The Journal of Animal & Plant Sciences, 21(2): 2011, Page: 157-160
ISSN: 1018-7081

NORMAL REFERENCE HEMATOLOGICAL VALUES OF ONE-HUMPED CAMELS *(CAMELUS DROMEDARIUS)* KEPT IN CHOLISTAN DESERT

U. Farooq, H. A. Samad, A. Khurshid and S. Sajjad*

University College of Veterinary & Animal Sciences, The Islamia University of Bahawalpur, Pakistan
*Department of Zoology, Lahore College for Women University, Lahore, Pakistan
Corresponding author: pathophysio@hotmail.com

ABSTRACT

Reference normal hematological values have been documented for various domestic animals under various climatic/geographical conditions; however there is a dearth of information in the literature concerning these values for camels kept in desert. The present pilot study was conducted to establish reference normal range of salient hematological parameters in clinically healthy camels (30 males and 30 females) being reared in a farm of Desert Rangers, Cholistan, in order to form a basis for clinical interpretation. Blood samples were aseptically collected and were analyzed for hematological parameters. The mean values for hemoglobin (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), and Mean Corpuscular Hemoglobin Concentration (MCHC) for males were 12.00±0.63 g/dl, 37.21 ±2.48 %, 6.83±0.38 x 10^6/µl, 12.38±0.97x 10^3/µl, 57.13±5.09 fl, 18.69±1.45 pg, and 33.61±1.42; and for females were 11.34±0.95 g/dl, 32.83 ±3.76 %, 7.31±0.58 x 10^6/µl, 12.97±0.99x 10^3/µl, 50.24±7.72 fl, 17.80±2.21 pg, and 34.81±2.16, respectively. The difference in values were statistically non significant for males and females. The Differential Leukocyte Count (DLC) revealed that the lymphocytes were the predominant leucocytes which are typical of most other ruminants.

Key words: Cholistan, camel, hematology

INTRODUCTION

Hematology is becoming an increasingly important diagnostic and management tool in veterinary medicine, globally. The blood picture of an animal provides an opportunity to clinically investigate the presence of different metabolites and other constituents in the body of the animal and it plays a vital role in the assessment of physiological, nutritional and pathological status of an organism (Doyle, 2006). It also helps in distinguishing the normal state from the state of stress, which can be nutritional, environmental or physical (Aderemi, 2004). In order to interpret the hematological data correctly, the results obtained in the laboratory have to be compared with normal reference values of clinically healthy animals, which serve as a yardstick to the clinician. Inappropriate reference values may increase the risk of either unnecessary additional investigations or failure to detect underlying disease (Tsang *et al.,* 1998). It is well known that a variety of factors such as species, breed, sex, age, nutrition, illness, stress, exercise, transport, and seasonal variations can affect the profile of these values (Jain, 1998). Some variations in the results may also occur due to quality of different reagents, analytical protocols and instruments used in different laboratories. Hence the reference haematological values reported from different workers from abroad in their native environments and conditions cannot be fully applicable to our local climatic conditions (Gul *et al.,* 2007).

A lot of work has been carried out on the blood parameters of various domestic species including sheep, goats, horses, cattle and buffalo, both globally (Tschuor *et al.,* 2008; Aengwanich *et al.,* 2009) and in Pakistan (Ahmad *et al.,* 2003; Sattar and Mirza, 2009; Gul *et al.,* 2007). However, there is a dearth in literature concerning these values for camels kept in desert climates of Pakistan, and the comparisons are usually made with the reference values obtained under varying geological/climatic conditions in different parts of the world. The present pilot study was hence conducted to have a base line data on normal reference range of hematological parameters for both male and female camels reared in Cholistan desert of Pakistan. Results of all these parameters are tabulated and discussed in relation to previous findings reported for camels, elsewhere.

MATERIALS AND METHODS

Study Area: The present study was conducted in the Camel Rearing Centre of HQ Desert Rangers, Cholistan, Bahawalpur, Pakistan located at latitudes 27º42´and 29º45´North and longitudes 69º52´and 75º24´East and at an altitude of 112m above the sea level. The climate of this area is arid, hot subtropical and monsoonal with the average annual rainfall of 180 mm. However, the rainfalls

are very inconsistent both in quantity and duration with prolonged droughts common every 10 years. The mean annual temperature is 28.33°C, with the month of June being the hottest when the daily maximum temperature normally exceeds 45°C (Farooq *et al.,* 2010).

Clinical health and management of experimental animals: The study included a total of 60 adult one-humped camels (30 males and 30 females) (*Camelus dromedarius*) ranging between 3 and 17 years of age. All the animals were kept under similar management and feeding conditions. They were well fed, clinically healthy, and free of any internal and external parasites. They were treated for endoparasite control twice a year and their health status was regularly monitored by qualified veterinarians.

Collection of blood: The present study was conducted in the month of April-June. From each animal, about 5 ml blood was collected aseptically with the help of a disposable syringe from the jugular vein and transferred into the screw capped tubes containing 0.5 ml of 1% ethylene diamine tetra acetate (EDTA) solution as an anticoagulant. In order to minimize the stress in the animal and to standardize the collection procedure, all the animals were restrained with the same technique and the collection was made by the same personnel. Blood samples were transported in ice box to the University College of Veterinary & Animal Sciences (UCV&AS), the Islamia University of Bahawalpur (IUB), refrigerated and analyzed within 48h for the study of hematological parameters.

Hematological studies: The blood samples were analyzed for hemoglobin (Hb) by acid hematin (Sahli's haemoglobinometer) method, Packed Cell Volume (PCV) by microhematocrit, and Total Erythrocyte Count (TEC) and Total Leukocyte Count (TLC) by Neubauer's haemocytometer. The erythrocytic indices *viz.* Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), and Mean Corpuscular Hemoglobin Concentration (MCHC) were calculated using the formula of Jain (1998).

Statistical analysis: The mean values (±SEM) of the haematological parameters were calculated and the effect of sex on these parameters was analysed using T- test according to Perrie and Watson (1999).

RESULTS AND DISCUSSION

The lack of published hematological reference values for camel in Pakistan makes it inevitable for both the researchers and clinicians to establish their own (local) reference values. At present, the comparisons are being made either with the hematological values obtained in other countries of the world like Nigeria (Fatihu *et al.,* 2000), United Arab Emirates (Ayoub, 2003) Saudi Arabia (Al-Busadah and Osman, 2000; Al-Busadah, 2007;Al-Sultan, 2008) and Iraq (Alsaad, 2009) which are internationally famed for having camel as a major part of their livestock; or with values given in certain text books (Jain, 1998; Chaudhary and Akbar, 2000) which provide a ready reference. The scanty work done in Pakistan has mostly been directed towards the study of the hematological parameters in hemoparasitized camels (Ahmad *et al.,* 2004).

The comparative mean ± SEM values of salient hematological parameters both for male and female camels are given in table 1 and 2. Statistical analysis showed a non significant effect of sex on all the parameters in the present study.

Red blood cell values: Blood hemoglobin concentration both for males and females recorded in this study (12.00±0.63 and 11.34±0.95 g/dl) is in accordance with the previous values reported by Al-Busadah (2007) and Alsaad (2009) in Saudi Arabia and Iraq, respectively. Similarly, Jain (1998) also documented a value of 11.1±0.3 g/dl for hemoglobin in *camelus dromedarious*. However, the values of the present study are higher than 9.68± 0.27 g/dl reported by Ahmad *et al.* (2004) in healthy camels of Faisalabad, Pakistan.

The mean values of PCV recorded in this study were 37.21 ±2.48 and 32.83 ±3.76 % for male and female animals, respectively. These values do not match with most of the previous studies. Ahmad *et al.* (2004) reported a mean value of 27.66±0.72% whereas Al-Busadah (2007) and Al-Sultan (2008) reported mean PCV values of 25±0.23 and 33±0.30%, respectively. Compared with the hematologic values for horses and cattle, camels have more RBCs but a lower PCV because the smaller elliptical cells pack tighter (Jain, 1998). However, the present study revealed the mean PCV value to be in close agreement with those of healthy equine species of Faisalabad, Pakistan (Gul *et al*., 2007).

The mean values of TEC recorded in this study were 6.83±0.38 and 7.31±0.58 x 10^6/µl for male and female animals, respectively. These are in line with the findings of Ahmad *et al.* (2004) who reported a mean TEC of 6.93±0.21x10^6/µl. Relatively higher values of 7.40±0.30 and 7.92±1.36 x10^6/µl have been reported by Al-Sultan (2008) and Alsaad (2009), respectively. Al-Busadah and Osman (2000) reported the mean TEC value of 10.8 and 10.0x10^6/µl in dry and lactating camels, respectively. Camels, like humans, seem to lack a splenic reserve of red cells, as indicated by a minimal increase in Hb and PCV after maximal exercise over 4 to 5 km (Snow *et al.,* 1988). Hence, the variation in TEC may not be correlated to stress. Rather these minor differences may be attributed to variable age and health status of the camels.

The mean MCV values for male and female camels in this study (57.13±5.09 and 50.24±7.72 fl) are higher than most of the work done earlier. Al-Sultan (2008) has reported the mean MCV value of 31.1±0.20fl in young Magaheim Dromedary camels, whereas Alsaad (2009) and Fatihu *et.al*. (2000) reported the mean values of 37.68±4.52 and 27.39±11.64fl, respectively. The mean MCH values of this study are in consistence with those reported by Al-Sultan (2008) for males i.e. 17.51±0.38pg but lower values of 12.45±1.21 pg have been reported by Kamal (2008). The MCHC in camels is generally over 40%, which is considerably in access of the range of 30 to 36% common to animals with discoid erythrocytes. It is a species characteristic and not a technical artifact (Jain, 1998). The mean MCHC values of 64.65±5.92, 43.9±0.2 and 42.6±7.81 have been reported by Kamal (2008), Al-Busadah and Osman (2000) and Alsaad (2009), respectively. The mean MCHC values in this study are lower from above referred reports. However, our value is in accordance to the value of 31.16±6.51 reported by Fatihu *et.al*. (2000). The variation in various erythrocytic indices may be attributed to variable RBC size, its oxygen carrying capacity in connection with age and physiologic state. The difference due to technique variance cannot also be ruled out.

Table 1. Mean (± SEM) red blood cells values in male and female camels

Parameters	Males	Females
Haemoglobin (g/dl)	12.00±0.63 (7-17)	11.34±0.95 (8-17)
Packed cell volume (%)	37.21 ±2.48 (22-67)	32.83 ±3.76 (24-50)
Total erythrocytic count (10^6/µl)	6.83±0.38 (4.3-12.4)	7.31±0.58 (4.25-12.9)
Mean corpuscular volume (fl)	57.13±5.09 (27-140)	50.24±7.72 (26-103)
Mean corpuscular hemoglobin (pg)	18.69±1.45 (11-35)	17.80±2.21 (7-35)
Mean corpuscular hemoglobin concentration	33.61±1.42 (22-46)	34.81±2.16 (27-42)

White blood cell values: The mean TLC values recorded for male and female animals in the present study were 12.38±0.97 and 12.97±0.99x 10^3/µl, respectively. These are comparable with those of 11.970 ± 0.461 and 11.54±1.74 x 10^3/µl reported by Ahmad *et al*. (2004) and Alsaad (2009), respectively. However, higher mean values of 20.1±0.44 and 19.5±0.32 x 10^3/µl have been reported by Al-Busadah (2007) for male and female camels, respectively. Al-Sultan (2008) also has reported a higher mean TLC value of 17.90±0.20 x 10^3/µl. The data on DLC of this report revealed that lymphocytes were the most predominant of leucocytes with neutrophils being the next. This is in line with the work of Al-Busadah (2007) and Jain (1998). However, an inverse ratio of neutrophils and lymphocytes has been documented in the work of Al-Sultan (2008), Al-Busadah and Osman (2000), and Ayoub *et.al*. (2003). This variation in white cell values can be attributed to breed differences or stress prior to sampling (Higgin and Kock 1986).

Table 2. Mean (± SEM) leucocytes values in male and female camels

Parameters	Males	Females
Total leucocytic count (10^3/µl)	12.38±0.97 (4.0-22.3)	12.97±0.99 (4.2-20.9)
Neutrophils (%)	44.70±1.4 (38-68)	43.60±1.30 (41-65)
Lymphocytes (%)	47.50±1.40 (40-55)	48.60±1.50 (43-63)
Eosinophils (%)	7.20±0.40 (5-11)	7.0±0.39 (3-9)
Monocytes (%)	1.20±0.10	1.0±0.10
Basophils (%)	<0.1	<0.1

Conclusion: Previous literature reveals very little information on normal hematological values of camels in Pakistan and there are variations between the values cited earlier and those found in this study. However, this study reports a preliminary data and envisages for the further studies with a larger population and sample. Although a non significant effect of gender has been noticed in the present work but other factors such as age, physiological state of the animal, breed, environment, husbandry practices etc may be incorporated in future investigations. The findings obtained could be used as a base line data for future research in the blood of camels in various camel breeds of Pakistan.

REFERENCES

Aderemi, F. A. (2004). Effect of replacement of wheat bran with cassava root sieviate supplemented or unsupplemented with enzyme on the hematology and serum biochemistry of pullet chicks. Trop. J. Anim. Sci. 7: 147-153.

Aengwanich, W., A. Chantiratikul and S. Pamok (2009). Effect of seasonal variations on hematological values and health monitor of cross bred beef cattle at slaughterhouse in northeastern part of Thailand. American-Eurasian J. Agric. & Environ. Sci 5 (5): 644-648.

Ahmad, I., A. Gohar, N. Ahmad and M. Ahmad (2003). Hematological profile in cyclic, non cyclic and endometritic cross bred cattle. Int. J. Agri. Biol. 5 (3): 332-334.

Ahmad, S., A. A. Butt, G. Muhammad, M. Athar and M. Z. Khan (2004). Haematobiochemical studies on

hemoparsitised camels. Int. J. Agric. Biol. 6(2): 331-334.

Al-Busadah, K. A. and T. E. A. Osman (2000). Hematological parameters of adult dry and lactating camel calves in Saudi Arabia. Pak. J. Biol. Sci. 3(10): 1749-1751.

Al-Busadah, K. A. (2007). Some biochemical and hematological indices in different breeds of camels in Saudi Arabia. Sci. J. King Faisal Univ. 8(1): 131-142.

Alsaad, K. M. (2009). Clinical, hematological and biochemical studies of Anaplasmosis in Arabian one-humped camels *(camelus dromedaries)*. J. Anim. Vet. Adv. 8(11): 2106-2109.

Al-Sultan, S. I. (2008). Studies on hematological and certain biochemical values in young Magaheim dromedary camels at Al-Ahsa province. Vet. Res. 2(3): 34-37.

Ayoub, M. A., A. A. El-Khouly and T. M. Mohamed (2003). Some hematological and biochemical parameters and steroid hormone levels in the one-humped camel during different physiological conditions. Emir. J. Agric. Sci. 15(1): 44-55.

Chaudhary, Z. I. and S. J. Akbar (2000). The camel and its diseases. 1st Ed. Al-Bayan, Dubai (UAE). 170 p.

Doyle, D. (2006). William Hewson (1739-1774): The father of hematology. Br. J. Haematol. 133: 375-381.

Farooq, U., H. A. Samad, F. Sher, M. Asim and M. A. Khan (2010). Cholistan and Cholistani breed of cattle. Pakistan Vet. J. 30(2): 126-130.

Fatihu, M. Y., A. S. James and M. B. Abubakar (2000). Hematological data of healthy and natural Trypanosoma evansi infected camels (*camelus dromedarius)* in Sokoto, Nigeria J Protozool. Res. 10(1): 1-5.

Gul, S. T., M. Ahmad, A. Khan, and I. Hussain (2007). Haemato-biochemical observations in apparently healthy equine species. Pakistan Vet. J. 27 (4): 155-158.

Higgin, A. J. and R. A. Kock (1986). A guide to the clinical examination, chemical restraint and medication of the camel. Br. Vet. J. 140(4): 485-504.

Jain, N. C. (1998). Essentials of veterinary hematology. 2nd Ed. Lea & Febiger; Philadelphia (USA). pp 65-68.

Kamal, A. M. (2008). Some biochemical, hematological and clinical studies of selected ruminal and blood constituents in camels affected by various diseases. Res. J. Vet. Sci. 1(1): 16-27.

Perrie, P. and P. Watson (1999). Statistics for veterinary and animal science. Blackwell, UK.

Sattar, A. and R. H. Mirza (2009). Hematological parameters in exotic cows during gestation and lactation under subtropical conditions. Pakistan Vet. J. 29 (3): 129-132.

Snow, D. H., A. Billah and A. Ridha (1988). Effects of maximal exercise on the blood composition of racing camel. Vet. Rec. 123(10): 311-318.

Tsang, C. W., R. Lazarus, W. Smith, P. Mitchell, J. Koutts and L. Burnett (1998). Hematological indices in an older population sample: derivation of healthy reference values. Clin. Chem. 44: 96–101.

Tschuor, A. C., B. Riond, U. Braun and H. Lutz (2008). Hematological and clinical biochemical reference values for adult goats and sheep. Schweiz. Arch. Tierh. 150 (287-295).