27.8
6-10	773	692	89.5
≥ 11	757	537	70.9
Total	**2000**	**1360**	**68**

Table 2 indicates that males recorded higher prevalence of 72.5% while the females recorded 62.7%. However, there is no significant difference (t =4.700; p=0.05) between male and female susceptibility to schistosomiasis infections.

Table 2. *Schistosoma haematobium* infection in relation to sex

Sex	Number Examined	Number Infected	Prevalence (%)
Male	1077	781	72.5
Female	923	579	62.7

In this study, various sources of water supply were observed in the study area. Table 3 shows that 73.3% of the study population depended solely on water from rivers for their daily activities. 65.1% of the study population was also observed to depend on stream water. No trace of the egg of *Schistosoma haematobium* was observed in the urine of those who had access to tap.

Table 3. Sources of water supply in relation to prevalence of *Schistosoma haematobium* in primary school children in Aramoko-Ekiti

Water supply	Number examined	Number infected	Prevalence (%)
Tap	28	0	0
Well	100	30	30
River	1365	1000	73.3
Stream	507	330	65.1
Total	**2000**	**1360**	**68**

Table 4 reveals that the prevalence rate of the disease was not uniform among the various schools visited. It shows the status of the infection in the community. The highest prevalence of 71.75% was found in Glory Nursery and Primary School, while Gospel Nursery and Primary School had the least prevalence of 63.3%.

Table 4. Prevalence of *Schistosoma haematobium* in the schools visited in the study area.

Schools	Number examined	Number infected	Prevalence (%)
St. Stephen primary School	280	188	67.14
St. Andrews Primary School	300	206	68.67
C. A. C Nursery/Primary School	350	224	64.00
Glory Nursery/Primary School	400	287	71.75
Gospel Nursery/Primary School	150	95	63.33
Victory Nursery/Primary School	200	143	71.50
First class Nursery/Primary School	320	217	67.81
Total	**2000**	**1360**	**68**

4. Discussions

The findings in this study indicate that the prevalence (68%) of *S. haematobium* infection is very high among the study population in the study area, it satisfies the W.H.O classification as endemic (WHO, 2002). This signifies that the study area needs mass chemotherapy since the prevalence obtained is higher than 50% prevalence recommended by the World health organization as the threshold for mass chemotherapy (WHO, 1993). The result observed in this study is closely related with the findings of Mafiana, *et al*., (2003), Ameachi (2014), and Ali, *et al*., (2016). The natural water bodies such as rivers, and streams were found to be the main means of transmission in the study area. The degree of exposure of the school children to water bodies through some indigenous water contact activities such as swimming and bathing, and the presence of the intermediate snail hosts in the local area were all factors that favoured the transmission of the infection in the area. The 68% overall prevalence recorded in this study is higher than the prevalence of 40.8% reported by Adewole and Fafure (2013) in Lagos; Nafiu *et al.* (2016) observed 15.6% in Tafa local government, Niger State; Sarkinfada *et al.* (2009) observed 41.6% in Danjarima community. The variance in the prevalence rates may be influenced by peculiar ecological characteristics, degree of exposure to infective stage of schistosome in different locations and levels of contact of individuals with water bodies (Sarkinfada *et al*., 2009).

Prevalence of urinary schistosomiasis among the participants in this study varied with age. Among 1-5 years age group, the prevalence was 27.8%; between 6-10 years age group, it was 89.5% while 70.9% was discovered among 11 years and above age group. These results were in accordance with the findings of Ameachi (2014) who discovered high prevalence of 70.3% in 10-14 years age group, Yunusa *et al*., (2016) who also observed high prevalence of 27.2% in the 5-9 age group. Nafiu *et al.* (2016) also observed an increase in the prevalence with increase in age. In their study, they observed that age group between 6-8 years had 8.6%, 9-11 years age group accounted for 12.5% and 12-14 years age group had the highest prevalence rate of 28.0%. These findings may be due to activities associated with regular water contact observed within the age groups (They tend to spend time swimming or bathing in water containing the larval form of the parasite).

High prevalence of 72.5% was also observed in the males than their female counterparts having 62.7%. Related trends have been observed in endemic areas as earlier reported by Ali *et al.* (2016), Ameachi (2014), Nafiu *et al.* (2016), and Sarkinfarda, *et al.* (2009). The high prevalence in males may be due to their frequent contact with water bodies, they often engage in swimming, fishing, playing and fetching water for domestic use than their female counterparts (Joachin *et al*., 2015).

Among pupils whose source of water was the river, the infection rate was observed to be higher (73.3%), followed by those whose source of water was stream (65.1%), those whose source of water was well had 30% prevalence while none was found infected among those whose water source was tap water. This finding is consistent with the observation of Amaechi (2014). However, Nafiu *et al*. (2016) reported that the prevalence rate of 31.7% was higher among those whose water source was stream. The high prevalence noticed among the inhabitants who depended largely on rivers and streams as water sources could be attributed to the fact that snail host shows preference for slow flowing and stagnant water bodies.

Poverty, unawareness of the risks, inadequacy or total lack of public health facilities, unhealthy conditions in which a lot of people live their daily lives especially in the rural areas of developing countries are all factors contributing to the risk of infection (Adewole *et al*., 2001).

5. Conclusion

This paper has investigated the urinary schistosomiasis among school children in Aramoko-Ekiti, Ekiti State, Nigeria. It is notable that *Schistosoma haematobium* infection in the study area has reached hyper-endemic state. To reduce the infection rate, children should be restrained from water contact activities, boiling of drinking water should be encouraged in the community, and the water bodies should be treated. It is recommended that the government should provide basic amenities, to reduce the transmission of the infection. There should also be integration of complementary intervention strategies by government and non-governmental organizations in the study area.

References

Adewole, S. O., Olofintoye, L. K and Hassan, A. A. (2001). Schistosomiasis and Schistosoma haematobium infection among school children in Ikere, Ekiti State, Nigeria. *African Journal of Science*; 1(1): 3842.

Adewole, S. O. and Fafure, T. H. (2013). Epidemiology and prevalence of urinary schistosomiasis in pre-school children in Lagos, Nigeria. *International Journal of Medicine and Medical Sciences*; 5(10): 456-459.

Ali, M. U., Umar, A. U., Idris, H. U., Abdullahi, Y., and Sabiu, M. D. (2016). *Schistosoma haematobium* infections: Prevalence and morbidity indicators in communities around Wasai Dam, Minjibir, Kano State, Northern Nigeria. *International Journal of Tropical Disease & Health; 17(2): 1-8.*

Amaechi, E. C. (2014). Urinary Schistosomiasis among school age children in some rural communities of Abia State, South Eastern Nigeria. *Animal Research International*; 11(2): 1953-1957.

Cheesbrough M. (2002). District laboratory practice in tropical countries. Cambridge University Press, New York.

Dawaki, S., Al-Mekhlafi, H. M., Ithoi, I., Ibrahim, J., Abdulsalam, A.M., Ahmed, A., Sady, H., Atroosh, W. M, Al-Areeqi, M. A, Elyana, F. N., Nasr, N. A., and Surin, J. (2016). Prevalence and risk factors of schistosomiasis among Hausa communities in *Kano* State, Nigeria. *Revista do Instituto de Medicinal Tropical de Sao Paulo*; 58:54.

Ezeamama, A. E., Friedman, J. F. and Acosta, L. P. (2005). Helminth infection and cognitive impairment among Filipino children. *American Journal of Tropical Medicine and Hygiene;* 72:540-548.

Goodhead, D. A., Dirisu, C. G. (2016). Prevalence of urinary schistosomiasis among pupils in endemic communities of Rivers State, Nigeria. *American Journal of Microbiology and Biotechnology*; 3(2): 7-12.

Mafiana, C. F., Ekpo, U. F and Ojo, D. A. (2003). Urinary Schistosomiasis in pre-school children in settlements around Oyan Reservoir in Ogun State, Nigeria: Implications for control. *Tropical Medicine and International Health*; 8(1):78-82.

Nafiu, S., Inuwa, B., Abdullahi, A., Alkali, Z. And Ibrahim, B.A. (2016). Prevalence of urinary schistosomiasis among primary school pupils in Kofa Primary School, Tafa Local Government, Niger State, Nigeria. *Journal of Epidemiology & Clinical Medicine;* 2(1): 7-13.

Ofoezie, I. E., Christensen, N. O. and Madsen, H. (1998). Water contact patterns and behavioural knowledge of schistosomiasis in south west Nigeria. *Journal of Biosocial Science*; 30: 245-259.

Oladejo, S.O, Ofoezie, I.E. (2006). Unabated schistosomiasis transmission in Erinle River Dam, Osun State, Nigeria: Evidence of neglect of environmental effects of water development projects. *Tropical Medicine and International Health*; 11(6):845-850.

Opara, K., Udoidung, N. and Ukpong, I. (2007) Genitourinary schistosomiasis among preprimary school children in a rural community within the Cross River Basin, Nigeria. *Journal of Helminthology*; 81:393-397.

Sarkinfada, F., Oyebanji, A. A., Sadiq, I. A. and Kyasu, Z. (2009). Urinary schistosomiasis in the Danjarima community in Kano, Nigeria. *Journal of infection in Developing Countries;* 3:452-457.

Steinmann, P., Keiser, J., Bos, R., Tanner, M., and Utzinger, J. (2006). Schistosomiasis and water resources development: Systematic review, meta-analysis, and estimates of people at risk. *Lancet Infectious Disease*; 6: 411-425.

USAID (2016). Schistosmiasis. United States Agency for International Developments Neglected Tropical Disease Program. Available at: http:www.neglecteddiseases.gov/target_diseases/schistosomiasis.

WHO (1993). The control of schistosomiasis. Second report of the WHO Expert Committee. WHO Technical Report Series. 830:1-86.

WHO (2002). Prevention and Control of Schistosomiasis and Soil Transmitted Helminthiasis. Technical Report Series, Number 912: 1-57, World Health Organization, Geneva.

World Health Organization (2012) Schistosomiasis; numbers of people treated in 2010. Weekly epidemiological record; 87(4): 37-44.

Yunusa, E. U., Awosan, K. J., Ibrahim, M. T. O., and Isah, B. A. (2016). Prevalence, epidemiological characteristics and predictors of occurrence of urinary schistosomiasis among Almajiri school children in Sokoto, Nigeria. *International Journal of Medicine and Medical Science;* 8(3): 22-29.