A Study on the Epidemiology of Schistosomiasis Infection in Some Selected IDP Camps Maiduguri, Borno State.

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ABSTRACT

Schistosomiasis also known as Bilharziasis or snail fever is a common intravascular trematode infection most common in developing regions of Africa and Asia. Five major species of parasitic trematodes of the family Schistosomatidae including *Schistosoma haematobium*, *Schistosoma intercalatum*, *Schistosoma japonicum*, *Schistosoma mansoni*, and *Schistosoma mekongi*. Over 200 million people, almost all of them in developing countries, suffered from *Schistosomiasis* which is associated with economic losses, and frequently interferes with development projects. The disease is endemic in most African countries where up to one-third of school age children may be actively infected. Hence this study was aimed to assess the distribution and pattern of *Schistosomiasis*. 600 urine/stool sample each were examined from 600 persons were a clean, pre-labelled screw-capped plastic container were distributed with instructions to collect urine or stool. The samples were immediately transported to diagnostic laboratory for examination. The overall number of people infected with *Schistosoma haematobium* and *Schistosoma mansoni* or other intestinal parasites was 162(27.0%) and 84(14.0%) respectively. The results also shows that age group 6-15 years has the highest infection rates of 92(43.6%) and 36(17.1%) of male infected with *Schistosoma haematobium* and *Schistosoma mansoni* or other intestinal parasites while 18(21.7%) and 12(14.5%) of female infected with *Schistosoma haematobium* and *Schistosoma mansoni* or other intestinal parasites respectively. Followed by age group 16-25 with 34(20.8%) and 23(14.1%) number of male infected with *Schistosoma haematobium* and *Schistosoma mansoni* or other intestinal parasites, while 10(13.2%) and 3(3.9%) of female infected with *Schistosoma haematobium* and *Schistosoma mansoni* or other intestinal parasites respectively. It is recommended that the control of snail intermediate host and the infective stage (*cercariae*) would in no doubt reduce the rate of transmission, thereby reducing the prevalence of infections. It was then concluded that *Schistosomiasis* among the study area was highly prevalent. Therefore, routine treatment, diagnosis and surveillance of the disease should be done by community-based organization to reduce the menace.

Key words: Helminth; Parasites; *Schistosomiasis*; *Schistosoma haematobium*; *Schistosoma mansoni;* Snails

INTRODUCTION

Schistosomiasis also known as Bilharziasis or snail fever is a common intravascular trematode infection most common in developing regions of Africa and Asia (Pugh, *et al*., 2008). Five major species of parasitic trematodes of the family Schistosomatidae including *Schistosoma haematobium*, *Schistosoma intercalatum*, *Schistosoma japonicum*, *Schistosoma mansoni*, and *Schistosoma mekongi*, infect humans. *Schistosomiasis*, in which the bladder is affected, is caused by infection with *Schistosoma haematobium*, while intestinal *Schistosomiasis* is caused by *Schistosoma mansoni* both of which occur mainly in Africa. Over 200 million people, almost all of them in developing countries, suffer from *Schistosomiasis,* which can cause urinary obstruction, organ damage or destruction and death. At the same time, *Schistosomiasis* is associated with economic losses, and frequently interferes with development projects, particularly water resource development projects such as dams, irrigation schemes, planned and unplanned forestry (Gryseels, *et al*., 2007). In 1993, the World Health Organization (WHO) noted that the prevalence and intensity of the disease have been increased in areas undergoing water resource development, especially irrigation (WHO, 2013). The disease is endemic in most African countries where up to one-third of school age children may be actively infected although not always aware of their status (Chidozie, *et al*., 2008). *Schistosomiasis* is a neglected disease and very few studies have described its epidemiology.

Thus studies are needed to understand the epidemiology of these infections in order to implement measures necessary for their control in this region. The distribution of *Schistosomiasis* varies considerably with regions. In developing countries, the true epidemiological picture is not clear because of inadequate research on this infection despite its relevance in planning *Schistosomiasis* control in many locality (Nmorsi, *et al*., 2011). The most common method of diagnosis of *Schistosomiasis* in epidemiological surveys carried out in Africa is the identification of eggs in the stool for *Schistosoma mansoni* or in the urine for *Schistosoma haematobium*. Drug treatment is still the principal method of control and the drug of choice is praziquantel, however the degree of recovery from the infection depends on the extent of the damage caused by the infection. Single dose praziquantel (40 mg/kg) is effective in reducing prevalence and in curtailing the disease (King, *et al*., 2008 ;).

Significance of the study.

This study will aimed at providing baseline information on *Schistosomiasis* infection among selected IDP camps Maiduguri. The study can also be used as a road map for effective control and probably the eradication of the infection.

Aim and objective of the study.

To study the distribution and pattern of *Schistosomiasis* infection among selected IDP camps, Maiduguri Borno State. And objectives includes;

1. To determine the distribution of *Schistosomiasis* infection among inhabitants of selected IDP camps Maiduguri.
2. To determine the association between *Schistosomiasis* infection and age among inhabitant of selected IDP camps Maiduguri.
3. To determine the association between *Schistosomiasis* infection and sex among inhabitants of selected IDP camps Maiduguri.

Description of the study area

Maiduguri, is the capital city of Borno State, Nigeria. It is one of the 27 Local Government Areas of the state located in the northern part of the country between latitudes 11° 50" north, 13° 09" east. It is part of the Sahelian region and has an area of 543km^2. With an estimated population of 1,907,600. As of 2006 census.

It is located at the central parts of the state and its shared common boundary with jere, konduga, kaga and magumeri local government area of the state. The study area perhaps represents a rain bow coalition of many tribes with kanuri being the dominant tribe, others are Babur bura, Chibork, Marghi, Fulfulde, Gwoza and Shuwa. Others are, Fulani herdsmen and Igbo traders forming the minority.

The relief of the area provides uplands that give rise to streams and the vegetation is that of savannah. It occupies a fertile land which receives much rainfall and they use the land for growing of millet, sorghum, Maize, rice, cotton, okra and vegetables. There are many streams, ponds and few earth dams for domestic, recreational and agricultural activities mostly in the dry season. Most of the inhabitants go to the streams that overflow their banks during the rainy season though some may dry up in the dry season, ponds and dams, especially children and teenagers to wade, swim and for fishing purposes, of which large proportion of these children become infected and re-infected (Cheesebrough, 2008).

The climate of area is close to sub-tropical (hot semi-arid) with the monthly temperature ranging 35°C and 47°C and a relative humidity of 38.4% to 63.4%, with august having the highest relative humidity. The annual rainfall is about 73.8mm to 193.2mm, and is recorded higher in august. The rainy season starts from June to September and the dry season from October to May. The dry, cold and dusty harmattan usually starts from November to February (Ikusemoran, M. and Jimme, A.M. 2014).

Research design

The distribution of *Schistosomiasis* infection will be determined by selecting 3 IDP camps (baga camp, gamboru camp and damboa camp). In each of the camp, 50 people (two sample each) will be collected cutting across all ages, giving a total number of 300 samples. With the cooperation of camp official and different organization rendering assistance, the aim of the study will be explain to the people in detail. This was to seek and obtain their consents. Mode and sources of transmission, effect and control measures of the disease will be emphasized to them. At the beginning of the study consent will be obtained from the camp official of the study area.

Collection of specimen

Information such as their Sex, Age, Occupation, Date of collection, Source of water supply will be recorded in a hard covered notebook. A clean, pre-labelled screw-capped sample container will be distributed with instructions to collect the first and last drops of mid-day (10.00am – 2.00pm) urine and stool to suit the diurnal rhythm corresponding to the peak output of *Schistosomal* eggs (WHO, 2013; Cheesebrough, 2008). 10% formal saline will be used to preserve the specimen. The samples will then transported immediately to state specialist Hospital Maiduguri diagnostic laboratory for examination between 30 minutes to 2 hours.

Microscopic examination

20 milliliters of urine sample will be collected from each respondant and allowed to settle to the bottom of the sample containers for 30-60 minutes by ordinary sedimentation method. The supernatant will be gently decanted until almost 10 milliliters was left. The 10 milliliters that remain will be mixed and turned inside a clean centrifuge tube, and centrifuged at 500 – 1000 revolution per minutes for 5 minutes. The supernatant was gently decanted off to leave only the deposits. Using a clean Pastuer pipette, a drop of the sediment was placed on a clean grease-free microscope slide and a cover slip was gently lowered on

it, avoiding air bubbles. Then, it was viewed under x10 and x40 microscope objectives respectively, for the characteristics terminal-spine of *Schistosoma haematobium* eggs (Cheesebrough, 2008)

30g of stool will be taken to determine the intensity of the infection in terms of eggs per gram of stool by preparing stool smears on each slide using formal-ether concentration technique. 1gram of well-mixed stool sample will be added to 10mls of formalin in a test tube and stir using applicator stick. The tube will then covered and its content mixed by shaking. The stool suspension was then passed through a sieve of 400um mesh size, collecting the fluid in a beaker and the particles discarded. The strained fluid was transferred into a centrifuge tube and centrifuged at 3,000rpm for 5minutes. The supernatant will then gently decanted off to leave only the deposits. Using a pastuer pipette, a drop of the sediment will be placed on a clean grease-free microscope slide and a cover slip will gently lowered on it before viewing under x10 and x40 microscope objectives respectively for the characteristics lateral-spine of *schistosoma mansoni* eggs. (Cheesebrough, 2008)

Statistical analysis

Chi-square test and percentage will be used to analyze the result of the various parameters, such as the age groups, sex, and environment (IDP camps). Each parameter will be calculated to determine whether or not an association exists between the parameter and the infection, where $p < 0.05$ was considered significant.

Ethical consideration

A letter of introduction from the department will be submitted to Borno State ministry of health to seek for ethical clearance. All participants in the research will be fully brief about the research. Participants are at liberty to ask question or withdrawn their information. Their identity will not be disclose and will be inform on the confidentiality of its outcome.

RESULTS

Table 1: shows the overall distribution of Schistosomiasis among the camps in relation to sex indicated that gamborou camp has the highest rate of 57 (28.5%) and 39 (19.5%) person infected with *Schistosoma haematobium* and *Schistosoma mansoni*. Out of that 46 (33.1%) and 30(21.6%) male infected while 11 (18.0%) and 9 (14.7%) female infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. Followed by baga camp has a total of 54 (27.0%) and 28 (14.0%)

person infected with *Schistosoma haematobium* and *Schistosoma mansoni*, out of that 44 (31.4%) and 23 (16.3%) male infected while 10 (16.7%) and 5 (8.3%) female infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. And lastly damboa camp has the lowest rate of 51 (25.5%) and 16 (8.0%) person infected with *Schistosoma haematobium* and *Schistosoma mansoni.* out of that 41 (29.1%) and 10 (7.1%) male infected with *Schistosoma haematobium* and *Schistosoma mansoni* while 10 (16.9%) and 6 (10.2%) respectively.

Table 2: shows a prevalence of infection in relation to sex which indicate that out of 600 person examined, 420 and 180 were male and female respectively. A total of 162 (27.0%) and 83 (14.0%) person infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. 131 (31.2%) and 63 (15.0%) male infected while 31 (17.2%) and 20 (11.1%) female with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. The results also shows that there was a significant difference in infection between the sexes where male has the highest rate of infection than the female.

Table 3: shows the distribution of Schistosomiasis among the study subjects in relation to age group, where it shows highest prevalence rate of infection among subjects belonging to age group 6-15 with 294 persons examined. Out of which 110 (37.4%) and 48 (16.3%) person infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. Age group 36-45 has 22 person examined where 2 (9.1%) person each infected with *Schistosoma haematobium* and *Schistosoma mansoni*. Other age group were 16-25 with 239 person examined where 44 (18.4%) and 26 (10.9%) person infected with *Schistosoma haematobium* and *Schistosoma mansoni*. And age group 26-35 has 44 number of person examined with 6 (13.6%) and 7 (15.9%) infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. 46-above has no infection. Statistical analysis shows that there were significant difference in infection between the age group. *Schistosoma haematobium* has the highest significant difference among the age group while *Schistosoma mansoni* has little or no significant difference among the age group.

Table 1: Prevalence of *Schistosomiasis* among study subjects in the study camps in relation to sex.

Sex	Camps								
		Damboa camp			Gamboru camp			Baga camp	
	No. Examined	S. haematobium	S. mansoni	No. Examined	S. haematobium	S. mansoni	No. Examined	S. haematobium	S. mansoni
Male	141	41(29.1%)	10 (7.1%)	139	46 (33.1%)	30 (21.6%)	140	44 (31.4%)	23 (16.3%)
Female	59	10 (16.9%)	6 (10.2%)	61	11 (18.0%)	9 (14.7%)	60	10 (16.7%)	5 (8.3%)
Total	200	51 (25.5%)	16 (8.0%)	200	57 (28.5%)	39 (19.5%)	200	54 (27.0%)	28 (14.0%)

Table 2: Prevalence of *Schistosomiasis* in relation to sex.

Sex	Number examined	*S. haematobium* (%)	*S. mansoni* (%)
Male	420	131(31.2%)	63 (15.0%)
Female	180	31 (17.2%)	20 (11.1%)
Total	600	162 (27.0%)	83 (14.0%)
Chi –Square (χ^2)		12.47	1.60
P-value		0.0004**	0.2061*

Table 3: Distribution of *Schistosomiasis* among the study subjects in relation to age groups.

Age group	Number examined	*S. haematobium* (%)	*S. mansoni* (%)
6-15	294	110 (37.4%)	48 (16.3%)
16-25	239	44 (18.4%)	26 (10.9%)
26-35	44	6 (13.6%)	7 (15.9%)
36-45	22	2 (9.1%)	2 (9.1%)
46-above	1	0 (0.0%)	0 (0.0%)
Total	600	162 (27.0%)	83 (14.0%)
Chi-square (χ^2)		33.06	4.02
P-value		0.0000**	0.4035*

Table 4: Shows the prevalence of Schistosomiasis in the study area in relation to age group and sex. This table shows that age group 6-15 has the highest rate of 92 (43.6%) and 36 (17.1%) male infected while 18 (21.7%) and 12 (14.5%) female infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. Lower rate of 2 (13.3%) and 1 (6.7%) male infected while 10 (0.0%) and 1 (14.3%) female infected with *Schistosoma haematobium* and *Schistosoma mansoni* was recorded in age group 36-45. Age group 16-25 has rate of 34 (20.0%) and 23 (14.1%) male infected while 10 (13.2%) and 3 (3.9%) female infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. 26-35 age group has rate of 3 (10.0%) male each infected while 3 (21.4%) and 4 (28.6%) female infected with *Schistosoma haematobium* and *Schistosoma*

mansoni. And lastly 46-above had no male or female infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively.

Table 5: Shows prevalence of Schistosomiasis among the three (3) camps in the study area. This table shows that in each of the camps two hundred (200) person were examined given a total of 600 person examined. Gamborou camp has highest prevalence rate of 57 (28.5%) and 39 (19.5%) person infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. Followed by baga camp with prevalence rate of 54 (27.0%) and 28 (14.0%) persons infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. And lastly damboa camp has a rate of 51 (25.5%) and 16 (8.5%) person infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. Chi-square analysis shows that there was significant difference in the infection between the camps in relation to *Schistosoma mansoni* while there is little or no significant difference in infection between the camps in relation to *Schistosoma haematobium*

Table 6: Shows the overall prevalence of *Schistosoma haematobium* and *Schistosoma mansoni* in relation to occupation among the study subjects in the three (3) IDP camps was 162(27.0%) and 83(14.0%) respectively. The results also shows that pupils and students has the highest rate of 67(36.6%), 42(22.9%), and 69(22.9%), 27(8.9%) number infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. Others are housewife 11(31.4%) and 3(8.6%), out of school children 9(17.3%) and 4(7.7%), unemployed 5(21.7%) and 6(26.1%) number infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. 2(40.0%) of civil servant infected with *Schistosoma mansoni* and only 1(100.0%) of farmer infected with *Schistosoma haematobium*. Chi-square analysis shows that there was significant difference between the infection of *Schistosoma haematobium, Schistosoma mansoni* and the people's occupation.

Table 4: Prevalence of *Schistosomiasis* in the study area in relation to age group and sex.

Age group		Male		Female	
	No. examined	*S. haematobium* (%)	*S. mansoni* (%)	*S. haematobium* (%)	*S. mansoni* (%)
6-15	294	92(43.6%)	36(17.1%)	18(21.7%)	12(14.5%)
16-25	239	34(20.8%)	23(14.1%)	10(13.2%)	3(3.9%)
26-35	44	3(10.0%)	3(10.0%)	3(21.4%)	4(28.6%)
36-45	22	2(13.3%)	1(6.7%)	0(0.0%)	1(14.3%)
46-above	1	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
Total	600	131(31.2%)	63(15.0%)	31(17.2%)	20(11.1%)

Table 5: Prevalence of *Schistosomiasis* among the camps in the study area.

Camps	No. examined	*S. haematobium* (%)	*S. mansoni* (%)
Damboa camp	200	51 (25.5%)	16 (8.5%)
Gamboru camp	200	57 (28.5%)	39 (19.5%
Baga camp	200	54 (27.0%)	28 (14.0%)
Total	600	162 27.0%)	83 (14.0%)
Chi-square (χ^2)		0.46	11.10
P-value		0.7959*	0.0039**

Table 6: Prevalence of *Schistosomiasis* among the study subjects in relation to occupations.

Occupation	Number examined	*S. haematobium* (%)	*S. mansoni* (%)
Pupils	183	67(36.6%)	42(22.9%)
Students	301	69(22.9%)	27(8.9%)
Housewife	35	11(31.4%)	3(8.6%)
Out of school children	52	9(17.3%)	4(7.7%)
Civil servant	5	0(0.0%)	2(40.0%)
Farmer	1	1(100.0%)	0(0.0%)
Unemployed	23	5(21.7%)	6(26.1%)

Total	600	162(27.0%)	83(14.0%)
Chi-square (χ^2)		16.67	26.84
P-value		0.0106**	0.0002**

Discussion

The results of this study showed that *Schistosomiasis* was prevalent in the study area with overall prevalence of 162(27%) in urine which is higher than 84(14%) in stool. This results agrees with Nale *et al.,* (2009) who reported a prevalence of 22.5% and this could be attributed to many outdoor activities engaged in infected water. The prevalence of infection in the camps could be attributed to closeness of the people from water bodies infected with snail intermediate host (Okon *et al.,* 2007). Those live close to the water bodies or irrigation canals were more exposed and therefore more vulnerable to Schistosomiasis than those who lived further from the water Ugbomoiko *et al.,* (2010), Abdullahi *et al.,* (2011). Gamboru camp had 57(28.5%) and 39(19.5%) of *Schistosomiasis* in urine and stool because of their closeness to water bodies, followed by Baga camp 54(27.0%) and 28(14.0%) and lastly the Damboa camp with 51(25.5%) and 17(8.5%) *Schistosomiasis* in urine and stool respectively. This give a total of 162(27.0%) in urine and 84(5.7%) in stool infected by *Schistosoma haematobium* and *Schistosoma mansoni*.

It is clear from the results that the study area is endemic of Schistosomiasis. This results agreed with (Kiran and Muddasiru, 2014; Pukuma and Musa, 2007) Who reported a prevalence rate of urinary Schistosomiasis at (60.80%), and that of intestinal Schistosomiasis at (2.93%), which may be attributed to water contact activities in the area. In relation to sex, the high infection rate observed in males than in females was also observed in other endemic areas as found by other authors (Ekejindu et al., 2002; Pukuma and Musa, 2007). This high prevalence in males than in females may be connected with the socio-cultural setup of the people of the study area. These people are predominantly Muslims, Hausa and Kanuri by tribe. Majority of the females are restricted to their houses therefore they have less contact with infested water compared to their male counterparts. Swimming and bathing in the open water bodies is also very uncommon among

females in community. This is in line with the observation made by other authors (Bello et al., 2003).

The infection rates in the study area varied according to their ages, where age group 6-15 years had the highest infection rates of 92(43.6%) and 36(17.1%) of infected with *Schistosoma haematobium* and *Schistosoma mansoni* while 18(21.7%) and 12(14.5%) of female infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. Followed by age group 16-25 with 34(20.8%) and 23(14.1%) number of male infected with *Schistosoma haematobium* and *Schistosoma mansoni*, while 10(13.2%) and 3(3.9%) female infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. This might be attributed to frequent water contact since those age groups engaged in activities that involved frequent contact with water. Nnoruka (2000) reported in mayo belwa, Adamawa state. A prevalence rate of *Schistosoma haematobium* in children between the ranges of 11-13 years. In zuru Kebbi state, the highest prevalence was among age group 11-15 years. Joseph et al., (2010) and Akinboye *et al.,* (2011) in their separate works showed higher prevalence of 15.0% in Maiduguri and 12.5% in Ibadan, respectively among school children of age group 12-15 yeasrs. However, results of this study agrees with Okoli *et al.,* (2006) who reported the highest prevalence of 22.2% in the age group 21-30 years cohort in Ohaji/Egbema LGAs, Imo State Nigeria. The results of this study do not agrees with Ombugadu, (2001) who reported peak prevalence of 40.2% and 28.6% in male and female between age group 21-25.

This results also showed that no infection rates was recorded in age group 46 above, this also agrees with Dawet *et al.,* (2012) who reported no infection among age group 40- above, the low prevalence in aged people may be due to progressive increase in the level of naturally acquired immunity against Schistosomiasis and less contact with water.

Based on occupation, the overall study showed that pupils and students has the highest peak of 67(36.6%), 42(22.9%) and 69(22.9%), 27(8.9%) infected with *Schistosoma haematobium* and *Schistosoma mansoni* respectively. followed by housewives 11(31.4%), 3(8.6%), out of school children 9(17.3%), 4(7.7%) and unemployed 5(21.7%), 6(26.1%) *Schistosoma haematobium* and *Schistosoma mansoni* respectively. And lastly 2(40.0%) of civil servant infected with *Schistosoma mansoni* and only 1(100.0%) of farmer infected with *Schistosoma haematobium*. This study also agrees with Pukuma *et al.,* (2006) who reported a high prevalence of 38.9% among school pupils

in Shelleng Town, Adamawa state. This could be associated with the fact that they can go to farms, ponds, streams for their domestic and recreational activities.

Conclusion

In conclusion, this study has indicated high prevalence of *Schistosomiasis* among the study area. Therefore, routine treatment, diagnosis and surveillance of the disease should be done by community-based organization to reduce the menace. The infection recorded could probably be due to reasons such as unhealthy environment, poverty, socio-cultural practices, lack of adequate health care facilities and ignorance. It has been observed that people in the study area were ignorant of the mode of transmission of this disease and proper sanitation which can increase contamination of the environment.

The overall number of people infected with *Schistosoma haematobium* and *Schistosoma mansoni* in the study area are 162(27.0%) and 84(14.0%) respectively.

Recommendations

Prevalence of *Schistosomiasis* includes basically the destruction of intermediate snail host and infective stage (*cercariae*) with molluscicides and larvicides respectively. The control of snail intermediate host would in no doubt reduce the rate of transmission, thereby reduction in prevalence of infections.

Workshops, seminars and control campaign programmed should be organized to train village heads who in turn educate their subjects on the mode of transmission, control strategies and dangers of the disease. Health education is a very effective means of improving knowledge about *Schistosomiasis* and the potential to reduce the prevalence of the diseases Jamda *et al*., (2007).

Subjects in the study area should be educated by the local government health workers on proper means of waste disposal and construction of sanitary latrines in their homes so as to reduce the act of urinating or defecating in the open surroundings. The communities in the study area should embark on a monthly environmental sanitation.

There should be provision of recreational centres in the communities to reduce the rate of contact with infected water, and village heads as well as opinion leaders should discourage on some of the

socio-cultural practices (like urinating and bathing in stagnant or slow moving water) that may expose them to infection.

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APPENDICES

Appendix I: Eggs of *Schistosoma haematobium*

Appendix II: Egg of *Schistosoma mansoni*