



Erythrocytic Indices of Kutchi Camel during Different Stages of Lactation

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Abstract | The present study was carried out on 30 clinically healthy female camels (*Camelus dromedarius*) from the herd maintained at Camel breeding farm, Dhori (Kutch, Gujarat) and categorized broadly into three groups comprising ten animals in each group: animals in early lactation in Group-I, in mid-lactation in Group-II and in late lactation in Group-III. The blood samples were collected from each experimental animal and analyzed for erythrocytic indices which were found to be within the normal range. TEC (9.06 ± 0.29 , 8.24 ± 0.71 and 9.79 ± 0.27 b, millions/ μ l, respectively), MCV (34.34 ± 1.09 , 37.13 ± 1.37 and 33.04 ± 0.62 , fl, respectively) and MCH (15.73 ± 0.63 , 16.98 ± 0.54 and 13.62 ± 0.90 , pg/cell respectively) showed significant ($p < 0.05$) variation between early, mid and late lactation stages. However, non-significant ($p > 0.05$) variation were found in Hb, PCV and MCHC during different stages of lactation. These data may be useful as reference value for Kutchi camel to assess the metabolic health status of the animals.

Keywords | Kutchi camel, Erythrocyte indices, Lactation stages, Physiological levels, Health status

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INTRODUCTION

Camel is an important component of desert ecosystem of Gujarat. It is primarily reared for carting/draft, agricultural operation and transportation in addition to the secondary utility of milk and hair production (Saini et al., 2006). India ranks 7th in the world in camel population which is mainly confined to the northern- western part of the country. India possesses mainly dromedary camels. There are 9 indigenous registered breeds of camels in India viz. Jaisalmeri, Jalori, Bikaneri, Kutchi, Malvi, Marwari, Kharai, Mewari and Mewati (NBAGR, 2016). Camels in India are mainly reared by landless nomadic or semi-nomadic tribes as an ancestral business. Camel has a unique ability to convert the scanty plant resources of the desert area into milk, meat and fibre (Ahmad et al., 2010).

Gujarat is having two breeds of Camel i.e. Kutchi and

Kharai (a recently recognized breed). Kutchi breed is inhabitant of Kutch and Banaskantha, dry and semi-arid districts of north Gujarat. According to 19th Livestock census, the camel population in Gujarat was 30415 including 16891 males and 13524 females (Livestock census, 2012). Though both Kutchi and Kharai camels share many characters they are not only morphologically distinct but also differ with respect to milk and wool quality. Hence their conservation assumes national priority (Mburu et al., 2003).

The erythrocytic indices are important parameters to be observed for monitoring the health status of animals. The reference values of such indices become helpful in the diagnosis, prevention and control of disease by providing the basis for clinical interpretation of laboratory data. However, the normal levels of haemato-biochemical parameters have been found to be influenced by different physiologi-

cal stages of animals (Ahmad et al., 2003). Pregnancy and lactation are two most important stages in the life of animals, which affect metabolism resulting in the alteration of the haemato-biochemical profile (Krajnicakova et al., 2003; Iriadam 2007). However, no such study has been performed to investigate the erythrocytic indices during different stages of lactation. Hence, the present study was undertaken to determine the reference values of erythrocytic indices in clinically healthy lactating Kutchi camel during different stages of lactation.

MATERIALS AND METHODS

LOCATION OF STUDY

The study was conducted at Sardarkrushinagar located in Banaskantha district of North Gujarat, in collaboration with Camel Breeding Farm, Dhori (Kutch, Gujarat), which is situated between 22° 44' 8" to 24° 41' 30" North Latitude and 68° 7' 23" and 71° 46' 45" 0" East Longitude in western India. The maximum annual average temperature and relative humidity of this region is 39-45°C and 63%, respectively. Kutch has wide range of climate conditions varying from dry to humid and extreme cold to hot with wide variation in landscaping.

EXPERIMENTAL ANIMALS

A total of 30 clinically healthy female Kutchi camels (*Camelus dromedarius*) of 8-10 years old were selected from the herd maintained at Camel Breeding Farm, Dhori (Kutch, Gujarat). These animals were categorized into three groups based on their stage of lactation: early lactation (1-3 months), mid-lactation (4-6 months) and late Lactation (≥ 7 months). The average body weight of the animals was about 500 kg with average milk yield of 4-5 kg per day per animal. The selected animals were maintained following standard farm practices. All the camels are left free to graze in the open desert. Adlibitum feed was provided to the animals. The animals appeared clinically healthy with no physical deformities. The health status of the selected animals was evaluated based on behavior, rectal temperature, pulse rate, respiratory rate and faecal consistency. The animals were also examined for parasites and deworming of the animals was done regularly.

COLLECTION OF BLOOD SAMPLES

The whole blood samples were collected in vials containing K₃ EDTA (Tripotassium ethylene diamine tetra acetic acid) supplied by P.H. Polyplast, Thane, India, for haematological analysis.

HEMATOLOGICAL ANALYSIS

Blood samples were analyzed for different erythrocytic indices viz. total erythrocyte count (TEC), hematocrit (HCT)/packed cell volume (PCV), hemoglobin (Hb),

mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) using Automated Hematology Analyzer (Cell-Dyn 3700, Abbott Diagnostics, USA).

DATA ANALYSIS

The data generated on erythrocytic indices were analyzed statistically using one way ANOVA model by sigma stat software, version 4.0, 2016 (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

The mean and standard error (mean±S.E.) values of erythrocytic indices of different experimental groups of Kutchi camels are presented in Table 1.

Table 1: Erythrocytic indices during different stages of lactation in Kutchi camels

Groups	Group-I Early Lactation (1-3 months)	Group-II Mid Lactation (4-6 months)	Group-III Late Lactation (≥ 7 months)
TEC (millions/μl)	9.06±0.29 ^{ab}	8.24±0.71 ^a	9.79±0.27 ^b
Hb (g/dl)	14.06±0.41	13.84±0.32	13.07±0.38
PCV (%)	28.62±0.59	27.91±0.90	30.03±0.50
MCV (fl)	34.34±1.09 ^{ab}	37.13±1.37 ^b	33.04±0.62 ^a
MCH (pg/cell)	15.73±0.63 ^{ab}	16.98±0.54 ^b	13.62±0.90 ^a
MCHC (g/dl)	48.11±1.66	47.69±1.24	44.37±1.26

Mean ± S.E with different superscripts in rows differ significantly (p<0.05).

TEC= Total erythrocytes count, Hb= Haemoglobin, PCV= Packed cell volume, MCV= Mean corpuscular volume, MCH= Mean corpuscular hemoglobin, MCHC= Mean corpuscular hemoglobin concentration

TOTAL ERYTHROCYTE COUNT

Result showed that the TEC was significantly (p < 0.05) lower in mid lactation as compared to late lactation. It was observed that the recorded data were comparable with the earlier studies (Hussein et al., 1992; Farooq et al., 2011; Mohamed and Hussein, 1999). Lower RBC concentration in mid lactation may indicate a negative correlation between higher milk production and RBCs concentration in lactating animals. However, Al-Busadah and Osman (2000) reported higher values of TEC as compared to the present study in lactating camels. Similarly, Tharwat et al. (2015) and Hagawane et al. (2009) reported the higher values of TEC than the result obtained in this study. El-Tarabany et al. (2016) observed the higher values of TEC in baladi goats than values obtained in present study. This difference may be ascribed to differences in breed and in the physical and environmental conditions.

HAEMOGLOBIN

Hb concentration obtained in this study is in agreement with the values reported in previous studies (Farooq et al., 2011; Mohamed and Hussein, 1999; Al-Busadah and Osman, 2000). The increased hemoglobin content in early lactation than in mid and late lactation in camels was probably due to higher demand for oxygen and the requirements of higher metabolic rate during and after parturition. However, results obtained in present study were higher than that reported by Hussein et al. (1992), Hagawaneet et al. (2009), El-Tarabany et al. (2016) and Nozad et al. (2012). The haemoglobin (Hb) concentration found in Kutchi camels during early lactation in this study was lower than reported by Tharwat et al. (2015) during first three weeks of lactation after parturition in camels. The change in the values of Hb may be due to the climatic and geographic conditions.

PACKED CELL VOLUME

The PCV values obtained in different groups of Kutchi camels did not differ significantly. However, lower values of PCV have been found in early and mid lactation as compared late lactation (Al-Busadah and Osman, 2000; Tharwat et al., 2015). This may be due to elevated erythrocyte devastation in mammary cells along with mobilization of water to mammary gland. PCV values observed in Kutchi camels in this study corroborate the reports of Hussein et al. (1992) and Farooq et al. (2011). The values of PCV observed by Nozad et al. (2012) in Holstein dairy cows were higher than values found in present study during early and mid-lactation. Hagawane et al. (2009) also reported the higher values of PCV in lactating buffaloes.

MEAN CORPUSCULAR VOLUME

There was no significant difference in MCV values between early and mid lactation as well as between early and late lactation but, statistically ($p < 0.05$) higher MCV levels were found in mid lactation as compared to late lactation. The findings of mean corpuscular volume (MCV) recorded in present study were comparable with values reported by previous studies (Hussein et al., 1992; Farooq et al., 2011; Mohamed and Hussein, 1999). The MCV values of this study were higher than reported by Al-Busadah and Osman (2000) and Tharwat et al. (2015).

MEAN CORPUSCULAR HEMOGLOBIN

The MCH concentration of mid lactation was significantly ($p < 0.05$) higher than late lactation. However, non-significant difference found between early and mid lactation as well as early and late lactation. The mean corpuscular haemoglobin (MCH) values recorded in present study were comparable with the values determined by previous reports (Hussein et al., 1992; Farooq et al., 2011; Mohamed and Hussein, 1999). The findings of Al-Busadah and Osman

(2000) were lower than the findings of this study.

MEAN CORPUSCULAR HEMOGLOBIN CONCENTRATION

There was no significant difference in MCHC among the experimental groups; rather the MCHC values were found to be almost similar at different lactation stages. The findings of mean corpuscular haemoglobin concentration (MCHC) recorded in present study were within the range reported in previous studies (Mohamed and Hussein, 1999, Al-Busadah and Osman, 2000). Tharwat et al. (2015) reported higher MCHC values than obtained in present study. MCHC in Kutchi camels during early and mid-lactation were higher than the values reported by the Hussein et al. (1992) in dromedary camels. However, the values of MCHC obtained in this study are higher than reported by Farooq et al. (2011).

The discrepancies in values for various haematological parameters between our findings and previous studies may be explained by differences in sampling interval, methods used, numbers of animals sampled, and/or degree of metabolic disturbances. Moreover, genetic differences between animals and subtropical conditions of the present study might have played a role for the differences with other studies.

CONCLUSION

The results observed during this investigation may be useful as reference values in future for the scientific community as this is the first study of its kind in case of Kutchi camel (*Camelus dromedarius*), a unique camel breed of Gujarat. The significant ($p < 0.05$) variation had been noticed in erythrocytic indices viz. MCV, MCH and TEC. However, non-significant ($p > 0.05$) variation was found in Hb, PCV and MCHC during different stages of lactation. Further, these values will be helpful to the clinicians for observing the health status of camels at different stages of life as well as in differential diagnosis, prevention and control of disease.

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CONFLICT OF INTEREST

There is no conflict of interest with any of the party either directly or indirectly to the content of this article.

Abdul Lateef and Nilufar Haque designed the experiment. Axay Joshi and Ajay Patel collected the blood sample and carried out the experiment. Axay Joshi and Nilufar Haque prepared the manuscript. Nilufar Haque and Pankaj Patel revised the final draft of the manuscript. All authors read and approved the final manuscript.

REFERENCES

- Ahmad I, Gohar A, Ahmad N, Ahmad M (2003). Haematological profile in cyclic, non-cyclic and Endometritic Cross-Bred cattle. *Int. J. Agric. Biol.* 5(3): 332-334.
- Ahmad S, Yaqoob M, Hashmi N., Ahmad S, Zaman MA, Tariq M (2010). Economic Importance of Camel: Unique Alternative under Crisis. *Pak. Vet. J.* 30: 1-7.
- Al-Busadah KA, Osman TEA (2000). Hematological Parameters of Adult Dry, Lactating and Camel Calves in Saudi Arabia. *Pak. J. Biol. Sci.* 3(10): 1749-1751. <https://doi.org/10.3923/pjbs.2000.1749.1751>
- 19th Livestock census, All India Report (2012). Department of animal husbandry, dairying and fisheries, Ministry of Agriculture, Government of India, Krishi Bhavan, New Delhi.
- El-Tarabany S, El-Tarabany A, Roushdy M (2016). Impact of lactation stage on milk composition and blood biochemical and hematological parameters of dairy Baladi goats. *Saudi J. Biol. Sci.* (In press). <https://doi.org/10.1016/j.sjbs.2016.08.003>
- Farooq U, Samad H, Khurshi A, Sajjad S (2011). Normal reference hematological values of one-humped camels (*camelus dromedarius*) kept in cholistan desert. *J. Anim. Plant Sci.* 21(2): 157-160.
- Hagawane SD, Shinde SB, Rajguru DN (2009). Haematological and Blood Biochemical Profile in Lactating Buffaloes in and around Parbhani city. *Vet. World.* 2(12): 467-469.
- Hussein M, Salah M, Mogawer H, Garelnabi A (1992). Effect of Lactation on the Haemogram and Certain Blood

Constituents of the Dromedary Camel. *J. Appl. Anim. Res.* 1(1): 43-50. <https://doi.org/10.1080/09712119.1992.9705907>

- Iriadam M (2007). Variation in certain haematological and biochemical parameters during the peri-partum period in Kilis does. *Small Rumin. Res.* 73: 54-57. <https://doi.org/10.1016/j.smallrumres.2006.11.001>
- Krajnicakova ME, Bekeova E, Kovac G, Kostecy M, Valocky I, Maracek I, Sutiakova I, Lenhardt L (2003). Selected clinical-biochemical parameters in the puerperal period of goats. *Bull Vet Inst Pulawy.* 47: 177-182.
- Mburu DN, Ochieng JW, Kuria SG, Jianlin H, Kaufmann B, Rege JEO, Hanotte O (2003). Genetic diversity and relationships of indigenous Kenyan camel (*Camelus dromedarius*) populations: implications for their classification. *Anim. Genet.* 34(1): 26-32. <https://doi.org/10.1046/j.1365-2052.2003.00937.x>
- Mohamed H, Hussein A (1999). Studies on normal haematological and serum biochemical values of the 'Hijin' racing camels (*Camelus dromedarius*) in Kuwait. *Vet. Res. Commun.* 23(4): 241-248. <https://doi.org/10.1023/A:1006253210461>
- NBAGR (2016). ICAR- National Bureau of Animal Genetic Resources. Available at <http://www.nbagr.res.in/regcamel.html> accessed on 18th December, 2016.
- Nozad S, Ramin A, Moghaddam Gh Asri-Rezaei S, Kalantry N (2012). Monthly evaluation of blood hematological, biochemical, mineral, and enzyme parameters during the lactation period in Holstein dairy cows. *Comp. Clin. Path.* 23: 275-281. <https://doi.org/10.1007/s00580-012-1607-2>
- Saini N, Kumar R, Kiradoo BD, Singh N, Bhardwaj A, Sahani MS (2006). Camel rearing practices – A survey study in arid western agro-ecosystem of Rajasthan. *J. Camel Pract. Res.* 13: 179-184.
- Snedecor GW, Cochran WG (1994). *Statistical Method.* 8th ed. Oxford and IBH Publishing Co., New Delhi. Pp 156-159.
- Tharwat M, Ali A, Al-Sobayil F, Selim L, Abbas H (2015). Haematobiochemical profile in female camels (*camelus dromedarius*) during the periparturient period. *Camel Pract. Res.* 22(1): 101-106. <https://doi.org/10.5958/2277-8934.2015.00016.8>