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OCCURRENCE OF HAEMOPARASITES IN CATTLE FROM THREE SELECTED ABATTOIRS IN PORT HARCOURT METROPOLIS, RIVERS STATE, NIGERIA.

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ABSTRACT

Haemoparasites infestation in cattle cause significant economic loss due to morbidity and mortality and pose a major threat to food security, particularly in sub-Saharan Africa. This research aimed at determining the prevalence of haemoparasites in cattle from three selected abattoirs in Port Harcourt metropolis, Rivers State, Nigeria. Blood samples were collected via jugular vein ligation into an Ethylenediamine tetraacetic acid (EDTA) bottle and examined for haemoparasites using standard laboratory techniques, after consent was obtained from cattle owners. Blood parasites detected were identified using keys. An overall prevalence of 21.31% was recorded; with 13 out of 61 samples examined being infected. Thirteen (13) male cattle were examined, out of which 4(30.77%) were infected; while, 9(18.75%) out of the 48 female cattle examined were infected. Although the males recorded a higher prevalence of infection than the females, the difference in prevalence between the sexes was not significant (P>0.05). Two tick-borne haemoparasites, namely Babesia sp. and Theileria sp. were recorded. Babesia sp. was found in 6(9.84%) while 11(18.03%) of Theileria were recorded (P<0.05). Abattoir-based prevalence indicated that of the 27 cattle examined in Aluu abattoir, 4(14.81%) were infected. Out of the 15 cattle examined in Choba abattoir, 3(20.00%) were infected; while of the 19 samples examined in Rumuosi abattoir, 6(31.58%) were infected. There was no significant association between the prevalence of infection and abattoirs sampled (P>0.05). High prevalence of haemoparasites indicates a potential risk of zoonosis among the population. Advanced studies on the disease's epidemiology are needed for effective investigation and control strategies.

Keywords: Babesia, cattle, haemoparasites, prevalence, theileria.

INTRODUCTION

Ruminants, which include sheep, buffalo, cattle and goats, are essential to global food security and nutrition, as well as to the livelihoods of farmers and other people involved in the agrifood chain. Ruminants provide more than half of the protein produced by the livestock industry for most households (Gboeloh and Araka, 2022), primarily in the form of milk and meat. In addition to offering a wide variety of economic important products like meat, milk, skins, wool, heat, and energy, ruminants are crucial to the animal-powered mechanization of farms (Gerber *et al*., 2013). About 17% of calories and one-third of the world's protein intake are derived from animals, primarily ruminants (FAO, 2018). As of 2019, India, Latin America, and Africa are

home to the greatest concentrations of cattle (including buffalos, cows, bulls, and veal), and the number of animals is expected to increase in Latin America (by 5% to 413 million head), Africa (by 13% to 362 million head), and India (by 3% to 315 million head) in the 10 years leading up to 2029 (Gerber *et al*., 2013).

Haemoparasitism remains a big threats to food and livestock production and a continuous source of veterinary and public health concern, especially in developing countries (Umoren and Adegbola, 2021) , due to the clear cause of mortality, reduced working efficiency and production (Akande *et al*., 2010) and higher costs associated with control efforts (Makala *et al*., 2003). Haemoparasitic diseases, caused by diverse species of haemoparasites including *Aegyptianella* species, *Anaplasma* species, *Babesia* species, *Ehrlichia* species, *Haemobartonella* species, *Haemoproteus* species, *Hepatozoon* species, *Leishmania* species, *Leucocytozoon* species, *Theileria* species, and *Trypanosoma* species, are economically significant vector-borne illnesses in ruminants (Salih *et al*., 2015) characterized by the presence of single or multiple developmental stages of the parasite in the bloodstream of animals (Zahid *et al*., 2005; Ola-Fadunsin *et al*., 2018). Haemoparasites and their vectors have a worldwide distribution, and are especially important in Sub-Saharan Africa (Okorafor and Nzeako, 2014). The prevalence of haemoparasites of cattle in Nigeria is generally considered to be very high due to the prevalence of their arthropod vectors (Kamani *et al.*, 2010; Okorafor and Nzeako, 2010). Most of the cattle in Nigeria are reared under the Fulani pastoral husbandry system which exposes them to these vectors during extensive pasture grazing in the forests (Obadiah and Shekaro, 2012). Moreover, poor nutrition and management are significant risk factors for acquiring this and other debilitating diseases (Paul *et al.*, 2016).

The main haemoparasitic illnesses that affect cattle include babesiosis, anaplasmosis, theileriosis, cowdriosis, and trypanosomiasis and are regarded as some of the main barriers to their health and efficiency. Approximately 80% of the world's cattle population is affected by them, having a significant negative economic impact on the livestock (Kasozi *et al*., 2014; Hamsho *et al*., 2015). By impacting the animals' blood and/or lymphatic systems, they can result in anorexia, fever, diarrhea, anaemia, weight loss, lymph node swelling, jaundice, dyspnoea, neurological abnormalities, and even death (Simuunza, 2009), thereby reducing the protein and economic value of the affected animals (Gboeloh and Araka, 2022). Additional symptoms include immunosuppression with decreased host response to subsequent infections, hepatomegaly and splenomegaly (WHO 2010). The presentation of haemoparasites' infestation can be subclinical or chronic on the affected animals, leading to reduction in productivity and eventual death of the affected animals (Akande *et al*., 2010), taking over 3 million animals lives each year, resulting in enormous financial losses and unimaginable impacts for livestock owners. Some of these parasites are zoonotic, therefore, their presence is of huge public health threat to humans and livestock productivity. Hence, this study aimed to determine the prevalence of haemoparasites in cattle from three different abattoirs in three different markets in Port Harcourt metropolis, Rivers State.

MATERIALS AND METHOD

Study Area

The study was conducted in Port Harcourt metropolis. Port Harcourt is the state capital of Rivers State, located in the Niger Delta region of Nigeria. It lies between latitudes 4^{o}450 N and 4^{o}550 N and longitudes 6^{o}550 E and 7^{o}050 E. Port Harcourt metropolis is made up of Obio/Akpor, Port Harcourt City, Ikwerre, and Oyigbo Local Government Areas. Agricultural produce and games are transported from nearby villages and settlements to the city. The temperature and vegetation of Rivers State are similar to those of a tropical rainforest, and the state is home to a wide variety of wild animals,

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including elephants, chimpanzees, wild pigs, antelopes, crocodiles, and monkeys. With a population of over 1.5 million, Port Harcourt is the capital and largest metropolis of Rivers state. It has an area of about 1811.6 km^2 (Kio-Lawson and Dekor, 2014). Being the capital of the state and home to one of the biggest seaports in the Niger Delta, it serves as the hub for government, business, and industrial activity (Weli and Efe, 2015). The states of Abia and Imo border the city on the north; Akwa-Ibom state borders it on the east; Bayelsa state borders it on the west; and the Atlantic Ocean borders it on the south (Weli and Efe, 2015).

Sample collection

Five millilitres (5ml) of blood was extracted from 61 cows individually via jugular vein ligation and placed in Ethylenediamine tetra acetic acid (EDTA) bottles between September and November 2023, from three (3) abattoirs in 3 different markets; Aluu, Choba and Rumuosi markets, after consent was obtained from cattle owners. The abattoirs in the markets were visited at different days. Each EDTA bottle was labelled with sex of cattle, the market and the date of collection of sample. Within an hour of each collection, the samples were transported to the Department of Animal and Environmental Biology laboratory at the University of Port Harcourt, without any preservative added, for immediate parasitological examinations.

Sample preparation

Using a spreader (another clean glass slide), a drop of blood placed on one end of a grease-free, and spotless glass slide was made into a thin film. In order to create the film with a feathered edge, the spreader was allowed to touch the blood at a 45° angle and then spread softly but firmly down the horizontal slide's surface. This caused the blood to be dragged behind the spreader. Following air drying, the thin film was fixed in methanol for five minutes and stained for approximately thirty minutes using newly made 10% Giemsa stain at pH 7.2. The stained film was then left to dry after being rinsed with buffered water. The thin film slide was examined under X100 magnification (oil immersion) of an Olympus microscope (manufactured in Germany) and blood parasites were detected and identified according to keys and descriptions as given by Soulsby (1982) and Taylor *et al*. (2016).

Data analysis

Statistical analysis was carried out using Statistical Package for Social Science (SPSS) version 22. Analysis using descriptive statistics in percentages (%) and tabulations were done therein. Chi-square analysis was done to show association between numerical variables. Values of $P < 0.05$ were considered as significant.

RESULTS

Overall prevalence of haemoparasites recorded in the study.

This study revealed that 13 out of 61 cattle examined for haemoparasites from three abattoirs in Port Harcourt metropolis were infected with an overall prevalence of 21.31% (Table 1).

Prevalence of haemoparasites based on sex of cattle examined

Thirteen (13) male cattle were examined, out of which 4(30.77%) were infected; while 9 (18.75%) out of the 48 female cattle examined were infected. Although the males recorded a higher prevalence of infection than the females, the difference in prevalence between the animal sexes was not significant (χ^2=0.95, df=1, P=0.33) (Table 1).

Table 1: Prevalence of haemoparasites based on sex of cattle examined.

Sex	No. examined	No. infected (%)	p	χ^2
Males	13	4 (30.77)		
Females	48	9 (18.75)		
Total	61	13 (21.31)	0.33	0.95

Haemoparasites species recorded in the study

Two tick-borne haemoparasites, namely *Babesia sp.* and *Theileria sp.* were recorded in the samples examined. Out of the 61 cattle examined, *Babesia sp.* was found in 6(9.84%), while 11(18.03%) of *Theileria* were recorded. From the result, *Theileria sp.* was more prevalent and the difference in occurrence of these parasites was significant (χ^2=4.24, df=1, P=0.04) as shown in Table 2.

Table 2: Haemoparasites species recorded in the study.

Species	No. cattle examined	No. infected (%)	χ^2	p
Babesia sp.	61	6(9.84)		
Theileria sp.	61	11(18.03)	4.24	0.04

Prevalence of haemoparasites based on abattoir sampled.

Abattoir-based prevalence of haemoparasites indicated 4(14.81%) of the 27 cattle examined in Aluu-market abattoir were infected. Out of the 15 cattle examined in Choba-market abattoir, 3(20.00%) were infected; while 6(31.58%) out of the 19 samples examined in Rumuosi-market abattoir were infected. Rumuosi-market abattoir showed highest prevalence of haemoparasites than the other abattoirs. Statistically, there was no association between the prevalence of haemoparasites infection in the cattle and abattoir sampled (χ^2=2.81, df=2, P=0.25) as shown in Table 3.

Table 3: Prevalence of haemoparasites based on abattoirs sampled.

Abattoir sampled	No. of cattle examined	No. infected (%)	p	χ^2
Aluu market	27	4(14.81)		
Choba market	15	3(20.00)		
Rumuosi market	19	6(31.58)		
Total	61	13(21.31)	0.25	2.81

DISCUSSION

The overall prevalence of haemoparasites in cattle studied was found to be 21.31%. This prevalence is higher than the 6.67%, 8.4%, 10.8%, 12.02% and 16.7% recorded by Okorafor and Nzeako (2014); Muhammad *et al.* (2023)**;** Paul *et al.* (2016); Alim *et al.* (2011) and Umoreh and Adegbola (2021) respectively, but lower than 25.7%, 43.18%, 51%, 62.5% and 64% recorded by Kamanin *et al*. (2010); Ananda *et al*. (2009); Akande *et al*. (2010); Gboeloh and Araka (2022) and Okeke *et al.* (2020) respectively. Varied sampling method, sample size and diagnostic techniques may be the cause of the variation in prevalence observed in these investigations. Nonetheless, different geoclimatic conditions, animal ages, breeds, and vector exposure may all have an impact on the fluctuating incidence of haemoparasitic infestation in the research regions (Nasir *et al.*, 2000; Muhanguzi *et al*., 2010).

The study found that there was a higher prevalence of haemoparasites in male cattle compared to female cattle, while there was no significant difference in prevalence (p>0.05) between the animal sexes. This, however, contradicts the findings of Kamani *et al.* (2010), Bitrus *et al.* (2021), Gboeloh and Araka (2022) and Muhammad *et al.* (2023), who reported higher prevalence in female animals than in male animals. Meanwhile, Bitrus *et al.* (2021) and Muhammad *et al.* (2023) concurred that the difference was not statistically significant. The difference in parasites' sex-prevalence could be due to varied number of males and females sampled for examination, since there were more female cattle present at the time of study. It could also be ascribed to the breeders' disregard for the management of male animals, particularly if

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the main goal is milk production, thereby focusing only on the health of the female animals.

Two tick-borne, haemoprotozoan parasites, *Babesia sp* and *Theileria sp,* were identified in the current study, with *Theileria* species recording highest occurrence (18%). These haemoparasites had occurred at varied percentages, either alone or alongside other parasites, in various studies **(**Akande *et al*., 2010; Kamani *et al*., 2010; Okeke *et al.*, 2020; Muhammad *et al.,* 2023), and are the causal agents of Theileriosis and Babesiosis which are serious obstacles to the health and productivity of cattle (Rajput *et al.,* 2005). Findings from Gboeloh and Araka (2022) and Muhammad *et al.* (2023) recorded four genera of haemoparasites, with *Anaplasma* species occurring most. Results from Kamani *et al*., (2010), Okeke *et al.* (2020) and Bitrus *et al.* (2021) also differ from this current study as *Babesia* species was recorded to be more prevalent in their studies. The occurrence rate and intensity of infestation by these haemoparasites are often influenced by factors like poor nutrition, immunosuppression and management (Paul *et al.,* 2016). Other factors like presence of vector / intermediate hosts, physical factors and hygiene condition are also necessary. *Babesia* and *Theileria* species found in the study can be linked to environmental suitability promoting proliferation and survival of the tick vector responsible for the transmission of these parasites (Adejinmi *et al.*, 2004). According to Sitotaw *et al.* (2014), vector-borne haemoparasitic diseases result from the complex relationships that exist between the environment, vertebrate hosts, vector, and causative organisms lead to vector-borne hemoparasitic illnesses. between the environment, vertebrate hosts, vector, and causative organisms. Olorunshola *et al*., (2020) opined that a tick vector that feeds on blood can simultaneously transmit multiple species of hemoparasites.

Varied abattoir-specific prevalence was recorded, with Rumuosi-market abattoir having the highest prevalence of haemoparasites; though there was no association between the prevalence of haemoparasites infection in the cattle and abattoirs sampled. In like manner, Gboeloh and Araka (2022) reported no significance difference (P>0.05) in the infection rate among the abattoirs, although there were numerical differences in the value obtained from difference abattoirs. The physiological states of the cattle, variations in the sample sizes of animals from the abattoirs, and the hygienic conditions of the abattoirs could all be contributing factors to these disparities in prevalence from various abattoirs.

CONCLUSION

The study has revealed relatively high haemoparasites prevalence in the study area indicating that the people are at risk of zoonosis. The occurrence of two tick-borne haemoparasites, *Babesia sp* and *Theileria sp*, were recorded. Although the male cattle recorded a higher prevalence of infection than the female cattle, the difference in prevalence between the animal sexes was not significant.

Recommendations

Implementing an integrated approach combining chemotherapy and vector control should be considered. Awareness of livestock owners and the general populace on the public health concern of these haemoparasitic diseases should be prioritised. The animal's health worker should be trained on diagnosis and treatment of these diseases.

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