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Short Communication

Anemia among dogs within Maiduguri, Northeastern Nigeria; A Retrospective Approach

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ABSTRACT

Anemia causes morbidity and mortality in dogs and it is one of the signs of disease in this species. Anemia can occur because of decrease or defective production of red blood cells, acute or chronic blood loss or due to intravascular hemolysis, extravascular hemolysis or both. The records of dogs presented for routine checkup at the Veterinary Teaching Hospital, University of Maiduguri was evaluated from 2015-2021 for diagnosed cases of anemia based on routine hematology. A total of 73 dog files were sorted out from the records. Fifty-three (53) dogs were found to be anemic (72.6%), while 20 (27.4%) were non-anemic. Puppies tend to have the microcytic hypochromic anemia possibly due to iron deficiency, while adult dogs had the macrocytic normochromic anemia. Anemia was more prevalent in male dogs than female dogs, probably due to movement of the males during mating season, thereby exposing them to risks of ecto and endo parasitism. In conclusion anemia is prevalent amongst dogs in Maiduguri metropolis, hence there is a need for further studies to identify and characterize the possible etiologies.

Keywords: Anemia, non-anemic, dogs, Maiduguri, puppies.

INTRODUCTION

Anemia is one of the common causes of morbidity and mortality in dogs and one of the hallmarks of diseases (Anderson, 2023). Anemia can occur because of hemolysis, hemorrhage and decreased erythrocytes production (Stockham, 2008). Dyserythropoiesis also plays a role in anemia as defective erythrocyte are release into circulation. Anemia can also be caused by vectors such as hemoparasites with a reported prevalence of 14.16% in Maiduguri (Ezema, 2021), gastrointestinal ulcers, hematopoietic neoplasia, parasitism such *Diphylidium caninum* and trauma (Yadav, 2021). Hemorrhagic anemia is initially regenerative but tends to deviate to non -regenerative anemia with chronicity due to iron loss. Shock or sometimes death can occur as a result of acute blood loss especially when 30-40% of the blood is lost. Trauma, surgery, bleeding tumours, coagulopathies, gastric ulceration all contribute to acute blood loss (Marks, 2019). Chronic blood loss can occur as a result of chronic parasitism (fleas, ticks, lice and intestinal parasitism), and in older animals bleeding from tumors and gastrointestinal ulcers is very common (Marks, 2019). Blood borne pathogens are common in dogs and are usually associated with high morbidity and mortality in dogs. Pathogens such as *Babesia spp, Hemobarthonella spp, Hepatozoan spp* and *Ehrlichia spp* are responsible for causing emaciation, anemia and other clinical signs. (Happi, 2012, Kamani, 2013, Adamu, 2014). Most diagnosis of canine anemia in Maiduguri is based on hematology evaluation. There is lack of information on canine anemia in Maiduguri metropolis hence the need for this retrospective study.

MATERIALS AND METHODS

STUDY AREA

This study was conducted in the University of Maiduguri Veterinary Teaching Hospital (VTH), using dog records from the small animal unit of the VTH.

DATA COLLECTION

A total of 73 hematology test results collected from canine case files from 2015-2021 were evaluated in this study. The types of anemia, sex and breed of the dogs were recorded

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and the prevalence of each of the determinants was calculated.

DETERMINATION OF ANEMIA

Anemia was diagnosed based on reduction in either the packed cell volume or hemoglobin concentration or red blood cell counts.

CLASSIFICATION OF ANEMIA

Anemia was classified using the erythrocytic indices such as mean corpuscular volume and mean corpuscular hemoglobin concentration. Elaborate here on the types.

DATA ANALYSIS

Data was expressed as mean ± standard deviation and comparison between groups was done using student's t-test and $p \leq 0.05$ was considered significant.

RESULTS

A total of 73 hematology results were obtained from the records between 2015 and 2021. 53 (72.6%) of cases of dogs are found to be anemic while 20 (27.4%) of the cases are non-anemic. Based on sample size, 2021, 2018 and 2020 had the highest number of reported cases (Table I).

Table 1. Cases of anemia from hematology records of dogs at the Veterinary teaching hospital of University of Maiduguri, Nigeria between 2015 to 2021

YEAR	ANEMIC (%)	NON-ANEMIC (%)
2015	3 (60)	2 (40)
2016	4 (100)	0 (0)
2017	4 (80)	1 (20)
2018	11 (68.5)	5 (31.25)
2019	5 (71.4)	2 (28.6)
2020	10 (71.4)	4 (28.6)
2021	16 (72.7)	6 (27.3)
TOTAL	53 (72.6)	20 (27.4)

COMMON CAUSE OF ANEMIA BETWEEN 2015-2021 IN MAIDUGURI

Common causes of anemia during the period of study were Helminthosis (23), parvo viral enteritis (19) and 1 each for Canine distemper and poisoning (Figure 1)

Mean packed cell volume and hemoglobin concentration were significantly lower ($p \leq 0.05$) in the anemic group in comparison to the non-anemic group. However, the red blood cell count, mean corpuscular volume and mean corpuscular hemoglobin concentrations were comparable ($p > 0.05$) between the anemic and the non-anemic groups (Table II)

Mean packed cell volume, hemoglobin concentration and mean corpuscular volume were significantly lower ($p \leq 0.05$) in the anemic group in comparison to the non-anemic group. However, the red blood cell count, mean corpuscular volume and mean corpuscular hemoglobin concentrations were comparable ($p > 0.05$) between the anemic and the non-anemic groups (Table III).

Mean packed cell volume, hemoglobin concentration and mean corpuscular volume were significantly lower ($p \leq 0.05$) in the anemic group in comparison to the non-anemic group. However, the red blood cell count, mean corpuscular volume and mean corpuscular hemoglobin concentrations were comparable ($p > 0.05$) between the anemic and the non-anemic groups (Table IV)

Packed cell volume, hemoglobin concentration and mean corpuscular volume were significantly lower ($p \leq 0.05$) in the anemic group in comparison to the non-anemic group. However, the red blood cell count, mean corpuscular volume and mean corpuscular hemoglobin concentrations were comparable ($p > 0.05$) between the anemic and the non-anemic groups (Table V).

Table II. Hematologic values in puppies with anemia diagnosed at Veterinary teaching hospital of University of Maiduguri, Nigeria

Parameters	Anemic (n= 18)	Non-Anemic (n= 6)
PCV	26.78 ± 1.28^{a}	45.50 ± 1.18^{b}
HB	9.03 ± 0.62^{a}	13.33 ± 1.16^{b}
RBC	4.56 ± 0.41	6.01 ± 0.58
MCV	65.38 ± 5.17	79.55 ± 6.33
MCHC	28.46 ± 2.78	27.70 ± 2.21

[a,b] Means with different superscripts are significantly different at $p \leq 0.05$ across rows

Table III. Hematology of dogs presented to Veterinary teaching hospital at University of Maiduguri, Nigeria.

Parameters	Anemic (n=37)	Non-Anemic (n=12)
PCV	25.14 ± 1.15^{a}	41.12 ± 0.69^{b}
HB	8.44 ± 0.40^{a}	12.88 ± 0.21^{b}
RBC	4.34 ± 0.23	5.72 ± 0.26
MCV	62.02 ± 3.76	71.07 ± 5.03
MCHC	33.55 ± 0.57	32.02 ± 0.83

[a,b] Means with different superscripts are significantly different at $p < 0.05$ across rows

Table IV. Hematology of bitches presented at Veterinary teaching hospital University of Maiduguri, Nigeria.

PARAMETERS	ANEMIC (N=25)	NON-ANEMIC (N=8)
PCV	25.16 ± 1.20^{a}	41.38 ± 0.98^{b}
HB	8.52 ± 0.52^{a}	12.68 ± 0.28^{b}
RBC	4.53 ± 0.33	5.35 ± 0.26
MCV	62.40 ± 4.86	78.34 ± 3.33^{b}
MCHC	30.51 ± 2.04	30.71 ± 0.81

a,b Means with different superscripts are significantly different at $p \leq 0.05$ across rows

Table V Hematology of male dogs presented at Veterinary teaching hospital University of Maiduguri, Nigeria

Parameters	Anemic (n=28)	Non-Anemic (n=12)
PCV	26.29 ± 1.42 [a]	41.75 ± 1.14 [b]
HB	8.68 ± 0.48 [a]	12.97 ± 0.40 [b]
RBC	4.36 ± 0.28	6.10 ± 0.35
MCV	64.57 ± 3.73 [a]	71.78 ± 4.73
MCHC	33.32 ± 0.69	32.02 ± 1.50

[a,b] *Means with different superscripts are significantly different at p≤0.05*

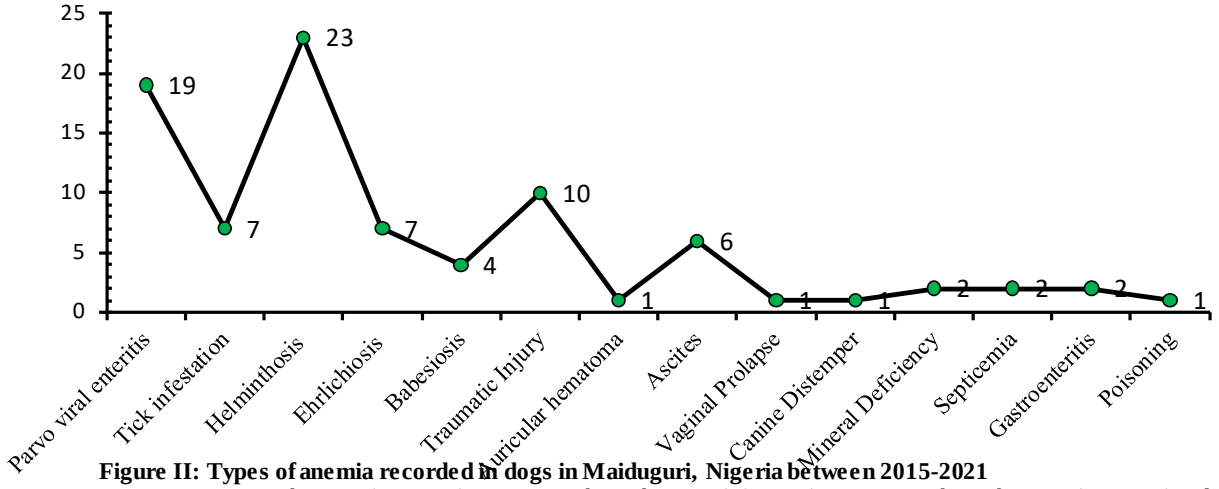

Figure II: Types of anemia recorded in dogs in Maiduguri, Nigeria between 2015-2021
Normocytic normochromic (21 cases), microcytic hypochromic (26 cases), macrocytic hypochromic (21 cases) and macrocytic normochromic (5), are the types of anemia obtained

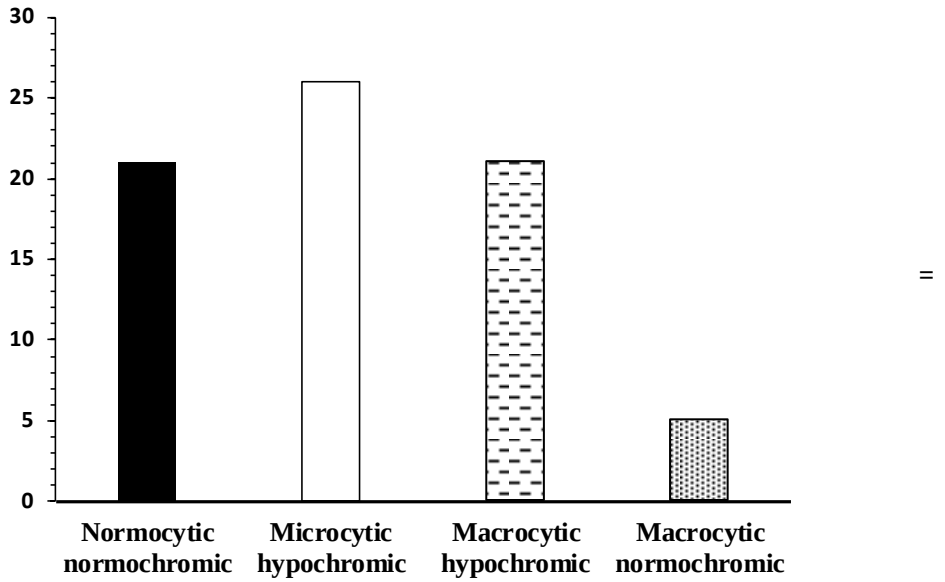

Figure I. Common causes of anemia in dogs between 2015-2021 in Maiduguri

DISCUSSION

The findings of this study showed that anemia is present amongst dogs within Maiduguri metropolis as obtained from the recorded data from the Veterinary Teaching Hospital. In this study, an overall prevalence of 53% was reported from 2015-2021. Different causes of anemia have been reported in dogs (Adebayo, 2016). However, in this study helminthosis with an incidence rate of twenty-three (23) and parvo viral enteritis (19) are the most commonly recorded. Canine distemper and poisoning had the least incidence rate. The presence of brown dog tick (*Rhipicephalus sanguineous*) has been reported in Maiduguri metropolis (10.8%) and hemoparasites such as Babesia and Ehrlichiosis were diagnosed in dogs harboring ticks (Konto, 2014) and in this study cases of tick infestation are among the common cause of anemia being recorded. The type of anemia found to be most consistent among puppies in Maiduguri during the which is usually non-regenerative in nature. This finding may be due to various causes including iron deficiency or failure of iron utilization for hemoglobin synthesis (Thrall, 2012). In adult dogs, macrocytic normochromic anemia was reported as the most diagnosed anemia from this study. It is a regenerative anemia that has been associated with Vitamin B12, folic acid and niacin deficiency (Willard, 2004). Gastrointestinal parasitism has also been reported to be prevalent in both adult and young dogs in Maiduguri, which can be attributed to the prevalence of anemia in dogs (Ezema, 2019).

The higher prevalence of cases in male dogs than females could be attributed to factors such as; movement of males during breeding season from one geographical location to the other in search of a mate, which exposes them to ecto-parasites such as ticks, fleas and lice. Another reason may be due to higher prevalence of gastrointestinal parasites such as *Dyphylidium spp* and *Ancylostoma spp* in Maiduguri (Mustapha, 2016).

CONCLUSION

Anemia is prevalent among dogs in Maiduguri metropolis. Puppies tend to have a microcytic hypochromic anemia, while adult dogs had a macrocytic normochromic anemia. Males tend to have a higher prevalence of anemia than females. There is a need to carry out a thorough investigation into the specific causes of anemia and molecular characterization of the possible etiological agents incriminated in cases of anemia within Maiduguri metropolis.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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