



Prevalence of schistosomiasis infection in cattle in selected Local Government Areas in Rivers State

By

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Abstract

The study was conducted to determine prevalence of schistosomiasis infection in cattle in selected Local Government Areas in Rivers State. The study animals was cattle population to be randomly selected in the Abattoir located in Ikwerre, Ahuada-East and Eleme representing the 3 Senatorial Districts in Rivers state which specifically comprising of cattle such as cattle. A cross-sectional study design was used to assess disease prevalence of bovine schistosomiasis in Rivers state. Field surveys were conducted to collect primary data on the prevalence and distribution of schistosomiasis among cattle in Rivers state. Physically, examination of the cattle for signs of schistosomiasis infection, including clinical symptoms and external lesions. The results showed that there a significant difference ($p < 0.05$) in prevalence of schistosomiasis across the LGAs and among the species studied. The results revealed that out of 180 cattle examined, 61 tested positive. In all the species examined, White Fulani was observed to be the species with highest prevalence of schistosomiasis in Ahuada (14.75%), Eleme (711.48%) and Ikwerre (11.48%) while the least species with schistosomiasis prevalence was recorded from the control site. Among the entire population of 180, 61 animals tested positive for schistosomiasis. The sex specific prevalence showed that females had the highest infection rate of 68.85% while males had 31.45% prevalence, although statistical analysis indicated no significant difference between the sexes ($p > 0.05$). This study provided the base line data on the prevalence and distribution of Schistosoma infection in cattle within the three Local Government Areas (Ahuada, Eleme and Ikwerre) in Rivers State, Nigeria.

Keywords: Prevalence, schistosomiasis, infection, cattle, Rivers State, Nigeria.

Introduction

Schistosomiasis has been implicated as the second highest socioeconomic impact of any parasitic disease (after malaria), and more than 220 million people are currently estimated to be infected, predominantly in low-income and middle-income countries [1]. Schistosomiasis, a neglected tropical disease targeted for elimination by the World Health Organization [2] is a significant public health problem, with Nigeria [3] ranking first among African countries with the highest disease burden. In Nigeria, schistosomiasis is known to be endemic, with various species of Schistosoma causing infections [4]. However, there is a lack of comprehensive data on the prevalence and distribution of schistosomiasis specifically in cattle, such as cattle, goats, and sheep, in Rivers State. Understanding the prevalence and distribution of schistosomiasis in cattle is crucial for several reasons. Firstly, it provides valuable information on the burden of the disease

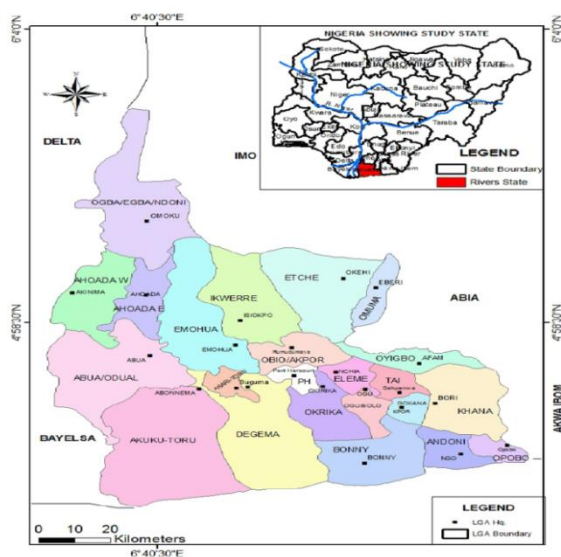
in this specific population, helping to identify areas of high transmission and potential hotspots. Secondly, it allows for appropriate control and preventive measures to be implemented to reduce the economic losses associated with the disease and improve animal health. Despite the importance of assessing the prevalence and distribution of schistosomiasis in cattle, there is a lack of recent and comprehensive studies in Rivers State. Existing data may not reflect the current situation and may not cover a wide enough geographical area within the state. Therefore, a research study focusing on the prevalence and distribution of schistosomiasis in cattle in Rivers State becomes necessary to address this gap in knowledge.

Materials and methods

Area of Study

The research was carried out in Rivers state. The study area was selected due to its location along the riverine area. Rivers

State is one of the six states that make up the South-South geopolitical zone of Nigeria southern Nigeria, comprising the Niger River delta on the Gulf of Guinea (Mckenna, 2023). It is bounded to the North by Imo, Abia, and Anambra States, to the East by Akwa Ibom State, to the South by the Atlantic Ocean, and to the West by Bayelsa and Delta States. The state capital is Port Harcourt and it made up of 23 local government area. Rivers State lies at latitude 4°45' North and longitude 6°50' East. It covers an area of 11,077 square kilometres. It has a population of 5,198,716 (2006 census) 7,303,924 (2016 forecast) and a population density of 469. The state accounts for 3.7% of Nigeria's total population.



Geographical Map of Study Area.

Source: <https://odml.org/discover-nigeria/states/rivers-state>

Study Population

The study animals was cattle population to be randomly selected in the Abattoir located in Ikwerre, Ahuada-East and Eleme representing the 3 Senatorial Districts in Rivers state which specifically comprising of cattle such as cattle. The study animals were both sexes (male and female) and two age categories as described as (young and adult years). 60 cattle were randomly selected from each study location making a total of 180 cattle population for the study.

Study Design

A cross-sectional study design was used to assess disease prevalence of bovine schistosomiasis in Rivers state. The study would involve selecting a representative sample of cattle farms or communities Igwuruta, Igbo-Ehuada and Akpajo of Ikwerre, Ahuada-East and Eleme Local Government Areas in Rivers State, using Stratified Random sampling techniques to ensure that the selected sample is a true representation of the cattle population in the region. Data was collected through interviews with cattle owners or farmers to gather information on animal health, management practices, and potential risk factors. Additionally, sample such as blood was collected for Polymerase Chain Reaction Molecular analysis to identify the presence of schistosomiasis

infection. Statistical methods such as confidence intervals was used to estimate the prevalence.

The study design also incorporated spatial analysis by mapping the prevalence and distribution of schistosomiasis in cattle across different locations within Rivers State. This helped to identify areas with higher or lower rates of infection and potentially investigate environmental or geographical factors influencing the distribution. Additionally, statistical analysis was performed to identify potential risk factors associated with schistosomiasis prevalence in cattle. This involved analyzing the relationship between disease prevalence and variables such as animal species, management practices, proximity to water bodies, or climatic factors.

Ethical Consideration

Ethical Clearance for the study was obtained from the Ethical Review Committee of the Department of Public Health, Federal University of Technology Owerri. Advocacy visit to the local government Area would be made prior to the commencement of the study. Approval to conduct the study in the Abattoirs was obtained from the Rivers State Primary Healthcare Management Board to Abattoir in-charge and was communicated to the Cattle Owners before sample collection. Fully informed consent would be obtained from the Cattle Owners.

Sample Size and Sampling Methods

Sample Size

The sample size was determined based on statistical considerations to ensure that the findings are representative and provide reliable estimates of 60 cattle were sampled from each senatorial zone given a total of 180 cattle in Rivers State.

To calculate the sample size, statistical formulas specific to estimating prevalence (such as the formula for estimating proportions) was used, taking into account the expected prevalence and desired precision.

Sampling Methods

Stratified random sampling, was used to ensure the representativeness of the sample. Randomly selecting cattle Abattoir or communities from three different LGAs Ikwerre, Ahuada-East and Eleme of Rivers State would minimize bias and increase the likelihood of generalizing the findings to the entire cattle population.

Instruments for Data Collection

Field surveys were conducted to collect primary data on the prevalence and distribution of schistosomiasis among cattle in Rivers state. Physically, examination of the cattle for signs of schistosomiasis infection, including clinical symptoms and external lesions. Field observations about cattle management practices, environmental conditions, and potential sources of water contamination was done. Data was recorded on the number of animals examined; a questionnaire was administered to cattle owners or farmers to provide valuable information on various factors related to schistosomiasis prevalence and distribution including animal demographics,

management practices, and history of infection, clinical signs, and preventive measures.

Validity of Instruments

The questionnaire covered all relevant aspects related to the study, including animal demographics, management practices, infection history, clinical signs, and preventive measures. The questions or tests were comprehensive and accurately measured and reasonable.

Reliability of Instruments

The field survey conduct was compared with other similar empirical studies carried out was used to access that the instrument produces consistent results over time. With clear and precise instructions to participants to access consistent interpretation and implementation of the instruments in order to reduces the likelihood of errors and enhances reliability.

Results and discussion

Prevalence of schistosomiasis infection in cattle in three LGA in Rivers State using Master Mix

The prevalence of schistosomiasis infection in cattle from Abbatoirs within the three Local Government Areas (Ahuada, Eleme and Ikwerre) in Rivers State is shown in Table 1. The results showed that there a significant difference ($p < 0.05$) in prevalence of schistosomiasis across the LGAs and among the species studied. The results revealed that out of 180 cattle examined, 61 tested positive. In all the species examined, White Fulani was observed to be the species with highest prevalence of schistosomiasis in Ahuada (14.75%), Eleme (711.48%) and Ikwerre (11.48%) while the least species with schistosomiasis prevalence was recorded from the control site. However, across the LGAs under study, results obtained showed that the highest prevalence of schistosomiasis was recorded from Ahuada with a value of 40.98% followed by Eleme (32.79%) while the least prevalence was recorded from control with percentage of 3.28%.

Table 1: Prevalence of schistosomiasis infection in cattle in three LGA in Rivers State using Master Mix

LGA	Abattoir/species	Number tested	Number infected (%)	P- Value	95% C.I (Lower – Upper limit)
Ahuada	Kuri	15	8(13.11)	0.01	0.372 – 4.949
	Sokoto gudali	15	8(13.11)		
	White Fulani	15	9(14.75)		
Sub-total	3	45	25 (40.98)		
Eleme	Kuri	15	7(11.48)	0.01	0.211 – 3.825
	Sokoto gudali	15	6(9.84)		
	White Fulani	15	7(11.48)		
Sub-total	3	45	20(32.79)		
Ikwerre	Kuri	15	4(6.56)	0.01	0.287 – 3.080
	Sokoto gudali	15	3 (4.92)		
	White Fulani	15	7(11.48)		
Sub-total	3	45	14(22.95)		
Control	Kuri	15	0(0.00)	0.01	0.131 – 1.472
	Sokoto gudali	15	1(1.64)		
	White Fulani	15	1(1.64)		
Sub-total	3	45	2(3.28)		
Total species	12	180	61(100)		

Prevalence of schistosomiasis infection in male and female cattle in three LGA in Rivers Sta

The prevalence of schistosomiasis infection in male and female cattle from the study areas (Ahuada, Eleme, Ikwerre and control) is presented in Table 2. Among the entire population of 180, 61 animals tested positive for schistosomiasis. The sex specific prevalence showed that females had the highest infection rate of 68.85% while males had 31.45% prevalence, although statistical analysis indicated no significant difference between the sexes ($p > 0.05$).

Table 2: Prevalence of schistosomiasis infection in male and female cattle in three LGA in Rivers State

Sex	Number tested	Number infected (%)	P- Value	95% C.I (Lower – Upper limit)
Male	77	19 (31.45)	0.01	0.254 – 3.841

Female	103	42 (68.85)
Total	180	61 (100)

Prevalence of schistosomiasis infection in cattle in three LGA in Rivers State in relation to age

Age related prevalence Prevalence of schistosomiasis infection in cattle in three LGA in Rivers State in relation to age is shown in Table 3. The results showed that species within the age of more than 1 year recorded the highest prevalence (78.69%) while the least was recorded in cattle species less than 1 year (21.31%). Statistical analysis revealed a significant difference ($p < 0.05$) between the age and prevalence of schistosomiasis infection in the study areas.

Table 3: Prevalence of schistosomiasis infection in cattle in three LGA in Rivers State based on age

Age (years)	Number tested	Number infected (%)	P- Value	95% C.I (Lower – Upper limit)
< 1 (young)	59	13 (21.31)	0.01	0.383 – 4.172
> 1 (Adult)	121	48 (78.69)		
Total	180	61 (100)		

Prevalence of schistosomiasis infection in cattle breeds in three LGA in Rivers State

Prevalence of schistosomiasis infection in cattle breeds in three LGA in Rivers State in relation to breeds is presented in Table 4. The results revealed that White Fulani species had the highest prevalence of schistosomiasis infection (54.10%) while the least prevalence of schistosomiasis infection was recorded in *Kuri* species (21.31%).

Table 4: Prevalence of schistosomiasis infection in cattle breeds in three LGA in Rivers State

Breeds	Number tested	Number infected (%)	P- Value	95% C.I (Lower – Upper limit)
White Fulani	81	33 (54.10)	0.01	0.297 – 4.423
Sokoto gudali	62	15 (24.59)		
Kuri	37	13 (21.31)		
Total	180	61 (100)		

Discussion

Schistosomiasis is a neglected tropical disease of global medical and veterinary importance. As efforts to eliminate schistosomiasis as a public health problem and interrupt transmission gather momentum, the potential zoonotic risk posed by cattle *Schistosoma* species via viable hybridization in sub-Saharan Africa have been largely overlooked. For this reason, the prevalence of schistosomiasis in cattle within the three Local Government Areas [5] in Rivers State was investigated in this study. The results showed that there was a significant difference ($p < 0.05$) in prevalence of schistosomiasis across the LGAs and among the species studied. The results revealed that out of 180 cattle examined, 61 tested positive. In all the species examined, White Fulani was observed to be the species with highest prevalence of schistosomiasis in Ahuada (14.75%), Eleme (11.48%) and Ikwerre (11.48%) while the least species with schistosomiasis prevalence was recorded from the control site. Findings in this study is comparable with the report of [6], who reported 13.7% in Fogera, Northwestern Ethiopia. This prevalence is relatively higher than a previous study by [7], who reported 23.28% in Fogera Woreda, Northwestern Ethiopia; [8], who reported 22.2% in the South Achefer district. [9] in Local

Government Areas of Borno State, Nigeria; and [10] in Federal Capital Territory, Nigeria.

The low prevalence of schistosomiasis reported in this study may be due to sample size, seasonal variation, humidity, management practices, and climate change. However, this result is higher than the report of [11] who reported 34.3% in Fogera Woreda, Northwest Ethiopia; and [12] who reported 39.6% in Debre Tabor. The differences may be due to the agroecological characteristics of the areas, such as the presence of water bodies (swampy or marshy), irrigation practices, and animal husbandry practices.

There was a statistically significant ($p = 0.01$) difference between male and female cattle and the prevalence of schistosomiasis, where a higher prevalence was reported in females (68.85%) than males (31.45%). On the other hand, the significant difference observed in the present study, between the sexes was in conformity to the report of Rim (2009) in Sokoto and [12] in Ibadan, who found both sexes to be equally at risk. The observed non-difference between the sexes in the present study could be due to involvement of females in some water contact activities.

The current study agrees with the study conducted by [13] and found a higher prevalence in females (33.1%) than males (27.1%). A study by Umar et al. (2016) reported higher

prevalence in female (37.7%) cattle than males (31.4%) which aligns with the findings in this study. However, this study disagrees with the previous study of [14] in and around Bahir Dar, who reported 29.61% in males and 19.54% in females and [15] in Dembia district 30.7% in males and 23.30% in females. In the present study areas, female cattle commonly were grazed in *Schistosoma*-contaminated pastures and marsh areas, whereas male cattle spent most of their time on farmland plowing activities, which could reduce the risk of exposure to *Schistosoma*-infected habitats.

The results showed that species within the age of more than 1 year recorded the highest prevalence (78.69%) while the least was recorded in cattle species less than 1 year (21.31%). Statistical analysis revealed a significant difference ($p < 0.05$) between the age and prevalence of schistosomiasis infection in the study areas. Out of the 180 fecal samples from cattle aged >1 year (adult) examined, 48 (78.69) were positive, while only 13 (21.31%) out of 59 fecal samples from cattle aged <1 year (young) were positive. This is in close agreement with [16], who stated a significant effect of age on *Schistosoma bovis* infection in animals. In contrast to the present finding, [17] reported a prevalence rate of 17.6% in cattle below 2 years of age, 30.10% in cattle between 2 and 5 years of age, and 27.80% above 5 years of age in Dembia district. In this study, depending on age, cattle greater than 1 years old had the highest prevalence. Animals that graze in swamps all day long and managed extensively have more access to contact with intermediate hosts and increase the risk of *Schistosoma* infection. The prevalence was lower due to mitigated risk in management practices.

The prevalence of schistosomiasis was significantly ($p = 0.01$) higher in white Fulani breeds (54.10%) than in other local breed cattle examined. From this study, the prevalence by breed was higher in Fulani breeds than other breeds. There was no statistical significant association among the breeds and the occurrence of the infection ($P > 0.05$). Similarly, [18] reported a higher prevalence of schistosomiasis in Fulani cattle breeds (8.3%) than in Kuri local breed cattle (7.2%). In contrast, [19] reported a higher prevalence of *Schistosoma* infection in local breed cattle (24.5%) than in crossbred cattle (18.6%). In the current study area, crossbred cows such as local Fulani were kept for milk purposes but were extensively and semi-intensively managed for a long period. The management techniques used increased the risk of infection. The higher prevalence in Fulani breed might be due to exposure of more of the Fulani breed to marshy cercariae invaded grazing areas.

According to this study, most respondents had no opinion of schistosomiasis. Respondents from Ahuada, majority (41.77%) had no opinion; about 35.44% said no, 12.66% were doubtful of schistosomiasis in their cattle while only 10% claimed to be aware of schistosomiasis in cattle. Same response was recorded in Eleme where 40.26% of the participants had no opinion; 35.06% said no while 15.58% were doubtful of the existence of schistosomiasis in cattle. In Ikwerre, 27.16% of the participants say no to the awareness; another 16.04% were doubtful while 43.21% claimed

awareness of schistosomiasis in their cattle. This could be attributed to the fact that the study area at the lakeside is characterized by high schistosomiasis prevalence and morbidity and therefore, that community is likely to pay less attention to the disease. This probably also explains why this study's findings contrast with the nationwide survey that Exum and colleagues conducted, which revealed that only about two-thirds (61.8%) of respondents had heard of schistosomiasis. Findings from the current study also differ from the one conducted along Lake Victoria on the Ugandan side, which showed limited knowledge of transmission routes [20].

Recommendations

1. In addition, there is a great need for health education on the signs, symptoms, and risk factors of schistosomiasis to strengthen the impact of control strategies and reduce infection.
2. Ultimately, it is expected that following a community-based public health education campaign, knowledge of common symptoms and transmission may lead to improved health-seeking behavior and early treatment.
3. Continued health education is critical in raising awareness in the population about schistosomiasis, and encouraging symptomatic individuals to seek care and treatment with praziquantel, the price of which has fallen enormously.
4. Emphasis on treatment in the early stages of infection (perhaps not always perceived as severe) can help to prevent later morbidity.

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