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PREVALENCE OF ANAPLASMOSIS IN SMALL RUMINANTS IN SOME SELECTED LIVESTOCK FARMS IN WUKARI METROPOLIS TARABA STATE NIGERIA

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ABSTRACT

Anaplasmosis is a tick-borne haemo-parasitic disease that causes huge economic loss in small ruminant flocks. The pathogen, *Anaplasma* Spp destroys red blood cells resulting in anaemia. The study was aimed at determining the prevalence of Anaplasmosis in Goats and Sheep in Wukari metropolis, Taraba State, Nigeria and to determine the prevalence based on age and sex. A total of 100 small ruminants (n =50 sheep, n =50 goats) were randomly sampled. 5mls of blood were collected via jugular vein puncture stained with Giemsa, and examined under a microscope for the pathogen. An overall prevalence of 21% was obtained; goats had a prevalence of 32% while sheep had 10%. Based on age, the prevalence was observed higher in adults (>2yrs) than the young ones (\leq 2yrs), while prevalence based on sex was higher in females than in the males. Prevalence among the female animals was observed higher in pregnant ones in both goats and sheep and therefore, special veterinary and management care should be given to tick infested pregnant animals because of their prone to the disease due to their suppressed immunity during pregnancy. Also, adult animals that have gone through many ticks' seasons with heavy tick infestation should also be given special veterinary and management attention. Veterinary care through prevention and control of ticks by chemical method either by fumigation of the animal farms with acaricides or regular treatment of tick infested animals with acaricides by direct application on the animal host is recommended. Also, management changes such as clearing bushes, keeping pastures mowed and avoiding tick habitats during the season of greatest tick activity may be helpful and therefore recommended. This will reduce the prevalence of the disease with the resultant effect of reduced economic loss.

Keywords: Anaplasmosis; Giemsa; Prevalence; Small ruminants; Taraba

INTRODUCTION

Small ruminant production in Nigeria contributes greatly to the socio-economic livelihood of many households. Goats and sheep are good sources of income generation and household consumption in Nigeria (Fakoya & Oloruntoba, 2009). Because of their high fertility, short generation interval, and adaptation even in harsh environments, many rural households consider sheep and goats production as a *lucrative* investment that provides them with cash income to purchase food during the period of economic hardship and crop failure (Sheferaw *et al.*, 2010). The economic, social, and nutritional benefits derived from sheep and goat production are limited due to increased mortality, reduced livestock production and productivity caused by many factors including diseases (Kagira & Kanyari, 2010). Diseases of various etiological origins are among the numerous factors responsible for poor production and productivity in livestock farming (Bekele *et al.* 2011). Vector-borne haemoparasitic diseases are economically important diseases in both tropical and subtropical parts of the world. Domestic ruminants in sub-saharan Africa may be infected with a wide variety of haemoparasites such as rickettsiae; like *Anaplasma* and *Ehrlichia* (Cowdria), and protozoan parasites such as *Theileria*, *Babesia* and *Trypanosome* (Bell-Sakyi *et al.*, 2004). These haemoparasites feed on the blood of host animals and

have generally been shown to destroy red blood cells resulting in anaemia (Githigia *et al.*, 2011). Farmers may be faced with the challenges of these haemoparasites on the health of their animals (Stuen, 2020). One of the haemoparasitic diseases affecting ruminants is anaplasmosis, a tick-borne disease (TBD) affecting majorly ruminants (Torina *et al.*, 2007). The disease is distributed worldwide (Chochlakis *et al.* 2009). In Nigeria, Igwenagu *et al.* (2018) reported a prevalence rate of 7% in goats in Maiduguri metropolis. Ruminants such as cattle, sheep, goats, deer, antelopes, giraffes and buffalo may be infected. *Anaplasma ovis* is pathogenic to small ruminants (goats and sheep) in tropical and subtropical regions of the world (Noaman, 2013). There have been findings of other *Anaplasma* infections in goats and sheep in which *A. marginale* has been proven capable of infecting goats and sheep (Stoltsz, 2004). The disease causes important economic loss, primarily due to the high morbidity and mortality in susceptible sheep and goats. The losses are measured through several factors including low weight gain, reduction in milk production, abortion, the cost of treatment and death. The level of *Anaplasma ovis* infection in small ruminants and its economic effects on livestock production is still poorly comprehended by many livestock farmers in Nigeria (Alayande *et al.*, 2016). Despite the wide spread of anaplasmosis, many livestock farmers have erroneously attributed the

economic loss caused by this pathogen to other haemoparasites such as *Babesia* and *Trypanosomes* due to its poor awareness. The intensity of tick infestation in goats and sheep kept in Wukari metropolis and the epidemiological link between ticks and the disease necessitates this study because the economic losses associated with the disease pose a great set-back to livestock farmers. This will minimize the economic effect associated with the disease on livestock production. It's against this background that this research was aimed broadly at finding the prevalence of anaplasmosis in small ruminants in some selected farms in Wukari metropolis. The results of the study provide data about the status of the disease in the study area. This data will be used to enlighten farmers on the need of vector (ticks) control to reduce the prevalence of the disease.

MATERIALS AND METHODS

Study Area

The study was conducted in some selected Livestock Farms such as Federal University Wukari Livestock Farm, Marmara Livestock Farm and Ajiduku Livestock Farm in Wukari metropolis, Taraba State. Wukari is situated in North Eastern Nigeria which lies within latitude 70.52'; 48°N to 70 .87' N and a longitude 90 .43' 38''E to 90 .77''E at an altitude of 189 meters above sea level (Taraba State Diary,2018).The town has an estimated population of 241,546 in 2006 population census (NPC,2006).Taraba State has a tropical climate, marked by two distinct seasons; a wet season which starts in March and ends in October, and a dry season which starts in November and ends in March or April (Taraba State Diary, 2018).The study areas were chosen because of the availability and accessibility to small ruminants.

Data Collection

Records on sex, age, specie, gravid status, and source of the animals were recorded. Only apparently pregnant animals were considered pregnant in this study. The small ruminants were grouped into two based on age: >2 years and ≤ 2 years old. The age was estimated through the dentition by looking at the appearance of the permanent incisor. On the other hand, the females among them were identified by the presence of prominent vulva in the perineal area and udder located in the inguinal area. The presence of the male organ (scrotal sac) located in the inguinal area was used in the identification of the males (rams and bucks)

Sample Collection

A cross sectional study was conducted from December, 2022 to February, 2023. Blood sampling was performed on animals with tick infestation. About

5ml of blood samples were collected via jugular vein puncture of hundred (100) randomly selected small ruminants of both sexes and different ages. Out of these one hundred (100), fifty (50) sheep and fifty (50) goats were sampled; twenty five (25%) per sex of each species. Thrusfield formula ($N = Z^2 P (1-P)/d^2$) was used in calculating the sample size of this study by considering 50% expected prevalence(P), 95% confidence interval (CI) ($Z = 1.96$) with 5% desired absolute precision (d)(Thrustfield,2007).Although, the required sample size obtained by this formula was relatively larger, but only 100 small ruminants were sampled for this investigation. All procedures involving the handling and collection of blood samples from the animals were approved by the Ethical Committee for Animal Research of Federal University Wukari Taraba State (Ref no:CAR/FUW/EL/057). The collected blood samples was gently transferred into ethylene diamine tetra acetic acid (EDTA) bottles and transported to the Microbiology and Parasitology Laboratory of College of the Agriculture, Science and Technology, Jalingo for laboratory analysis.

Laboratory Analysis

The thin blood film method was used in detecting the parasite. A drop of blood from each blood sample was placed on a clean grease-free glass slide to prepare a thin blood smear (Houwen, 2002).The samples were air dried, fixed in methanol for 2-3 minutes, stained in 10% Giemsa-stain, and rinsed in buffered water according to Jain (1986). The smear was examined on a microscope at ×100 magnifications (Oil immersion) at Microbiology and Parasitology Laboratory of College of Agriculture, Science and Technology, Jalingo. Blood smears were recorded positive for anaplasmosis if Anaplasma inclusion bodies were observed. Blood smears without anaplasma inclusion bodies were recorded as negative. *Anaplasma ovis* and *Anaplasma marginale* inclusion bodies were seen as small dots staining deep purple located at the margin of the erythrocyte (Stoltsz,2004)

Statistical Analysis

Positive samples were expressed using simple percentages and presented in tables. Association of sex, age, and specie with the prevalence of anaplasmosis in small ruminants was tested using Chi-square at a 0.05 level of significance using the Statistical Package for Social Sciences (SPSS) version 17. Results were considered significant at $P \leq 0.05$.

RESULTS

A total number of 100 blood samples were analyzed with an overall prevalence of 21%. Out of the 100 small ruminants examined, 21 were positive for anaplasmosis. The study revealed that 16 goats and 5 sheep were positive for anaplasmosis. Goats had the highest prevalence rate of 32% as compared to 10% in

sheep. Association between species and prevalence was statistically significant, $P < 0.05$ (Table 1). Out of the 16 positive goats, 5 were male and 11 were female while 2 male and 3 female were recorded in sheep. The male goats had a prevalence rate of 20% as compared to 44% in females. In sheep, the males had prevalence rate of 8% while the female had 12%. In both species, the prevalence rate was higher in female animals than the males. Out of the positive female animals, 11 (78.6%) were apparently pregnant. There was no association between sex and anaplasmosis, $P > 0.05$

(Table 2). Out of the 16 positive goats, 6 were young (≤ 2 years), and 10 were adults (> 2 years), while among the 5 positive sheep, 2 were young (≤ 2 years), and 3 were adults (> 2 years). The young goats had a prevalence rate of 28.6% as compared to 34.5% for adults. In the sheep, the young had a prevalence rate of 8.7% while the adult had a prevalence rate of 11.1%. In both species, the prevalence rate was higher in adult animals than in the young. The relationship between age and prevalence was statistically insignificant, $P > 0.05$ (Table 3).

Table 1: Prevalence of Anaplasmosis Based on Species

Species	Sex	No. examined	No. positive	% Prevalence	<i>P-value</i>
Goat	M	25	5	20	0.132.
	F	25	11	44	
Subtotal		50	16	32	
Sheep	M	25	2	8	<i>P-value</i>
	F	25	3	12	
Subtotal		50	5	10	0.2
Overall		100	21	21	

*Significance = $P \leq 0.05$

Table 2: Prevalence of Anaplasmosis in Small Ruminants Based on Sex

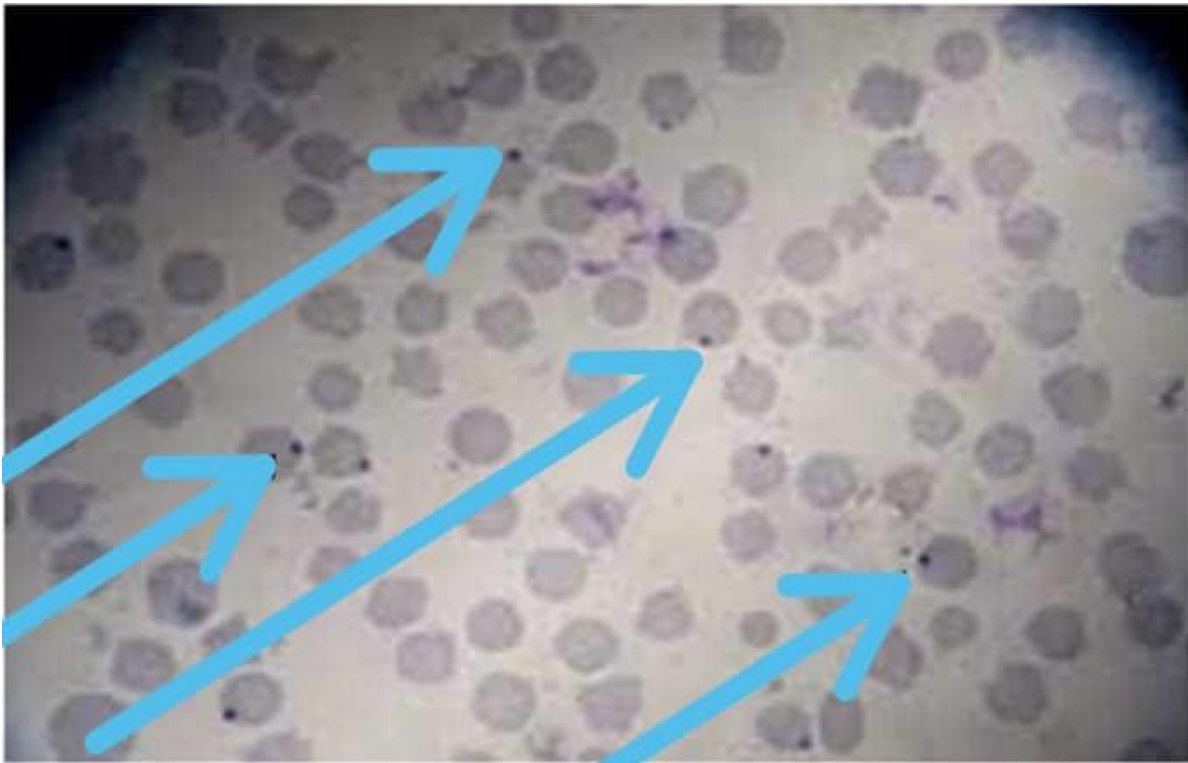
Species	No. examined	No. positive	%prevalence	<i>P-value</i>
Goats	50	16	32	0.02
Sheep	50	5	10	
Total	100	21	21	

*Significance = $P \leq 0.05$

Table 3: Prevalence of Anaplasmosis in Small Ruminants Based on Age

Species	Age(yrs)	No.examined	No. positive	%Prevalence	<i>P-value</i>
Goats	≤ 2 yrs	21	6	28.6	0.72
	>2 yrs	29	10	34.5	
Subtotal		50	16	32	
Sheep	≤ 2 yrs	23	2	8.7	<i>P-value</i>
	>2 yrs	27	3	11.1	
Subtotal		50	5	10	0.79
Overall		100	21	21	

*Significance = $P \leq 0.0$



Blood film showing *Anaplasma* inclusion bodies. The arrows are pointed at the inclusion bodies which are small dots staining deep purple located at the margin of the erythrocytes

DISCUSSION

The findings of this study show that Anaplasmosis is present in both goats and sheep kept in some farms in Wukari Metropolis, Taraba state, Nigeria. An overall prevalence of 21% was obtained in this study and is comparable with 21.7% (Sadaf *et al.*, 2020) and 23.3% (Nasreen *et al.*, 2016) reported in Pakistan and the 11.7% reported in China (De la Fuente *et al.*, 2006). The marked variations in prevalence across the different countries above could be attributed to either geographical locations, different diagnostic methods used, animal breeds with different susceptibility to pathogens, the season of sample collection, climatic differences, tick infestation density, number of samples involved, or non-regular use of acaricide by livestock farmers in some study areas. Previous studies in Nigeria by Adamu & Balarabe (2012), Opara *et al.* (2016), and Anyanwu *et al.* (2016) recorded varied prevalence across species of small ruminants examined. In this study, the prevalence was higher in goats (32%) than in sheep (10%) which agrees with the reports of Anyanwu *et al.* (2016) and Opara *et al.* (2016) who reported prevalence rates of (13.7% and 20.7%) and (9.4% and 15.3%) in sheep and goats respectively. In contrast, Adamu & Balarabe (2012) reported a higher prevalence in sheep (13%) than in goats (11%).

Sex-specific data revealed that female animals in both species had higher prevalence than male animals. This finding agrees with previous reports on sheep by other investigators such as Alayande *et al.* (2016), Ademola & Onyiche (2013) who reported higher prevalence in female sheep than in males. Similarly, in goats, Sadaf *et al.* (2020) reported a higher prevalence in females compared to males. However, Igwenagu *et al.* (2018) and Da Silva *et al.* (2018) observed in contrast, higher prevalence in male goats and sheep than in the female ones. The observed higher prevalence in the female animals in this study may be attributed to immune-suppression in advanced pregnancy because it was observed that 11 (78.6%) of the 14 positive female animals were grossly pregnant. Association between pregnancy and anaplasmosis was not ascertained. The prevalence based on age was higher in adults (> 2 years) than in the young (≤ 2 years) animals in both species which is in tandem with the findings of Mourad *et al.* (2015) and Arankumar (2014), but contradicts the report of Sadaf *et al.* (2020) who observed higher prevalence in young animals compared to adults. The higher prevalence in adult animals in this study may likely be because adult animals are more exposed to tick infestation as they have gone through more tick seasons than the young animals.

CONCLUSION AND RECOMMENDATIONS

This study revealed that prevalence among the female animals was observed higher in pregnant ones in both goats and sheep and therefore, special veterinary and management care should be given to tick infested pregnant animals because of their prone to the disease due to their suppressed immunity during pregnancy. Also, adult animals that have gone through many ticks' seasons with heavy tick infestation should also be given special veterinary and management attention. Veterinary care through prevention and control of ticks by chemical method either by fumigation of the animal farms with acaricides or regular treatment of tick infested animals with acaricides by direct application on the animal host is recommended. Also, management changes such as clearing bushes, keeping pastures mowed and avoiding tick habitats during the season of greatest tick activity may be helpful and therefore recommended.

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