



## Blood Biochemical Profile of Weaned Barela (*Camelus dromedarius*) Calves Reared under Extensive Management System

ASIM FARAZ<sup>1\*</sup>, ABDUL WAHEED<sup>1</sup>, NASIR ALI TAUQIR<sup>2</sup>, MUHAMMAD SHAHID NABEEL<sup>3</sup>

<sup>1</sup>Department of Livestock and Poultry Production, Bahauddin Zakariya University Multan, Pakistan; <sup>2</sup>Department of Animal Science, University of Sargodha, Pakistan; <sup>3</sup>Camel Breeding and Research Station Rakh-Mahni, Punjab, Pakistan.

**Abstract** | This study was undertaken to investigate blood biochemical profile of weaned Barela dromedary camel calves reared under extensive management system (EMS) at Desert Thal. A total of 30 weaned camel calves were selected and divided into two groups viz: the first group (G1) of 15 male calves and the second group (G2) of 15 female calves. The animals were reared under traditional husbandry conditions, fed with gram straw and available grazing/browsing on desert species, twice watering was provided. Deworming was done with 1% Ivermectin injection at of 1ml / 50kg body weight. Blood biochemical parameters such as haemoglobin (Hb), glucose, cholesterol, triglycerides, total protein, albumin, globulin, urea, creatinine, calcium and phosphorus were determined. The haemoglobin concentration ( $P < 0.05$ ) was found to be  $14.12 \pm 1.22$  and  $13.78 \pm 1.38$  (gm/dl) respectively in male and female camel calves. The values of glucose, cholesterol, total protein, globulin, urea and creatinine were found to be significantly varied ( $P < 0.05$ ) among groups. While the concentrations of triglycerides and albumin were found to be varied non-significantly ( $P > 0.05$ ) among G1 and G2. The results are discussed with comparison to literature data and will be a useful addition in primary database for further studies of this field.

**Keywords** | Camel calves, Biochemicals, Desert, Sex, Pastoral

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\***Correspondence** | Asim Faraz, Department of Livestock and Poultry Production, Bahauddin Zakariya University Multan, Pakistan; **Email:** drasimfaraz@bzu.edu.pk

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## INTRODUCTION

Camel is an even-toed ungulate of genus *Camelus*, having three species in the world: *Camelus dromedarius* (single humped), *Camelus bactrianus* (double humped) and *Camelus ferus* (wild bactrian camel). The single humped camel is commonly known as dromedary or Arabian camel. The dromedaries are well-known for transportation, racing, milk, meat and fiber (Faraz et al., 2019a). They can adapt easily in desert regions due to their ability to remain without drinking water for extremely long periods and have fluctuating body temperature (Fayed, 2001; Faraz et al., 2019b). They are well-equipped, anatomically and physiologically, to survive, produce and work in harsh and hostile environments (Wu et al., 2014; Faraz et al., 2019c; Faraz, 2020a).

About 94% of world camel population is of the dromedary type. They are usually found in the horn of Africa, Middle East and South Asia (Bernstein, 2009). India and Pakistan have 70% of the camel population of Asia (Rosati et al., 2005). The camel plays an indispensable role in the social life and economy of pastorals in various regions of the world Pakistan is not exception to this. Despite its significant and contribution, the camel is one of the most neglected species in Pakistan with very few attempts made so far to characterize its production potential and related parameters under natural conditions (Faraz et al., 2018, 2019d).

The study of blood constituents provides valuable information about the general health condition of animal (Faye and Bengoumi, 2018) and is considered as biomarker

of body status which also provides information about the sickness of animals (Getnet et al., 2005). However, this biomarker is variable in different physiological, pathological and climatic conditions (Mohamed and Hussein, 1999) while these indices are very important for assessing feed conversion performances and proper dosing of drugs (Abebe et al., 2002).

Many researchers have conducted study on camel blood biochemicals and also the effect of season, age, physiological condition and lactation stage on haematological and biochemical profile in Saudi-Arabia (Al-Busadah and Osman, 2000), Sudan (Babeker et al., 2013) and Iran (Jalali et al., 2018). However, there is only limited information on this subject available in Pakistan (Faraz et al., 2018). The previous studies do not justify the requirements of this subject: therefore, this study was attained to investigate about the blood biochemicals of Barela dromedary camel calves reared under extensive management system (EMS) in Thal Desert. This study will be a useful addition to build the country's primary database and will pave a way for further investigations in this field.

## MATERIALS AND METHODS

### STUDY AREA AND METEOROLOGICAL CONDITIONS

The study area is adjacent to Camel Breeding and Research Station (CBRS) Rakh-Mahni situated in Desert Thal which is located between 31° 10' and 32° 22' North Latitude and 70° 47' and 72° East Longitude. This area is included in the Agro Ecological Zone-III A and B having narrow strips of sand dunes. The climate is arid to semi-arid, subtropical continental and means monthly highest temperature goes up to 45.6°C, while in winter it goes from 5.5 to 1.3°C. Mean annual rainfall in the region ranges from 150-350 mm, increasing from South to North (Rahim et al., 2011).

### EXPERIMENTAL CALVES AND MANAGEMENT

Thirty weaned Barela camel calves approximately 2 years old, reared under extensive conditions, were selected by purposive sampling technique and divided into two groups; 1<sup>st</sup> group (G1) of 15 male calves and 2<sup>nd</sup> group (G2) of 15 female calves. Before commencing the experiment, all calves were examined and color marked for identification with only physically healthy calves included in the trial. Calves were dewormed by injection 1% Ivermectin at 1ml / 50kg body weight and sprayed with Ecofleece solution at 1cc/liter of water. All calves were sent for jungle grazing/browsing for 10 hr daily and were fed 2-3 kg gram straw (*Cicer arietinum*) per head as manger feeding. Salt lumps were placed in mangers and twice watering was provided. The forage species available for grazing/browsing were *Acacia-nilotica*, *Acacia-modesta*, *Ziziphus-mauritiana*, *Albizia-labbek*, *Prosopis-cineraria*, *Tamarix-aphylla*,

*Cenchrus-ciliaris*, *Suaeda-fruticosa*, *Cymbopogon-schoenanthus*, *Kochia-indica*, *Tribulus-terrestris*, *Capparis-spinosa*, *Haloxylon-salicornicum*, *Calligonum-polygonoides* and *Haloxylon-recurvum* (Faraz, 2020b).

### SAMPLING AND ANALYSIS

The jugular vein was cleaned with antiseptic (spirit) for collection of blood. Blood samples were collected into a vacutainer; with and without EDTA for serum separation. Haemoglobin and biochemical parameters were analyzed by using standard kits on haematology analyzer (BC 2300, Mindray Germany) and biochemistry analyzer (DL 9000, Italy) respectively at Laboratory of Camel Breeding and Research Station (CBRS) Rakh-Mahni. Sampling was done twice a month and all tests were performed in duplicate. Hb, glucose, cholesterol, triglycerides, total protein, albumin, globulin, urea and creatinine were determined. Data collected on different parameters was analyzed statistically by applying t-test using SPSS software (SPSS, 2008; Gecer et al., 2016; Akin et al., 2017).

## RESULTS AND DISCUSSION

### HAEMOGLOBIN

The mean values of haemoglobin ( $P < 0.05$ ) were found to be  $14.12 \pm 1.22$  and  $13.78 \pm 1.38$  (gm/dl) for G1 and G2 respectively in EMS (Table 1). Hb was found to be higher in males compared to females, probably due to testosterone effects on the kidneys to produce more erythropoietin that accelerates the erythropoiesis (Murphy, 2014). Al-Busadah and Osman (2000) determined haematological values in camels of Saudi Arabia and reported mean value for Hb as  $13.3 \pm 0.6$ ,  $12 \pm 0.2$  and  $10.1 \pm 0.8$  (gm/dl) in dry-adult, lactating and calves, respectively. Reported range values for Hb was 8.9-15 (gm/dl) (Hassan et al., 1968), 7.8-15.9 (gm/dl) (McGrane and Kenyon, 1984), 11.4-14.2 (Higgins and Kock, 1984) and 11.5 (gm/dl) on average (Omer et al., 2006).

Omer et al. (2008) studied haematological profile of Sudanese camel calves and reported significantly higher Hb concentration in suckling calves as  $11.42 \pm 1.20$  compared to their lactating dams as  $10.69 \pm 0.62$  (gm/dl). In Pakistan, Farooq et al. (2011) studied the normal reference haematological concentration of one-humped camels in Cholistan desert and reported a range for Hb as 7-17 and 8-17 (gm/dl) in male and females, respectively. The reported concentration of Hb is found to be varied in a majority of the references between 9.3 and 15.5 (g/dl) (Faye and Bengoumi, 2018). Hb concentration varies in range of 13-16 (gm/dl), which is relatively higher compared to other domestic animals. It is recognized that the camel's haemoglobin has higher affinity for oxygen (Bogin, 2000; Ouajd and Kamel, 2009). However, Hb was found at a

greater level in dromedary camel of India (Narnaware et al., 2016). Similarly, Hb level was found to be higher in suckling camel calves (Omer et al., 2006).

Amin et al. (2007) studied seasonal variation in blood constituents of Sudanese dromedary camel and reported Hb concentration as 10.67±0.19, 10.73±0.18 (gm/dl) respectively, in dry and green season. Reported Hb concentration was 14.80±1.15 (gm/dl) in male dromedary camels (Al-Harbi, 2012). Hb concentration was found to be 14.06±0.24 (gm/dl) in female dromedary camels (Zaher et al., 2017). Adah et al. (2017) reported Hb concentration as 7.33±0.35 (g%) in Nigerian dromedary camel. Reported Hb concentration was 10.4 (gm/dl) in Bangladeshi dromedary camels (Islam et al., 2019). Ghafoor et al. (2018) reported average concentration of Hb as 11.78±0.57 (gm/dl) in Pakistani dromedary camel. Abdalmula et al. (2018) reported Hb concentration and range as 12.55±0.27 and 7.28-17.70 (gm/dl), respectively in Libyan dromedary camel. Reported Hb concentration was 11±0.41 and 13.44±0.27 (gm/dl) respectively, in Libyan male and female dromedary camels (Abdalmula et al., 2019).

**ENERGETIC PARAMETERS**

The values of glucose and cholesterol were found to be significantly varied (P<0.05) among groups, while triglycerides were found to be non-significantly varied (P>0.05) among groups under EMS (Table 1). Cholesterol and triglycerides concentrations were found to be higher but in normal range in male calves while glucose was found to be higher in female calves depicting that the calves were in active metabolic state. Glucose level in camels was found to be higher than other ruminants which could be the reason for reported higher lactic acid contents in the blood of camels (Osman and Al-Busadah, 2003). Contrary to our findings, Indian scientist Bhakat et al. (2008) determined blood biochemicals in camel calves under different management systems and reported significant differences for triglycerides as 34.8±3.7, 19.1±2.9 (mg/dl) in camel calves in intensive and semi-intensive system of management, respectively. While in another study, Saini et al. (2014) found significantly lower glucose values in grazing prepubescent camels than a stall-fed group under pastoral management in arid western Rajasthan.

In a different study, Osman and Al-Busadah (2003) investigating normal concentrations of serum biochemicals of she-camels in Saudi Arabia, determined glucose (134.4±11), cholesterol (58.4±8.6) and triglycerides (31.4±3) (mg/dl). In Sarwar et al. (1992) and Al-Busadah (2007) reports on blood values in Saudi camels' cholesterol range was 1.9-4.2 (mmol/L). Nagpal et al. (2012) determined serum profile of weaned Indian camel calves and reported glucose as 110.5±3.7, 105.5±0.8 (mg/dl);

cholesterol as 35.8±3.4, 28.0±1.4 (mg/dl) and triglycerides as 28.3±1.3, 48.4±2.8 (mg/dl) in weaned calves at 6 and 9 months age, respectively. Reported normal plasma glucose concentration varied between 60-140 (mg/dl) (Faye and Bengoumi, 2018). Amin et al. (2007) reported glucose (mmol/l) and triglycerides (mg/dl) mean concentrations as 3.31±0.13, 34.24±1.55 and 4.81±0.13, 26.71±1.51 respectively, in dry and green season in the blood of Sudanese dromedary camel.

**Table 1: Blood biochemical profile of extensive kept Barela camel calves at Desert Thal, Punjab.**

Parameters	Male (n=15)	Female (n=15)
Haemoglobin (gm/dl)	14.12±1.22 <sup>a</sup>	13.78±1.38 <sup>b</sup>
Glucose (mg/dl)	133.28±6.23 <sup>a</sup>	135.62±5.62 <sup>b</sup>
Cholesterol (mg/dl)	38.17±2.02 <sup>a</sup>	36.68±2.16 <sup>b</sup>
Triglycerides (mg/dl)	19.52±4.38	18.92±3.86
Total Protein (gm/dl)	5.81±1.07 <sup>a</sup>	5.14±0.98 <sup>b</sup>
Albumin (gm/dl)	2.02±0.68	1.96±0.88
Globulin (gm/dl)	1.98±0.76 <sup>a</sup>	1.69±0.78 <sup>b</sup>
Urea (mg/dl)	35.43±3.68 <sup>a</sup>	31.95±4.06 <sup>b</sup>
Creatinine (mg/dl)	1.45±0.07 <sup>a</sup>	1.48±0.06 <sup>b</sup>

Means having different superscript in columns are significantly different (P<0.05).

Kelanemer et al. (2015) reported glucose (gm/l), cholesterol and triglycerides (mg/l) mean concentration as 0.91±0.02, 229.93±1.31 and 399.09±1.87 in pregnant Algerian dromedary she-camel. Mean glucose concentration was found to be 88.68±1.66 mg/dl in female dromedary camels (Zaher et al., 2017). Abdelmula et al. (2018) reported mean concentrations and range of glucose (gm/dl), cholesterol and triglycerides (mg/dl) as 111.8±5.36, 26.14-240.9; 36.39±1.72, 5.72-77.60 and 31.60±1.81, 8.14-82.22 respectively, in Libyan dromedary camels. Reported glucose mean concentration was 228.0±5.21 (mg/dl) during transition period in Egyptian female dromedary camel (Ebissy et al., 2019). Reported glucose concentration of dromedary camels in Bangladesh was 114.9 (mg/dl) (Islam et al., 2019). Mohamed et al. (2019) reported glucose mean concentration as 176±10.7 (mg/dl) in Egyptian dromedary lactating camels.

**PROTEIN PARAMETERS**

The values of total protein, globulin, urea and creatinine were found to be varied significantly (P<0.05) among groups while the albumin concentration was varied non-significantly (P>0.05) among groups under EMS (Table 1). All values were found to be higher in male calves compared to female calves except creatinine, males being healthier and heavier than females. Urea and creatinine are the indirect tests for proper kidney functioning and excretion. Creatinine which is an anhydride of creatine phosphate

results by the muscle synthesis, a routine product formed due to muscle metabolism and excreted on regular basis (Brar et al., 2000). Being in active fattening condition, the levels of total protein and albumins were also higher as the animals showed increased growth rate. Both energetic and protein parameters testify the highest growth in response to proteo-energetic values of available browsing species.

Bhakat et al. (2008) determined blood biochemicals in Indian camel calves under different management systems and reported significant differences for total protein as  $6.3 \pm 0.3$ ,  $4.7 \pm 0.4$  (gm/dl) in camel calves in intensive and semi-intensive system of management, respectively, while non-significant differences were found regarding urea and albumin. In another study, Saini et al. (2014) found significantly higher urea values in grazing pre-pubescent camels than stall fed group under pastoral management in arid western Rajasthan. In their study, Osman and Al-Busadah (2003) investigating normal concentrations of serum biochemicals of she-camels in Saudi Arabia, determined urea ( $49.8 \pm 5.5$ ), creatinine ( $1.5 \pm 0.1$ ) (mg/dl), total protein ( $7.1 \pm 0.3$ ) and albumin ( $3.7 \pm 0.3$ ) (gm/dl). Reported value for albumin was 2.5-5.2 (gm/dl) (McGrane and Kenyon, 1984); 3-4.4 (gm/dl) (Higgins and Kock, 1984); 3.3 (g/dl) (Omer et al., 2006); 4.5 (gm/dl) (Osman and Al-Busadah, 2003). In addition to this, Sarwar et al. (1992) and Al-Busadah (2007) determined blood values in Saudi camels and reported creatinine as 0.16-0.5 (mmol/L).

In another study, Nagpal et al. (2012) determined serum profile of weaned Indian camel calves and reported total protein as  $5.7 \pm 0.2$ ,  $5.1 \pm 0.2$  (gm/dl); albumin as  $3.7 \pm 0.1$ ,  $3.7 \pm 0.1$  (gm/dl) and urea as  $20.0 \pm 1.1$ ,  $25.4 \pm 1.7$  (mg/dl) in weaned calves at 6 and 9 months of age, respectively. Reported range of normal urea concentration in blood varied between 5-40 (mg/dl), creatinine 0.8-2 (mg/dl), serum albumin concentration 25-45 (gm/l) in camels (Faye and Bengoumi, 2018). Kelanemer et al. (2015) reported total protein and urea mean concentration as  $57.84 \pm 0.46$  (gm/l) and  $372.65 \pm 1.83$  (mg/l) in Algerian female dromedary camels. Reported protein concentration was  $73.00 \pm 2.20$  (gm/l) in Nigerian dromedary camels (Adah et al., 2017). Reported mean concentrations of total protein and creatinine were found to be  $6.27 \pm 0.13$  (gm/dl) and  $1.12 \pm 0.05$  mg/dl in female dromedary camels (Zaher et al., 2017).

Abdelmula et al. (2018) reported mean concentrations and range of total protein (gm/l) and urea, creatinine (mg/dl) as  $50.98 \pm 0.91$ ,  $31.09-67.82$  and  $43.31 \pm 1.39$ ,  $17.00-69.00$ ;  $1.50 \pm 0.02$ ,  $1.002.10$  respectively, in Libyan dromedary camels. Reported concentrations of total protein (gm/dl) and urea (mg/dl) in dromedary camels of Bangladesh were to be 8.2 and 25.04 (Islam et al., 2019). Mohamed et

al. (2019) reported mean concentrations of total protein (gm/l) and creatinine (mg/dl) as  $5.8 \pm 0.08$  and  $0.88 \pm 0.07$  in Egyptian dromedary lactating camels. Reported total protein (gm/l), blood urea nitrogen (mmol/l), creatinine (mg/dl) mean concentrations were to be  $5.92 \pm 0.17$ ,  $17.09 \pm 0.46$ ,  $1.05 \pm 0.11$  during transition period in Egyptian female dromedary camels (Ebissy et al., 2019).

## CONCLUSIONS AND RECOMMENDATIONS

The study of blood constituents can provide valuable information about the general health status of animals and consequently about the animal welfare (Previti et al., 2016). Observation of a deviation of certain blood parameters from their normal limits could be a guide for diagnosis of a disease condition. This paper describes the haemoglobin and biochemical blood serum constituents of weaned Barela dromedary calves reared under extensive conditions in Desert Thal and could be used as a primary data base for future studies in this field.

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## AUTHOR'S CONTRIBUTIONS

Asim Faraz conducted research and wrote the paper. Muhammad Shahid Nabeel helped in conduct of research. Abdul Waheed helped in data analysis while Nasir Ali Tauqir helped in write-up.

## CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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