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Original article

Prevalence of haemoparasites and haematological indices of slaugthered Cattle in Ijebu-Ode, Southwest Nigeria

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ABSTRACT

This study investigated the prevalence of haemoparasites and haematological indices of slaughtered cattle in Ijebu-Ode, Southwest Nigeria. A total of one hundred blood samples of slaughtered cattle were randomly collected. Thin smears of blood were prepared for haemoparasite detection, lymphocytes, neutrophils, monocytes and eosinophils. The packed cell volume was determined using microhaemocritic centrifugation method. The red blood cells, white blood and the platelets counts were obtained using the automated machine (Hema Vet® 950) .The overall prevalence was (12%), the two genera of haemoparasites encountered were *Theilera* sp and *Trypanosoma* sp, with prevalence of (6%) each. Haematological parameters in the blood of the screened cattle such as Packed cell volume (PCV), haemoglobin (Hb), red blood cells (RBC) and lymphocytes of infected cattle were significantly lower when compared to uninfected cattle ($p<0.05$) while higher counts of white blood cells, platelets and neutrophils were recorded in the infected cattle compared to uninfected cattle. Though the prevalence of haemoparasites was low, there is the need for frequent investigation in the study area, on haemoparasites and the associated haematological parameters in view of scarcity of information on it, to raise alert in case of incidence in order not to hamper the productivity of the conventional livestock industries and to make protein diet continuously available to the citizens.

Keywords: Haemoparasites, Haematology, Cattle, Prevalence, *Theileria* species *Trypanaosoma* species

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INTRODUCTION

Haemoparasites are organisms that live within their host bloodstream, and are found worldwide. They include bacteria, protozoa and flagellates (1). Their distribution is worldwide stretching from the polar region to the equator due to the global distribution of ticks and blood sucking flies which are their vectors (2). The importance of haemoparasites such as trypanosomes affecting livestock production in Sub-Saharan Africa cannot be underestimated as it infects, and had caused a loss running to billions of dollars with an unfair effects being experienced in the rural areas (3). Haemoparasites in cattle have led to a disease condition which has been of great economic importance (4), and of which its impacts on cattle productivity remains difficult to quantify (5).

Amongst the effects of haemoparasites are low productivity and profitability in livestocks (6). Others include increased mortalities, reduction in weight gain and low fertility (7). Haemoparasites have also caused losses in traction power, milk and meat production in cattle (8).The effect of tick and tick borne diseases on livestock had been estimated at 13.9 -18.7 billion USD per year (9). About 200 billion USD have been reported as indirect economic loss, while 20 billion USD has been estimated for direct losses due to zoonotic diseases on livestock production in the last decade (10). The importance of livestock production cannot be undervalued as it contributes both about 10% as livestock resources and 40% in terms of monetary value to the total livestock revenue of Nigeria (7).

The livestock sector is crucial, as it supports human growth and contributes 40% of the global agricultural output, poverty reduction and generation of employment, and more importantly the global food system (11). About 1.3 billion people depend on it worldwide for employment in a long chain market, as well support the livelihood of 600 million poor small holders farmers of developing world (12). Thus, deleterious effect on the production of livestock may be a serious threat to global food security.

The effects of haemoparasites on animals may not be noticeable by farmers when there are subclinical symptoms and chronic infections especially those not resulting in mortality (13). However, the disease manifestation can be confirmed through blood examination of apparently healthy animals.

Haemoparasites have been reported to cause destruction of red blood cells resulting in anaemia, jaundice, anorexia, weight loss and infertility (14). Losses due to haemoparasites can be direct, which has brought about acute illness, death, premature slaughter, and rejection of some parts through meat inspection, the indirect losses of parasitism include decreased growth rate, weight loss in young animals and late maturity of slaughter stock (15).

Haemoparasites have been reported to cause pre-immunity of infected animals in which the host becomes carriers of the tick and other host vectors which serve as sources of infection to other animals (5).

The high incidence of haemoparasites in the tropics could be the results of the favourable environmental conditions which promote the survival and proliferation of arthropods vector that are responsible for the transmission of the

parasites (16). This is supported by the investigations of Kamani *et al*., (17); Okorafor and Nzeako (2) that the prevalence of haemoparasites reported in cattle are due to greater number of arthropods vector which infected cattle that are reared under the pastoral husbandry system, of which 90% of cattle population in Nigeria are raised (7).

The free-range system where cattle grazed on pastures and forests often times have exposed the cattles to arthropodal vectors of haemoparasitic infection (17). Some of the haemoparasitic diseases are caused by *Theleria, Anaplasma, Babesia* and *Trypanosoma* species (18).The arthropods responsible for the transmission of *Theleria* and *Anaplasma* are ticks (19,20), while *Babesia* and *Trypanosoma* are transmitted by *Rhipicephalus microplus* and *Glossina* sp respectively.

An overall prevalence of five percent (5.0%) was reported among ruminants in Ibadan, while (6.38%) prevalence was found among cattle, consisting of *Trypanosoma* spp, *Anaplasma* spp and *Onchocerca* spp (21). A higher prevalence of (70%) was reported in slaughtered cows with the parasites consisting of *Babesia* sp (40%), *Anaplasma* sp (20%) and *Theilera* sp (10%) (20). The investigation of Paul *et al*., (22), had an overall prevalence of (10.8%) in Maiduguri and the haemoparasites recorded consisted of *Anaplasma* (5.8%), *Babesia* (4.2%) and *Trypanosoma* sp (0.8%). The packed cell volume (PCV) of blood may be a good indicator to measure haemoparasites presence in cattle as all infected cattle had low PCV values, which often times resulted to anaemic situation (20-22). A report of prevalence rate of (4.5%) was made by Pam *et al.*(23), which comprise *Trypanosoma congolense* (2.0%), *T.vivax* (1.5%) while the least was *T.brucei* (1.0%). The bulls (7.5%) were more infected than the females (3.2%), other haemoparasites recorded were *Babesia bijemina* (1.5%) and *B. bovis* (2.0%).

Haematological parameters are referred to those related to blood and blood forming organs (24). The use of haematological parameters in the monitoring and diagnosis of diseases have been emphasized (25) and equally the extent of blood damage is very critical in haematological studies (26), while its studies are of ecological and physiological importance in determining the relationship between the blood and the environment (27). Laboratory examinations of blood are vital investigation that help detect deviation from the normal status either in animals or humans (28) as this plays a vital role in the physiological, nutritional and pathological status of animals (29). The various haematological components of animals consisted red blood cells which are carriers of haemoglobin, and itself, is the iron-containing oxygen-transport metalloprotein in the red blood cells of all vertebrates (30) and plays critical roles in oxygenation and deoxygenation of the body (31). A Red blood cell count (RBC) is a blood test which indicates the number of red blood cells (RBC) that an animal possess. The RBC count is always part of the CBC (Complete Blood Count). White blood cells (leucocytes), and its differentials fight infections, by phagocytosis and production of antibodies (31). According to Falcone *et al*., (32), five different and diverse types of leucocytes exist, but they are all produced and derived from the bone marrow and form the immune system. The cells live for about 3 to 4 days in the average human and animal body. Leucocytes are found

throughout the body, including the blood and lymphatic system (33), while platelets have vital roles to play in clotting process of blood, as packed cell volume is equally involved in oxygen transport and nutrient absorption (34) which is also considered an integral part of an animal's complete blood count result. The aim of this investigation was to assess the prevalence of the haemoparasites and the haematological indices of cattle in Ijebu-ode.

MATERIALS AND METHODS

Study area

This study was conducted in Ijebu Ode. The town is located in the forest zone belt of the Country and lies between 6º49´47.94´´N Latitude and $3^0$54´59.24´´ E Longitude (35). It consists of a heterogeneous population of people, and it also has a major cattle market within the metropolis that receives and houses animals such as cattle, goats and sheep, from the northern part of the country. These animals could have passed through various vegetation belts. It is from this major cattle market that butchers and livestock traders purchase animals from and transport them to the main abattoir for slaughtering and which becomes available for the final consumers to purchase for their various needs. However, Ijebu Ode apparently remains unexplored in terms of the study of prevalence of haemoparasites as information on it remains scanty despite flocks of cattle that influxed into the town from the northern part of the country

Sample Collection

A total of 100 cattle slaughtered during the dry season were randomly sampled during the period of the study (February to April, 2021). An average of 8 samples was collected weekly for twelve weeks in the study area.

Blood sample collection

Blood sample was collected at the main abattoir in Ijebu Ode between the months of February to April 2021 covering 3 months duration. The samples were collected into a properly labeled Ethylene diamine tetra acetic acid (EDTA) bottles as soon as blood started coming out in trickles after slaughtering, these were immediately preserved with ice packs and transported to the Veterinary clinical Pathology Laboratory of University of Ibadan where the parasitic and other blood indices investigation were carried out.

Laboratory examination

Thin blood smears were prepared on clean glass slides, air dried, fixed in methyl alcohol for 3 to 5 minutes, stained with Giemsa for 30 to 45 minutes and rinsed in buffered distilled water (17). These slides were observed using oil immersion objective (x100 magnification) of a compound microscope. The identification of haemoparasites was done using morphological characteristics as described by (36). The packed cell volume (PCV) was determined using microhaematocrit centrifugation technique as described by Brar *et al.,*(37), as blood was introduced into microhaematocrit with one end of the capillary tube sealed with plasticine which was spun in a microhaematocrit centrifuge (Hawksley, England) at 3000g for 5 minutes. The red blood cells, white blood and the platelets counts were obtained using the automated machine (Hema Vet® 950) by Drew Scientific limited UK. While the lymphocytes, neutrophils, monocytes and eosinophils were obtained from the thin smear.

Data analysis

The data generated were collated and analyzed using Statistical package for Social Science (SPSS) version 20. T-test was used to determine the significant differences between the mean haematological parameters of infected and uninfected cattle, the mean value of blood indices were expressed as Mean ± standard error of twelve determinations at significance level of ($p<0.05$).

RESULTS

The result obtained showed that out of the 100 blood samples of slaughtered cattle examined, 12 (12.0%) were positive for two types of haemoparasites Figure 1.

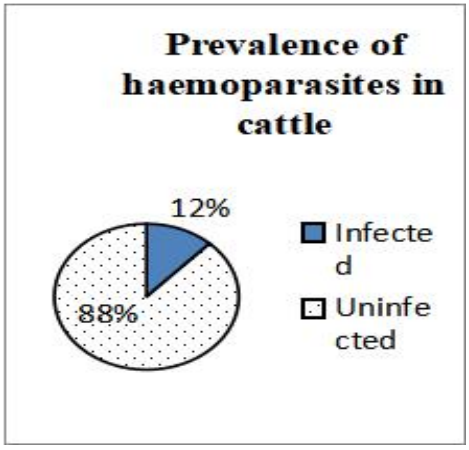

Figure 1: Prevalence of haemoparasitic diseases of Cattle in Ijebu-Ode

The two haemoparasites identified in this study were *Theileria* species and *Trypanaosoma* species (Table 2).

Table 2: Distribution of haemoparasites of Cattle in Ijebu-Ode

Animal species	Number examined	Haemoparasites		% infection
		Theilera sp	*Trypanosoma* sp	
Cattle	100	6 (6%)	6(6%)	12

Haematological indices of infected and uninfected cattle

Packed cell volume, haemoglobin, red blood cells and lymphocytes of infected cattle were lower ($p<0.05$) when compared to uninfected cattle (Table 3). Infected cattle had higher white blood cells and platelets ($p>0.05$) compared to uninfected cattle. However, eosinophils were significantly higher ($p<0.05$) in infected cattle than uninfected cattle.

Table 3: Haematological indices of infected and uninfected cattle

Haematological indices	Infected N = 12	Uninfected N = 88	p-value
PCV %	29.83±8.86	35.84±0.56	0.04
Hb g/dl	8.97±0.71	11.65±1.86	0.00
RBC $x10^6/mm^3$	4.20±0.46	5.25±0.16	0.01
WBC (x1000)	9891.67±1133.38	8246.59±454.94	0.21
Platelets	109166.67±13470.70	93000±1133.39	0.12
Lymphocytes	54.50±2.41	59.34±0.75	0.03
Neutrophils	39.33±2.82	36.86±0.89	0.35
Monocytes	2.83±0.58	1.80±0.14	0.11
Eosinophils	3.33±0.54	2.20±0.16	0.02

Values are expressed as mean ± standard error at p<0.05
PCV-Packed cell volume, Hb – Haemoglobin, RBC – Red Blood Cells
WBC – WhiteBloodCells

DISCUSSION

The outcome of this investigation revealed that haemoparasites prevalence in cattle was (12%) in the study area. This was lower than investigations of Adua and Idahor (38); Bitrus *et al.,* (39) who reported prevalences of (20.1%) and (12.25%) respectively. This may be due to the low presence of haemoparasitic vectors, most especially *Glossina* sp, in the study area which is responsible for trypanosomiasis transmission in cattle. For other parasite encountered in the investigation, its low prevalence could be due to application of acaricides at sighting of the ticks which are vectors for blood parasites by the farmers, so as to prevent transmission of the parasites among animal in captivity meant for slaughtering. The prevalence of haemoparasites in this study was higher than that of Ademola and Onyiche (21), where overall prevalence was 5% among ruminants and 6.3% in the same study among cattle. This finding showed that prevalence was significantly lower than the study of Egbe-Nwiyi *et al.* (40) with a prevalence of 13.5% among ruminants. The prevalence of haemoparasites in Ijebu – Ode is lower than that of Atsuwe *et al.* (41) in Makurdi where (54.8%) was recorded and Bakare *et al.,* (20) with overall prevalence of (70%) among cattle in Igbo-Ora. The findings of this study were lower compared to Talabi *et al.*(42) in a trans-boundary area of same state. The variation may be due to the cosmopolitan nature of the study area which may not favour proliferation of some haemoparasitic vectors as well as

different ecological variations between the two areas. Also, the trans-boundary area may be rich in vegetation allowing the breeding of arthropodal vectors of diseases, while a poor management practice of animal husbandry may favour high prevalence of haemoparasites in that area. The report of this study is at variance with Okorafor and Nzeakor (2) with a prevalence of (6.7%) for various haemoparasites species.

This study carried out in the dry season recorded prevalence of 12% which was very low as against 50.93% recorded by Atsuwe *et al.,* (43) also in the dry season. This may be attributed to different variations in the ecological conditions between the two regions and other environmental conditions of the animal ranches.

The red blood cell counts among the infected cattle were significantly lower compared to uninfected cattle. This suggests that the animals were anaemic which may be due to haemoparasitic infection which often destroys the red blood cells, most especially trypanosomes as reported by Ademola and Onyiche (21). Supporting Karori *et al.* (44), where destruction of red blood cells came up through trypanosomes generated reactive oxygen species by invading red blood cells membranes, inducing oxidation and subsequently haemolysis. Other factors that could account for low RBCs are hemorrhage due to topical injury, malnutrition, nutritional deficiencies of iron, copper, folate, Vitamin B12, Vitamin B6 and over-dehydration (45). Also, the reduction in RBC may be due to some drugs effects which are often associated with over dosage (46). The significant reduction in PCV and haemoglobin of the infected cattle is in consonance with the findings of Egbe-Nwiyi *et al.* (40) who reported anaemia as a reliable indicator of haemoparasitic infections. Furthermore, the increase in the eosinophils of the infected cattle is an indication of parasitic infection (Deka and Borah, 2008). The increase in white blood cell is a result of eosinophilis which is associated with parasitic infection (Ademola and Onyiche, 2013). Other causes for the increased WBC could be stress, inflammation, trauma and allergy (Etim *et al.,* 2013). However, the observed elevated lymphocytes are indication of infection or other inflammatory conditions.

Conclusion

Variations in the health status of farm animals may emanate from many factors, though haematological parameters are very important means for assessing the health conditions of animals. In this study, the two types of haemoparasites encountered were *Trypanosoma* sp and *Theilera* sp. Packed cell volume, haemoglobin, red blood cells and lymphocytes of infected cattle were lower when compared to uninfected cattle. The prevalence of haemoparasites in the study area was low, although there is paucity of information on the haemoparasites and its associated haematological parameters in the study area. Thus, call for continuous investigation to create awareness in order to forestall high incidence of haemoparasites.

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Conflict of interests

The authors declare that they have no competing interests regarding the publication of this article.

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