Journal of Advanced Veterinary and Animal Research
ISSN 2311-7710 (Electronic)
http://doi.org/10.5455/javar.2016.c132
A periodical of the Network for the Veterinarians of Bangladesh (BDvetNET)

March 2016
Vol 3 No 1, Pages 56-61.

Original Article

Sero-prevalence of *Schistosoma* species in cattle in Maiduguri Metropolis and Jere Local Government Areas of Borno State, Nigeria

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• **Received:** February 2016 • **Revised:** February 2016 • **Accepted:** February 2016 • **Published Online:** February 2016

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ABSTRACT

Objectives: This study was designed to investigate the Sero-prevalence of *Schistosoma* species in cattle in Maiduguri Metropolis (MMC) and Jere Local Government Areas (LGAs) of Borno State, Nigeria.

Materials and Method: Blood samples (n=200) from cattle were collected using a multistage sampling technique; 100 samples each were collected from MMC and Jere LGAs, respectively. The samples were subjected to screening for *Schistosoma* antibodies using Enzyme Linked Immunosorbent Assay (ELISA). Age, sex, breed and location of cattle were recorded.

Results: The overall prevalence of *Schistosoma* infection among cattle in MMC and Jere LGAs was 10%. Jere LGA had a prevalence rate of 14% and MMC had 6%. At the ward levels, Custom Area in Jere LGA had the highest number of *Schistosoma* positive (50%). Out of 103 female and 97 male cattle screened, the prevalence of *Schistosoma* infection in female and male were 9.71% (n=10/103) and 10.31% (n=10/103). Out of the 177 serum samples from cattle aging >1-year (adult) examined, 16 (9.04%) were positive, while only 4 (17.39%) out of 23 serum samples from cattle aging <1-year (young) were positive. Out of the eight (8) breeds screened, the highest number of cases was recorded in Kuri breed (16.22%). This was followed by Sokoto Gudali (10.9%) breed. The prevalence in other breeds was as follows: Abore- 10%, Red Bororo- 5.26%, and White Fulani- 6.67%.

Conclusion: It is concluded that schistosomiasis in cattle was prevalent in MMC and Jere LGAs of Borno State. A regular checking program is suggested to constantly check out whether the prevalence rate is increasing, so that effective control measures can be strenthened.

KEYWORDS

Cattle, ELISA, Sero-prevalence, *Schistosoma* species

How to cite: **Hambali IU, Adamu NB, Ahmed MI, Bokko P, Mbaya AW, Tijjani AO, Biu AA, Jesse FFA, Ambali A-G (2016). Sero-prevalence of *Schistosoma* species in cattle in Maiduguri Metropolis and Jere Local Government Areas of Borno State, Nigeria. Journal of Advanced Veterinary and Animal Research, 3(1): 56-61.**

INTRODUCTION

Schistosomiasis is a debilitating parasitic disease caused by several species of fluke of the genus *Schistosoma*, affecting both animals and human. The disease is found in tropical countries in Africa, Eastern-South America, Caribbean, Middle East, and Southern-East Asia (Kassaw, 2007). The disease is found as endemic in more than 70 countries, affecting about 200 million people all over the world. Most of the affected people live in the African countries (Fenwick, 2006, Sowole et al., 2012). Fenwick (2006) reported 80-85% distribution of Schistosomiasis in Sub Saharan Africa.

Schistosomiasis has been spreading in the tropics due to changes in landscape for the establishment of irrigation schemes (Umeh et al., 2004). Like Malaria, it is characterised by increase in morbidity and mortality and decline in productivity of infected persons (WHO, 2004). In Nigeria, like many other African countries, schistosomiasis caused to reduce income generation, productivity of workers, farm size, and rate of land clearing (Umeh et al., 2004). It could therefore be said that the direct impacts caused by schistosomiasis lead to enormous annual economic losses and inhibition of socio-economic development due to low production and income of those people infected (Salehe and Hassan, 2012; URT, 2008; Hotez and Ferris, 2006; King et al., 2010). In addition it prevents children from attending school and adults from being productive members of their communities (Hotez and Kamath, 2009). Of significance is the threat to public health due to natural interactions and hybridization between *Schistosoma* species. Huyse et al. (2009) reported the isolation of a hybrid worm from patients in Senegal which was as a result of hybridization between *Schistosoma bovis* and *Schistosoma haematobium.*

Schistosomiasis is one of the major veterinary problems in many Africa countries. Cattle infected with *Schistosoma bovis* develop a syndrome characterized by liver damage, roughness of hair coat, pale mucous membrane, serious emaciation and a very poor reproductive performance (Aradaib et al., 1993) that results in a significant economic down turn and a threat to public health. This study is aimed at determining the distribution of *Schistosoma* infection in cattle in Maiduguri Metropolis and Jere LGAs of Borno state.

MATERIALS AND METHODS

Study area: The study was conducted in Maiduguri Metropolis and Jere Local Government Areas (LGA) of Borno State (**Figure 1**). The boundaries of the state are the Republic of Niger to the North, Cameroon Republic to the east and to the Northeast by Chad Republic. Within the country, its neighbouring states are Adamawa to the South, Yobe to the West and Gombe to the Southwest.

Study design: A cross sectional study was conducted in accordance with the method of Thrusfield (2002). Blood samples were aseptically collected from cattle on herd basis using a multistage sampling technique. The 5 wards under Maiduguri Metropolis were Shuwari, Bolori, Jiddari, and Bullabulin. On the other hand, 5 wards under Jere LGA were Dusuman, Khaddamari, Gongulong, Maimusari, and Custom Area. Ten (10) out of 27 wards initially selected by simple random sampling from both LGAs were subjected to the next stage of survey. At each of the 10 selected wards and average of 3 cattle were selected from an earlier 5 cattle herds randomly selected for blood collection.

Sample size: Sample size for the cattle was calculated using the formula Z^2pq/L^2 where Z=1.96, p=prevalence, q=1–p, L=level of significant (5%) as described by Thrusfield (2002). By using known prevalence rate of 12.5% for Schistosomiasis in cattle, a total of 168 samples was the true representative of the sample population. However, a total number of 200 blood samples were collected in order to increase precision (20 samples coming from each of the ten wards).

Ethical approval and blood sample collection: Blood samples were collected from the cattle after proper restrain without harming the animal. Sex, age, breed, source of water, date and location of the animals were determined and recorded at the time of sample collection. 10 mL of blood was aseptically collected from the jugular veins using 10 mL, 18Gx1.5 inches syringes and needles. The blood samples collected were poured into non-heparinized universal bottle for serum to be separated and collected. In the laboratory, the blood samples were further centrifuged at 3,000 g for 15 min. Thereafter clarified sera was decanted into clean labelled serum vials and stored at –20ºC until analysed.

Laboratory examination of sample

Serological test: Serological test was conducted using an IgG Enzyme–Linked Immunosorbent Assay (ELISA) at the laboratory of the Department of Medical Sciences, University of Maiduguri Teaching Hospital. The IgG *Schistosoma* ELISA Kit was supplied by the Diagnostic Automation/Cortez Diagnostics Inc. Calabasas, California, USA.

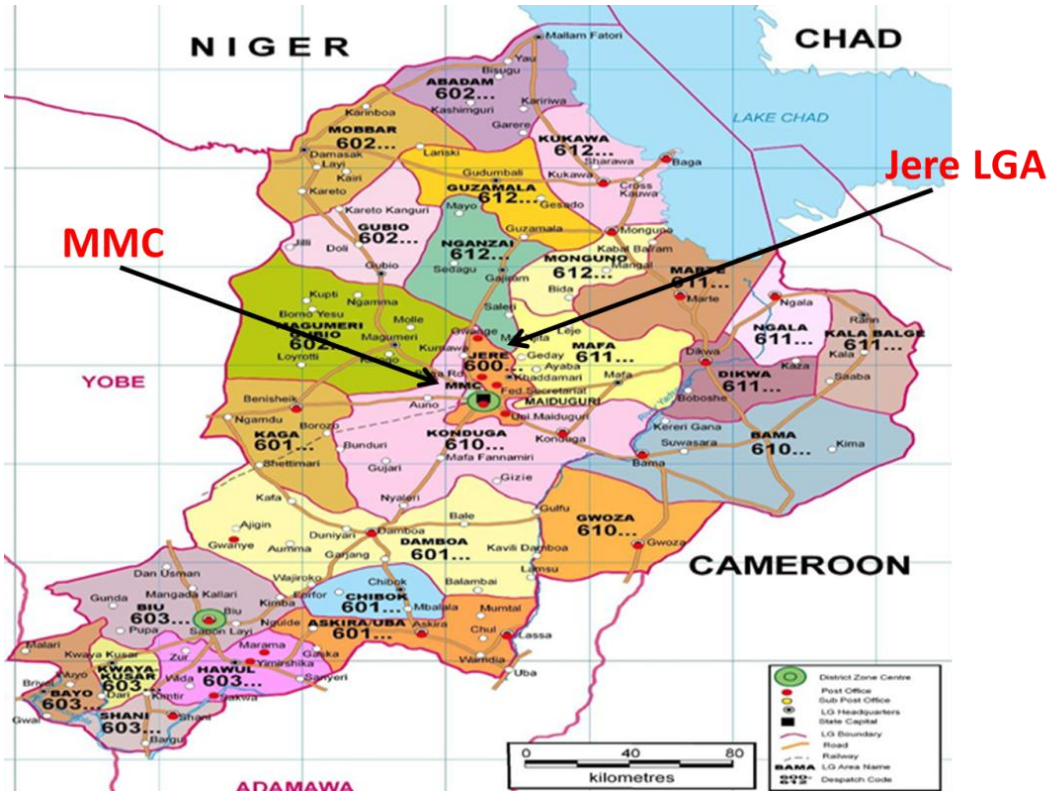

Figure 1. Map showing the study area.

ELISA: Wash Buffer-cap was removed and content of bottle was added to 475 ml Distilled water. The diluted wash buffer was placed into a squeeze bottle. Washings consisted of filling to the top of each well, shaking out the contents and refilling. Generating of bubbles in the wells during the washing steps was avoided. Test samples: Dilution of 1:40 of the test sera was made using the dilution buffer. The number of wells needed were broken and placed in strip holder. Thereafter, negative control (100 µL) was added to well A1, 100 µL of positive control to well B1, and 100 µL of the diluted (1:40) test samples to the remaining well. It was Incubation at room temperature for 10 min , contents were then shaken out and washed 3 times with the diluted wash buffer and enzyme conjugate (100 µL) was added to each well. It was also incubation at room temperature for 10 min .Contents were shaken out and washed 3 times with the diluted wash buffer. To each of the well, Chromogen (100 µL) was added and incubation at room temperature for 5 min. And finally a stop solution (100 µL) was added to end the procedure. ELISA wells were read using a micro-plate reader at 450 nm with a reference filter at 620-650 nm.

Statistical analysis: Data generated were analysed using a computer software Graphpad instat 3. Tables, Percentages, *Chi*-square were analysed from the data generated in this study.

RESULTS

The overall prevalence of *Schistosoma* infection in cattle in Maiduguri Metropolis and Jere LGAs of Borno State is presented in **Table 1**. Out of the 200 cattle tested in both LGAs 20 (10.00%) were positive by ELISA. Jere LGA had the highest number of cattle positive by ELISA (14.00%) than MMC (6.00%). At the ward levels, Custom Area in Jere LGA had the highest number of *Schistosoma* positive (50.00%) followed by Jiddari ward in MMC with 30.00%. However, with the exception of Gongulong in Jere LGA where 20.00% positive cases were recorded, all the remaining seven(7) ward levels spread among the two LGAs recorded negative cases of *Schistosoma* infection when the cattle were screened. There was no statistical significant association between the LGA and positive serological reaction to *Schistosoma* infection ($P>0.05$). The prevalence of *Schistosoma* infection by ELISA in MMC and Jere LGAs of Borno State based on Sex are shown in **Table 2**. Out of the 103 serum samples

from female cattle tested 10 (9.71%) were positive. In the Males, only 10 (10.3%) were positive. There was no statistical significant association in

Table 1: Prevalence of *Schistosoma* infection in cattle in Maiduguri and Jere Local Government Areas of Borno State based on ELISA.

LGA	WARDS	NO. tested	ELISA + (%)	*P*-value	OR	95% C.I (Lower-Upper)
MMC						
	Gwange	20	0(0.0)			
	Shuwari	20	0(0.0)			
	Bolori	20	0(0.0)			
	Jiddari	20	6(30.0)			
	B/bulin	20	0(0.0)			
Sub-total		100	6(6.0)	0.09	0.39	0.14-1.06
Jere						
	Dusuman	20	0			
	K/mari	20	0			
	G/long	20	4(20.0)			
	M/sari	20	0			
	C/area	20	10(50.0)			
Sub-total		100	14		2.55	0.93-6.93
Total for both LGAs		200	20(10.0)			

B/bulin=Bullabulin, K/mari=khaddamari, G/long=Gongulong, M/sari=Maimusari and C/area=Custom area.

Table 2: Prevalence of *Schistosoma* infection in cattle in Maiduguri and Jere Local Government Areas of Borno State based on Age.

Sex	No. Tested	ELISA + (%)	*P*-value	OR	95% C.I Lower-upper
Female	103	10(9.71)	1.00	0.935	0.371-2.357
Male	97	10(10.31)		1.069	0.424-2.694
Total	200	20(10.0)			

Table 3: Prevalence of *Schistosoma* infection in cattle in Maiduguri and Jere Local Government Areas of Borno State based on Age.

Age (Years)	N0. Tested	ELISA + (%)	*P*-value	OR	95% C.I Lower-upper
Adult (>1)	177	16(9.04)	0.258	0.472	0.142-1.559
Young (<1)	23	4(17.39)		2.118	0.641-6.996
Total	200	20(10.0)			

Table 4: Prevalence of *Schistosoma* infection in cattle in Maiduguri and Jere Local Government Areas of Borno State based on the trend of occurrence in breeds.

Group Trend	No. Tested	ELISA + (%)	*P*-value	OR	95% C.I Lower-upper
A	195	20(10.00)	1.000	1.285	0.068-24.104
B	5	0(0.0)		0.778	0.041-14.600
Total	200	20(10.0)			

Group A=White Fulani, kuri, Red Bororo,Sokoto Gudali, and Abore Group B=Porland, Mbala and Wafara.

prevalence rate among the sex group in the study area (*P*>0.05).

The prevalence of *Schistosoma* infection by ELISA in cattle in MMC and Jere LGAs of Borno State based on Age are shown on **Table 3**. Out of the 177 serum samples from cattle aged above 1year (adult) examined, 16 (9.04%) were positive , while only 4 (17.39%) out of 23 serum samples from cattle less than one year(young) were positive by ELISA. There was no statistical significant association in prevalence rate among age groups and the positive serological reaction to *Schistosoma* infection in the study areas (*P*=0.25) (*P*>0.05). The prevalence based on the trend of occurrence of *Schistosoma* infection among

the eight (8) breeds is presented in table 4 below. Out of the eight (8) breeds screened the highest number of cases recorded was in Kuri breed with 6 (16.22%). This was followed by Sokoto Gudali with 6 (10.9%) positive cases. The prevalence of other breeds recorded are as follows: Abore: 10.00%, Red Bororo: 5.26%, White Fulani: 6.67%, Porland, Mbala and Wafara recorded no cases of *Schistosoma* infection. However, the difference in prevalence rates among the breeds were not statistically significantly associated (P=0.100) (P>0.05).

DISCUSSION

The current study provides information on the prevalence of *Schistosoma* infection among cattle in MMC and Jere LGAs. The overall prevalence of *Schistosoma* infection among cattle in the study area was 10.0%. This is of public health significance because it has been established that *S. bovis* can cause infection in children (Huyse et al., 2009). Because of the close interaction between the cattle and herdsmen with their families in the study area, the cattle can be a potential reservoir of the infection. Considering the population of cattle in these two LGAs, infection to the tune of 10.0% is economically significant. Cattle are known to be an important source of protein and means of livelihood to the people in the study area. The result of the present study is lower than 12.3 and 12.5% reported by Zelalem et al. (2010). The differences could be attributed to more sensitive technique used in this study. The study area also have less water bodies compared to areas with high prevalence and the difference in waste product management in the herds and environs. The association between the animals in the two LGAs and the occurrence of the infection was not statistically significant (P>0.05). This means that the location of the animal does not affect the occurrence of the infection. The higher prevalence recorded in Jere LGA were from Custom Area and Gungulong , this could be associated with presence of more water bodies on the Jere axis compared to MMC axis.

In the current study, the prevalence rate was higher in male than female. There was no statistical significant association between sex and occurrence of the infection (P>0.05). The higher prevalence in male in this study is lower than the 15.4% as reported by Mersha and Belay (2012). This could be attributed to the fact that more of the male are practically grazed around for nutrient than the female within the study area. The prevalence rate was higher in the young than adult. The high prevalence rate in the young in this study is higher than 12.64% as reported by Mersha et al., (2012). There was no statistical significant association among age groups and occurrence of the infection (P>0.05). The higher prevalence in the young could be due to lack of immunity in the young to resist infection than it is expected in the adult. From this study, the prevalence by breed was higher in Kuri than other breeds. There was no statistical significant association among the breeds and the occurrence of the infection (P>0.05). The higher prevalence in Kuri breed might be due to exposure of more of the Kuri breed to marshy cercariae invaded grazing areas.

CONCLUSION

This study provided the base line data on the prevalence and distribution of *Schistosoma* infection in cattle in MMC and Jere LGAs of Borno state, Nigeria. Lack of clinical sign of *Schistosoma* infection is not an indication of the amount of infection in the herd or individual animal as the cattle may show no apparent clinical sign and may still harbour the parasite. Therefore, due to its public health importance, there is need for more effort in preventing and controlling the infection by way of constituting preventive and control measures.

CONFLICT OF INTEREST

The authors declare that they have no competing interest.

ACKNOWLEDGEMENT

Nothing to declare.

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