A Study on the Epidemiology of Schistosoma Mansoni in some Selected Riverine Internally Displaced Persons (IDP) Camps in Maiduguri, Borno State.

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Abstract

Schistosomiasis also known as bilharzia is an infectious disease that affects more than 230 million people worldwide, according to conservative estimates. It is caused by trematode parasites of the genus Schistosoma; the adult male and female worms live within the veins of their human, where they mate and produce fertilized eggs. The eggs are either shed into the environment through faeces or are retained in host tissues where they induce inflammation and then die. 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 stool sample were examined from 600 persons were a clean, pre-labelled screw-capped plastic container were distributed with instructions to collect stool. The samples were immediately transported to diagnostic laboratory for examination. Formal-ether concentration techniques was used to examine the stool. The overall number of people infected with *Schistosoma mansoni* was 83(14.0⁄). The results also shows that age group 6-15 years has the highest infection rates of 36(17.1⁄) of male infected with *Schistosoma mansoni* while 12(14.5⁄) of female infected with *Schistosoma mansoni* respectively. Followed by age group 16-25 with 23(14.1⁄) number of male infected with *Schistosoma mansoni*, while 3(3.9⁄) of female infected with *Schistosoma mansoni* 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,

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diagnosis and surveillance of the disease should be done by community-based organization to reduce the menace.

Key words: Helminthes; Parasites; *Schistosomiasis*; *Schistosoma mansoni*; Snails;

Introduction

Schistosomiasis also known as bilharzia is an infectious disease that affects more than 230 million people worldwide, according to conservative estimates. It is caused by trematode parasites of the genus Schistosoma; the adult male and female worms live within the veins of their human, where they mate and produce fertilized eggs. The eggs are either shed into the environment through faeces or are retained in host tissues where they induce inflammation and then die. 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 any 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. 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).

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 (NPC, 2006).

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 people then, 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 purposes 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 was determined by selecting 3 IDP camps (Damboa camp, Gamboru camp and Baga camp). In each of the camp, 200 person were randomly selected cutting across all ages, giving a total number of 600 person involved. With the cooperation of camp official and different organization rendering assistance, the aim of the study was explained 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 was emphasized to them. At the beginning of the study consent was obtained from the camp official of the study area.

Collection of Stool

A clean, pre-labelled screw-capped plastic container were distributed with instructions to collect the first and last drops of mid-day (10.00am – 2.00pm) stool to suit the diurnal rhythm corresponding to the peak output of Schistosomal eggs (WHO, 2013; Cheesebrough, 2008). 10% formal saline was used to preserve the specimen. The samples were then transported immediately to state specialist Hospital Maiduguri diagnostic laboratory for examination between 30 minutes to 2 hours.

Stool Examination

1gram of well-mixed stool sample was added to 10mls of formal-saline in a test tube using applicator sticks. The tube was 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 was placed on a clean grease-free microscope slide and a cover slip gently lowered on it before viewing under x10 and x40 microscope objectives respectively for the characteristics lateral-spine of Schistosoma mansoni eggs. (Cheesebrough, 2008).

Chi-square test and percentage was used to analyze the result of the various parameters, such as the age groups, sex, and prevalence. Each parameter was calculated to determine whether or not an association exists between the parameter and the infection. Where $p < 0.05$ was considered significant. Using statistix8.0 version.

Results

Table 1: shows the overall distribution of *Schistosoma mansoni* among the camps in relation to sex indicated that gamborou camp has the highest rate of 39 (19.5⁄) person infected with Schistosoma mansoni. Out of that 30(21.6%) male infected while 9 (14.7%) female infected with Schistosoma mansoni respectively. Followed by baga camp has a total 28 (14.0%) person infected with Schistosoma mansoni, out of that 23 (16.3%) male infected while 5 (8.3%) female infected with Schistosoma mansoni respectively. And lastly damboa camp has the lowest rate of 16 (8.0%) person infected with Schistosoma mansoni. out of that 10 (7.1%) male infected with Schistosoma mansoni while 6 (10.2%) female with Schistosoma mansoni respectively.

Table 2: shows a prevalence of *Schistosoma mansoni* in relation to sex which indicate that out of 600 person examined, 420 and 180 were male and female respectively. A total of 83 (14.0⁄) person infected Schistosoma mansoni. 63 (15.0⁄) male infected while 20 (11.1%) female with 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 *Schistosoma mansoni* 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 48 (16.3⁄) person infected with Schistosoma mansoni. Age group 36-45 has 22 person examined where 2 (9.1%) person infected with Schistosoma mansoni. Other age group were 16-25 with 239 person examined where 26 (10.9%) person infected with Schistosoma mansoni. And age group 26-35 has 44 number of person examined with 7 (15.9%) infected with Schistosoma mansoni. 46-above has no infection.

Statistical analysis shows that there were significant difference in infection between the age group. Schistosoma mansoni has little or no significant difference among the age group.

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

Sex			**Camps**			
	Damboa	**camp**	**Gamboru**	**camp**	**Baga**	**Camp**
	No.Examined	**S. mansoni**	**No.Examined**	**S. mansoni**	**No.Examined**	**S. mansoni**
Male	141	10 (7.1⁄)	139	30 (21.6⁄)	140	23 (16.3⁄)
Female	59	6 (10.2⁄)	61	9 (14.7⁄)	60	5 (8.3⁄)
Total	200	16 (8.0⁄)	200	39 (19.5⁄)	200	28 (14.0⁄)

Table 2: Prevalence of *Schistosoma mansoni* in relation to sex.

	Number Examined	**Number (⁄) Infected with *S. mansoni***
Male	420	63 (15.0⁄)
Female	180	20 (11.1⁄)
Total	600	83 (14.0⁄)
Chi –Square (χ^2)		1.60*
Degrees of freedom		0.2061
P-value		1

Table 3: Distribution of *Schistosoma mansoni* among the study subjects in relation to age group.

Age group	**Number Examined**	**Number (⁄) Infected with *S. mansoni***
6-15	294	48 (16.3⁄)
16-25	239	26 (10.9⁄)
26-35	44	7 (15.9⁄)
36-45	22	2 (9.1⁄)
46-above	1	0 (0.0⁄)
Total	600	83 (14.0⁄)
Chi-square (χ^2)		4.02*
Degrees of freedom		0.4035

P-value	4

Table 4: Shows the prevalence of *Schistosoma mansoni* in the study area in relation to age group and sex. This table shows that age group 6-15 has the highest rate of 36 (17.1⁄) male infected while 12 (14.5%) female infected with Schistosoma mansoni respectively. Lower rate of 1 (6.7%) male infected while 1 (14.3%) female infected with Schistosoma mansoni was recorded in age group 36-45. Age group 16-25 has rate of 23 (14.1%) male infected while 3 (3.9%) female infected with Schistosoma mansoni respectively. 26-35 age group has rate of 3 (10.0%) male infected while 4 (28.6%) female infected with Schistosoma mansoni. And lastly 46-above had no male or female infected with Schistosoma mansoni respectively.

Table 5: Shows prevalence of *Schistosoma mansoni* 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 39 (19.5⁄) person infected with Schistosoma mansoni. Followed by baga camp with prevalence rate of 28 (14.0%) persons infected with Schistosoma mansoni. And lastly damboa camp has a rate of 16 (8.5%) person infected with Schistosoma mansoni respectively. Chi-square analysis shows that there was significant difference in the infection between the camps in relation to Schistosoma mansoni.

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

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

Age group	**No. Examined**	**Male** **Number (⁄) Infected with *S. mansoni***	**Female** **Number (⁄) Infected with *S. mansoni***
6-15	294	36(17.1⁄)	12(14.5⁄)

16-25	239	23(14.1⁄)	3(3.9⁄)
26-35	44	3(10.0⁄)	4(28.6⁄)
36-45	22	1(6.7⁄)	1(14.3⁄)
46-above	1	0(0.0⁄)	0(0.0⁄)
Total	600	63(15.0⁄)	20(11.1⁄)

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

Camps	**No. Examined**	**Number (⁄) Infected with *S. mansoni***
Damboa camp	200	16 (8.5⁄)
Gamboru camp	200	39 (19.5⁄
Baga camp	200	28 (14.0⁄)
Total	600	83 (14.0⁄)
Chi-square (χ^2)		11.10**
Degrees of freedom		0.0039
P-value		2

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

Occupation	**Number Examined**	**Number (⁄) Infected with *S. mansoni***
Pupils	183	42(22.9⁄)
Students	301	27(8.9⁄)
Housewife	35	3(8.6⁄)
Out of school children	52	4(7.7⁄)
Civil servant	5	2(40.0⁄)
Farmer	1	0(0.0⁄)
Unemployed	23	6(26.1⁄)

Total	600	83(14.0⁄)
Chi-square (χ^2)		26.84**
Degrees of freedom		0.0002
P-value		6

Discussion

The results of this study showed that *Schistosoma mansoni* was prevalent in the study area with overall prevalence of 83(14.0%). 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 39(19.5%) of Schistosomiasis in stool because of their closeness to water bodies, followed by Baga camp 28(14.0%) and lastly the Damboa camp with 16(8.5%) Schistosomiasis in stool respectively. This give a total of 83(14.0%) in stool infected by 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 36(17.1%) of infected with Schistosoma mansoni while 12(14.5%) of female infected with Schistosoma mansoni respectively. Followed by age group 16-25 with 23(14.1%) number of male infected with Schistosoma mansoni, while 3(3.9%) female infected with 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 42(22.9%) and 27(8.9%) infected with Schistosoma mansoni respectively. followed by housewives 3(8.6%), out of school children 4(7.7%) and unemployed 6(26.1%) infected with Schistosoma mansoni respectively. And lastly 2(40.0%) of civil servant infected with Schistosoma mansoni. This study does not agrees with Pukuma et al., (2006) who reported a high prevalence of 38.9% among civil servant 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 and Recommendations

In conclusion, this study has indicated high prevalence of *Schistosoma mansoni* 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 mansoni in the study area is 83(14.0%).

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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