Research Article

Prevalence and Risk Factors of Babesia Infection in Cattle Slaughtered in Nigerian Abattoirs

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Abstract | Babesiosis is a tick-borne haemoparasitic disease caused by protozoa of the genus *Babesia*, posing significant health and economic burdens on both livestock and their handlers. This study investigated the prevalence of *Babesia* infections among cattle slaughtered in abattoirs within Odeda Local Government Area, Abeokuta, Ogun State, Nigeria. Blood samples were collected in EDTA tubes from the jugular vein of 26 cattle at the point of slaughter and analysed. Giemsa-stained blood smears were examined microscopically under ×100 oil immersion. Results indicated that the cattle sampled were sourced from two major abattoirs: Oduweran (61.5%) and Lafenwa (38.5%). Of these, 57.7% were males and 42.3% females. Age distribution showed 42.3% were under 3 years, 30.8% were 4 years old, and 26.9% over 5 years. Predominant breeds included White Fulani (46.2%), Bororo (38.5%), and Sokoto Gudali (15.4%), mainly originating from North Eastern (50%), North Western (26.9%), and North Central (23.1%) Nigeria. Clinical assessments indicated tick infestation in 34.6% and visible skin infections in 23.1%, although 80.8% appeared healthy. The overall prevalence of *Babesia* infection was 30.8%. Infection was more common in males (33.3%) than females (27.3%) (p=0.741). Cattle under 3 years had the highest prevalence (45.5%) and were five times more likely to be infected (OR=5.000; 95% CI: 0.442–56.623). Higher infection rates were also observed in Bororo cattle (40.0%) and those from North Central Nigeria (50.0%), though differences were not significant. These findings underscore age, breed, and geographic origin as potential risk factors for *Babesia* infection in slaughter cattle.

Keywords | Prevalence, Babesia, Cattle, Slaughtered, Abattoirs, Ogun State

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INTRODUCTION

Bovine babesiosis is a tick-borne haemoparasitic disease caused by intraerythrocytic protozoa of the genus Babesia, primarily *Babesia bovis* and *Babesia bigemina*. These parasites infect a wide range of domestic and wild animals and, occasionally, humans (Sam-Wobo *et al.*, 2016). In cattle, babesiosis is of major economic importance, particularly in tropical and subtropical regions, where it severely impacts livestock productivity due to erythrocyte destruction, leading to anaemia, jaundice, anorexia, weight loss, infertility, and sometimes death (Joseph et al., 2025; Wama et al., 2021; Akande *et al.*, 2010; Soulsby, 1982).

The Nigerian livestock sector is conservatively valued at USD 6 billion (Akande *et al.*, 2010; Anon, 2006), with cattle production contributing up to 40% of the agricultural GDP (McIntyre *et al.*, 1992). Cattle serve multiple functions

including provision of protein through meat and milk, generation of income, farm labour, and supply of manure for crop farming (Ikhatua and Asaka, 2000). Culturally, cattle also represent a symbol of prestige among Fulani and Shuwa-Arab pastoralists (Salih *et al.*, 2015).

About 90% of cattle in Nigeria are raised under the extensive pastoral husbandry system, particularly by Fulani herders (Lasisi *et al.*, 2002). This system increases exposure to tick vectors that transmit haemoparasites such as Babesia, Anaplasma, Trypanosoma, and Theileria (Samdi *et al.*, 2010). Several studies in Nigeria and globally have reported the prevalence of these haemoparasites in cattle populations (Qadeer *et al.*, 2015; Okorafor and Nzeako, 2014; Ademola and Onyiche, 2013; Enwezor *et al.*, 2012).

Babesia infections contribute to major economic losses by reducing productivity, increasing veterinary costs, and causing cattle mortality in the tropics (Soulsby, 1982). The parasites effect on red blood cells often results in clinical manifestations such as anaemia, jaundice, and reproductive failure (Akande *et al.*, 2010; Justin, 2008; Jonsson, 2006; Kaufman *et al.*, 2006; Mtshali *et al.*, 2004).

Beef, being an essential source of high-quality protein and micronutrients such as zinc, selenium, phosphorus, iron, and B-complex vitamins, remains a critical part of human nutrition. Red meat is also the richest dietary source of carnitine and creatine (Sam-Wobo *et al.*, 2016). The presence of haemoparasitic infections in cattle destined for human consumption raises important veterinary and public health concerns, particularly in endemic regions such as Nigeria.

This study aims to assess the prevalence of Babesia infections in cattle slaughtered at abattoirs in Odeda Local Government Area of Ogun State, Nigeria, thereby providing data that can inform control strategies and safe meat production.

MATERIALS AND METHODS

Study design and animal selection

This cross-sectional study was conducted at selected abattoirs within Odeda Local Government Area, Abeokuta, Ogun State. A total of 26 cattle were conveniently sampled at slaughter. Data including age, sex, breed, and body condition scores were documented. Gender determination was based on the appearance of external genitalia, and breed identification was based on morphological characteristics as described by Yunusa et al. (2013).

Sample collection and handling

Approximately 5 mL of blood was aseptically drawn from the jugular vein of each animal into EDTA bottles at the point of slaughter. Samples were properly labelled and transported in ice-packed containers to the laboratory for analysis. Samples were subsequently stored at 4°C until microscopy was performed.

Microscopy and parasite identification

Thin blood smears were prepared by placing a drop of blood on a clean glass slide and spreading it at a 45° angle using a cover slip to create a feathered edge. The smears were air-dried, fixed in methanol for 5 minutes, stained with 1:10 Giemsa-buffer solution for 30–40 minutes, rinsed with distilled water, and air-dried again. Slides were examined under light microscopy at ×100 magnification (oil immersion) for detection and morphological identification of Babesia species (Mosqueda et al., 2012).

Statistical analysis

All data collected were analyzed using IBM SPSS version 20.0. Descriptive statistics (frequencies and percentages) were used to summarize the demographic characteristics and Babesia prevalence. Associations between infection status and independent variables (age, sex, breed, body condition) were tested using Pearson's Chi-square test. Confidence intervals were set at 95%, and statistical significance was defined as $p \leq 0.05$.

RESULTS

Socio-demographic characterization of cattle

A total of 26 cattle were examined in abattoirs located within Odeda Local Government Area, Ogun State. The distribution by sex showed that males constituted 57.7% (n=15) while females accounted for 42.3% (n=11) of the sampled cattle. In terms of age, 42.3% (n=11) were less than 3 years old, 30.8% (n=8) were 4 years old, and 26.9% (n=7) were older than 5 years. The majority of cattle were sourced from Oduweran abattoir (61.5%), with the remaining 38.5% from Lafenwa.

Regarding health indicators, 23.1% of the cattle exhibited visible skin infections, while 34.6% showed evidence of tick infestations. Most cattle (80.8%) were considered healthy at the time of slaughter based on gross examination. Cattle were predominantly sourced from North Eastern Nigeria (50%), followed by North Western Nigeria (26.9%), and North Central Nigeria (23.1%). The major breeds identified were White Fulani (46.2%), Bororo (38.5%), and Sokoto Gudali (15.4%) (Table 1).

Prevalence of babesia infections by sex and age

The overall prevalence of Babesia infection among the slaughtered cattle was 30.8% (8/26). Prevalence was slightly higher among male cattle (33.3%) compared to females

Table 1: Socio-demographical characterisation of cattle slaughtered in the study area.

Variable	Category	Frequency	Percent
Sex of Animal	Male	15	57.7%
	Female	11	42.3%
	Total	26	100%
Ages of Animal	<3 years	11	42.3%
	4 years	8	30.8%
	>5 years	7	26.9%
	Total	26	100%
Study Location	Oduweran	16	61.5%
	Lafenwa	10	38.5%
	Total	26	100%
Skin Infection	Yes	6	23.1%
	No	20	76.9%
	Total	26	100%
Ticks Infestations	Yes	9	34.6%
	No	17	65.4%
	Total	26	100%
Healthy and Unhealthy Cows	Healthy	21	80.8%
	Unhealthy	5	19.2%
	Total	26	100%
State of Cattle Purchased	North Eastern Nigeria	13	50%
	North Western Nigeria	7	26.9%
	North Central Nigeria	6	23.1%
	Total	26	100%
Types of Cattle Breeds	White Fulani	12	46.2%
	Bororo	10	38.5%
	Sokoto Gudali	4	15.4%
	Total	26	100%

(27.3%), although the difference was not statistically significant (p=0.741; OR=1.333; 95% CI: 0.242–7.348). Age-wise, cattle aged less than 3 years had the highest prevalence of infection (45.5%), followed by those aged 4 years (25.0%) and greater than 5 years (14.3%). However, these differences were also not statistically significant (p=0.333). Nevertheless, cattle under 3 years of age were five times more likely to be infected (OR=5.000; 95% CI: 0.442–56.623) compared to cattle older than 5 years, suggesting a possible age-related susceptibility (Table 2).

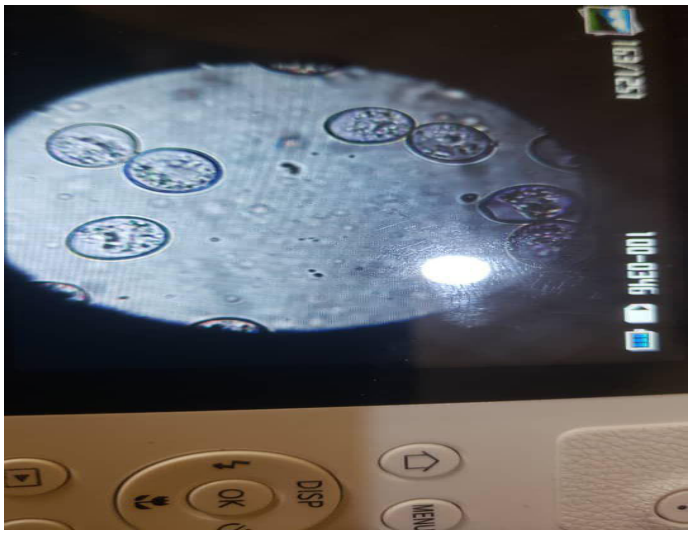

Figure 1: Presence of *Babesia piroplasms* within the erythrocytes (1000×).

Prevalence of babesia infections by region of origin

Cattle purchased from North Central Nigeria exhibited the highest prevalence of Babesia infection (50.0%), compared to cattle sourced from North Eastern (23.1%) and North Western Nigeria (28.6%). Despite this observed variation, no significant association was found between region of origin and Babesia infection (p=0.492) (Table 3).

Prevalence of babesia infections by breed

Infection rates among breeds showed that breed of Bororo cattle had a slightly higher prevalence (40.0%) compared to the breed of White Fulani (33.3%), while no infections were detected among the Sokoto Gudali breed. The calculated odds ratios indicated higher odds of infection in Bororo (OR=15.824) and White Fulani (OR=11.866) breeds relative to Sokoto Gudali. However, these differences were not statistically significant (p=0.33) (Table 4).

Table 2: Prevalence of *Babesia* infections among sex and ages of cattle slaughtered in the study areas.

Variable	Category	N. E	Negative	Positive	OR	CI	X^2	P-V
Sex	Male	15(100.00)	10(66.70)	5(33.30)	1.333	0.242-7.348	0.109	0.741
	Female	11(100.00)	8(72.70)	3(27.30)	0.750	0.136-4.133		
	Total	26(100.00)	18(69.20)	8(30.80)				
Ages of animal	<3 years	11(100.00)	6(54.50)	5(45.50)	5.000	0.442-56.623	2.131	0.333
	4 years	8(100.00)	6(75.00)	2(25.00)	2.000	0.141-28.416		
	>5 years	7(100.00)	6(85.70)	1(14.30)	Ref	Ref		
	Total	26(100.00)	18(69.20)	8(30.80)				

Number Examine (N. E), Old ratio (OR), Confidence Interval (CI), Chi Squire (X^2), Significance (P. V).

Table 3: Prevalence of *Babesia* infections among regions of cattle purchased in Nigeria.

Variable	Regions of Purchased	N. E	Negative	Positive	X2	p-v
Region of Cattle Purchased	N.E N	13(100.00)	10(76.90)	3(23.10)	1.419a	0.492
	N. W. N	7(100.00)	5(71.40)	2 (28.60)		
	N. C. N	6(100.00)	3(50.00)	3(50.00)		
	Total	26(100.00)	18(69.20)	8(30.80)		

North Eastern Nigeria (N. E. N), North Western Nigeria (N. W. N), North Central Nigeria (N. C. N), Number Examine (N. E), Chi Squire (X^2), Significance (P. V).

Table 4: Prevalence of *Babesia* infections among different breeds of cattle slaughtered in the study areas.

		N. E	Negative	Positive	OR	CI	X2	P-V
Types of Cattles Breeds	White Fulani	12(100.00)	8(66.70)	4(33.30)	11.866	20.751-67.883	2.215a	0.33
	Bororo	10(100.00)	6(60.00)	4(40.00)	15.824	19.248-21.512		
	Sokoto Gudali	4(100.00)	4(100.00)	0(0.00)	Ref	Ref		
	Total	26(100.00)	18(69.20)	8(30.80)				

Number Examine (N. E), Old ratio (OR), Confidence Interval (CI), Chi Squire (X^2), Significance (P. V).

DISCUSSION

This study assessed the prevalence of Babesia infections among cattle slaughtered in selected abattoirs in Odeda Local Government Area, Ogun State, Nigeria. The findings provide important insights into the epidemiology of bovine babesiosis in the study area, with implications for cattle health management and public health safety in the region.

Socio-demographic characteristics of the cattle

The cattle sampled were predominantly male (57.7%), and the majority were less than 4 years old, with 42.3% aged below 3 years and 30.8% aged 4 years. This age distribution reflects typical commercial slaughter patterns in Nigeria, where younger cattle are often preferred for meat production due to better carcass quality and tenderness (Alhaji and Babalobi, 2015).

Furthermore, most cattle were sourced from Oduweran (61.5%) and had a relatively healthy appearance (80.8%). However, 23.1% exhibited skin infections, and 34.6% were infested with ticks a critical finding given that ticks are the principal vectors of *Babesia* spp. (Bock *et al.*, 2004). Tick infestation among one-third of the cattle highlights an ongoing risk of tick-borne diseases in traded livestock, warranting improved tick control measures during transportation and at markets.

Cattle originated predominantly from the Northern parts of Nigeria, specifically North Eastern Nigeria (50%). This pattern is consistent with established cattle trade routes, where animals are transported from the northern pastoral regions to southern urban centers for slaughter.

The breeds represented included White Fulani (46.2%), Bororo (38.5%), and Sokoto Gudali (15.4%), which are among the most common indigenous breeds raised for meat and draught purposes across Nigeria (Mamman et al., 2018).

Prevalence of *Babesia* infection and association with sex

The overall prevalence of Babesia infection was found to be 30.8%, aligning with prevalence rates reported in other parts of Nigeria (ranging between 25%–40%) (Kamani et al., 2010). Although male cattle had a slightly higher prevalence (33.3%) compared to females (27.3%), the difference was not statistically significant (p=0.741). This suggests that sex may not be a major determinant of susceptibility to Babesia infection in cattle, corroborating findings by Okaiyeto et al. (2012), who also found no significant association between sex and babesiosis prevalence in Nigerian cattle populations.

Nevertheless, the slightly higher prevalence in males could relate to differences in stress levels, hormonal influence, or management practices that favor males for long-distance transport, thereby predisposing them to higher tick exposure.

Prevalence by age group

Age was observed to influence the prevalence of Babesia infections, with cattle younger than 3 years showing the highest infection rate (45.5%). Although the association was not statistically significant (p=0.333), younger cattle were found to be five times more likely to be infected (OR=5.000) compared to those older than 5 years.

This trend aligns with the concept of inverse age resistance, where younger animals, having immature immune systems,

are more susceptible to protozoal and tick-borne infections compared to older cattle who may have developed partial immunity through repeated exposure (Schnittger *et al*., 2012). It is worth noting that stress factors associated with transportation and adaptation to new environments could exacerbate susceptibility in younger cattle.

Prevalence by region of origin

Analysis of Babesia infection by cattle purchase region revealed the highest infection prevalence among cattle sourced from North Central Nigeria (50%), followed by North Western (28.6%) and North Eastern Nigeria (23.1%). However, no significant regional difference was detected (p=0.492).

The relatively higher infection rate from North Central cattle could be linked to regional differences in tick density and veterinary infrastructure. Previous studies have documented higher tick burdens in the savannah zones of North Central Nigeria due to favorable climatic conditions for tick survival (Adamu *et al*., 2015). Moreover, lower access to veterinary services in remote regions may also contribute to increased exposure and persistence of Babesia infections in these areas.

Prevalence by breed

Breed-specific analysis showed that the Bororo breed had the highest prevalence (40%), followed by White Fulani (33.3%), while no cases of Babesia infection were detected among Sokoto Gudali cattle. Although these differences were not statistically significant (p=0.33), the calculated odds ratios suggest a markedly higher susceptibility among Bororo and White Fulani breeds.

Genetic factors may partly explain breed-specific differences in Babesia infection rates. Some indigenous breeds, such as Sokoto Gudali, may possess greater natural resistance to tick infestation and tick-borne diseases due to long-term adaptation to endemic parasitic challenges (Chaudhry *et al*., 2010). The absence of infection in Sokoto Gudali cattle, although based on a small sample size, supports the need for further investigation into breed-based resistance mechanisms.

CONCLUSION

This study highlights a moderate prevalence of Babesia infections among slaughtered cattle in Odeda LGA, with trends suggesting higher susceptibility in younger cattle, Bororo, and White Fulani breeds. Although no statistically significant associations were found between sex, region of origin, or breed, the findings underscore the importance of addressing tick infestations, which are likely contributing to the spread of Babesia. The study highlights the need for continued surveillance, effective tick control measures, and improved veterinary practices to reduce the impact of Babesia on cattle health and the Nigerian livestock industry.

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NOVELTY STATEMENT

This study provides updated evidence on the prevalence and risk factors of Babesia infection in slaughtered cattle in Ogun State, Nigeria, a region with limited recent abattoir-based surveillance data. Unlike previous studies, it simultaneously evaluates demographic factors (age, sex, breed, and region of origin) in cattle at the point of slaughter, highlighting age-related susceptibility and breed-specific trends. The findings contribute valuable epidemiological data for improving tick-borne disease control strategies and ensuring safer meat production in Nigeria.

AUTHORS' CONTRIBUTION

JJ conceived the idea for this study, did the statistical analysis, and wrote the manuscript. All authors carried out the literature search and research. JJ wrote the research protocol. All authors read and approved the final manuscript.

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Ethical approval

This research was approved by the Research Ethics Committee (REC) of the Veterinary research unit, Federal University of Agriculture, Abeokuta (VRU/20/03/2025).

Generative AI and AI-assisted technology statement

The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were used in the design of the study, data collection, data analysis, or interpretation of results. AI tools were not used to generate scientific content. The manuscript was written, reviewed, and approved entirely by the authors.

Conflict of interest

The authors have declared no conflict of interest.

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