

Religion and Gender Behavior: Understanding Variations in Urinary Schistosomiasis Among Farmers

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Abstract

Urinary schistosomiasis is a chronic disease that is widely spread among the poor. It is caused by blood fluke of the genus *Schistosoma*, and transmitted to humans through water related activities by way of skin penetration. The infection is rarely fatal, however, it could impact on economic and health situations of infected individual often leading to learning disabilities and poor work productivity. We evaluated the prevalence level and dissimilarity of endemicity of urinary schistosomiasis among farmers in Shonga, a rural community in Edu Local Government Area (LGA) of Kwara State, Nigeria. Prior to the initiation of sample collection, we sought permission from the community head (Emir), followed by community awareness creation among head of farmers association, religious leaders and women leaders. Subsequently, we collected 121 urine samples from the consenting farmers and examined specimens for the presence of *S. haematobium* eggs using filtration techniques. Urinary schistosomiasis was endemic and dissimilar among the examined farmers, with 56(46.3%) out of the 121 examined specimens positive. Grouping farming type by religion, yam farmers were significantly different from the sugar cane farmers, but there was no statistical difference among Muslim and Christian farmers even though there was higher infection rate (50.7%) among the Muslim farmers than their Christian counterparts (40%). Conversely, classifying farming type by gender, vegetable farmers were significantly different from sugar cane farmers while female farmers were also statistically more infected than their male counterparts. This study shows that urinary schistosomiasis is endemic among farmers in Shonga, with significant variations in farming type and gender. Therefore, this finding will provide necessary guidance in allocating limited public health interventions among endemic groups to ensure such are delivered to the categories that require it most.

Introduction

Schistosomiasis (Biharziasis) is a major chronic parasitic and Neglected Tropical Disease (NTD) that continues to cause morbidity and mortality among endemic population (Adenowo et al., 2015). Schistosomiasis is caused by a platyhelminthes, a member of the digenetic blood trematodes commonly referred to as the blood fluke in the genus *Schistosoma*. There are three main species that affect humans namely, *S. haematobium* which causes urinary schistosomiasis, and *S. japonicum* & *S. mansoni* which cause intestinal schistosomiasis respectively.

Urinary Schistosomiasis affects more than 779 million people in 79 tropical and subtropical countries, with 101.3 million of those from Nigeria thereby making the country the most endemic in Africa (Steinmann et al., 2006; Ofoezie 2002). It is typically common in the underprivileged rural communities characterized by low socioeconomic status (Zhang et al., 2010). This disease is one of the main occupational diseases that is acquired by man through activities associated with fresh water, such as washing, bathing, fishing, recreation and farming, especially the type of farming that bring farmers into frequent contact with contaminated water (irrigation activities) e.g. rice, sugar cane, vegetable etc. (Ofoezie 2002).

Humans are generally infected through skin penetration of the infective stage of the parasite called cercarial when they come in contact with contaminated fresh water during daily activities (WHO 2015; Steinmann et al., 2006). Although, urinary schistosomiasis is rarely fatal with most people in endemic countries asymptomatic, however, it could impact on economic and health situations of infected individual with learning disabilities, school absenteeism, poor work productivity and severe pathological effect such as; calcification of the urinary bladder, enlargement of the liver, spleen and the lymph node etc (WHO update, 2004).

In spite of the partnership of Schistosomiasis Control Initiative in Nigeria (SCI) and the activities of the West African Centre for International Parasite Control (WACIPAC) in fighting parasitic disease, the concentration and ecological distribution of the disease in Nigeria remains poorly defined, especially among the underprivileged rural communities. In addition, the degree of ignorance, poverty, poor basic social amenities, insecurity and insurgencies of tribal and religion crisis, political hostility among others have also greatly hindered success of research efforts in containing schistosomiasis in the country.

Shonga community in Edu LGA of Kwara State was chosen for this study, because of its closeness to River Niger and Kainji Basin which is known as reservoir for *Schistosoma* the parasite that causes schistosomiasis (Amin 2018). The two rivers flow through the community, and majority (97.5%) of the residents depend on it for their domestic and agricultural purposes (Amin 2018). Despite the prevalence of schistosomiasis in most rural communities of Nigeria, to our knowledge studies characterizing the prevalence of the disease among the most vulnerable groups (farmers) and the relationship among farming type, gender and religion are either scanty or nonexistent. For this reason, we examined the prevalence of urinary schistosomiasis among farmers, and the associations of different farming type (sugar cane, rice, vegetable and yam) with gender and religion in Shonga, Edu LGA of Kwara state. Outcome from our study will provide epidemiological data useful in directing future intervention and control measures in the study site and other communities with similar socio-ecological status.

Materials And Methods

Study area

This study was carried out in Shonga, a rural community located in Edu LGA of Kwara State, Nigeria. The community lies on longitude $9^{\circ} 1' 0''$ N and latitude $5^{\circ} 9' 0''$ E, and is located about 120km to Ilorin, the Kwara State capital. Its rainfall has an annual range of 1,000 – 1,500 mm and an average maximum temperature between $30 - 35^{\circ}$ C (Elelu et al., 2016). The predominant soil type in Shonga is loamy, which favors agricultural activities, and the major crops planted are rice, sugarcane, vegetable, yam among others. Majority of the households have low socioeconomic status, with their principal occupations being subsistence farming and petty trading. Islam and Christianity form their major religion. In this community, social amenities like water supply, health care services, waste management, sewerage and electricity are overly poor.

Study design

Prior to collection of urine samples, we visited the community head (Emir), explained the purpose of the research to him and then sought for his approval. Following this, other community leaders (Chiefs), head of farmers association, women leaders and religious leaders were properly briefed about the purpose, importance, procedures and their roles in the study. Also, in order to secure maximum cooperation of the farmers, we observed intense community advocacy among one hundred and fifty eight (158) registered farmers previously identified by the head of farmers association, where necessary, some were visited in their farms.

Sample collection

We gave 158 sterile specimen bottles to all the registered farmers and explicitly explained the procedure for urine collection. Following the method previously described by Cheesbrough (1998). We collected fresh urine samples between 09/08/2013 to 21/08/2013 within the hours of 10:00am to 2:00pm. Out of the 158 specimen bottles distributed to the farmers, only one hundred and twenty one (121) consented to give their urine samples for the study. The specimens were coded with names of farmers omitted. Specimens were stored in closed containers with icepacks and transported immediately to the laboratory for parasitological examination.

Sample technique and laboratory analysis

Examination of the specimens for the presence of eggs and sediment was carried out as soon as possible to avoid cloudiness due to prolonged storage. Microscopic examination of the specimens for detection of *S. haematobium* eggs was performed using filtration technique method earlier validated by Cheesbrough (1998). Briefly, 10ml of each urine sample was centrifuged at 5000 rpm for 5mins. The supernatant was discarded to leave the sediment, which was then placed on a clean glass slide and covered with a cover slip. The slides were then microscopically examined using x40 objective lens for the presence of eggs (terminal-spined ova) of *S. haematobium*.

Statistical analysis

We used descriptive statistics to calculate the frequency of schistosomiasis infections among the farmers. We used sugar cane farming as a reference point since it has been shown to be strongly correlated with schistosomiasis (Amorim et al., 2014), to analyze the association between farming type & gender and farming type & religion using generalized linear model (glm), with significance testing. P values of <0.05 were considered statistically significant. All analyses were performed in R 3.6.1 version (R Core Team, 2019).

Results

Out of the 121 urine samples examined for the presence of the eggs of *S. haematobium*, a total of 56(46.3%) returned positive. As shown in Table 1, sugar cane was the most practiced type of farming in

the community followed by vegetable and rice while yam farming was the least practiced. Grouping farming type by religion, muslims had the highest number of farmers with 71 (58.7%) as oppose christains 50 (41.3%). Muslim rice farmers were the most infected with urinary schistosomiasis while christain yam farmers were the least infected, with infection prevalence varying between 16% – 56%. Considering farming type by gender, male farmers 78 (64.5%) were in excess of female farmers 43 (35.5%). Male vegetable farmers and female sugar cane farmers had the highest infection rate of 66.7% while male sugar cane farmer recorded the least infection rate 36.8%. Also, it was observed that no female was involved in yam farming.

In Table 2, the interaction effect of farming type and gender showed that vegetable farming was significantly different from sugar cane while male farmers were also significantly different from their female counterpart. In addition, male vegetable farmers were significantly different from female vegetable farmer, while there were no significant difference among male and female of the other farming type when compared with sugar cane farming. Likewise, interaction between farming type and religion showed that only yam farmers were significantly different from sugar cane farmers while there was no significant difference among Muslim/Christain farmers. Additionally, there was no significant difference among Muslim, Christain sugar cane farmers and the Muslim/Christain farmers of the other three farming types.

Table 1
Prevalence of urinary schistosomiasis among farmers by
religion and gender

Variable	Total No. tested (% infected)	
Farming Type		
Rice	28 (53.6)	
Sugar-cane	44 (40.9)	
Vegetable	32 (50.0)	
Yam	17 (41.2)	
Total	121 (46.3)	
Farming Type By Religion	Christianity	Islam
Rice	12 (50.0)	16 (56.3)
Sugar-cane	23 (34.8)	21 (47.6)
Vegetable	9 (55.6)	23 (47.8)
Yam	6 (16.7)	11 (54.5)
Total	50 (40.0)	71 (50.7)
Farming Type By Gender	Female	Male
Rice	8 (50.0)	20 (55.0)
Sugar-cane	6 (66.7)	38 (36.8)
Vegetable	29 (48.3)	3 (66.7)
Yam	0 (0.0)	17 (41.2)
Total	43 (51.2)	78 (43.6)

Table 2
Interaction effect of urinary schistosomiasis among farmers by gender and religion

<i>Predictors</i>	Infected farmers (gender)		Infected farmers (religion)	
	<i>Incidence Rate Ratios</i>	<i>CI</i>	<i>Incidence Rate Ratios</i>	<i>CI</i>
(Intercept)	2.00	0.75–5.33	4.00 ***	2.00–8.00
Farming type-Sugar-cane (Ref)	-	-	-	-
Farming type-Yam	0.00	0.00 – Inf	0.13 *	0.02–1.00
Farming type-Rice	1.00	0.25–4.00	0.75	0.26–2.16
Farming type-Vegetable	3.50 *	1.15–10.63	0.62	0.20–1.91
Sex-Male	3.50 *	1.15–10.63		
Farming type-Yam * Sex-Male	0.08	0.00 – Inf		
Farming type-Rice * Sex-Male	0.79	0.16–3.87		
Farming type-Vegetable * Sex-Male	0.04 ***	0.01–0.26		
Religion-Islam			1.25	0.49–3.17
Farming type-Yam * Religion-Islam			4.80	0.48–48.46
Farming type-Rice * Religion-Islam			1.20	0.30–4.82
Farming type-Vegetable * Religion-Islam			1.76	0.43–7.19

NB: * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Discussion And Conclusions

The transmission and epidemiology of urinary schistosomiasis is associated with low socioeconomic status such as poverty, overcrowding and poor sanitation (Zhang et al., 2010), and other religious/occupational related activities like ablution, fishing and farming-irrigation activities (Ofoezie

2002). These factors that characterized Shonga community, may readily account for the long standing history of schistosomiasis among her farmers (Amin 2018). Farida and Hassan (2012) also recorded a similarly high infection (60%) among rice growers in Morogoro, Tanzania which has a comparable socio-economic and environmental status to that of Shonga.

This study shows that the overall prevalence of urinary schistosomiasis is high (46.3%) among the farmers, similarly, Robert et al., (2009) recorded 41.5% among farmers in Benue state, Nigeria. However, our result is lower than the 60% prevalence rate recorded by Farida and Hassan (2012) among rice growers in Morogoro, Tanzania, while it is higher than that of Damen et al., (2018), who recorded 18.7% among irrigation farmers in North-central of Nigeria. Nevertheless, high prevalence of schistosomiasis among pre-school and school children with 71.8% and 57.7% had been documented by Mafiana et al., (2003) and Adeyeba et al., (2002) in Ogun and Ibadan, Oyo State, Nigeria. These variations may be related to several factors such as differences in socio-economic status, socio-cultural, public health provision, gender, personal hygiene, occupation and religion, as all these could influence frequent human contact with contaminated fresh water (**Huang and Manderson 1992**). Another factor that might contribute to the variations in the result is the period of the year when the study was conducted.

Few works have dealt with variation of urinary schistosomiasis among farmers while grouping them by their gender and religion, probably because of the general believe that females are more involved with water related activities (domestic chores) likewise Muslims engaging more with water related activities, i.e. their "ablution rituals" which they do five times daily in addition to their regular anal or urethral orifice washing after urination or defecation. Consequently, this predisposes these groups to urinary schistosomiasis. With regards to infection prevalence among farmers by religion, although Muslim farmers were slightly more infected than Christian farmers, but with no statistical significant difference, however, this finding is in agreement with that of Larry et al., (2005). This could be due to an improvement in awareness creation among the group over the years. Considering infection prevalence among farmers by gender, we observed significantly higher infection prevalence among female farmers than their male counterpart, which may be due to their domestic responsibilities like washing of clothes and fetching of water from the stream, as this is the usual custom in Africa. Nevertheless, our result is similar to a study reported in Nigeria by Oluwasogo and Fagbemi (2013), but differs from that of Geleta et al., (2015) reported in Ethiopia.

The result of our generalized linear model with interactions between farming type and gender, and farming type and religion using sugar cane farming type as a reference point, given that this type of farming has been reported to be strongly correlated with schistosomiasis (Amorim et al., 2014), shows that vegetable farming is significantly different from other types of farming while infection prevalence between male vegetable farmers is also statistically different from female vegetable farmers. The odds of contracting urinary schistosomiasis among vegetable farmers are 3.5 higher than other types of farming while the odds of male vegetable farmers getting infected is 0.04 significantly higher than female vegetable farmers. These differences could be due to vegetable farming requiring more irrigation activities than other farming types for example yam farming. Also, grouping farming type by religion

shows that yam farmers were statistically different from other farmers, while there was no significant difference between Muslim and Christian farmers irrespective of their farming type.

This study shows that urinary schistosomiasis is endemic among the farmers in Shonga, Edu Local Government of Kwara State, Nigeria, and that different crop producers are statistically not uniformly exposed to the disease, especially when grouping the farmers by their gender and religion. We believe that our findings will be useful in guiding the Federal Government and Non-Governmental Organizations (NGOs) in appropriate channeling of public health interventions in the study location as well as other communities with schistosomiasis history and similar socio-environmental status to control this life threatening parasitic disease, especially among farmers who strive through the huddles to put food on our tables. However, owing to our limited resources, the authors agree that their sample size is relatively small to infer a more logical conclusion. Therefore, it would be nice to conduct a similar investigation with larger population for an evidence-based guidance in urinary schistosomiasis management.

Abbreviations

NTDs - Neglected Tropical Diseases

LGA - Local Government Area

WHO - World Health Organization

SCI - Schistosomiasis Control Initiative in Nigeria

WACIPAC - West African Centre for International Parasite Control

GLM - Generalized Linear Model

NGOs - Non-Governmental Organizations

TWAS - The World Academy of Sciences

CNPq - Conselho Nacional de Desenvolvimento Cientifico e Tecnologico

Declarations

Ethical approval and consent to participate

The study was approved by the Ethical Review Committee, College of Health Sciences University of Ilorin and the Emir of Shonga. Also, informed consent was obtained from all participants included in the study. Participants were not forced to participate and were free to drop at any stage of the study.

Consent for publication

Not applicable

Availability of data and material

The datasets used and/or analyzed during the current study are available from the corresponding authors on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

KAY, OAD and ABM collected the data. KAY wrote the first draft of the manuscript. AMA analyzed the data and critically revised the manuscript for important intellectual content. All authors read and approved the final version of the manuscript.

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