Effects of Sex and Season on Haematological Indices of Apparently Healthy Camels (Camelus dromedarius) in a Subtropical Climate

S.M. Sir. and D.J. U. Kalla

Animal Production Programme, Abubakar Tafawa Balewa University
P.M.B. 0248, Bauchi, Nigeria.
Postcode 740001.

ABSTRACT

The influences of sex, season and their interaction on haematological indices of apparently healthy camels (Camelus dromedarius) were studied. Blood samples were collected from a total of 59 camels (30 males and 29 females) presented for slaughter at the Jos abattoir. The results showed that sex had a significant influence on haemoglobin (Hb g/dL), Packed Cell Volume (PCV %), Red Blood Cells (RBC), White Blood Cells (WBC), Neutrophils (N), Basophils (B) and Eosinophils (EO). Male camels had higher Hb (17.71±0.73 vs 13.82±0.69, P<0.001), PCV (35.71±1.24 vs 30.31±1.13, P<0.01), RBC (7.87±0.32 vs 6.63±0.30, P<0.01), Eosinophils (6.64±0.30 vs 5.47±0.28, P<0.01) but lower WBC (3.44±0.25 vs 4.25±0.24, P<0.05), N (36.42±1.56 vs 41.47±1.48, P<0.05) and B (0.24±0.13 vs 0.69±0.12, P<0.05). The results of interaction of sex and season indicated that only PCV was significantly affected (P<0.05) with dry season having higher values in both sexes. Lymphocytes were significantly (P<0.05) the predominant cells (50.12±1.49%) followed by Neutrophils (38.95±1.52%) and the Basophils (0.47±0.13%). Since these indices are indicators of health or disease conditions, the influence of sex and season on them should be considered during diagnosis.

Keywords: Camels, Sex, Season, Haematological Indices.

INTRODUCTION

The ability of the one humped camel or dromedary (Camelus dromedarius) to survive in harsh arid and semi-arid areas of the world as well as its high potential to convert the scanty resources in these areas into milk and meat makes it unique and more important to dry land pastoralists than any other domestic animal. The dromedary is superbly adapted to the condition of the desert due to its ability to withstand water shortage and lower water turn over. This and many other
physiological performances which have not been observed in any other large mammal has made the camel such a versatile companion of the nomads of Asia and Africa desert (Parker, 1990).

The dromedary is a multipurpose animal used mainly for meat, milk and traction purposes. It is currently replacing oxen in the farming activities especially in the extreme northern parts of Nigeria. Besides, camels produce milk with comparable nutritional content to that of cattle (Hjort of Ornas, 1991). Long lactation and ability to maintain milk production through long dry spells are important facets of camel productivity. Vitamin C content of camel milk is superior to that of cow’s milk. The fat content is lower than that in cow’s milk making it easily digestible and it does not go sour as quickly as cow’s milk. Meat from camel is tasty and compares favourably with beef (Knoss, 1977; Yagil, 1985; Ghaji and Adogwa, 1986).

Blood is an important clinical specimen in assessing the health status of animals (Oduye, 1976; Egbe – Nwiyi, 1995). Among the domestic animals, camel’s blood is unique because it shows the highest total leucocyte counts (Sarwar et al., 1993). Since camels are becoming important animals in the northern part of Nigeria and there is little work on their haematological characteristics under variable environmental conditions in this area, there is need to compare the haematological values of the male and female camel as influenced by season. This study was therefore designed to determine reference haematological values for diagnosis and assessment of the health status of camels in a subtropical climate of Jos, North-Central Nigeria.

MATERIALS AND METHODS

Study Area

The study was conducted at the Jos abattoir in May, June, July and December, 2001. Jos city, the capital of Plateau State of Nigeria lies on longitude 8°45’ east and latitude 9°43’ north at an altitude of 1280m above sea level. The average annual precipitation ranges between 1250 and 1650 mm. The rainy season extends from April to October with peak rainfall in August. Relative humidity and evaporation ranges between 49 – 85.1% and 14 – 298 mm respectively.

The mean air temperature varies from 19.5°C to 32.5°C. Unlike the surrounding low land areas, the climate shows a characteristics cold spell common to high altitudes and subtropical regions; the climate has therefore been described as subtropical with montane vegetation (Mbag and Ngere, 1989).
Sample Collection

Blood samples were collected from one-humped camels (*Camelus dromedarius*) presented for slaughter at the Jos abattoir. The animals were transported from Borno and Sokoto States to the study area. Forty one blood samples were collected during the period of May to July, 2001. These consisted of 22 males and 19 females of varying ages. Blood samples were also collected from 10 females and 8 males in December 2001, making a total of 59 samples from clinically healthy camels.

Four to five milliliters of blood samples were collected from the jugular vein of each animal and placed into sample containing 0.5mls anticoagulant (sodium citrate). The bottles were taken to the laboratory for haematological evaluation.

Evaluation of the samples

Packed cell volume (PCV) was determined using the microhaematocrit method as described by Siros (1995). Haemoglobin (Hb) reading was obtained using C12 digital calorimeter in optical density (A0) which was later converted as follows:

\[ \text{Hb (g/100)} = \text{Digital calorimeter reading} \times 14.5 \text{g/1000 gHb} \]

\[ 0.35A^0 \]

For determination of Red Blood Cells (RBC). Hayem’s solution was used to dilute anticoagulated blood samples (0.005mls of blood diluted into 0.995 Hayem’s solution) giving a diluting factor of 1:20. Blood slides were then prepared and counted in an improved Neubaur chamber under microscope of X40 objective lens. Number of cells counted are in 5 small squares, each with 16 small squares and values added and multiplied by 10,000 to get the value of RBC in mm³.

In order to study White Blood Cells (WBC). Tuerk’s solution was used to dilute anticoagulated blood samples (0.01m blood diluted into 0.19ml of Tuerk’s solution). Prepared slides were counted under the microscope in 4 large squares with each containing 16 small squares. Cells in all squares were summed up and multiplied by 50 to obtain the WBC values. Differential leucocyte counts were based on 100 cells and erythrocyte indices calculated using standard formulae as described by Siros (1995). Platelets were counted as in RBC after diluting blood samples with Boar’s solution (0.01mls of blood into 0.19mls Boar’s fluid). Colour index (CI) was determined using the following relations:

\[ CI = \%_{\text{normal Hb}} \times 100 \]

\[ \%_{\text{normal RBC}} \]
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\[
\text{CI} = \frac{\% \text{normal Hb} \times 100}{\% \text{normal RBC}}
\]
STATISTICAL ANALYSIS

The data generated from the experiments were subjected to analysis of variance with sex, season and sex by seasonal interactions as fixed effect using MINITAB® statistical Software (Rayan et al., 1985) was used to test for any significant differences between the indices.

RESULTS AND DISCUSSIONS

The effect of sex and season and their interactions on the haematological indices of the camels are presented in Tables 1 and 2. The results showed that male camels have significantly higher (P<0.001) Hb value (17.71±0.73) than the females (13.82±0.69). This finding agrees with the report of Egbe – Nwiyi et al. (2000) for camels in Maiduguri. Male camels showed a significantly (P<0.001) higher PCV value (35.71±1.24) than their female counterparts (30.31±1.13). This observation does not agree with the reports of Egbe – Nwiyi et al. (2000) for camels. The RBC of the males showed higher value (7.87±0.32) than that of the females (6.63±0.30). This is at variance with what was reported earlier by Egbe – Nwiyi et al. (2000) in arid region. These results conform to the reports that sex has influence on the haematological values of various animal species (Fraser, 1930; Anderson and Gee 1958; Wilkin and Hodges, 1962; Stanley and Crammer 1968; Vaidya et al., 1970; Schalm et al., 1975).

The results obtained in this study indicated no significant sex differences on MCV, MCH, MCHC, and Colour Index. This is in agreement with previous reports (Sawar and Majeed, 1997). They were however slightly higher than those reported by Egbe – Nwiyi et al. (2000) in Maiduguri. These areas have varying climate it is not clear how long the camels stayed in Jos to have caused a variation the variation might have been as a result of method of assay since the camels originated from the same source. Mehrotra and Gupta (1989) however reported a relatively high erythrocyte counts for camelidae that lived at high altitudes. Camels like humans lack splenic reserves of RBC, as there is minimal increase in Hb and PCV after maximal exercise over 4km (Snow et al., 1988). Generally, the MCV, MCH and MCHC values are dependent upon the other parameters like RBC, Hb and PVC (Egbe-Nwiyi et al., 2000). The results obtained in this study indicated higher values though not significant in MCH (22.31±0.53) and MCHC (49.67±1.23) for male camel. This is due to the higher values of RBC and Hb obtained for the effect sex on Hb and RBC (Sawar and Majeed, 1997).

Sex had a significant (P<0.05) effect on WBC as higher value was recorded for the
females (4.28±0.24) than the males (3.44±0.25). This is contrary to the report of Egbe – Nwiyi et al.(2000). This could be due to the fact that as the RBC values increase, it leads to a decrease in WBC. Therefore low value of WBC was expected since higher value of RBC was recorded for the male animals. Sex also significantly affected Neutrophil (N) and Basophil (B) (P<0.05) and Eosinophil (P<0.01). The N and B values followed similar trend as WBC, whereas in Eosinophil higher value was recorded for the males (6.64±0.30) than for the females (5.47±0.28). As expected in old animals lymphocytes were the predominant cells (50.12±1.49) followed by Neutrophil (38.95±1.52) and Basophil (0.47±0.13). These values are in conformity with those reported by Sarwar et al (1991). The differential leucocyte counts obtained in the present study were within established ranges (Ghodsian et al, 1978; Majed et al., 1980).

During the dry season, significantly higher Hb (17.12±0.83) and PCV (34.95±1.42) values were recorded compared to the rainy season. These values were reported to be influenced by watering frequency (Ziv et al., 1997), as such, these higher values are probably due to water and electrolyte imbalance as little or no water was available to the animals during the dry season. Sex and season interaction was significant on PCV (P<0.05). This influence on PCV could be due to physiological status of the camels especially in the dry season.

CONCLUSION AND RECOMMENDATION

Male camels had significant higher values of Hb, PCV and RBC, while the females had higher WBC. The effect of season on Hb and PCV showed higher values in the dry season. This study has thus provided a reasonably extensive analysis of the major constituents of apparently healthy camels in Jos Plateau area of Nigeria. There are few variations between the present findings and those from previous work. Therefore it can be concluded that the influence of sex and season on these parameters should be considered during diagnosis. Further study however should aim at determining the values of these blood indices all year round at various locations which will help establish reference values for camel (Camelus dromedarius) under various environmental conditions.

Acknowledgements

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REFERENCES:


<table>
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<tr>
<th>SN</th>
<th>Col Index</th>
<th>MCHC</th>
<th>MCH</th>
<th>Mean Corp Volume</th>
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<tr>
<td>0.03</td>
<td>100.0 &gt; d = ***</td>
<td>100.0 &gt; d = **</td>
<td>50.0 &gt; d = *</td>
<td>X</td>
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</table>

**NS** = non-significant

**Sex** = interaction of sex and session

**PCV** = packed cell volume

**Hb** = Hemoglobin

**RBC** = red blood cells

**n** = number of samples

<table>
<thead>
<tr>
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<th>Season</th>
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<tbody>
<tr>
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<td>1.00 + 0.02</td>
</tr>
<tr>
<td>M2</td>
<td>1.00 + 0.02</td>
</tr>
<tr>
<td>F1</td>
<td>1.00 + 0.02</td>
</tr>
<tr>
<td>F2</td>
<td>1.00 + 0.02</td>
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Table 1: Effects of Sex and Season on RBC Indices and Colour Index of Apparently Healthy Camps
<table>
<thead>
<tr>
<th>Sex</th>
<th>Season</th>
<th>NS</th>
<th>M</th>
<th>B</th>
<th>MWC</th>
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<tr>
<td>Male</td>
<td>Summer</td>
<td>2.0±0.26</td>
<td>6.0±0.39</td>
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<td>2.0±0.39</td>
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<tr>
<td>Male</td>
<td>Winter</td>
<td>2.0±0.26</td>
<td>6.0±0.39</td>
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<td>2.0±0.39</td>
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<tr>
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<td>Summer</td>
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<td>1.0±0.25</td>
<td>2.0±0.39</td>
</tr>
</tbody>
</table>

NS = No significant difference. M = Monocytes, B = B-lymphocytes, MWC = Mean White Blood Cells.