Studies on some biochemical and haematological indices of Sudanese camels (*Camelus dromedarius*)

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Abstract

The objective of this work was to study the biochemical and haematological indices of three age groups, suckling, weaned and lactating, of Sudanese dromedary camels. Forty eight samples were collected from each of the three groups. Suckling calves had higher ($p>0.05$) haemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin, white blood cells count and phosphorus concentrations than the weaned calves which had higher levels of red blood cells count, magnesium, sodium and iron contents. When the haematological profile of the suckling calves was compared with that of their lactating dams, the formers were found to have higher ($p>0.05$) red blood cells count, total white blood cells count, haemoglobin and packed cell volume while the lactating dams had higher mean cell haemoglobin concentration.

The serum biochemical indices of the suckling calves were compared with those of the weaned calves. The former group was found to have higher ($p>0.05$) total protein and creatinine while the latter had higher uric acid concentration.

The study revealed that the lactating dams had higher bile, alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP) contents than their suckling calves. The study also showed that no significant differences were found in all the studied minerals in the serum of the suckling calves in contrast to their lactating dams. These results were compared and discussed with the findings of similar studies conducted by other researchers.

Introduction

Camels (*Camelus dromedarius*) play a very important and vital role in the economy and social life of a large sector of pastoralists in arid and semi-arid regions in several localities in the world. Despite this fact, yet few reports have been published either on its blood parameters as affected by different pathological and physiological events or on the normal levels of blood constituents of camel calves and adults in relation to their age and physiological status (suckling and weaned calves or lactating dams) (e.g. Hussein *et al*., 1982; Ateeg *et al*., 1984; Bengoumi *et al.*, 1997; Osman and Busadah, 2000). In Sudan, still data concerning normal blood constituents of camels kept under intensive conditions are scanty. However, a few published data of camels under natural conditions are available (Hassan *et al*., 1968; Wahbi *et al*., 1980; Eldirdiri *et al*., 1987). Similar data of camels in some other localities are available such as Soni and Aggarawala (1958), Banaerjee *et al*. (1962), and Lakhotia *et al.* (1964) for the Indian camels. In other camel rearing areas some reports are also available including Hussein *et al.* (1982), El-Amrousi *et al*. (1984) and Osman and Al-Busadah (2000) for Saudi camels and Abd El-Samee (1987) and Dessouky (2006) for Egyptian camels.

The study of blood constituents can provide valuable information about the general health of

an animal and, therefore, can be used for evaluating the health status of the animal. Observation of a deviation of certain blood parameters from their normal limits could be a guide for diagnosis or differential diagnosis of a disease condition. The following paper describes the haemogram and biochemical blood serum constituents of young suckling and weaned calves as well as of their lactating dams in a camel herd naturally ranging in Khartoum North outskirts, Sudan.

Materials and Methods

Animals: A total of 48 blood samples were obtained from lactating dromedary she-camels aged over 6 years naturally grazing in the area of *Abu Deleig* (North-east of Khartoum Town). A similar group of 48 samples were obtained from their suckling dams which were less than one year old and the other 48 samples were collected from weaned camel calves aged over one year ranging under the same field conditions.

Blood sampling and analysis: For the hematological analysis blood was obtained by jugular venipuncture into vacutainers containing di-sodium ethylenediamine-tetra-acetic acid (EDTA) as an anti-coagulant. More 5 ml of blood were drawn into clean dry plain vacutainer tubes for serum analysis. Serum was separated by centrifugation and then stored at -20º C for later analysis. The anti-coagulated blood was used immediately for the determination of erythrocyte count, packed cell volume (PCV), hemoglobin (Hb) concentration and total leukocyte count. The hematological indices, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC), were calculated from the erythrocytic series values (Dacie and Lewis, 1992).

Colorimetric method was adopted for the determination of phosphorus (P) and magnesium (Mg) using Unicam-8625 UV Spectrophotometer. Serum sodium (Na), potassium (K) and iron (Fe) were determined by a flame photometer (Corning 400, England). Linear Chemicals were used. The ALT, AST, ALP were estimated spectrophotometrically using commercial reagent kits.

Data were analyzed by student t-test using SPSS.

Results

As shown in Table 1, suckling calves had higher ($P<0.05$) haemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin, white blood cells count and phosphorus concentrations than weaned calves which had higher levels of red blood cells count, magnesium, sodium and iron contents. The suckling calves were found to have higher ($P<0.05$) red blood cells count, total white blood cells count, haemoglobin and packed cell volume than the lactating dams which had higher mean corpuscular haemoglobin concentration. When the biochemical indices of suckling calves were compared with those of the weaned calves, the formers were found to have higher ($P<0.05$) total protein and creatinine while the weaned calves had higher uric acid concentration (Table 2). No significant differences were observed between the suckling and weaned calves in the levels of all the three enzymes investigated (AST, ALT and ALP) as well as the bile, albumin and urea.

The suckling calves were found to have higher concentrations of haemoglobin, packed cell volume, red blood cells count and total white blood cells count than their lactating dams (Table 3). The lactating dams, on the other hand, had higher bile, alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP) contents than their suckling calves while no significant differences were observed in all the investigated minerals in the serum of the suckling calves and their lactating dams (Table 4).

Discussion

The results obtained in this study regarding lack of significant differences between the lactating dams and their suckling calves in serum content of total proteins, albumin, creatinine, urea and uric acid supports the conclusion of Idris and Tartour (1977) who found no relationship between the camel age and several protein parameters they examined in camels. The result recorded by Osman and Busadah (2000), however, was in line with the result of this work as both studies confirmed the higher creatinine content in the serum of the suckling calves compared to their lactating dams.

Although the lactating camels had higher AST, ALT and ALP contents than their suckling calves in this study, Osman and Busadah (2000) reported a reverse result when they found that camel calves had higher AST and ALP than their lactating dams. The high AST content in the calves serum was attributed to the less stable biological membrane in camel young animals which allows more leakage of cellular enzymes into the blood (Sarwar *et al.,* 1992). Moreover, The latter authors agreed with Osman and Busdah (2000) regarding lack of effect of age on ALT activity while our findings in this study recorded significant difference in the ALT concentration between the lactating dams and their suckling calves. The lack of consistency between the results of this work and the results of other studies could be attributed to geographical or nutritional factors or due to species variation. It worths mentioning that, the high concentration of ALP reported by other workers in the serum of young animals was attributable to the active osteogenesis in these growing animals (Bengoumi *et al.,* 1997).

The higher bile serum content in the lactating camel dams recorded in this study did not support the findings of Hussein *et al*. (1982) and Osman and Busadah (2000) who concluded that age had no significant effect on total bilirubin concentration.

The results of this study were not in line with the findings that white blood cells count decreases with age in the camel (Dessouky, 1992) as these cells increased in suckling calves when compared with the weaned calves and lactating dams.

The findings of this study confirmed the little variation reported in regard to the effect of age on the serum biochemical constituents in camels as no significant differences were observed between the levels of total protein, albumin, creatinine, urea and uric acid in calves and dams serum (Sarwar *et al*., 1991).

The current investigation revealed no significant variations in the serum of the examined calves and their lactating dams regarding all the studied minerals. However, phosphorus (P) level is known to be high in young animals but increases further when cereal is fed to the calves (Abu Damir, 1998). Blood level of sodium (Na) and potassium (K) are usually high in the early faetal development, but subsequently becomes lower than those of the dam (Salib *et al.,* 1984). Generally, camel serum is known to show a wide range of normal levels of sodium content (Abu Damir, 1998). The minerals and trace elements status, requirements, deficiencies, toxicities and imbalances are well reviewed by Faye and Bengoumi (1994) and Abu Damir (1998).

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Table 1. Haematological profile of suckling and weaned Sudanese camel calves.

Parameter	Suckling calves (<1 year)	Weaned calves (> 1 year)	Significance
Red blood cells (RBC) (10^6/ml)	6.22^{b} ±0.92	7.45^{a}±1.43	*
Haemoglobin (Hb) (gm/100ml)	11.42^{a}±1.20	10.62^{b}±1.51	*
Packed cell volume (PCV) (%)	26.69^{a}±3.25	24.87^{b}±2.63	*
Mean corpuscular volume (MCV) (fl)	42.89^{a}±4.55	33.65^{b}±4.39	*
Mean corpuscualr haemoglobin (MCH) (pg)	19.30^{a}±3.66	14.23^{b}±2.19	*
Mean corpuscular haemoglobin concentration (MCHC)	42.95^{b}±2.73	42.41^{b}±3.73	N.S.
White blood cells (WBC) (10^6/ml)	14.13^{a}±3.16	8.47^{c}±1.86	**
Magnesium (Mg) (mg/100ml)	1.76^{b}±0.19	2.25^{a}±0.33	*
Phosphorus (P) (mg/100ml)	4.00^{a}±0.19	3.73^{b}±0.42	*
Potassium (k) (mEq/l)	4.16^{a}±0.29	4.15^{a}±0.15	N.S.
Sodium (Na) (mEq/l)	123.42^{b}±3.03	127.29^{a}±3.08	*
Iron (Fe) (µg/100ml)	48.84^{b}±9.17	57.00^{a}±13.00	*

* denotes significant difference at the level p>0.05

N.S. denotes non-significant difference

Table 2. Serum biochemical profile of suckling and weaned Sudanese camel calves.

Parameter	Suckling calves (<1 year)	Weaned calves (> 1 year)	Significance
Total protein (gm/100 ml)	7.24^{a}±0.20	7.13^{b}±0.39	*
Albumin (gm/100 ml)	3.34^{a}±0.21	3.34^{a}±0.23	N.S.

Urea (mg/100 ml)	26.78^{a}±1.77	25.29^{a}±2.20	N.S.
Uric acid (mg/100 ml)	2.75^{b}±0.38	3.04^{a}±0.49	*
Creatinine (mg/100 ml)	1.33^{a}±0.20	1.21^{b}±0.13	*
Bile (mg/100 ml)	0.15^{a}±0.06	0.19^{a}±0.08	N.S.
Alanine aminotransferase (ALT) (iu/l)	9.74^{a}±1.98	9.94^{a}±3.06	N.S.
Aspartate aminotransferase (AST) (iu/l)	25.24^{b}±2.27	25.67^{b}±3.06	N.S.
Alkaline phosphatase (iu/l)	84.89^{a}±1.70	85.06^{a}±1.10	N.S.

* denotes significant difference at the level p>0.05
N.S. denotes non-significant difference

Table 3. Haematological profile of suckling Sudanese camel calves and their lactating dams.

Parameter	Suckling calves (<1 year)	Lactating dams (> 6 year)	Significance
Red blood cells (RBC) (10^{6}/ml)	6.22^{b} ±0.92	5.56^{c}±1.20	*
Haemoglobin (Hb) (gm/100ml)	11.42^{a}±1.20	10.69^{b}±0.62	*
Packed cell volume (PCV) (%)	26.69^{a}±3.25	23.76^{b}±2.23	*
Mean corpuscular volume (MCV) (fl)	42.89^{a}±4.55	44.15^{a}±9.51	N.S.
Mean corpuscular haemoglobin (MCH) (pg)	19.30^{a}±3.66	20.20^{a}±5.41	N.S.
Mean corpuscular haemoglobin concentration (MCHC)	42.95^{b}±2.73	45.26^{a}±3.41	*
White blood cells (WBC) (10^{6}/ml)	14.13^{a}±3.16	12.59^{b}±3.45	*
Magnesium (Mg) (mg/100ml)	1.76^{b}±0.19	1.76^{b}±0.15	N.S.
Phosphorus (P) (mg/100ml)	4.00^{a}±0.19	3.93^{a}±0.19	N.S.
Potassium (k) (mEq/l)	4.16^{a}±0.29	4.14^{a}±0.36	N.S.
Sodium (Na) (mEq/l)	123.42^{b}±3.03	122.54^{b}±3.19	N.S.
Iron (Fe) (µg/100ml)	48.84^{b}±9.17	46.19^{b}±9.19	N.S.

* denotes significant difference at p>0.05
N.S. denotes non-significant difference.

Table 4. Serum biochemical profile of suckling Sudanese camel (*Camelus dromedarius*) calves compared to their lactating dams.

Parameter	Suckling calves (<1 year)	Lactating dams (> 6 year)	Significance
Total protein (gm/100 ml)	7.24^{a}±0.20	7.28^{a}±0.18	N.S.
Albumin (gm/100 ml)	3.34^{a}±0.21	3.35^{a}±0.18	N.S.
Urea (mg/100 ml)	26.78^{a}±1.77	26.78^{a}±1.77	N.S.

Uric acid (mg/100 ml)	2.75^{b}±0.38	2.86^{b}±0.29	N.S.
Creatinine (mg/100 ml)	1.33^{a}±0.20	1.35^{a}±0.20	N.S.
Bile (mg/100 ml)	0.15±0.06	0.18±0.08	*
Alanine aminotransferase (ALT) (iu/l)	9.74^{a}±1.98	10.43^{b}±2.92	*
Aspartate aminotransferase (AST) (iu/l)	25.24^{b}±2.27	26.65^{a}±2.70	*
Alkaline phosphatase (ALP) (iu/l)	84.89^{b}±1.70	85.30^{a}±1.88	*

* denotes significant difference at the level p>0.05

N.S. denotes non-significant difference

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