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SOME HAEMATOLOGICAL, BIOCHEMICAL AND HORMONAL PROFILE OF PREGNANT AND NON-PREGNANT SHE-CAMELS (*Camelus dromedarius*) RAISED IN A SUDAN SAVANNA ZONE OF NIGERIA

B.F. Muhammad, D. Aliyu, A.A. Njidda and I.L. Madigawa
Department of Animal Science, Bayero University, P.M.B. 3011, Kano, Nigeria

ABSTRACT

The study assessed haematological, biochemical and hormonal parameters in 12 pregnant and non-pregnant she-camel (*Camelus dromedarius*) managed extensively in a Sudan savannah ecological zone of Nigeria. The parameters were determined at monthly interval during the last trimester in the case of pregnant she-camels. The result shows significantly ($p<0.05$) higher mean corpuscular haemoglobin concentration in pregnant (49.0g/dl) compared to non-pregnant (19.2g/dl) she-camels. No significant difference was recorded on haemoglobin concentration, packed cell volume, mean haemoglobin concentration and lymphocytes. The blood urea level, total protein, serum globulin and albumin showed no significant different ($P>0.05$) among the pregnant and non-pregnant she-camels. The progesterone concentration was significantly higher in pregnant (4.23ng/ml) compared to non-pregnant (1.39ng/ml) camels. However, alkaline and inorganic phosphatase were not significantly different in both pregnant and non-pregnant she camels ($p>0.05$). Serum calcium concentration in non-pregnant she-camels (2.63µmol/l) was significantly higher than that in pregnant ones (2.17 µmol/l). It was concluded that physiological condition had more influence on biochemical and hormonal rather than heamatological indices in camel raised in a Sudan Savannah ecological zone of Nigeria.

Key words: Blood serum index, camel, heamatology, hormonal parameters, pregnancy

Some recent studies have reported on serum biochemical values of healthy camels in Tunisia (Hammadi *et al,* 2001), United Arab Emirates (Salman and Afzal, 2004), Sudan (Abd El Hag *et al,* 2005), Saudi Arabia (Al-Busadah, 2007), Nigeria (Mohammed *et al,* 2007) and India (Potadkar *et al,* 2010) dealing with various conditions of environment and management. The results showed noticeable variations due to location, sex, season, health and physiological condition of the animals and these necessitated more investigations in different areas.

Pregnancy in camel is 387 days (Wilson, 1989) and is accompanied by changes in hormonal and blood biochemical concentrations. For instance, the progesterones level in camel at oestrus are about 0.5ng/ml and oestrogens are in a peak at 75 pg/ml (Banerjee, 2005). The oestrogen and progesterone are important female sex steroid hormones, whose rhythmical secretion determines ovulation, pregnancy and parturition (Sumar, 2000; Ayoub *et al,* 2003).

The pattern of hormone and blood biochemical changes in pregnant cattle, buffalo, sheep and goat has been well-documented but less is reported in camel (Deen *et al,* 2010). Blood, is an index of several metabolic processess and its differential concentration and periodic changes in its metabolites determine genetic and production potential of specific livestock species (Yadav and Bissa, 1998). Likewise, haematological values are widely used to determine systemic relationship and physiological adaptation including the evaluation of general health conditions, diagnoses and prognoses of various livestock diseases. The current study determines the influence of pregnancy on hormonal, haematological and blood biochemical levels of she-camels raised in a sudan Savanna ecological zone of northern Nigeria.

Materials and Methods

A total of 12 she-camels aged between 7 and 14 years were used for the study, half (6 she-camels) of which were pregnant at different stages. The data was collected between June, 2009 and February, 2010. Blood collection was done early in the morning at 6:30 hrs. The blood samples collected for haematological analysis were obtained by jugular venipuncture into vacutainers containing ethylenediamine tetraacetic acid (EDTA) anti coagulant. Blood plasma for

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biochemical and hormonal analyses was harvested by centrifugation at 2500 rpm for 15 minutes in a refrigerated centrifuge and stored at – 20°C.

The anti-coagulated blood was used to determine heamoglobin (Hb) concentration, total white blood cells (WBC), red blood cell (RBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC), mean haemoglobin concentration (MHC), lymphocytes, neutrophils and packed cell volume (PCV) automatically using Haematocrit blood analyser (Sysmex KX-21 Automated Hematology Analyser). Calorimetric method was used in blood urea concentration determination using Randox Kit-urease–berthelot (Randox, Lab. Ltd, UK) method; Alkaline phosphatase activity and the total protein was determined using Biuret reagent (Tietz, 1994).

Blood albumin concentration was determined using modified Bromocresol Green calorimetric method (Tietz, 1990). Calcium concentration in the blood serum was determined using O-cresolphthaline complexone calorimetric method (Young, 1990). Inorganic phosphorous was determined using Agappe test kit (AGAPPE, Diagnostics Ltd., India). Estrogen and progesterone concentrations were automatically analysed using E. Elecsys, 2010 and Cobas analyser Kits (Roche, Diagnostics, USA). The means of parameters collected on haemato-biochemical and hormonal concentrations were analysed using student t-test in an SPSS statistical package version 16.0 (Gupta, 2002).

Results

Table 1 showed the effect of pregnancy on haematological parameters of she-camels. A trend of increased Hb (14.3 vs 10.9 g/dl), RBC (7.02 vs 4.9 x10^2/l), WBC (19.2 vs 15.7 x10/l) were recorded on pregnant and PCV (32.7 vs 38.9%) on non-pregnant she-camels, though not significant (P>0.05) statistically. A significantly higher MCHC was recorded on pregnant (49.0g/dl) she-camels. No significant difference (P>0.05) was found on MCV (61.3 and 73.9 fl) and MCH (24.1 and 26.9 pg) between pregnant and non-pregnant she-camels. Similarly, no significant difference was recorded on percentage neutrophils and lymphocytes of pregnant (62.3 and 24.6%) and non-pregnant (50.4 and 25.0%) camels.

The blood biochemical components of pregnant and non-pregnant she-camels are shown (Table 2). The result revealed that calcium content in pregnant (2.17 µmol/L) was significantly lower than that of non-pregnant she-camel (2.63 µmol/l). Although, no significant difference was recorded on alkaline phosphatase as well as inorganic phosphate between the pregnant and non-pregnant she-camels (P>0.05). The results showed no significant difference in albumin, globulin and total protein due to pregnancy of the she-camels (Table 2). However, a trend of higher values was recorded on the pregnant she-camels. Table 3 showed the hormone concentration in the pregnant and non pregnant she-camels. The results revealed no statistical difference in oestrogen concentration. However, a significant difference in progesterone concentration ($p < 0.05$) was observed and it was higher in pregnant (4.23 ng/ml) than non-pregnant (1.39 ng/ml) she-camels.

Table 1. Effect of pregnancy on haematological parameters of she-camels.

Parameter	Physiological condition		t-value
	Pregnant	Non-pregnant	
Hb(g/dl)	14.3	10.9	2.308^{ns}
PCV (%)	32.7	38.9	-0.386^{ns}
RBC (x102/l)	7.02	4.90	1.034^{ns}
MCV (fl)	61.3	73.9	-0.512^{ns}
MCHC (g/dl)	49.0	19.2	1.304*
MCH (pg)	24.1	26.9	-0.219^{ns}
WBC (x10/l)	19.2	15.7	0.661^{ns}
Neutrophils (%)	62.3	50.4	0.639^{ns}
Lymphocyte (%)	24.6	25.0	0.031^{ns}

Hb = Haemoglobin; PCV= pack cell volume; RBC = red blood cells; MCHC = mean corpuscular haemoglobin concentration; MHC = mean haemoglobin concentration; WBC= white blood cell

ns = Non Significant different * = Significant different (P<0.05)

Table 2. Biochemical blood component of pregnant and non-pregnant camel.

Parameter	Physiological condition		t-value
	Pregnant	Non-pregnant	
Alkaline Phosphatase (µ/L)	36.7	35.0	0.81^{ns}
Inorganic Phosphatase (mmol/l)	1.77	2.10	0.69^{ns}
Calcium (µmol/l)	2.17	2.63	3.74*
Urea (mmol/l)	6.03	5.50	0.194^{ns}
Albumin (g/l)	38.67	36.00	-0.85^{ns}
Globulin (g/l)	36.00	31.00	0.82^{ns}
Total Protein (g/l)	74.00	70.00	0.32^{ns}

ns=Non Significant difference *=Significant difference (P<0.05)

Table 3. Hormone concentration of pregnant and non-pregnant she-camels.

Parameter	Physiological condition		t-value
	Pregnant	Non-pregnant	
Oestrogen (pg/ml)	27.03	19.79	0.776
Progesterone (ng/ml)	4.23	1.39	1.166*

* P<0.05= Significant difference between the means ns = No Significant different between the means.

Discussion

The values of haematological indices obtained in the current study were within the range reported for both pregnant and non-pregnant she-camels (Abdelgadir *et al,* 1984; Osman and Al-Busadah, 2000; Salman and Afzal, 2004; Al-Busadah, 2007). However, the slight increase in haemoglobin concentration, RBC and WBC recorded on pregnant compared to non-pregnant she-camels could be attributed to physiological changes due to corpus luteum and foetal development. Earlier, Wilson and Payne (1999) reported rapid development of corpus luteum after successful mating in camel and that it reaches its greatest weight and size by the 60th day, required mainly for pregnancy maintenance. The higher MCHC values recorded on pregnant she-camels were in line with the findings of Al-Busadah (2007) and it is a function of RBC count which was related to PCV, a denominator in the computation of MCHC values (Jain, 1986).

The percentage neutrophils and lymphocytes recorded in the pregnant and non-pregnant she-camels were similar and falls within the range of 20.3 to 45.1% reported for different breed of camels (Ayoub *et al,* 2003; Abd El Hag *et al,* 2005; Al-Busadah, 2007). Gesnet and Abebe (2005) observed an increase in leukocyte during pregnancy in camel and attributed it to physiological changes associated with foetal growth and development. Similarly, the reports of Patodkar *et al* (2010) on blood calcium content in female camels corroborated the current findings of 2.63 µmol/l, slightly higher than during pregnancy. The values of urea, albumin, globulin and total protein tend to be higher in pregnant she-camels, which compare favourably to the reports of Bhargara *et al* (1964), Rezakhani *et al* (1997), Ayoub *et al* (2003) and Mohammed *et al* (2007). They observed higher urea concentration in pregnant she-camel which implied higher protein catabolism activities; urea being an end product of protein metabolism. Ali *et al* (2004) observed decreased in urea concentration in non-pregnant she-camels.

The elevated serum protein level was attributable to age of camel and prevailing environmental conditions. The slightly higher albumin concentration recorded in the present study is in agreement with the results of Zia-ur-Rahman *et al* (2007) for pregnant she-camel. Albumin is known to play a vital role in development of colloidal pressure associated with high viscosity of the follicular fluids. Also, albumin solubilises many compounds such as calcium and bilirubin. Although, no significant difference was recorded on alkaline phosphatase (ALP) concentration in the current study, Saeed *et al* (2008) reported that sera of pregnant group of camel had higher mean ALP activity and lower mean albumin, calcium and phosphorus concentrations. Alkaline phosphatase catalyses the hydrolysis of a wide variety physiologic and non-physiologic phosphoric acid esters in alkaline medium (pH 10). Normal ALP level is known to be age dependent.

The results of the current study indicated lower calcium concentration level in pregnant as compared to non-pregnant she-camels which was similar to those reported by Ali *et al* (2004). The findings suggest strong possibility that calcium is being withdrawn from the dam and transferred to the foetus. Over 98% of body calcium is present in the skeleton, one half of the remaining 2% was found in the extracellular fluid and the rest in the tissues. Calcium is crutial in bone numeralisation and for basic physiological processes such as blood coagulation particularly required for foetal growth during the last stage of pregnancy. The current values for inorganic phosphate were similar to the reports of Ali *et al* (2004) for serum inorganic phosphate which was high in regular breeder and low in pregnant mare.

The findings of the current study implies that the blood progesterone levels increased significantly with pregnancy in camels and emphasised its rolein maintenance of pregnancy. Progestrone is formed mainly in the cell of the corpus luteum and during pregnancy in the placenta (Johnson *et al,* 1993). Progesterone promote the proliferation, secretion and deposition of alveoli. The oestrogen concentration on the other hand remained the same, though it indicated tendency to increase with weeks of pregnancy. Earlier, Alfuraiji (1998) recorded a decline in mean progesterone concentration from day 21 pre-partum, reaching its lowest level of 3.2 nmol/l on the day of parturation. In a study of ovarian activity of the she-camel, Hussein *et al* (2008) reported estradiol level of 22.00±2.56 pg/ml which corroborated the current findings and that it tend to decline to basal level. Oestrogen are mainly formed in the placenta during pregnancy and 98% of oestradiol is bound to transport protein (Juhl, 1994).

Conclusions

The study concluded that heamatological and biochemical indices for pregnant and non-pregnant she-camels raised in the Sudan savanna zone of Nigeria were similar except for low serum calcium level in the pregnant ones. Also, the progesterone concentration in pregnant camel was higher. The current study provides some base line information and could be used in further studies of camel reproduction and physiology in the Sudan Savannah ecological zone.

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