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Epidemiology of urinary schistosomiasis and knowledge of health personnel in rural communities of South-Western Nigeria

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Human schistosomiasis is a major water-borne parasitic disease in Nigeria with limited control programme. This study was conducted to determine the prevalence and intensity of urinary schistosomiasis, and knowledge of local health personnel in rural communities of the south-western states of Osun and Kwara, Nigeria, by using a filtration technique and a pre-tested structured questionnaire. Of the 620 individuals examined, 346 (55.8%) had an infection with a mean intensity of 65.60 eggs/10ml urine. The age-related prevalence was unimodal with the highest prevalence, 65.9% and mean intensity 67.4eggs/10 ml of infection in the age group of 10 to 14 years. There was a significant difference (P<0.005) in infection rate with respect to male and female (61.9 vs 47.3%) individuals. Of the 92 health personnel interviewed, 32.6% were clinicians, 22.8% health care assistants, and 44.5% consists of others like chemists and pharmacists. The knowledge of health personnel on urinary schistosomiasis varied significantly (p<0.005). Though 46.7% of the clinicians have good knowledge of the treatment and control measure, and 56.7% have a fair knowledge of prevention of schistosome, a very high number of the interviewee (46.7%) consisting of most of the Auxiliary health workers, and others like chemists and pharmacists have no knowledge of the infection. The high prevalence and intensity of *Schistosoma haematobium* infection in the current study area clearly indicated that this infection remains unabated and as such, local health personnels should be adequately trained on handling urinary schistosomiasis cases in these communities.

Key words: Urinary schistosomiasis, rural communities, health personnel, prevalence, intensity, South-western Nigeria.

INTRODUCTION

Schistosomiasis is a water-borne parasitic disease of public health importance, ranked second to malaria, and it is the most devastating disease in the developing world (WHO, 1993). Global statistics indicates that close to 800 million individuals were at risk of infection, 207 million were infected worldwide and 93% of these cases occur in

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tropical Africa (Hotez and Kamath, 2009).

According to Chitsulo et al. (2000) and Steinmann et al. *(*2006), 120 million suffered from clinical disease while 20 million exhibit severe morbidity. The prevalence of the disease is attributable to extensive water contact activities, poor personal hygiene and other cultural practices (Oladejo and Ofoezie, 2006).

In Nigeria, both urinary and intestinal schistosomiasis, caused by *Schistosoma haematobium and Schistosoma mansoni* respectively, are prevalent (Opara et al., 2007; Oladejo and Ofoezie, 2006) though urinary schistosomiasis is more distributed (Ofoezie, 2002), and widespread in both rural and urban communities with prevalences of infection ranging between 2 and 90% with many cases occuring among school-aged children, especially the poor and marginalized (Ofoezie et al., 1997; Okoli and Odaibo, 1999; Ugbomoiko, 2000; Mafiana et al., 2003; Okoli and Iwuala, 2004; Oladejo and Ofoezie, 2006; Opara et al., 2007; Hotez and Kamath, 2009).

Thus, Nigeria has the highest burden of schistosomiasis infection in Africa with about 29 million infected individuals (Steinmann et al., 2006; Hotez and Kamath, 2009). Despite the heavy impact of schistosomiasis infection on human populations in Nigeria, there are limited control measures and programme, thus the impact of local health personnel with knowledge in the prevention, control and treatment of urinary schistosomiasis cannot be underestimated. Therefore, this research focuses on the prevalence and intensity of urinary schistosomiasis infection and the knowledge of the health personnel on the disease, in some selected rural communities of Osun and Kwara States, Nigeria.

MATERIALS AND METHODS

Study area

The study was conducted in three selected rural communities, namely Ilie in Osun State, Ajase ipo and Bacita in Kwara state, Nigeria. The Ilie is located in the rain forest zone on latitude 4°34' and 4°36'E, and Longitude 7°56' and 7°58'N in Osun State with a population of about 2,268 (National Population Commission, 1991). Ajase ipo with a population of 8953 (National Population Commission, 1991), located on latitude 8°13' 60 N and longitude 4°49' 0 E, and serves as the major junction for other cities and towns in Kwara state, including Ilorin which is Kwara state capital, Omu- aran, Offa and Igbaja, while Bacita which is about 78km to Ilorin and having a population of 2541 (National Population Commission, 1991) is located on latitude 9°4' 59.99"N and longitude 4°57' 0.00"E. The local climate of these rural communities is tropical with dry (November to March) and rainy (April to October) seasons. The mean annual rainfall is 1100 mm for Ilie, 1238 mm for Ajase ipo and 1143 mm for Bacita while the mean annual temperature is 27°C for Ilie, 26°C for Ajase ipo and 27.9°C for Bacita (Ayoade, 1982). These rural communities have rivers and streams on which the community members depend for their domestic water supply, fishing and other water related activities and also have similar ecological, socio-economic and cultural characteristics.

Study population and design

A student-based study was conducted between February and July, 2012. The consent of the parents, teachers and local government was sought prior the commencement of sample collection. After detail explanation of the study processes, interested students who volunteered were selected randomly. However, any girl observed menstruating during sample collection was exempted. Also, each health care centre in the study area was visited to interview the health personnels.

Data collection

Relevant information and data were collected from the students and health personnels using pre-tested structured questionnaire and qualitative interview method in the language that each student and health personnel understand best (English or Yoruba). The questionnaire was used to obtain student's information on name, gender, age, father's occupation, source of water supply, mode of infection transmission, symptoms of infection among others and health personnels were qualitatively interviewed on the source of infection, description of intermediate host, symptoms of infection, prevention of infection, control and treatment of infection. The health personnels' knowledge level of the infection was scored by calculating the number of positive answers from 5 related items in the questionnaire.

Each item has a maximum score of 2 points which is graded as 0, 1, and 2 points. The average score, which was qualitatively graded on a scale of 1 to 10 was calculated in percentage and classified as "no idea" (<40%), "fair idea" (40 to 59%) and "good idea" (≥60).

A single urine sample was collected between 10:00 am and 14:00 pm h from each subject in a pre-labelled, sterile, wide-mouthed, screw-capped plastic container and immediately checked for microhaematuria and proteinuria using commercial reagent strip (Medi-test combur-9; Analyticon Biotecnologies, Lichtenfels, Germany), in accordance with the manufacturer's instructions. Immediately after these procedures, samples were transported to the Laboratory of Zoology, University of Ilorin.

Thereafter, 10 ml of each sample was passed through an 8-µm-pore membrane filter in order to retain any *S. haematobium* egg present, which is then viewed and counted under a light microscope (WHO, 1993). Intensity of infection was graded as light (≤50 eggs/10 ml), moderate (51 to 499 egg/10 ml) and heavy (≥500 egg/10 ml).

Ethical clearance

The study protocol was reviewed and approved by the Research and Ethical Committee of the University of Ilorin Teaching Hospital. The village heads and the guardians or caregivers of each child were fully informed on the objective of the study. Thereafter, informed written consent was obtained from each adult subject and the guardians or caregivers of each child investigated prior the subjects were enrolled in the study.

Statistical analysis

Data analysis was performed using the version 16.0 of the statistical package for social sciences (SPSS) for Windows software package (SPSS Inc, Chicago, IL). Comparisons of prevalence by age and sex were made using chi square tests. The mean egg count was explored using Student's t-test to obtain dichotomous variable while variable with more than two levels were obtained using the one way analysis.

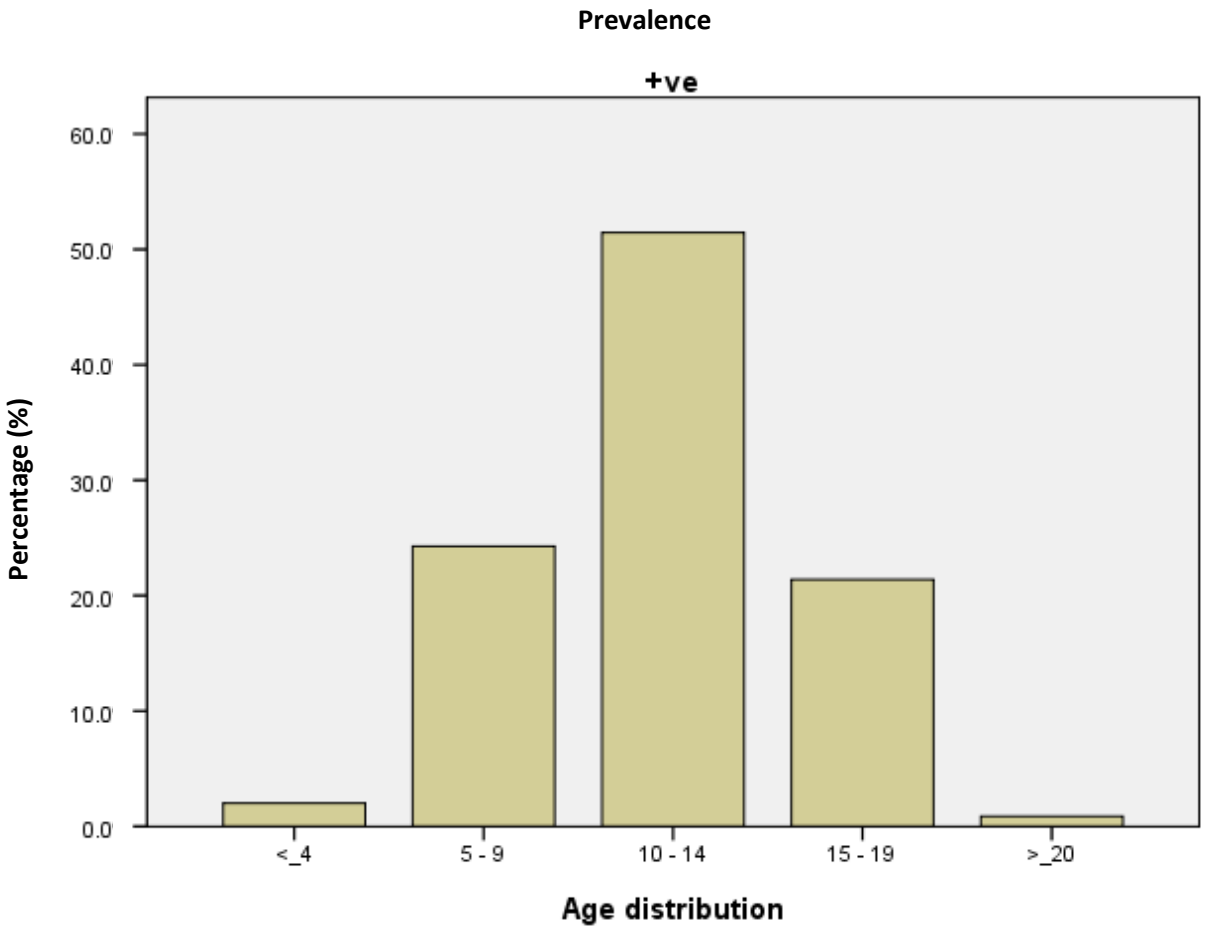

Figure 1. Prevalences of *S. haematobium* infection, according to the age groups of rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

RESULTS

Infection parameters of *S. haematobium* among the local subjects

A total of 620 (362 males and 258 females) was examined for *S. haematobium* infection, with age ranges between 3 to 22 years. The overall prevalence of *S. haematobium* infection was 55.8%, with a mean intensity (S.D) of 65.60 (0±59.3) eggs/10 ml urine. Prevalence of *S. haematobium* infection, according to the age groups of rural communities is shown in Figure 1.

The age-specific patterns in the prevalence of infection in this study significantly ($p < 0.001$) indicated age group 10 to 14 years with the prevalence of 65.9% as the highest prevalence among the age groups studied. This was closely followed by age group 5 to 9 with 53.8% prevalence. In subjects with age group greater than 14 years, the prevalence significantly declines gradually with increasing age to reach the prevalence of 33.3% at age ≥20 years (Table 1). The prevalence patterns of infection were also significantly gender-related ($p<0.001$). The male subjects have an overall highest prevalence of infection (61.9%) than their female counterparts (47.3%) (Table 1). The mean intensity of infection was related to age and gender. There are decreases in intensity with increasing age of the subjects which peak in age group ≥20 with a mean intensity (S.D) of 33.7 (0±11.8) eggs per 10 ml urine. The intensity (S.D) of infection in male (69.3 (± 69.0) eggs per 10 ml urine) was higher than in female (58.8 (± 34.6) eggs per 10ml urine) (Table 1).

Father's occupation was found to be significantly associated with the prevalence of infection ($p<0.001$) with farming having the highest prevalence of 66.2%. Among the father's educational level recorded, incomplete primary education gave the highest prevalence and intensity of infection (Table 2). Infection appeared to be strongly associated with the river as a source of water supply since those having river as their main source of water supply have the highest prevalence and intensity than other sources (Table 2). It is also more likely that engaging in agricultural activities form the major contact

Table 1. Prevalence and intensity of urinary schistosomiasis with respect to demographic factors among rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

Variables	Number examined	Number infected (prevalence %)	Mean intensity± S.D
Age group (years)			
≤4	**17**	7 (41.2)	80.1 ± 54.3
5-9	**156**	84 (53.8	77.8 ± 97.0
10-14	**270**	178 (65.9)	67.4 ± 44.1
15-19	**168**	74 (44.0)	47.4 ± 18.6
≥20	**9**	3 (33.3	33.7 ± 11.8
Total	**620**	346 (55.8)	65.6 ± 59.3
P –value	**-**	<0.001	0.017
Gender			
Male	362	224 (61.9)	69.3 ± 69.0
Female	258	122 (47.3	58.8 ± 34
Total	620	346 (55.8)	65.6 ± 59.3
P –value	-	<0.001	0.017
Communities			
Ajase ipo	212	121 (57.1)	64.41±53.2
Ilie	203	119 (58.6)	70.91±80.1
Bacita	205	106 (56.0)	60.99±32.6
Total	620	346 (55.8	65.60±59.3
P –value	-	0.335	0.541

Table 2. Prevalence and intensity of urinary schistosomiasis with respect to socio-economic factors among rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

Variable	No. examined	No. infected (prevalence %)	Mean intensity ± S.D
Father's occupation			
Fishing	15	9 (60.0)	109.3±110.7
Farming	263	174 (66.2)	64.7±63.5
Trading	161	86 (53.4)	61.4±41.3
Salary earner	132	55 (41.7)	68.8±64.4
Wage earner	49	22 (44.9)	63.1±38.6
Total	620	346 (55.8)	65.6±59.3
P-value	15	P<0.001	P=0.236
Father's educational level			
Complete primary	477	242 (50.7)	58.9±41.5
Incomplete primary	143	104 (72.7)	81.3±86.1
Total	620	346 (55.8)	65.6±59.3
	-	P<0.001	P=0.001
Main source of water supply			
Tap	71	35 (49.3)	53.4±24.0
Well	309	134 (43.4)	63.0±50.9
River	237	176 (74.3)	70.1±69.3
Others	3	1 (33.3)	51.0
Total	620	346 (55.8)	65.6±59.3
Water contact habit			
Play or bath	137	84 (61.3)	67.7±63.2

Table 2. Contd.

Washing	344	214 (62.2)	60.7±47.3
Agricultural work	51	39 (76.5)	82.2±93.1
Fishing	13	8 (61.5)	92.0±88.6
No contact	75	1 (1.3)	56.0
Total	620	346 (55.8)	65.6±59.3
-	-	P<0.001	P=0.167

Table 3. Demographic and socio-economic characteristics of the health personnel's (n=92) in rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

Variable	Heath personnel's No. (%)
Sex	
Male	41 (44.6)
Female	51 (55.4)
Total	92 (100)
Occupation	
Clinicians	30 (32.6)
Auxiliary health workers	21 (22.8)
Others	41 (44.6)
Total	92 (100)
Education level	
Secondary	37 (40.2)
Tertiary	55 (59.8)
Total	92 (100)
Years of experience	
<2 years	6 (6.5)
2-5 years	55 (59.8)
6-10 years	21 (22.8)
>10 years	10 (10.9)
Total	92 (100)

medium for the transmission of urinary schistosomiasis. Those who have contact with the river through agricultural work have the highest prevalence of infection (Table 2).

Local health personnel's

The survey study included 92 volunteered health personnel's (44.6% male and 55.4% female) with ages ranging from 25 to 55. Their average age was 40 years old. Of the 92 health personnels interviewed, 32.6% were clinicians, 22.8% Auxiliary health workers, and 44.5% consists of others like chemists and pharmacists. The numbers of health personnels with secondary and tertiary education are 37 (40.2%) and 55 (59.8%) respectively (Table 3).

The respective knowledge of each health personnel on each question item was significantly dependent on their occupation (Table 4). Despite the fact that the number of clinicians examined is relatively few, 53.3 and 43.3% of them have a fair and good knowledge of the source of schistosome infection respectively. However, a very high number of others, such as chemists (75.6%) have little or no knowledge of the source of infection. Though, most of the health personnels (77.2%) especially all others, such as chemists cannot describe the intermediate hosts of *S. haematobium*, few clinicians (46.7%) have a fair knowledge of the intermediate host description (Table 4).

Most of the health personnels (52.2%) tend to have a fair knowledge of symptoms of infection (Table 4). Although 46.7% of the clinician have good knowledge of the treatment and control measure, and 56.7% have a

Table 4. Occupation with respect to knowledge of the health personnels (n=92) in rural communities of Ilie, Ajase ipo and Bacita, south-western Nigeria.

Knowledge item	Occupation	Health personnel No. (%)	No idea No. (%)	Fair idea No. (%)	Good idea No. (%)	p-values
Source of infection	Clinicians	30 (32.6)	1 (3.3)	16 (53.3)	13 (43.3)	<0.001
	Auxiliary health workers	21 (22.8)	9 (42.9)	9 (42.9)	3 (14.3)	
	Others	41 (44.6)	31 (75.6)	8 (19.5)	2 (4.9)	
	Total	92 (100)	41 (44.6)	33 (35.9)	18 (19.6)	
Intermediate host	Clinicians	30 (32.6)	11 (36.7)	14 (46.7)	5 (16.7)	<0.001
	Auxiliary health workers	21 (22.8)	19 (90.5)	1(4.8)	1 (4.8)	
	Others	41 (44.6)	41 (100)	0	0	
	Total	92 (100)	71 (77.2)	15 (16.3)	6 (6.5)	
Symptoms	Clinicians	30 (32.6)	0	15 (50.0)	15 (50.0)	<0.001
	Auxiliary health workers	21 (22.8)	4 (19.0)	16 (76.2)	1 (4.8)	
	Others	41 (44.6)	23 (56.1)	17 (41.5)	1 (2.4)	
	Total	92 (100)	27 (29.3)	48 (52.2)	17 (18.5)	
Prevention	Clinicians	30 (32.6)	1 (3.3)	17 (56.7)	12 (40.0)	<0.001
	Auxiliary health workers	21 (22.8)	12 (57.1)	8 (38.1)	1 (4.8)	
	Others	41 (44.6)	35 (85.4)	6 (14.6)	0	
	Total	92 (100)	48 (52.2)	31(33.7)	13 (14.1)	
Treatment and control	Clinicians	30 (32.6)	2 (6.7)	14 (46.7)	14 (46.7)	<0.001
	Auxiliary health workers	21 (22.8)	11 (52.4)	7 (33.3)	3 (14.3)	
	Others	41 (44.6)	30 (73.2)	7 (17.1)	4 (9.8)	
	Total	92 (100)	43 (46.7)	28 (30.4)	21 (22.8)	

No idea, fair idea and good idea means <40% score, 40-59% score and ≥60% score respectively.

fair knowledge of prevention of schistosome infection in these communities, a very high number of the subject population of 52.2 and 46.7% have no knowledge of both prevention of treatment and control measures respectively (Table 4).

DISCUSSION

The result of the present study showed that Ilie, Ajase-ipo and Bacita rural communities of south-western Nigeria fall within the world health organization (WHO) classification as endemic for urinary schistosomiasis (WHO, 2002). The overall prevalence of 55.8% was observed in these rural communities. This is higher than the national Nigerian mean of 13% (Ofoeze, 2002), and the prevalence of infection in many rural communities and farm settlements in Nigeria (Ekejindu et al., 2002; Ejima and Odaibo, 2010; Houmsou et al., 2012).

However, similarly high prevalence of *S. haematobium* infection has been reported by some other authors in areas where the infection is endemic within and outside Nigeria (Akokun et al., 1994; Anosike et al., 1999; Oladejo and Ofoeze, 2006; Oniya and Olofintoye, 2009; Ekpo et al., 2010; Ugbomoiko et al., 2010; Senghor et al., 2014). The high rate of the prevalence reported in the present study may be an indication of the rate of *S. haematobium* transmission in various areas in these communities. The rivers are the main transmission points in these communities. They serve as a natural water source and a meeting point for the schistosome parasites, their intermediate host and the people. The people depend on these rivers for their farming and fishing activities, bathing, swimming and other domestic needs.

These provide an avenue for infection transmission and reinfection. This prevalence is however, lower than the prevalence rate of 98.0% reported from an Agricultural

settlement near Yola, and some other areas within and outside Nigeria (Akogun, and Akogun, 1996; Ologunde et al., 2012). This difference in the prevalence rate may be influenced by peculiar ecological characteristics, the degree of exposure of people to water bodies through some indigenous water contact activities, and the presence or absence of intermediate snail hosts in the local river.

In the present study, more than half of the subjects (52.6%) harboured moderate infection. This can easily become aggravated to heavy infection that may lead to low human performance, reduced physical and intellectual function, and infertility (King, 2010). The infection pattern in the present study showed a typical high prevalence in the early adolescence with males having a higher rate of 61.9% prevalence than their female counterparts having 47.3% prevalence. Similar trends have been recorded before in endemic settings, in Nigeria and elsewhere in Africa (Chandiwana et al., 1988; Amankwa et al., 1994; Ofoezie et al., 1997, 1998; Okoli and Odaibo, 1999; Aryeetey et al., 2000; Okoli and Iwuala, 2004; Yapi et al., 2005; Rudge et al., 2008; Otuneme et al., 2014). Some other studies have found no significant differences in gender prevalence (Wilkins, 1977; Mafiana et al., 2003; Ekpo et al., 2010). This high prevalence in male may be due to the fact that males tend to go to river water on regular bases to fetch water for domestic use, play or bath, to swim, and to fish unlike the females that may not necessarily attach any importance to such water-contact activities but rather prefer to stay close to their mother at home while assisting with domestic chores. Also in this research, it was observed that the highest prevalence of 65.9% occurs in the age group 10 to 14 years.

In subjects with age group greater than 14 years, prevalence gradually declines with increasing age to reach the least prevalence of 33.3% at age ≥20. This is probably due to a reduction in exposure pattern and acquired immunity (Woolhouse et al., l991). The intensity patterns of infection showed that the age group ≤4 has the overall highest level of mean intensity. The subjects revealed that contact with river water, particularly for subjects aged ≤4 was due to their mothers' activities such as washing, fishing and bathing children in such river water. This high intensity is in agreement with results of previous studies in other *S. haematobium* endemic areas (Wilkins, 1987; El-Harvey et al., 2000; Abdel-Wahab et al., 2000). This high intensity in children may be attributed to increased worm burden and low immunity against the parasite, while the opposite was encountered in adult subjects who probably have reduced schistosome worms and high immunity (Ogbe, 1995). The differences in the male and female intensities of infection may reflect the degree of exposure to intense water contact activities by the males, since they usually engage in all the water contact activities such as washing, drinking, swimming, fetching, farming and fishing (Bala et al., 2012).

The impact of local health personnels in the treatment, prevention and control of schistosome infection in endemic areas cannot be underestimated. A total of 92 health personnel participated in the questionnaire survey. The knowledge of health personnel which include clinicians for example, doctors and nurses, auxiliary health workers and others, such as chemists were exploited in these communities. The knowledge of these health personnels on schistosome infection is an indication of their ability to effectively carry out their duty with respect to treatments, control, and prevention of urinary schistosomiasis in these study communities. Although, there were multiple risks for potential *S. haematobium* infections in these communities, knowledge level on schistosomiasis was relatively low among health personnels in these areas.

This was corroborated by the result of Zenq et al. (2011) that showed the majority of the health personnel to have relatively low knowledge of schistosomiasis infection in the study area as a result of lack of adequate training.

Generally, utilization rates are often low in rural clinics because of the peoples' attitude (Zenq et al., 2011) and also, health care workers often lack the training required to attend effectively to the infected individuals (Zenq et al., 2011). Though the clinicians have fair and good knowledge of schistosome infection, their knowledge score shows that they need more training on neglected tropical diseases especially on the endemic schistosome infection.

Conclusion

The disease, urinary schistosomiasis is still endemic in the study area, and there is the need for adequate training of health personnel in order to equip them for proper control of the disease.

RECOMMENDATIONS

Control program for urinary schistosomiasis and training of health personnel should be encouraged in the study area.

Conflict of Interests

The authors have not declared any conflict of interests.

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