



UROGENITAL SCHISTOSOMIASIS AMONG COMMUNITIES SURROUNDING KIRI RESERVOIR, ADAMAWA STATE, NIGERIA.

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ABSTRACT

Schistosomiasis is endemic and remains a life-threatening problem in Nigeria, especially among communities that come in frequent contact with water bodies. Information on the level of endemicity varies from place to place and is vital for control purposes. There is a paucity of such data for the Kiri reservoir and environs. A longitudinal study was undertaken in 7 communities surrounding the reservoir from 2018 to 2019 to assess the prevalence of urogenital schistosomiasis. A total of 688 urine samples were assayed for schistosome ova using the sedimentation technique. Out of these, 296 (43%) were positive for *Schistosoma haematobium* ova. Males were significantly more infected than females ($p < 0.05$). Infection was also significantly higher in younger than older individuals ($p < 0.05$). There was a significant relationship between the prevalence of infection and distance from the reservoir, occupation as well as the level of education of individuals. With the observed level of endemicity, mass chemotherapy, provision of potable water and health education are advocated as mitigation measures that will reduce endemicity and curtail the further spread of the infection.

Keywords: *Schistosomiasis, Kiri, Reservoir, Urine, Sedimentation technique, Endemicity, Mass chemotherapy*

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INTRODUCTION

Since the report of Thompson (1967) for the Bacita Sugar Company in Kwara State, Nigeria, Betterton (1984) for the South Chad Irrigation Project Area, Borno State, Nigeria and, Betterton *et al.* (1988) for the Kano River Irrigation Project Area Phase I in north west of Kano State, located in Nigeria, many more recent studies have all linked the damming of rivers and streams creating reservoirs to occurrence or increased prevalence of infections of waterborne diseases, for example schistosomiasis and other snail-borne infections in Nigeria (Adamu *et al.*, 2004; Abdulkadir *et al.*, 2014; Timothy *et al.*, 2018). This is because damming of rivers and streams give rise to significant modification in the natural ecology of the original water bodies creating new biotopes which are conducive for breeding of fresh water snails which serve as vectors for these parasitic agents.

The Kiri dam was built in 1982 with a reservoir capacity of 615 million m³ of water for irrigation, hydroelectric power generation and water supply to the Savannah Sugar Company in Numan, Adamawa State, Nigeria.

There are several communities around the reservoir with 7 of them being the closest. The communities heavily rely on the reservoir as their main source of water for domestic use, irrigation and fishing activities. Thus, they are constantly in touch with the infested dam water which may harbour disease agents thereby risking infection.

Aside from the account of Akogun and Akin (1993) on the prevalence of schistosomiasis in the Savannah Sugar Plantation Staff Village and that of Birma *et al.* (2017) on urinary schistosomiasis in four communities around Kiri Lake, there is a paucity of information on the disease status in the majority of the communities surrounding the reservoir. Therefore, we report here the prevalence of *Schistosoma haematobium* among 7 communities surrounding the Kiri reservoir, Adamawa State, Nigeria.

METHODOLOGY

DESCRIPTION OF STUDY AREA

The 7 communities selected for the study and their location concerning the reservoir are shown in Fig 1. The area is located in shelleng Local Government Area situated between coordinates 9050' N and 12051'E. The area has landforms characterized by extensive flood plains and swamps with open vegetation of shrubs and herbaceous plants. Like any other part of Northern Nigeria, the area has a marked dry season extending from October to April and a rainy season lasting from April/May to October. The area receives a mean annual rainfall of between 759-1011mm. The driest and coldest months are December to January. The average minimum and maximum temperatures are 25°C and 40°C respectively. The major ethnic groups are the Kanakuru, Lala and Lunguda but smaller groups like the Fulani nomads are found. The predominant occupation of the people is farming and fishing. There are few health facilities in the area. Sanitary infrastructure like safe water and latrines are grossly inadequate as a result of which most residents defecate and urinate indiscriminately polluting the environment which eventually gets washed into and contaminate the reservoir. The only borehole available is inadequate and controlled. Therefore, residents prefer to use reservoir water for diverse purposes.

COLLECTION OF URINE SAMPLES

In all six hundred and eighty-eight (688) urine specimens were gathered from the communities. Before sample collection, randomly selected respondents were instructed on how to do so after which 15 ml capacity screw-cap specimen bottles were given to each of them. Approximately 15 ml of mid-stream urine was obtained from each

donor. The name, age, gender, occupation, educational status and specimen characteristics of each participant were recorded on a data collection form. Specimens collected from the field were fixed in 4% Formalin and then brought to the laboratory for microscopy.

EXAMINATION OF SAMPLES

Urine specimens were processed using the sedimentation technique described by Cheesbrough (2006) and resultant sediments were examined under the light microscope using x10 and x40 objective lenses. Eggs recovered were identified by their characteristic terminal spines with reference to Cheesbrough (2006).

DATA ANALYSIS

Data obtained were analysed using Chi-Square analysis to determine any significant relationships between infection and age, gender and other selected parameters using SPSS Computer Software Version 21. The 95% confidence level was used in all the comparisons made.

RESULTS

Result indicated that 296 (43.0%) of the 688 urine samples assayed for schistosome ova were found to be positive. The overall gender-based prevalence of infection showed males having significantly higher ($p < 0.05$) infection than their female counterparts.

Table 2 shows the overall prevalence of age related schistosome infection. The general trend that emerged was that younger people of the age group 11-40 years old recorded higher prevalence of infection. Specifically, the peak prevalence was observed among the 11-15 years old followed by the 16-20 years old. Curiously the 41-45 years old showed the least prevalence of infection compared to older respondents aged 60 years and above. The observed age disparity was also statistically significant ($p < 0.05$).

The intensity of schistosome infection among different communities based on their proximity from the reservoir is presented in Table 3. The general trend that emerged was that communities closer to the reservoir recorded more infections than those communities further away from it. Thus, Bondo community which is closest to the facility had significantly more infections than Boyire community which is located farthest from the Lake ($p < 0.05$).

The overall Schistosome infection rates based on the occupation of people examined showed that infection was higher among the fishermen among students/pupils closely followed by fishermen while the lowest number of infections was recorded among civil servants. Although students and pupils who are not a professional also recorded a considerably high value of infection. A statistically significant ($p < 0.05$) association was observed between infection and occupation. The detail is shown in Table 4. Data on the overall schistosome infection rate with respect to the educational status of people examined is expressed in Table 5. Clearly infection was significantly higher among the non-educated people compared to those who have attained some level of education ($p < 0.05$).

DISCUSSION

The level of infection obtained in this result, showed the high endemicity of urogenital schistosomiasis in communities surrounding Kiri Dam. In a related study in the Kiri reservoir by the same authors, *Bulinus globosus* and *Bulinus truncatus* which are known snail intermediate hosts of *Schistosoma haematobium* were commonly observed. Coupled with this was the observation during the study of poor hygienic habits of indiscriminate defecation and urination around the banks of the reservoir which eventually got washed into it causing contamination. In addition, inhabitants of these communities rely heavily on the reservoir as available source of water. This brought them in constant contact with cercariae infested water thereby enhancing transmission of infection. Therefore, it is to be expected that the infection rates will be high. However, the observed level of endemicity is in agreement with reports of Ofoeze *et al.* (1996), Okpala *et al.* (2004), Mordi and Ngwodo (2007) and Ladan *et al.* (2012) from elsewhere in Nigeria.

While the previous study by Nnoruka *et al.* (2002) did not show a consistent pattern on gender related prevalence of *Schistosoma haematobium*, this result has revealed a higher prevalence among males than females which is statistically significant ($P < 0.05$). This agrees closely with several previous reports (Egwunyenga *et al.*, 1994; Duna and Bristone, 2000; Okoronkwo *et al.*, 2003; Ukwandu and Nmorsi, 2008; Birma *et al.*, 2017). The higher prevalence recorded among males could be attributed to their cultural habit of regular and longer contact with infested water bodies through farming, fishing or swimming than their female counterparts who are restricted by socio-cultural factors that do not permit them to engage actively in the aforementioned activities. Our finding however differs from that of Anya and Okafor (1986) who found more females than males being infected in Anambra State, Nigeria. This disparity may be related to differences in socio-cultural practices between the two study areas.

The finding in this result revealed higher prevalence of schistosome infection among young fellows within the age range of 11-20 years agrees with those of Egwunyenga *et al.* (1994), Ukwandu and Bukbuk (1996), Mafiana *et al.* (2003) and Nwosu *et al.* (2005). This is probably related to the habit of these young individuals of having more frequent and prolonged water contact through playing, bathing and swimming activities or other activities like washing of clothes. As a result, they easily become infected.

This work has also revealed that distance from water reservoir has a direct relationship with the infection rates observed. Thus, communities closer to the reservoir (Bondo) recorded highest number of infections than Boyire that is the farthest community from the facility. This is in conformity with earlier findings of Anobike *et al.* (1992), Duna and Bristone (2000), Chidi *et al.* (2006) and Uneke *et al.* (2007). It was noted during our study that Bondo community did not have any alternative source of safe water and since they are near the reservoir, contact with its snail infested water became inevitable. Incidentally, the only borehole available to the communities is sited in Boyire, thus, an alternative source of clean water is available. Therefore, availability of alternative source of water coupled with distance from the reservoir, frequency of contact with its snail infested water was drastically reduced.

Schistosomiasis has been considered as an occupational hazard for ages. This is so because some occupations necessitate prolonged body exposure to water than others. Thus, fishing ranks ahead of other water-based occupations in predisposing to infections. Therefore, the high prevalence of infection observed among fishermen is not only in agreement with this age-long phenomenon but is in consonance with the reports of previous workers (Thompson, 1967; Egwunyenga *et al.*, 1994); Nwosu and Usman, 2006 ; Chidi *et al.*, 2006). Similarly, a high infection rate among students/pupils is to be expected. This category of respondents is known to engage in swimming, bathing or playing for prolonged periods of time in water especially during the hot weather in order to cool-off the body from the high

prevailing environmental temperature. Often, they urinate in the water or defecate at the banks of the reservoir. These faeces eventually get into the water further contaminating it thereby increasing the risk of infection.

The result obtained showed a relatively high number of infections among the non-educated people is also to be expected. This category of people is oblivious of the means of transmission of this infection. Therefore, no precautionary measures are taken by them. This is in close agreement with the views expressed by previous workers (Musa and Benjamin, 2010; Houmsu *et al.*, 2012; Balla and Jabbo, 2013; Okworie *et al.*, 2014) who similarly showed that illiteracy or very low tier of education accounted for the observed high infection rates among the people they examined.

CONCLUSION

This study has revealed that the disease *Schistosoma haematobium* is endemic among all the 7 communities surrounding the Kiri reservoir. Owing to this, mass chemotherapy with Praziquantel, provision of portable water and proper health education on the infection and its preventive measures should be undertaken so as to mitigate against this infection.

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FIGURES AND TABLES

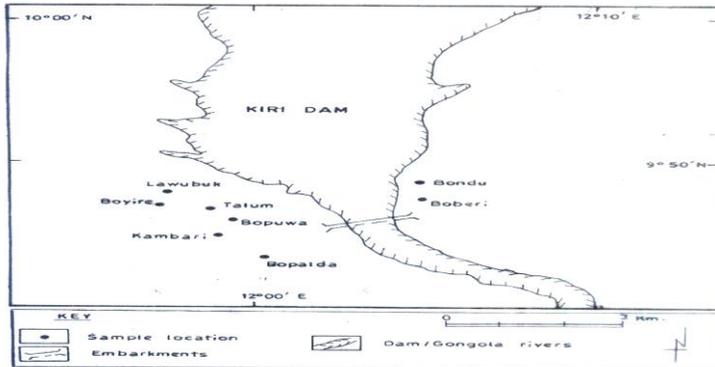


Fig. Source: Ministry of Land and Survey Yola

Figure 1: Kiri dam showing location of the 7 communities sampled

Table 1: Prevalence of *Schistosoma heamatobium* infection based on gender of people examined

Gender	No. exam	No +ve	Prev. (%)	No -ve	Prev. (%)
Male	357	191	50.5	166	24.2
Female	331	105	31.2	226	32.8
Total	688	296	40.0	392	60

$X^2_{cal} = 33.24, X^2_{tab} = 33.50, P = 0.01$

Table 2: Prevalence of *Schistosoma haematobium* infection in relation to age of people examined among communities surrounding Kiri Reservoir.

Age group (years)	No. Exam	No. +ve	Prevalence (%)	No. -ve (%)	Prev. (%)
1-5	39	13	33.3	26	66.7
6-10	177	59	33.3	118	66.7
11-15	98	70	71.4	28	28.6
16-20	78	53	67.9	25	32.1
21-25	47	22	46.8	25	53.2
26-30	54	26	48.1	28	51.9
31-35	26	11	42.3	15	57.7
36-40	48	15	31.2	33	68.8
41-45	22	4	18.2	18	81.8
46-50	32	7	21.8	25	78.2
51-55	19	4	21.0	15	78.9
56-60	11	3	27.2	8	72.7
61-65	27	8	29.6	19	70.4
66 and above	10	1	10.0	9	90.0
Total	688	296	43.0	392	57.0

$X^2_{cal} = 12.54$, $X^2_{tab} = 12.63$, $P = 0.024$

Table 3: Prevalence of Schistosome infection among different communities surrounding Kiri reservoir based on distance from the facility.

Community	Dist. From Dam (M)	No. Examined	No. +ve	Prev (%)	No. -ve	Prev (%)
Lawubuk	80	89	39	43.8	50	56.2
Boyire	200	79	29	36.7	50	63.3
Talum	100	109	49	44.9	60	55.1
Kambari	180	113	35	30.9	78	69.1
Bopabla	90	84	32	38.1	52	61.6
Boberi	70	96	44	45.8	52	54.2
Bondo	43	118	68	57.6	49	41.5
Total		688	296	43.0	392	56.7

$X^2_{cal} = 12.51$, $X^2_{tab} = 12.54$, $P = 0.034$

Table 4: Prevalence of schistosome infection among different communities surrounding based on occupation of the people.

Occupation	No. Exam	No. +ve	Prev. (%)	No. -ve	Prev. (%)
Civil Servants	68	8	11.8	60	88.2
Farmers	97	35	36.1	62	63.9
Fishermen	136	75	55.1	61	44.8
Traders	39	9	23.1	30	76.9
Students/pupils	257	156	60.7	101	39.3
Un-employed	86	13	15.1	73	84.9
Total	688	296	43.0	392	60.0

X^2 Cal = 139.84, X^2 tab = 150.13, P = 0.036.

Table 5: Prevalence of Schistosome infection in relation to educational status of inhabitants of communities surrounding Kiri reservoir

Educational. Status	Number examined	No. +ve	Prev. (%)	No. -ve	Prev. (%)
Primary	101	21	20.7	80	79.2
Secondary	54	6	11.1	48	88.9
Tertiary	22	2	9.0	20	90.9
Non-Educated	511	267	57.9	244	47.7
Total	688	296	43.0	419	

X^2 cal = 17.47, X^2 tab = 20.28, P = 0.01