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Babesiosis in Cattle slaughtered at Zango Abattoir Zaria, Kaduna State, Nigeria: A Short Communication

Wada, Y[1*]., Tijjani, M[1]., Abdulmalik, Y[2].and Wada, M[3].
[1]Department of Zoology, Ahmadu Bello University, Zaria Nigeria.
[2] Department of Microbiology, Umar Musa Yar'adua University, Katsina, Nigeria
[3]Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria Nigeria
[*]Corresponding Author E-Mail: wadayusuf34@gmail.com

Abstract
Babesiosis constitutes a major public health threat to cattle rearing in most countries, including Nigeria. This study was designed to determine the prevalence of Babesia sp. in cattle slaughtered at Zango abattoir. Blood samples were collected from 200 Cattle at slaughter in bottles containing EDTA and transported to the laboratory. A thin blood smear was made, air-dried, fixed in absolute methanol for 5 minutes and stained with 10% Giemsa. Slides were examined for Babesia spp. under oil immersion (x100) objective lens. An overall prevalence of 6.5% (13/200) was observed. Prevalence in males and females were 4.35% (3/69) and 7.63% (10/131) respectively and the differences in their prevalence rates were not significant (x^2=0.803, p value=0.370). Females had a higher chance of getting infected (OR=1.818, CI=0.483-6.838) than male (OR=0.550, CI=0.146-2.068). The prevalence in White Fulani 6.63% (12/181) was higher than that of Sokoto Gudali 5.26% (1/19) although not significant (x^2=0.053, P-Value=0.818). White Fulani had a higher chance of getting infected (OR=1.278, CI=0.157-10.407) than Sokoto Gudali (OR=0.782, CI=0.096-6.371). The prevalence in cattle at > 8.5 years was 4.35% (3/69) as compared to 7.63 % (10/131) of cattle within 5-8.5 years. There was also no association between the age of cattle and the prevalence of Babesia (x^2=0.803, P value=0.370). Other haemoparasites observed were Anaplasma spp 16.5% (33/200), Theileriaspp11.0% (22/200) and Trypanosoma sp0.5% (1/200). This study has detected a low prevalence of Babesia in the study area. There is therefore the need for large scale studies and also studies using ELISA and PCR.
***Keywords**: Abattoir, Babesia, Cattle, Nigeria, thin blood smear*

INTRODUCTION

Babesia is a protozoan parasite of the blood that causes a haemolytic disease known as Babesiosis, an emerging zoonotic disease in all continents and very debilitating. Parasites of the genus *Babesia* infect a wide variety of domestic and wild mammals as well as man (Krause, 2019). *Babesia*parasites are found in the blood and are transmitted to the host by *Ixodidae* ticks through blood-sucking (silver *et al.,* 2010). *Babesia bovis* and *B. bigemina* are common species that affect cattle (Yusuf, 2017). *Rhipicephalus (Boophilus) microplus*is the principal vector of *B. bigemina* and *B. bovis* and is widespread in the tropics and subtropics (OIE, 2018). Species of *Babesia* varies in their infectivity, virulence and pathogenicity for people. Various factors (e.g., increased interactions between people and the environment, increased immunosuppression, changes in landscape and climate, and shifts in host and vector species abundance and community structures) have led to an increase in tick-borne diseases in people, including babesiosis (Yabsley and Shock, 2012).

Haemoparasites, most importantly *Babesia* species constitute a major public health threat to cattle rearing in most countries, including Nigeria (Samreen *et al.,* 2012). The disease caused by *Babesia* spp imposes a serious burden on the healthcare infrastructure of both the cattle and their handlers (Okorafor *et al.*, 2014). Babesiosis like other tick-borne diseases is generally characterised by fever, anaemia, debility and emaciation (Penzhorn 2015). Babesiosis, especially in cattle has great economic importance, because unlike many other parasitic diseases, it affects adults more severely than young cattle, leading to direct losses through death and the restriction of movement of animals by quarantine laws (Onoja *et al.*, 2013).

Studies have shown a different prevalence of Bovine Babesiosis in Nigeria. A recent study by Onojo *et al.* (2013) reported a prevalence rate of 9.5% in Zaria. Another study conducted in Adamawa by Sam-wobo *et al.* (2016) showed a prevalence rate of 8.5% in cattle. However, frequent research on the prevalence of parasites and other risk factors are important for effective control measures.

There are concerns that the Nigerian Government will close its land borders with neighbouring countries. Nigerians will now have to eat what they produce including meat and other products. While this move will be a thing of joy for a lot of people especially farmers, it is not completely free of problems. The issue of "quality control" will therefore come to mind. How safe is the meat we will be consuming from our abattoirs? Do we have a proper and rigorous protocol for checking the health status of these animals before slaughter? All this and more were the questions on our mind plus the zoonotic nature of *Babesia* that had led us to design this study that will detect *Babesia* among cattle slaughtered at the Zango abattoir in Zaria, Kaduna State, Nigeria.

MATERIALS AND METHODS

Study area

The study was conducted in Zango abattoir located in Samaru Zaria, Kaduna state Nigeria. The abattoir lies between latitude 11°08'13.7"N and longitude 07°40'03"E and its owned by the Kaduna state government. Animals slaughtered daily at the abattoir are cattle of different breeds. This abattoir supplies meat to a very large percentage of the population of Samaru, Zango and neighbouring towns. The sample size of this study was calculated using a prevalence of 9.5% from a previous study in Zaria by Onoja *et al* (2013).

Sample size

$N = \frac{z^2pq}{d^2}$ (Thrusfield, 2007)

$N = \frac{(1.96)^2(0.095)(0.905)}{(0.05)^2} = 132$ samples (minimum)

Where:

n = the desired sample size (when N is greater than 10,000)

z = the standard normal deviation set at 1.86, which corresponds to the level of the 95% confidence level

P= 9.5% (Onoja *et al.*, 2013)

q = 1- P = 0.905

d = the degree of accuracy desired usually set at 0.05.

A sample size of 132 was calculated, however, a total of 200 blood samples were therefore collected.

Study Design

This study was carried out at Zango abattoir Zaria Kaduna State, Nigeria. A total of 200 cattle were sampled using systematic random sampling (blood samples were collected from every 4th animal brought in for slaughter). Cattle slaughtered at the abattoir were mostly Bunaji (White Fulani) and a few Sokoto Gudali and Red Bororo breeds. Information concerning the sex, age and breed of the animals were recorded. The cattle were grouped into two age group of 5-8.5 years and >8.5 years solely based on the examination of the teeth visually.

Collection of samples

A total of 200 blood samples were collected from the jugular vein of the animals at the point of slaughter in a bottle containing ethylene diamine tetraacetic acid (EDTA). Each bottle was properly labelled with the sex and breed of the cattle immediately after collection and transported in a cold box to protozoology laboratory of the Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria for parasite identification and analysis.

Parasitological Analysis

A drop of blood was collected using micropipette from the sample bottles for each cattle and placed on a clean and grease-free labelled microscope slide. A Thin blood smear was made, air-dried, fixed in absolute methanol for 5 minutes and stained with 10% Giemsa accordingly. Slides were examined for *Babesia* spp. under oil immersion X100 objective lens. In *Babesia* infections, infected red blood cells (RBCs) are normal in size.Typically, rings are seen, and they may be vacuolated, pleomorphic or pyriform. Extracellular or tetrad-forms may also be present. Unlike *Plasmodium* spp., *Babesia* organisms lack pigment. Rings of *Babesia* sp. have delicate cytoplasm and are often pleomorphic. Infected RBCs are not enlarged; multiple infections of RBCs can be common. Rings are usually vacuolated and do not produce pigment. Occasional classic tetrad-forms (Maltese Cross) or extracellular rings can be present (www.cdc.gov/dpdx/resources/pdf/benchAids/Babesia).

Statistical analysis

Software package for social science (SPSS) version 20 was used to analyse data obtained. The statistical association of the risk factors (sex and breed) and the prevalence of *Babesia* were determined using chi-square and odds ratio. Values of $P<0.05$ was considered significant. The prevalence (p) in percentage (%) was calculated using the formula P= d/n where d is the number of positive samples analysed at that point in time and n is the total number of cattle sampled at that point in time.

RESULTS AND DISCUSSION

Of the 200 cattle examined, only 13 (6.5%) were infected with *Babesia* spp. This study showed a low prevalence of *Babesia* in the study area as shown in table 1. Whether babesiosis is a reportable disease in Nigeria or not, the mere fact that it is zoonotic calls for

concern especially for the management of this abattoir.

The detection of other haemoparasites in this study is also worrisome as this says a lot about cattle inspection in this abattoir. This result is in accordance with a similar study conducted in the same study area where a prevalence rate of 9.5% was recorded by Onoja *et al.,* (2013). However, the prevalence reported in this research is very low compared to that of Qadeer *et al*. (2015) where a prevalence rate of 48.2% was recorded in Adamawa State, Nigeria. The prevalence recorded in this study is higher than that recorded by Ola-fadunsin (2017) where the prevalence rate is 1.5%. The differences in geographical location, presence and spread of competent vector could have played a significant role in these differences. The low prevalence observed in the study could also result from a state of active immunity being acquired by the animals, resulting in endemic stability in which only low level of parasites was present in the blood or possibly adequate food and veterinary care had been administered to the animals.

Table 1: Overall prevalence of *Babesia* in Cattle slaughtered at Zango Abattoir, Zaria Kaduna State.

Animal	Number Examined	Number Infected	Prevalence (%)
Cattle	200	13	6.50

The prevalence of *Babesia* infection based on sex shows a slightly higher infection rate in females 7.63% (10/131) than in males 4.34% (3/69) as depicted in table 2. Even though the difference was not statistically significant (x^2=0.803, P-Value=0.370). Further, in this study females, cattle had a higher chance of getting infected (OR=1.818) than males (OR=0.550). Although these odds are not significant (females CI=0.483-6.838, males CI=0.146-2.068). This finding is in agreement with the report of Kocan *et al*. (2010) where they got a higher prevalence of *Babesia* in female 11.2% (184/1639) compared to male cattle 6.96%. Moreover, the higher prevalence of tick-borne diseases in female animals could be because female animals are kept longer for breeding and milk production purposes (Kamani *et al.,* 2010). On other hand higher prevalence in female animals might be due to hormonal disturbances due to its use in milk production and breeding system which lowers the immune system of the animal.

The study observed exposure of both sexes of cattle to *Babesia* infection this could be because both sexes of cattle graze together in a ranch or farmland. This practice is likely to facilitate the transfer of ticks within the herds and eventually, facilitate the distribution of ticks among cattle leading to exposure in both sexes (Abdullah *et al.,* 2015). Thus, both females and males are susceptible to infection with *Babesia* in areas where the parasite vectors are endemic.

Table 2: Sex-based Prevalence of *Babesia* in Cattle slaughtered at Zango Abattoir, Zaria Kaduna State.

Sex	Number Examined	Number Infected	Prevalence (%)	Chi square	P value	Odds ratio	CI
Male	69	3	4.34	0.803	0.370	0.550	0.146-2.068
Female	131	10	7.63			1.818	0.483-6.838
Total	200	13					

Table 3 describe the breed-based prevalence recorded in this study, a higher prevalence was observed in white Fulani (6.5%) than in Sokoto Gudali (5.26%), although this difference was statistically not significant (x^2=0.053, P-value=0.818). This agreed with the work of Akande *et al*. (2010) which reported a higher prevalence in white Fulani (8.0%) than in Sokoto Gudali (6.7%). Furthermore, White Fulani had a higher chance (OR=1.278) of getting infected than Sokoto Gudali (0.782). These odds are however not significant (White Fulani CI=0.157-10.407; Sokoto Gudali CI=0.096-6.371). The differences in parasitaemia observed between the breed may be associated with differences in sample numbers.

Table 3: Breed-based Prevalence of *Babesia*in Cattle slaughtered at Zango Abattoir, Zaria Kaduna State.

Breed	Number Examined	Number Infected	Prevalence (%)	Chi square	P value	Odds ratio	CI
White Fulani	181	12	6.63	0.053	0.818	1.278	0.157-10.407
Sokoto Gudali	19	1	5.26			0.782	0.096-6.371
Total	200	13					

In this study, only adult cattle were sampled (above 5 years) and this could have concealed the effect of age on the infection as calves were not sampled. A low prevalence was observed in older cattle as compared to those within the age range of 5 to 8.5 years as shown in table 4. The host immune response could be responsible for the drop in the prevalence rate in older cattle and the number sampled could also be a factor. There was no significant association between age and *Babesia* (p = 0.370). However, older cattle (>8.5 years) have almost twice the risk (OR = 1.818) of being infected with *Babesia* than those relatively younger (5-8.5 years) (OR = 0.550).

Table 4: Age-based prevalence of *Babesia* in Cattle slaughtered at Zango Abattoir, Zaria Kaduna State.

Age group	Number Examined	Number Infected	Prevalence (%)	Chi square	P value	Odds ratio	CI
5-8.5 Years	131	10	7.63	0.803	0.370	0.550	0.146-2.068
> 8.5 Years	69	3	4.35			1.818	0.483-6.838
Total	200	13					

Table 5 shows the prevalence of other haemoparasites in cattle slaughtered at the Zango abattoir, Zaria The presence of other haemoparasites found in the study confirmed the availability of other disease vectors in the study area.

Table 5: Prevalence of other Haemoparasites in Cattle slaughtered at the Zango abattoir, Zaria

Parasites	Number Infected	Prevalence
*Anaplasma*spp	33	16.5
*Theileria*spp	22	11
*Trypanosoma*sp	1	0.5

CONCLUSION AND FUTURE THOUGHT

This study has revealed that *Babesia* occurs in the study area with a low prevalence. Higher prevalence was recorded in female than in male cattle. Also, the higher prevalence was observed in White Fulani than in Sokoto Gudali breed. Nevertheless, proper vector control methods using acaricides and treatment with drugs in some of the source ranches would be necessary to avoid vertical transmission between infected cattle and susceptible ones. Meat buyers from this abattoir should be advised on the importance of adequate boiling of meat before consumption seeing that the disease is zoonotic. Abattoirs workers should also be advised on the proper use of personal protective gears when working in the abattoir. There is a need for large scale studies to conclusively determine the true prevalence of *Babesia* in the study area.

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