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A Study on Schistosomiasis in Three Communities along Lake Alau, Konduga Local Government Area, Borno State, Nigeria

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Abstract:
Schistosomiasis, despite the control strategies adopted for its control in Nigeria, remains a public health problem in North Eastern part of the country. This study was conducted to determine the prevalence of Schistosomiasis among the residents of Alau, Kayamla and Wanori living around Lake Alau in Konduga Local Government. Data on Gender, Age, and Occupation and Water source were analyzed using a questionnaire. Formal Ether concentration technique was used for detection of eggs of Schistosoma mansoni in stool samples and sedimentation technique was used for detection of eggs of Schistosoma haematobium in urine. Out of the 460 people, examined, 21.1% had Schistosomiasis, with Schistosoma haematobium (13.9%) being higher in prevalence than Schistosoma mansoni (7.1%). Males had higher prevalence of both Schistosoma haematobium (16.3%) and Schistosoma mansoni (8.2%) than the Females (10.8%) and (5.9%) respectively, and the difference was significant. Males had higher intensity of infection for both Schistosoma haematobium and Schistosoma mansoni than their female counterparts did. The highest rate of infection was recorded among the fishermen (46.6%), followed by farmers (19.3%) while the traders had 7.7%.These statistically showed significant difference ($P<0.05$). Subjects who used Lake Water (23.7%) were more affected than those who used well Water (8.6%).Which shows significant difference.($P<0.05$).This study has established the presence of Schistosomiasis in the study area. These constitute potential public health significance and could be a threat to important socio economic activities in the area as it could rise if not quickly checked. There is the need for the authorities concerned to initiate and establish feasible control programmes against the disease in the area.

Keywords: *Schistosomiasis, Lake Alau, Borno, Nigeria*

1. Introduction

Schistosomiasis is a major parasitic disease caused by trematodes belonging to the genus Schistosoma and is considered as one of the major public health problems. It is the second most prevalent tropical diseases and a leading cause of severe morbidity in several foci in Africa, Asia, and South America. The second most economical devastating parasitic diseases after malaria, is prevalent in tropical and sub-tropical areas, in poor communities, without portable water and adequate sanitation.

Globally, the Schistosomiasis affects 78 countries out of which 52 are at most risk of the infection (WHO, 2013). About 243 million people are affected, and more than 700 million people live in endemic area of the disease and of these numbers, about 200,000 – 300,000 people die annually, and most affect people in the developing countries .It is estimated that at least 90% of those requiring treatment for Schistosomiasis live in Africa.

In Nigeria, The current picture of Schistosomiasis endemicity is very worrisome, for instance the transmission of the disease has increased over the years. This has been due to large-scale irrigation project, which created new habitat for the water snails. It is estimated that 30 million Nigerians were infected with Schistosomiasis. When examined against a projected population of 162 million Nigerians, it becomes clear that over 18.5% of the populace have Schistosomiasis useh. (2013)

2. Methodology

2.1. Study Site and Population

Borno state was created in 1976 from the Northeastern State of Nigeria. It has an area of 69,435sqkm and lies within Latitude 10^0N and 13^0N and Longitude 12^0 and 15^0E. The 2006 census put the population of the state at 4,151,193 (Nigerian Population Commission, [NPC], 2006).

Lake Alau was created by damming river Ngadda about 14km from Maiduguri along Maiduguri-Bama road. It is located between Latitude 13º N, 14º N, Longitude 12º E, and 13º E (Bankole *et al.*, 2003 [Fig.2]). It has a total surface area of 56km^2 being located in the Northeast Arid zone. The climate is Sahel with two distinct seasons, the rainy season with a mean annual rainfall of about 600mm from March to July. The dry season is proceeded by a period of harmattan with very low temperature and dry harmattan wind between November and February. Lake Alau dam has a maximum depth of 10m with an effective storage capacity of 54, 000 cm^3 (Idowu *et al*., 2011).

The total population of Konduga Local Government Area was 157,322 (NPC, 2006). The three villages selected for the study are namely, Alau, Kayamla and Wanori, which are located surrounding the lake Alau, which serves as the residents major sources of water supply. Lake Alau is a site for intensive farming, especially irrigation during the dry season. Fishing is another Economic activity that takes place on the Lake's shores. It also provides water to Maiduguri Metropolis through the water treatment plant. According to NPC, (2006), the population of the three communities namely Alau, Wanori and Kayamla villages are 2101, 715, and 1772 respectively. Only a small proportion of the road network in the Local Government was tarred. Administratively the three communities have village head each and they are answerable to the district head in konduga. Each of the communities has a primary school with a very low school attendance, and non-functional health facilities. The people in these communities often go to Konduga or Maiduguri state specialist hospital for medical services. Neither is there a pipe borne water supply nor electricity supply in any of the three communities mentioned. The major source of Water is the surface water of the lake Alau and dug up wells in the area.

Lake Alau is a very old settlement with various ethnic groups from various neighboring local government area, which include Marghi, Chibok, Higi, Fulani, Shuwa Arabs, Hausa, and Wula but predominantly Kanuri all of which reside along the shore of the Lake Alau for their livelihood. Inhabitants are predominantly farmers, practicing irrigation farming systems, fishing, and cattle rearing.

2.2. Data Collection

Socio-demography information was collected using administered questionnaire. During collection of specimens, the procedure for collecting faecal materials into a bottle using applicator sticks was explained to the participants, and then two clean sterilized and labeled sample bottles were given to each participant. One of the bottles was for urine collection and the other bottle was for stool collection.

2.3. Urine Examination

A quantitative examination of a urine specimen using sedimentation technique for the detection of eggs of Schistosoma haematobium as described by Cheesborough (2004) was used. The subjects were requested to provide terminally voided urine in the early morning for examination. Urine collected was preserved with boric acid powder and transported to the Laboratory for the detection of eggs.

Ten (10)mls of the urine was collected in a clean dry centrifuge test tube; then placed into a centrifuge for centrifugation at 2000rpm for three minutes. After centrifugation, the supernatant, was discarded and a drop of the sediment was placed on a glass slide and covered with cover slip, it was then examined microscopically using low power x10 and then x40 objective lens. Presences of Schistosoma haematobium were identified with terminal spine as described by Cheesborough (2004). The number of eggs in the preparations was counted and recorded as egg/10mls of urine. From 0-20 eggs count was considered as low infection. 21 – 49 eggs were considered as moderate and 50-above eggs were considered as severe infection as described by Bichi et al. (2009)

2.4. Stool Examination

Formal ether concentration methods were used in examining the stool sample of the subject. The stool specimens collected were preserved in 10% formalin before taking to the laboratory for examination. Ten mls of (10%) formol-saline were added to 1gm of faces and stirred using an applicator stick, until slightly cloudy suspensions were formed. The suspensions were then filtered using fine mesh filter into a beaker, the filtrates was transferred to the centrifuge test tube until it reaches 7mls mark, then 3ml of ether were added to centrifuge tube containing the stool filtrate after mixing thoroughly for one minute. It was transferred to centrifuge machine and spinned for three minutes at 2000rpm and centrifuge tube was then removed. The supernatants was then discarded by quickly inverting the tube, the sediment part was then transferred to a clean microscopic slide and covered with cover slip and examined under a light microscope using ×10 and then ×40 objective lens. A Schistosoma mansoni eggs was identified with the lateral spine. The number of eggs in the preparation was counted and recorded as means eggs per gram (Epg) as described by Cheesborough (2004).

3. Results

Three communities namely Alau, Kayamla and Wanori located along Lake Alau in Konduga Local Government Area studied for Schistosomiasis, indicates the overall prevalence of Schistosomiasis as 97(21.1%), of the 460 subjects examined,(Table1) Schistosoma haematobium was more prevalent with 64(13.9%) than Schistosoma mansoni with 33(7.2%). Comparing the infection rates of Schistosoma haematobium and Schistosoma mansoni they differed significantly ($p<0.05$) when analyzed using chi-square.

The level of Schistosomiasis for each community under study is shown in Table 1. Alau community recorded the highest infections of 59 (28.1%), followed by Wanori with 11(15.3% and Kayamla, 27 (15.2%).

Males had the highest intensity of infection with 11 and 11 people having severe infection (50Eggs/10ml of urine) for both Schistosoma haematobium and Schistosoma mansoni respectively .The least intensity of infection was observed among the female with eight(8) having severe infection for Schistosoma haematobium (Table 2). There was significant association between Schistosoma mansoni infection intensity and gender ($P<0.05$) but no association between Schistosoma haematobium infections intensity and gender ($p>0.05$).

Study subjects aged 21-30 years had the highest intensity of infection with 11subjects having 50 eggs/10mls of urine for Schistosoma haematobium and 6 subjects with 50eggs/1g of faeces, for Schistosoma mansoni (Table 3). Schistosoma haematobium infection with moderate intensity was observed among eighteen (18) subjects belonging to 0-10 years age group, followed by 11-20 years age group with nine (9) subjects. There was significant association between Schistosoma haematobium infection intensity and age. Schistosoma mansoni infection with moderate intensity was observed among 11 subjects examined within 0-10 years age bracket. No infection was observed in subjects aged 51 years old and above.

Two hundred and fifty seven 257 (55.9%) Males and two hundred and three, 203 (44.1%) Females were examined (Table 4).Higher prevalence of Schistosoma haematobium infection among the Males in the area was 16.3%and the Females with (10.8%). Similarly, Males had the highest prevalence (8.2%) than their Female counter-parts (5.9%) for Schistosoma mansoni. In relation to age distribution, subjects aged 11-20 showed the highest rate of Schistosoma haematobium infection with 19.8%, while age group 21-30 years had the highest rate of Schistosoma mansoni with 9.4% (Table 4).However, there was no significant association between the prevalence of Schistosomiasis and age and gender ($p>0.05$).

Fishermen had the highest prevalence of both Schistosoma haematobium (30.7%) and Schistosoma mansoni (15.9%) infection, with total prevalence of 41 (46.6%), followed by the farmers with total prevalence of 45(19.3%). while others had the least prevalence of infection, with total prevalence of 2(4.9%). The prevalence of Schistosomiasis in relation to occupational distribution was found to be significant.($P<0.05$), Table 5

The result of this study revealed that subjects that used Lake Water had the high prevalence for both Schistosoma haematobium (15.8%) and Schistosoma mansoni (7.9%), with total prevalence of 90(23.7%), while the lower prevalence for both Schistosoma haematobium (4.9%) and Schistosoma mansoni (3.7%) was observed among people that used well water with total prevalence of 7(8.6%). There was significant association between Schistosomiasis and water source (Table 6).

S/N	Communities	No Examined	No. Infected (%)		Total Prevalence (%)
			S. haematobium	*S. mansoni*	
1	Alau	210	41 (19.5)	18 (8.6)	59 (28.1)
2	Kayamla	178	17 (9.5)	10 (5.6)	27 (15.2)
3	Wanori	72	6 (8.3)	5(6.9)	11(15.3)
	Total	460	64 (13.9)	33 (7.2)	97(21.1)

Table 1: Prevalence of Schistosomiasis in the Study Area.

Egg count	*S. haematobium*		*S. mansoni*	
	Male	Female	Male	Female
0 – 20 (low infection)	0	0	1	2
21 – 49 (moderate infection)	31	14	9	10
50 and above (severe infection)	11	8	11	0
Total	42	22	21	12

Table 2: Gender and Intensity of Schistosomiasis in the study area

Age	*S.haematobium*			*S. Mansoni*		
	Low infection (0-20)	Moderate infection (21-49)	Severe infection (50>)	Low Infection (0-20)	Moderate infection (21-49)	Severe infection (50>)
0-10	0	18	0	0	11	0
11-20	0	9	8	0	3	5
21-30	0	6	11	0	3	6
31-40	0	8	0	2	2	0
41-50	0	4	0	1	0	0
51>	0	0	0	0	0	0
Total	0	45	19	3	19	11

Table 3: Age related Intensity of Infection

Age Group	Male *S. haematobium*		Female *S. haematobium*			Male *S. mansoni*		Female *S. mansoni*		Total Prevalence (%)
	No. Examined	No. infected (%)	No. Examined	No. infected (%)	Total Prevalence (%)	No. Examined	No. infected (%)	No. Examined	No. infected (%)	
0 – 10	85	13 (15.3)	66	5 (7.6)	18(11.9)	85	7 (8.2)	66	4 (6.1)	11(7.3)
11 – 20	43	9 (20.9)	43	8 (18.6)	17(19.8)	43	5 (11.6)	43	3 (6.9)	8(9.3)
21 – 30	59	11 (18.6)	40	6 (15.0)	17(17.7)	59	6 (10.2)	40	3 (7.5)	9(9.4)
31 – 40	30	5 (16.7)	37	3 (8.1)	8(11.9)	30	2 (6.7)	37	2 (5.4)	4(6)
41 – 50	26	4 (15.4)	10	0 0	4((11.1)	26	1 (3.8)	10	00	1(2.8)
51 >	14	00	7	0 0	0(00)	14	0 (0)	7	00	0
Total	257	42 (16.3)	203	22 (10.8)	64(13.9)	257	21 (8.2)	203	12 (5.9)	33(7.2)

Table 4: Gender and Age-related Prevalence of Schistosomiasis in the study area

Occupation	No examined	*S haematobium* (%)	*S mansoni* (%)	Total Prevalence (%)
Farmers	233	30(12.9)	15(6.4)	45 (19.3)
Fishermen	88	27(30.7)	14(15.9)	41 (46.6)
Traders	65	3(4.6)	2(3.1)	5 (7.7)
c/servant	33	2(6.1)	2{6.1)	4 (12.1)
Others	41	2(4.9)	0	2 (4.9)
Total	460	64(13.9)	33(7.2)	97(21.1)

Table 5: Occupational related Prevalence of Infection

Sources of water	No examined	*S haematobium* (%)	*S mansoni* (%)	Total Prevalence (%)
Well	81	4(4.9)	3(3.7)	7(8.6)
Lake water	379	60(15.8)	30(7.9)	90(23.7)
Total	460	64(13.9)	33(7.2)	97(21.1)

Table 6: Water contact activities, Sources and Infection Rate

4. Discussion

The study has shown that both Schistosoma haematobium and Schistosoma mansoni infection are prevalent in the area. Although the prevalence of the disease appears relatively low in the area, however, this constitutes a potential public health problem as it could rise unless curtailed early. This could be similar to what was obtained in a study by Useh, et al. (2013), in Adim community located in South South Nigeria. They reported an overall prevalence of 53.8%, with males and females accounting for 53.8% and 53.9% infection respectively. Three years after, in the absence of a control programme, the prevalence of the disease in this same community rose astronomically to 90.7% among children out of the school system, while those who attended school had a prevalence of 86.8 %. The prevalence of the infection was attributed to human water contact activities by the inhabitants as shown by Bichi, et al.(2009), Uwaezuoke et al. (2009) and Bala et al. (2012).

The prevalence rate for the three communities studied showed that transmission was higher at Alau communities followed by Wanori and Kayamla. These differences could be due to the degree of exposure to the infected water by the residents in their localities. Alau community recorded the highest infection rate with Schistosoma haematobium (19.5%) and 8.6% Schistosoma mansoni. This could be attributed to the closeness of the Alau community to the dam, which is in line with the report by Akogun (1996), who reported that water demand index is an important factor in the epidemiology of Schistosomes infection in rural communities.

The prevalence of infection was found to be higher in males than the females, and this agrees with report by Akogun et al. (1998) who reported higher prevalence among males than the females in Jambutu and Bajabure, Adamawa State Nigeria, and Okon et al. (2007), who reported higher prevalence of (39.2%) among the males than the females (30.6%). This could be because males were more exposed to infected water than the females, because of their activities such as fishing, swimming and irrigation farming. The females are more restricted socially from such water contact activities like swimming/bathing in the lake water. The result of this study also agrees with the work of Dunah et al. 2000. They reported that infection of Schistosomiasis was found to be higher among the males than females. In the same vein, Ekejindu et al. (1999) reported that males had higher infection rate than females. Similarly, Abolarinwa (1999) study result revealed that Schistosomiasis was higher among males (38.5%) than females (21.7%). Equally, this work disagrees with result by Adamu et al. (1998) who conducted a research in Bakalori irrigation project area and reported females to be more infected than the males.

Subjects aged 11-20years had the highest prevalence in all the three communities, with the exception of Schistosoma mansoni in Wanori with 21-30 years who recorded the highest infection of 7.5%. However, these groups were most likely responsible for the transmission of Schistosomiasis, having accounted for this higher prevalence. This could be due to their frequent visits to the Lake Water in the quest to swim as well as farming both in the dry and wet seasons. This finding also agreed with the work of Akogun,

(1998) who reported that in Bajabure, infections with Schistosoma haematobium was highest in the 11-13 years age –group, while in Jambutu the highest infection rate occurred in the 14-16 year age groups. In addition, Abolarinwa (1999); Dunah et al. (2000); Ugbomoiko et al. (2000); Gundiri et al. (2007); Okon et al. (2007); and Nanvya et al. (2011) reports were similar to the findings of this work. The extent of infection in individuals in this study decreased as the age advanced and this agrees with the report given by Nanvya et al. (2011). The drop in infection rate in the older groups could probably be due to either reduced water contact activities or due to decrease in survival and fecundity of worms already in the human host which is consistent with the slowly acquired immunity to infection.

The survey of the result showed that fishermen had the highest prevalence than the other occupations in the study area. This corresponds with Chitsulo et al. (2000) who stated that those of the high risk of Schistosomiasis infection are people involved in fishing activities. The reason could be subjects spent long period of time fishing in contaminated water, exposing them to infection. The finding of the study also agrees with that of Nanvya et al. (2011) in which they reported that fishermen had the highest prevalence of Schistosomiasis infections in Ndinjor District of Langtang North Local Government Area of Plateau State, Nigeria.

Concerning water source, there was a higher infection among people that used lake water than those that used well water in the communities. This could be attributed to the facts the ecology of the lake water supports the rapid development of the snails intermediate host better than those of the wells. This also agreed with the report of Nanvya et al. (2011) who reported that there was a higher infection among people that used Lake Water than those who used well Water.

5. Conclusion

This study has established the presence of *Schistosomiasis* in the communities, along Lake Alau, Konduga Local Government Area, though at a low prevalence, This constitute potential public health significance and could be a threat to important socio economic activities in the area, as it could rise if not quickly checked. There is, therefore, urgent need for the authorities concerned to initiate and establish feasible control programmes in the area.

6. Recommendation

Based on the findings and observations the following recommendations were made in helping the communities to control the disease.

The communities should organize themselves through participatory rural appraisal, with the help of village head to sensitize the communities.

Government should as a matter of emergency make adequate provisions of the portable drinking water to the communities. Make health facility functional, deploy the services of environmental health workers, to create awareness among inhabitant of the communities about the diseases,(public health education),and treatment of infected individuals for all age groups in all the villages with the drugs praziquantel and mass chemotherapy be encouraged. In addition jobs should be created to the communities to empower their socio-economic status.

7. References

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ANNEXURE

Figure 1: Water contact activity of Children at Lake Alau

Figure 2: People Fishing in Lake Alau

Figure 3: People Fishing in Lake Alau

Figure 4: Swimming in Lake Alau

Figure 5: Washing activities in Lake Alau