

Research Article

Reference Values for Some Serum Biochemical Parameters of Adult Male of Libyan and Sudanese Camels in North Africa, Libya

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Abstract

The normal concentrations of some blood constituents were determined in adult one-humped camels from Libya and Sudan. The current study employed the Mindray BC-5000 analyzer to conduct biochemical measurements on thirty adult dromedary camels. Results obtained were compared and interpreted in light of findings reported by other researchers about camelids. The study investigated the normal concentrations of blood constituents in adult one-humped camels from Libya and Sudan. The results indicated that the mean values of total protein were 8.59 ± 0.64 g/dL and 8.74 ± 0.37 g/dL in the Libyan and Sudanese camels, respectively. For albumin, the mean concentrations were 3.47 ± 1.03 g/dL and 3.92 ± 0.53 g/dL, while for globulin, they were 5.03 ± 0.41 g/dL and 4.83 ± 0.44 g/dL in experimental animals respectively. The mean Na concentrations were 153.44 ± 3.04 mmol/l in Libyan camels and 164.39 ± 4.29 mmol/l in Sudanese camels. Ca levels were found to be 11.89 ± 0.74 mmol/l and 9.90 ± 1.37 mmol/l in Libyan and Sudanese camels, respectively. The values of K concentrations showed 5.880 ± 0.102 mmol/l and 6.860 ± 0.249 mmol/l in Libyan and Sudanese camels respectively. While ESR was measured at 0.40 ± 0.13 mmol/c in the study. Conclusion, the study provides a preliminary report on hematological and serum biochemical parameters of camel in North Africa (Libya). Furthermore, future studies can explore blood standards and biochemical measurements across various age groups of *Camelus dromedaries* to enhance the applicability and interpretation of biochemical data in camel research.

Keywords

Camel, Serum, Biochemical, Protein, Globulin

1. Introduction

The camel plays a much more important role in the economy, due to the numerous advantages. It has over other livestock species in terms of work capacity, milk and meat production and environmental conservation [10, 26]. This animal, belonging to the genus *Camelus*, is prevalent in

countries with hot climates and classified as an even-toed ungulate. There are three camel species worldwide: the single-humped camel (*Camelus dromedarius*), the double-humped camel (*Camelus bactrianus*), and the wild Bactrian camel (*C. ferus*). In Arab countries, the single-humped

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camel is commonly referred to as the Dromedary (Arabian camel), according to Muhammad et al. [22].

The biochemical values have been extensively documented in various domestic species, although research in this area is limited in camels [8]. In a study by Al-Ali et al. [4] and Haroun [16], the concentration of bilirubin in *C. dromedarius* was measured, along with various other serum constituents such as protein, calcium, sodium, and potassium. Nazifi et al. [23] studied normal serum from adult camels of the same species, *C. dromedarius*, to analyze these serum constituents. According to EL-Naser and Khamis [15] the study indicated that, presence of high significant decrease in the levels of total protein and albumin in serum constituents of Arabian camel.

Several previous studies have addressed the establishment of normal biochemical standards for camels [1, 3, 14]. These studies have contributed significantly to our understanding of the biochemical profiles specific to camel species, providing essential reference values for clinical and research purposes. Furthermore, these biochemical standards, researchers and veterinarians gain valuable insights into the health and metabolic status of camels, facilitating more accurate diagnosis and treatment strategies. In addition to, these standardized values serve as a benchmark for comparative studies across different populations and geographical regions, enhancing the reliability and applicability of camel health assessments in diverse contexts [25].

The parameters of blood serum is important are vital indicator of the animals' physiology status. Numerous studies have been conducted on the impact of different seasons, ages, health statuses, and lactation stages on the biochemical profile in countries such as Saudi Arabia, Sudan, Iran, and Bangladesh [5, 9, 17]. In Libya, biochemical parameters were studied by Ismail-Hamdi et al. [18], which the studied focused on biochemical analysis of serum proteins that provides valuable information for diagnosis of some diseases. However, there is a lack of documentation on blood serum parameters in camels in the environmental climatic conditions of Libya. Therefore, the objective of the present study was to determine the normal values for serum biochemical levels in adult one-humped camels from Libya and Sudan.

2. Materials and Methods

2.1. Experimental Animal and Collection Samples

Thirty adult one-humped camels were divided into two groups: the first group consisted of 15 male Libyan camels and the second group consisted of 15 male Sudanese camels. Blood samples were obtained from the camels in this research by collecting jugular puncture (Needle 21 G, luer-slip) and the samples were stored in tubes containing anticoagulant (Ethylenediaminetetraacetic acid, EDTA) for biochemical analysis.

All blood samples were then transported on ice to the Ebn Alhitam Lab in Misurata, Libya (It is located on Ring Road four) for further analysis. The blood was allowed to clot, then underwent centrifugation at 5000 rpm for 15 minutes using a Mindray BC-5000 machine, and finally stored at -20 °C for future analysis. The spectrophotometer model (Biosystem; BTS=305) was used to estimate the levels of total protein, albumin, and globulin in the serum samples.

2.2. Statistical Analysis

Data collected on different parameters was analyzed statistically by applying t-test using software and LSD test at 0.05 levels of significance was used to compare the differences among the treatment means, 2019 edition.

3. Result

The experiment involved determining the levels of total protein, albumin, and globulin in the blood (Table 1). The average total protein (TP) concentration in the serum of one-humped Libyan and Sudanese camels was found to be 8.59 ± 0.64 (g/dL) and 8.74 ± 0.37 (g/dL), respectively. For albumin (Alb), the mean concentrations were 3.47 ± 1.03 (g/dL) in Libyan camels and 3.92 ± 0.53 (g/dL) in Sudanese camels. The average levels of globulin (Glb) in serum samples were 5.03 ± 0.41 (g/dL) and 4.83 ± 0.44 (g/dL) for Libyan and Sudanese camels. Furthermore, there were differences in the immune blood proteins (TP, Alb, and Glb) between the two camel strains, with p values less than 0.05 for Alb and Glb in the serum of Libyan and Sudanese camels.

Table 1. Mean values of total protein, albumin and globulin of Camels strain.

Camels strain	Parameter (Mean \pm SE) (g/dL)		
	TP	Alb	Glb
Libyan camels	8.59 ± 0.64	3.47 ± 1.03	5.03 ± 0.41
Sudanese camels	8.74 ± 0.37	3.92 ± 0.53	4.83 ± 0.44

The camel blood serum in the study samples displayed an increase in electrolytes such as Ca^+ , Na^+ , and K^+ . The rise in Na and Ca^+ was found to be statistically significant in the study samples (Table 2) with a P value of less than 0.05. On the other hand, the average Na^+ levels were 153.44 ± 3.04 for Libyan camel strains and 164.39 ± 4.29 for Sudanese camel strains. Additionally, the average values of Ca^+ were 11.89 ± 0.74 and 9.90 ± 1.37 for Libyan and Sudanese camel serum, respectively, with no statistical significance ($P > 0.05$). The study also indicated that the levels of K^+ were 5.880 ± 0.102 in Libyan camels and 6.860 ± 0.249 in Sudanese

camels, showing no statistical significance ($P>0.05$).

Table 2 indicates the rate of deposition speed (ESR) of Libyan and Sudanese camels, with 0.40 ± 0.13 mmol/c for

Libyan camels and 1.460 ± 0.30 mmol/c for Sudanese camels. The results also show the rate of ESR (p -value less than 0.05).

Table 2. Mean values of serum electrolytes and ESR of Camels strain.

Camels strain	Parameter (Mean \pm SE)			
	Na	Ca	K	SER (mmol/c)
Libyan camels	153.44 \pm 3.04	11.89.0.74	5.880 \pm 01.02	0.40 \pm 0.13
Sudanese camels	164.39 \pm 4.29	9.90.0.1.37	6.860 \pm 02.49	1.460 \pm 030

4. Discussion

The study aimed to establish reference intervals for various serum biochemical parameters in camels. Significantly, There is no published literature on these reference values specifically for camels in Libya. Therefore, this study serves as a foundational guide for interpreting biochemical changes in camels in the future in Libya. In addition to the findings reported in a previous study on the reference standards for hematological parameters in Libyan and Sudanese camels [3].

In the present study, the total protein (TP) albumin (Alb) levels observed in the animals were consistent with those reported by Amin et al. [7], Abdoslam et al. [2], and Alzubaidi et al. [6]. While the values of TP and Alb in the current study differed with the results of the study of Ayoub et al. [8], where total protein levels increased in pregnant camels. Rainy season has an effect on increased level of TP and Alb in camel also [9]. TP level significantly increase in female camel during breeding season (Dec-Mar) [20]. Thus, the results may be associated with the particular climatic conditions [21]. Furthermore, It was believed that this may be attributed to seasonal effect with relation to nutritional effect for difference of roughs while grazing during different seasons [9]. In addition to the effect of the physiological condition on the values and rates of biochemical parameters of camels [13]. Furthermore, as stated by Abdoslam et al. [2], an increase may occur due to aging.

Globulin (Glb) in serum of Libyan and Sudanese camels showed a significant increase compared to the study of Abdoslam et al. [2]. Concentrations of both albumin and globulin At birth are typically low. Following ingestion of colostrum, globulin levels increase due to the absorption of immunoglobulin. Additionally, serum protein levels are often reported to decrease during pregnancy and lactation [19]. Production of albumin and globulin increases as the animal matures and reaches adulthood [19]. Rabana et al., [24]; Durrani et al., [12], interpreted the elevation in sedimentation rate as influenced by gender and the likelihood of parasitic

infection, which resulted in an increased ESR.

Level of electrolytes in serum of Libyan and Sudanese camels were in accordance with studies of Abdalmula et al. [1], when studying young and adults Libyan camels. In addition to the effect seasonal variation on ESR due to dehydration, the physiological responses of increased arousal and respiratory distress can lead to the release of red blood cells from the spleen [11]. This phenomenon contributes to elevated E. S. R levels during dry and hot summer seasons. The spleen plays a crucial role in regulating the number and circulation of erythrocytes, and under conditions of stress or dehydration, its function can influence hematological parameters such as ESR. Accordingly, the results obtained in the present study of the ESR within the physiological normal for this species.

5. Conclusion

The hematological and biochemical reference values obtained from Libyan and Sudanese camels in North Africa were found to be comparable to those previously reported for dromedaries. The immunoglobulin levels in the blood of Libyan and Sudanese camels were similar, with no statistically significant differences observed ($P>0.05$). In contrast, the blood electrolytes exhibited a significant variation between Libyan and Sudanese camels ($P<0.05$), while the ESR values were higher in Sudanese camels compared to Libyan camels ($P>0.05$).

Abbreviations

EDTA	Ethylenediaminetetraacetic Acid
SPSS	Statistical Package for the Social Sciences
ESR	Sedimentation Rate
TP	Total Protein
Alb	Albumin
Glb	Globulin
Ca+	Calcium Ion
Na+	Sodium Ion
K+	Potassium Ion

Author Contributions

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Conflicts of Interest

The authors declare no conflicts of interest.

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Research Fields

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