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Full Length Research Article

DETERMINATION OF PREVALENCE, RISK FACTORS AND SYMPTOMS OF URINARY SCHISTOSOMIASIS AMONG SCHOOL CHILDREN IN KADUNA SOUTH LOCAL GOVERNMENT AREA, KADUNA STATE

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ABSTRACT
Schistosomiasis negatively impacts children's health. Children expose themselves daily to schistosome infections due to lack of awareness and knowledge about the disease or the danger of infested water bodies. This study was aimed at determining the prevalence, risk factors and symptoms of urinary schistosomiasis among school children in Kaduna South Local Government Area, Kaduna State, Nigeria. Four hundred (400) consented school children submitted 10mL urine each and responded to structured questionnaires. Sediment of each urine sample was examined by light microscopy, after centrifugation at 3000 rpm for 5 min. Overall prevalence of urinary schistosomiasis was 4.5%. Both male and female children were equally infected (4.5% each). Older children between 13-17 years old were more infected (5.0%) and more at risk (OR = 2.982) than younger children (8-12 years old) who had 1.7% of the infection. No infection was recorded among children who had awareness about the disease. Water-based activities that served as significant risk factors for the infection included swimming in river (8.7%, P=0.016, OR= 3.064), fishing (12.2%, P=0.005, OR=3.942) and washing of clothes in river (17.4%, P=0.002, OR=5.459). Significant symptoms of urinary schistosomiasis identified were frequent urination (12.5%, P=0.023, OR=3.612), abdominal pain (10.0%, P=0.045, OR=2.880), and terminal haematuria (13.6%, P=0.002, OR=4.526). Infected individuals were more at risk of experiencing pains during urination (7.4%, OR=2.047). Unawareness promotes the spread of schistosomiasis among Nigerian children; their continuous exposure to infested water poses a greater risk. Creation of awareness amongst children will help to control their play habits in unsafe water bodies.

Keywords: Urinary schistosomiasis, unawareness, risk factors, symptoms, play habits.

INTRODUCTION

Many parts of African continent suffer a great deal from water-related problems. Schistosomiasis thrives in sub-Saharan Africa, with about 120 million individuals having related symptoms. However, Nigeria is the most endemic country for schistosomiasis in Africa (Adenowo *et al.*, 2015). Persistence of the disease is promoted by certain play habits among children, water-based occupations (Kanwai *et al.,* 2011), unawareness about the disease and its risk factors (Bishop *et al.*, 2016), lack of safe alternatives of water supply in poor rural communities, proximity to infested water bodies, rise in ambient temperature, climatic changes and global warming (Adenowo *et al.*, 2015).

Children are noticeably the most affected set of individuals in endemic areas, mainly due to their uncontrolled play habits in infested water bodies (Bishop *et al.*, 2016; Bishop, 2017). Children have continuously remain vulnerable to urinary schistosomiasis (Oyibo *et al.,* 2011) and serve as reservoir for community spread of the infection (Ibironke *et al.,* 2011). The nature of African ecology, human behaviours and pattern of agricultural practices encourage the continuous transmission of schistosomiasis (SarkinFada *et al.*, 2009). Children are known to indiscriminately play in unsafe water bodies (Kanwai *et al.*, 2011), thereby become repeatedly more infected and re-infected (Cheesbrough, 2009). There is a problem of poor level of awareness about the disease in many Nigerian communities. Hence, children daily go to fetch water, wash clothes, swim, bathe or fish in infested rivers (Bishop *et al.*, 2016, Bishop, 2017).

Urinary schistosomiasis affect the health of children: it causes anaemia due to haematuria (Antwi *et al.*, 2014; Bishop *et al.*, 2016) and damages bladder tissues (Ross *et al.*, 2002; King, 2011). In Africa and the Middle East, chronic urinary schistosomiasis accounts for 50% of bladder cancers, mainly squamous cell carcinoma (Zaghloul and Gouda, 2012; Moshtaghi-Kashanian and Ketabchi, 2012). Though Praziquantel is given through mass drug administration to control schistosomiasis by selectively killing adult worms, it does not kill immature or juvenile schistosomes. Also, complications like tissue fibrosis cannot be effectively reversed (Weerakoon *et al.*, 2015).

MATERIALS AND METHODS

Study area and population

The study was conducted in Kaduna South Local Government Area (LGA) located in Central Senatorial Zone of Kaduna State, Nigeria. River Kaduna is the largest river in the state, which runs through some communities in the LGA. Many tributaries flow through some communities into the River Kaduna. Children often go to swim and fish in both smaller tributary rivers and River Kaduna, especially during the dry season. Children in selected schools were sensitized about schistosomiasis and the purpose of the study. Four hundred (400) consented school children between the ages of 8-17 years were enrolled.

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Ethical clearance
Ethical clearance for this study was obtained from Kaduna State Ministry of Health. Permission to conduct a school-based study was obtained from Kaduna State Ministry of Education, Science and Technology.

Collection of urine samples and administration of questionnaires
Structured questionnaires were administered to gather some data on socio-demography, exposure to certain risk factors and symptoms of the disease among school adolescents who consented to the study. From each consented subject, 10mL urine sample was collected in a wide screw-capped sample bottle. All the samples were taken for examination at the Parasitology Laboratory in Department of Microbiology, Faculty of Life Sciences, Ahmadu Bello University, Zaria, Nigeria.

Parasitological examination
After a gentle agitation of each urine sample in screw-capped universal plastic bottle, it was transferred unto sterile tubes and centrifuged at 3000 revolutions per minute (rpm) for 5 minutes (Cheesbrough, 2009; Bishop *et al.,* 2016). Supernatant was discarded and the sediment was transferred onto clean glass slide by means of Pasteur pipette. Cover slip was applied on the wet mount. The wet mount was examined for identification of characteristic terminal-spined eggs of *Schistosoma haematobium* using 10× and 40× objectives of the light microscope (Cheesbrough, 2009).

Statistical analysis
Data obtained from the study subjects together with the laboratory findings were subjected to Chi-square (χ^2) and Odds ratio (OR) analyses using IBM SPSS version 23 at 95% confidence interval. Final results were simplified in a chart and tables.

RESULTS
Urinary schistosomiasis was established by the detection of terminal-spined eggs of *Schistosoma haematobium* in urine sediment of the school children. A total of 18 out of 400 urine samples examined were positive for urinary schistosomiasis, giving an overall prevalence of 4.5% among children in Kaduna South LGA. However, 382 (95.5%) were negative for urinary schistosomiasis (Figure 1).
In Table 1, there were equal occurrences of 4.5% each of urinary schistosomiasis in male and female subjects. School children between the ages 13-17 years old had 5.0% urinary schistosomiasis, which was higher than 1.7% occurrence of the infection among those of 8-12 years old. Age-related distribution of urinary schistosomiasis among the children showed that older children are more at risk of the infection than the younger children (OR = 2.982).
Urinary schistosomiasis was not found among children who had awareness about the disease. Children who engaged in swimming in rivers had significant higher infection of 8.9% (P = 0.016), compared to those who did not (3.0%). Similarly, there was higher infection (12.2%) among children who participated in fishing, than 3.4% infection among those who did not (P = 0.005). Children who washed their clothes in rivers were significantly more infected (17.4%, P = 0.002), than those who washed their clothes at home (3.7%). There was higher infection among children whose source of water at home was well (6.3%), followed by those who used boreholes (3.7%), but the infection was absent among those who used tap water (Table 2).
In Table 3, children with urinary schistosomiasis significantly presented with the following symptoms: frequent urination (12.5%, P = 0.023, OR = 3.612), abdominal pain (10.0%, P = 0.045, OR = 2.880) and terminal haematuria (13.6%, P = 0.002, OR = 4.526). Infected children more likely presented with painful urination (7.4%, OR =2.047).

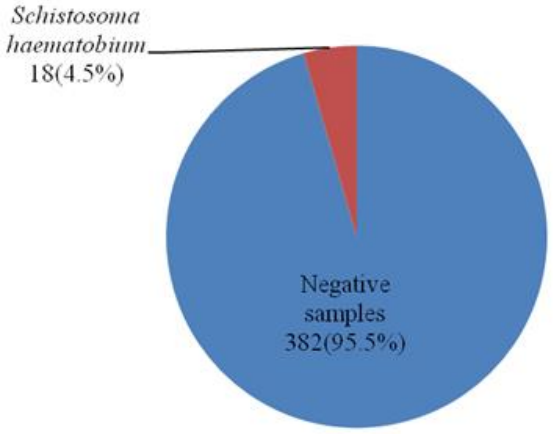

Figure 1: Prevalence of urinary schistosomiasis among school children in Kaduna South LGA, Kaduna State

Table 1: Age and gender distribution of urinary schistosomiasis among school children in Kaduna South LGA, Kaduna State

Demographic factor	Category	Number examined	*Schistosoma haematobium* Number (%)	χ^2	df	P-value	Odd ratio (OR)
Gender	Female	157	7(4.5)	0.01	1	0.974	1.016
	Male	243	11(4.5)				
Age (years)	8-12	58	1(1.7)	1.216	1	0.270	2.982
	13-17	342	17(5.0)				

Table 2: Risk factors of urinary schistosomiasis among school children in Kaduna South LGA, Kaduna State

Risk factor	Category	Number examined	*Schistosoma haematobium* Number (%)	χ^2	df	P-value	Odd ratio (OR)
Awareness	No	369	18(4.9)	1.583	1	0.208	0.951
	Yes	31	0(0.0)				
Irrigation farming	No	299	14(4.7)	0.092	1	0.762	0.839
	Yes	101	4(4.0)				
Swimming	No	297	9(3.0)	5.797	1	0.016	3.064
	Yes	103	9(8.7)				
Fishing	No	351	12(3.4)	7.794	1	0.005	3.942
	Yes	49	6(12.2)				
Source of water at home	Borehole	161	6(3.7)	3.898	2	0.142	
	Tap	48	0(0.0)				
	Well	191	12(6.3)				
Place for washing clothes	Home	377	14(3.7)	9.437	1	0.002	5.459
	River	23	4(17.4)				

Table 3: Symptoms of urinary schistosomiasis among school children in Kaduna South LGA, Kaduna State

Symptom	Category	Number examined	*Schistosoma haematobium* Number (%)	χ^2	df	P-value	Odd ratio (OR)
Painful urination	No	319	12(3.8)	1.998	1	0.158	2.047
	Yes	81	6(7.4)				
Frequent urination	No	368	14(3.8)	5.180	1	0.023	3.612
	Yes	32	4(12.5)				
Abdominal pain	No	350	13(3.7)	4.022	1	0.045	2.880
	Yes	50	5(10.0)				
Terminal haematuria	Absent	356	12(3.4)	9.603	1	0.002	4.526
	Present	44	6(13.6)				

DISCUSSION

Urinary schistosomiasis persists in many Nigerian communities due to persistent problems of unsafe water bodies, children's indiscriminate play habits in such bodies of water and discharge of human wastes into water channels. This study found a prevalence of 4.5% of urinary schistosomiasis among school children in Kaduna South LGA of Kaduna State, Nigeria. Despite efforts aimed at creating awareness about the danger of unsafe water bodies, the disease still persists. Though the prevalence in the area is low compared to reports from other locations, it is still a public health concern, because infected children that have not received treatment constitute a source of spread (or reservoir) in the community as long as human wastes are discharged into the rivers, where *Bulinus* snails (which serve as intermediate host) exist. Within Kaduna State, higher prevalence had been reported: 36.0% in Birni-Gwari LGA (Alhassan *et al.*, 2013), 19.5% in Bomo village in Zaria (Omenesa *et al.* 2015), 12.3% among school children in Lere LGA (Luka *et al.*, 2001), 12.3% among pupils in Jaba LGA (Bishop *et al.*, 2016), 12.9% among pupils and students in Zaria (Bishop and Ahmadu, 2018), and 10.5% among pupils in Zaria (Bishop and Akoh, 2018). The reports all together indicated the continued persistence of the disease in Kaduna State, Nigeria.

Gender-based distribution of urinary schistosomiasis among the school children within the LGA was equally the same. It means therefore as long as one has contact with cercariae-infested water, infection will occur regardless of gender. Most previous studies had implicated the male gender as having a higher risk of urinary schistosomiasis. A few other studies however demonstrated higher occurrence of urinary schistosomiasis among females (Oluwasogo and Fagbemi 2013; Bishop *et al.*, 2016). Older children have higher tendency to explore their environment; their play habits are not restrained and without precaution they bathe, swim, fish or wash clothes in unsafe bodies of water, but the younger ones may not be such bold. Hence, more infections will be found among the older children, as equally observed by Bigwan *et al.* (2013), Omenesa *et al.* (2015), and Geleta *et al.*, 2015).

In this study, urinary schistosomiasis was only found in children who were not aware about the disease. It means awareness will play a vital role in the prevention and control of urinary schistosomiasis. The potential of wide-spread awareness campaign in addition to Praziquantel administration will be enormous. Unawareness about urinary schistosomiasis is an important risk for continuous spread of the infection among children in local communities in Nigeria (Bishop *et al.*, 2016; Bishop, 2017; Bishop and Akoh, 2018).

Water-contact activities like swimming, fishing and washing of clothes significantly predisposed the children to urinary schistosomiasis. These activities bring human skin in direct contact with water infested with schistosome cercariae. These risk factors had been previously reported (Brindley and Hotez, 2013; Bishop *et al.*, 2016; Bishop and Akoh, 2018; Bishop and Ahmadu, 2018). It will be difficult to separate children from enticing water-based activities, especially swimming and fishing. A supportive intervention approach will be the provision of safe water-based recreational centers in the community. This is where governmental and non-governmental organizations need to expedite their roles to salvage the devastating health impacts of schistosomiasis in Africa, especially in Nigeria.

Symptoms of a disease are helpful during diagnosis. Infected children in this study had the following significant symptoms: painful urination, frequent urination, abdominal pain and terminal/visible haematuria. These symptoms had been severally reported during schistosomiasis (Morenikeji *et al.*, 2014; Dawaki *et al.,* 2015; and Bishop *et al.,* 2016). In endemic areas these symptoms are of diagnostic value. In fact, terminal haematuria is a classical sign of urinary schistosomiasis. Absence of haematuria among children in an endemic area is predictive of absence/elimination of the disease (Van der Werf and de Vlas, 2004; WHO, 2016). Children's health should be a collective responsibility of parents, teachers, community leaders and the government. Their daily activities should be closely monitored, and be disallowed from having body contact with unsafe water bodies.

Conclusion

This study found a prevalence of 4.5% of urinary schistosomiasis among school children in Kaduna South LGA of Kaduna State, Nigeria. Both male and female children were equally infected (4.5% each). Older children (13-17 years old) had more infections and were more at risk of urinary schistosomiasis than the younger children (8-12 years old). Unawareness was a key factor promoting the spread of urinary schistosomiasis among the children. Other significant risk factors included swimming, fishing and washing of clothes in infested rivers. The infected children presented with painful urination, frequent urination, abdominal pain and terminal haematuria as significant symptoms. Close monitoring of children's play habits will help to prevent them from engaging in activities in unsafe bodies of water. As an advocacy, creation of awareness, provision of safe water, standard water-recreational facilities in communities and anti-helminthic drug intervention will help to eradicate urinary schistosomiasis in Nigeria.

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