

## Effect of Pregnancy on Haematological and Biochemical Profiles in the Mountain Gazelles (*Gazella gazelle*)

<sup>1</sup>M.S. AL-Eissa, <sup>2</sup>Saad Alkahtani, <sup>2</sup>Hamad Al-Yahya and <sup>3</sup>Mohammed AL-Marzoug

<sup>1</sup>Department of Biology, Faculty of Science, Hail University, P.O. Box 291996, Riyadh 11362, Saudi Arabia

<sup>2</sup>Department of Science, Teachers College, King Saud University, Riyadh 11352, Saudi Arabia

<sup>3</sup>Ministry of Education, Dammam, Saudi Arabia

**Abstract:** The propose of this study was to investigate the effect of pregnancy on hematological and biochemical parameters. This parameters were measured in 20 blood samples collected from 10 pregnant and 10 non- pregnant captive mountain gazelles (*Gazella gazelle*) in Saudi Arabia. The effects of pregnancy on the intracellular concentrations of sodium (Na<sup>+</sup>), Potassium (K<sup>+</sup>), Blood Urea Nitrogen (BUN), Alanine amino Transferase (ALT), Aspartate amino Transferase (AST), Total protein, albumin, Alkaline Phosphatase (AP), Creatinine, Cholesterol and Triglyceride were analyzed. The levels of Sodium ions, GGT, ALT, AST, cholesterol and triglycerides were significantly (p<0.01) increased in pregnant group compared to non-pregnant group. These result due to the physiological and metabolism changes during pregnancy. So this study suggested to supply pregnant Gazelles with proteins during pregnancy.

**Keywords:** Biochemistry, gazelle, heamatology, metabolism, pregnancy, reproduction

### INTRODUCTION

Haematological parameters pass through a series of changes and are helpful to determine the health and nutritional status of animals (Gupta *et al.*, 2007). The implication of determining hematological parameters of domestic animals is well- documented (Obi and Anosa, 1980). The significance and the great variation in the haematological and biochemical indices observed between breeds of goats and rabbits has been well documented (Abdel-maksoud, 1999; Tambuwal *et al.*, 2002; AL-Eissa, 2011).

These differences have underscored the need to establish an appropriate physiological baseline values for various breeds of livestock including the mountain gazelles which could be used in the realistic evaluation of the management practice, nutrition and diagnosis of health condition. The data of hematology and blood biochemistry in pregnant and non-pregnant antelopes females are scarce. It is well known that during the pregnancy some metabolic changes occur that may alter physiological range of blood constituents (Jainudeen and Hafez, 1994; El-sherif and Assad, 2001; Khan and Ludri, 2002) Therefore, we have hypothesized the influence of the pregnancy on hematological and biochemical parameters in blood of the deer species as it was confirmed in the domesticated ruminants.

The concentrations of erythrocyte and electrolytes in the dairy cows were determined during late pregnancy and early lactation (Muller *et al.*, 1988; Mulei and Daniel, 1990; Ozegbe, 2001). On the other hand Evans *et al.* (1963) reported the effects of experimentally induced anaemia in the sheep on some erythrocyte intracellular indices. Since late pregnancy is associated with decreased packed cell volume and red blood cells counts, similar to the situation obtained during lactation as well as anaemia caused by experimental Heammonchus cotilortus infection. Therefore, the aim of the present study was to assess and determine changes in some haematological and serum biochemical values for pregnant and non-pregnant mountain gazelles across the gestation period. And can define the adaptation that occur during pregnancy due to the rare data available for this species.

### MATERIALS AND METHODS

All of the experimental procedures were conducted in the research center of The National Commission for Wildlife Conservation and Development (NCWCD), Riyadh, Saudi Arabia between 2010 and 2011.

Two groups of pregnant and non-pregnant mountain gazelles (*Gazella gazelle*) at third months of gestation were maintained and managed at the

KKWRC (Riyadh, Saudi Arabia ). Each group contained ten animals. All female used were about 3 years old and around 14 kg weight. They were fed on dry alfalfa (*Medicago sativa*; min. 15% crude protein) and 1.5 L of water, quantities 10-15% above their average daily requirements. Animals were kept in small pens (0.5 h) for research purposes.

Ten mL blood samples were collected from each gazelle by jugular vein puncture into clean vacuum tubes (Becton, Dickinson and Co., USA) containing EDTA-K2, while the animal was manually restrained. Each tube was inverted 2-3 times to ensure thorough mixing. The method of Fairbanks and Klee (1987) was used for preparing the lysate for enzymes assays. About 109 of erythrocytes were mixed with normal saline and diluted with 2 mL of Na<sub>2</sub>EDTA-2-mercaptoethanol.

The haemolysate was prepared as described by Wilson and Dixon (1991) in order to determine chemical parameters assays. The erythrocyte count of the lithium chloride-washed cells was determined as described by Jam (1986) after thorough mixing, 108 Red Blood Cells (RBC) were thereafter put into 2 mL of deionized water and mixed in a vortex machine.

Na<sup>+</sup> and K<sup>+</sup> concentrations were determined using the flame photometer (Corning model 400, Corning Scientific Ltd, England). The haemolysates were diluted with deionised water in the ratio of 1:100 for Na and 1:50 for P Urea nitrogen. creatinine and triglycerides profiles were determined as described by (Eun *et al.*, 2009), while total cholesterol was determined according to Zlatkis *et al.* (1953). The concentrations of ALT and AST were determined according to Reitman and Frankel (1957). The method of Albillos *et al.* (2011) was used in determining the level of alkaline phosphatase.

**Statistical analysis:** Statistical significance of differences between pregnant and non-pregnant groups were analyzed by using the Students t-test procedure of embedded in SPSS version 16.

## RESULTS

The levels of haematological and biochemical are presented in Table 1. The concentrations of Na<sup>+</sup> were significantly (p<0.001) increased in the pregnant group compared with non-pregnant group, but the intracellular K<sup>+</sup> and Na<sup>+</sup>/K<sup>+</sup> value did not change significantly between the two groups.

The levels of ALT, AST and GGT were significantly (p<0.01) increased in the pregnant group compared with non-pregnant group. The mean intracellular concentrations of total protein, albumin,

Table 1: Haematological and biochemical parameters differences between pregnant and non-pregnant gazelles

Parameters	Concentration	
	Pregnant	Non-pregnant
Na <sup>+</sup> (nmoL/L)	3000*	2100
K <sup>+</sup> (nmoL/L)	900	980
BUN (nmoL/L)	1700	2000
GGT (u/L)	5250*	2050
ALT (u/L)	1400*	450
AST (u/L)	7300*	2800
Total proteins (g/L)	2100	3000
Albumin (g/L)	900	980
Alkaline phosphatase (u/L)	1700	2000
Creatinine (u/L)	2050	2250
Cholesterol	200**	80
Triglyceride	650**	550

\*: p<0.001; \*\*: p<0.01

alkaline phosphatase and creatinine fluctuated non-significantly during pregnancy. The triglycerides and cholesterol values were significantly (p<0.001) increased during pregnancy compared with non-pregnant group.

## DISCUSSION

The significant increased in the levels of intracellular Na<sup>+</sup> in the pregnant group (p<0.001) is comparable to the uniformly observed hypernatraemia during late pregnancy (Kaiser and Cummings, 1958; Rowlands *et al.*, 1975; Kleinman and Lorenz, 1989). This late pregnancy-induced hypernatraemia may have resulted from the particularly high aldosterone production, which promotes K<sup>+</sup> excretion and Na<sup>+</sup> reabsorption in the renal tubule, during pregnancy (Rowlands *et al.*, 1975) The increased Extra-Cellular Fluid (ECF) Na<sup>+</sup> will cause water to pass out of the cells which could result in intracellular dehydration (Latner, 1975) and the associated increase in intracellular Na<sup>+</sup> concentration.

The non-significant rise in the concentration of the erythrocyte potassium accompanied by a significant rise in the Na<sup>+</sup> level could also be attributed to either physiological alteration in the balance between the rate of erythropoiesis and aging or the initial phase of the reversal, i.e., increased EK and decreased erythrocyte Na<sup>+</sup> during lactation as reported by Mulei and Daniel (1990)

The increased counts in the RBC Na<sup>+</sup>/K<sup>+</sup> ratio observed in the pregnant group may be due to either *in vivo* aging (Bernstein, 1959) or some degree of failure of the sodium pump mechanism (Koter *et al.*, 1985). It could also have resulted from differences in the distribution pattern of high and low K<sup>+</sup> subjects among

the experimental groups. The increased intracellular levels of ALT, AST and GGT during pregnancy are differing to the report findings in the plasma (Allard *et al.*, 1989). These alterations could have been a product of accelerated erythropoietic activity since young blood cells are characterized by increased activities of enzymes (Sass *et al.*, 1964). Otherwise, it could be attributed to the intracellular dehydration induced by increased Extra-Cellular Fluid (ECF) Na<sup>+</sup>.

The observed constancy in the total protein, albumin and AP, could probably as a consequent of them being required by the fetus for bone and other tissues formations. The cell membranes are generally permeable to metabolites or non-protein nitrogen (Latner, 1975) The observed increase in the intracellular concentrations of metabolites, against the reported decreased plasma levels (Brzostowski *et al.*, 1995), could then be due to the shift from the plasma to the erythrocyte by such small molecules.

### CONCLUSION

The obtained data in this study was revealed that some haematological and biochemical parameters significantly changes during pregnancy period in the mountain gazelles (*G. gazelle*). Since these parameters are strongly influenced as a result of pregnancy, this study therefore suggests to provide pregnant Gazelles with some extra food supplements such as proteins during pregnancy. These supplements are very useful in Saudi environment to conservative *G. gazelle*.

### ACKNOWLEDGMENT

The authors extend their appreciation to the Research Center of Teachers College, King Saud University for funding this study through project No: RGP-TCR-03.

### REFERENCES

- AL-Eissa, M.S., 2011. Effect of gestation and season on the hematological and biochemical parameters in domestic rabbit (*Oryctolagus cuniculus*). Brit. Biotechnol. J., 1(1): 10-17.
- Albillos, S.M., R. Reddy and R. Salter, 2011. Evaluation of alkaline phosphatase detection in dairy products using a modified rapid chemiluminescent method and official methods. J. Food Prot., 74(7): 1144-54.
- Allard, R.L., A.D. Carlos and E.C. Faltin, 1989. Canine haematological changes during gestation and lactation. Compan. Anim. Pract., 19(3): 3-6.
- Abdel-maksoud, A.M., 1999. Changes in some haematological and biochemical parameters during pregnancy and post-partum periods in female Baladi goats. Small Rum. Res., 34: 77-85.
- Bernstein, R.E., 1959. Alternations in metabolic energetics and cation transport during ageing of red cells. J. Clin. Invest., 38(9): 1572-1586.
- Brzostowski, H., S. Milewski, A. Wasilewska and Z. Tanski, 1995. The influence of the reproductive cycle on levels of some metabolism in ewes. Arch. Veterinarium Polonicum., 35(1/2): 53-62.
- El-Sherif, M.M.A. and F. Assad, 2001. Changes in some blood constituents of Barki ewes during pregnancy and lactation under semi arid conditions. Small Ruminant Res., 40: 269-277.
- Evans, J.V., M.H. Blunt and W.H. Southcott, 1963. The effect of infection with *Haemonchus contortus* on the sodium and potassium concentrations in erythrocytes and plasma in sheep of different haemoglobin types. Australian J. Agr. Res., 14(4): 549-558.
- Eun, K., M. Young, T. Jin, K. Bo, Y. Hwa, H. Yun, S. Kyong, C. Hak, Y. Seong and K. Hong, 2009. Derivation of a new equation for estimating creatinine clearance by using fat-free mass and serum creatinine concentration in Korean patients with type 2 diabetes mellitus. Diabetes Res. Clin. Pr., 83: 44-49.
- Fairbanks, V.F. and G.G. Klee, 1987. Biochemical Aspects of Haematology. In: Tietz, N.W. (Eds.), Clinical Chemistry, W.B. Saunders Co., Philadelphia, pp: 789-824.
- Gupta, A.R., R.C. Putra, M. Saini and D. Swarup, 2007. Haematology and serum biochemistry of Chital (*Axis axis*) and barking deer (*Muntiacus muntjak*) reared in semi-captivity. Vet. Res. Commun., 31: 801-808.
- Jam, N.C., 1986. Schalm's Veterinary Haematology, Lea and Febiger, Philadelphia.
- Jainudeen, M.R. and E.S.E. Hafez, 1994. Gestation, Prenatal Physiology And Parturition. In: Hafez E.S.E. (Eds.), Reproduction in Farm Animals. Lippincott, Williams and Wilkins, pp: 247-283.
- Kaiser, H. and J.N. Cummings, 1958. Plasma electrolytes of the pregnant. ewe and fetal lamb. Am. J. Physiol., 193(3): 627-33.
- Khan, J.R. and R.S. Ludri, 2002. Changes in blood glucose, plasma non-esterified fatty acids and insulin in pregnant and non-pregnant goats. Trop. Anim. Health, Pro., 34: 81-90.

- Kleinman, L.I. and J.M. Lorenz, 1989. Physiology and Pathophysiology of Body Water And Electrolytes. In: Kaplan, L.A. and A.J. Pesce (Eds.), Clinical Chemistry, Theory, Analysis and Correlation. V. Mosby, Toronto, pp: 313-331.
- Koter, M., J. Kedziora, D. Palecz, G. Bartosz and W. Leykor, 1985. Erythrocyte cation content and ATPase activity in Down's syndrome. *IRCS Med. Sd.*, 13: 109.
- Latner, A.L., 1975. Cantarow and Trumper Clinical Biochemistry. W.B. Saunders and Co., Philadelphia, pp: 355-356.
- Mulei, C.M. and R.C.W. Daniel, 1990. The effects of age on the erythrocyte sodium and potassium concentrations of dairy cows during late pregnancy and early lactation. *Vet. Res. Comm.*, 1(1): 63-70.
- Muller, C.M., R.C.W. Daniel and D. Green, 1988. Changes in erythrocytes Mg, Na and K concentrations in late pregnancy and early lactation and their relationship with subsequent fertility and milk production in dairy cows. *J. Vet. Med. A.*, 35: 522-528.
- Obi, T.U. and V.O. Anosa, 1980. Haematological studies of domestic animals. IV: Clinico haematological features of bovine trypanosomiasis, theileriosis, anaplasmosis, eperythrozoonosis and helminthiasis. *Zentralblatt Fur Veterina Medizin Relhe*, 17: 789-797.
- Ozegbe, P.C., 2001. Influence of on some erythrocyte biochemical profiles the rabbits. *Afr. J. Biomed. Res.*, 4(3).
- Reitman, S. and S. Frankel, 1957. A colorimetric method for the determination of serum glutamic oxalacetic and glutamic pyruvic transaminases. *Am. J. Clin. Pathol.*, 28(1): 56-63.
- Rowlands, G.J., R. Manston, R.M. Pocock and S.M. Dew, 1975. Relationships between stage of lactation and pregnancy and blood composition in a herd of dairy cows and the influences of seasonal changes in on these relationships. *J. Dairy Res.*, 42: 349-362.
- Sass, M.D., E. Vorsanger and P.W. Spear, 1964. Enzyme activity as an indicator of red cell age. *Clin. Chim. Acta.*, 10: 21-26.
- Tambuwal, F.M., B.M. Agale and A. Bangana., 2002. Haematological and biochemical values of apparently healthy Red Sokoto goats. *Proc. 27th Annual Confr. Nig. Soc. Anim. Prod. (NSAP), FUT, Akure, Nigeria*, pp: 50-53.
- Wilson, O. and E. Dixon, 1991. Erythrocyte cation content and sodium transport in Siberian Huskies. *Am. J. Vet. Res.*, 52(9): 1427-1432.
- Zlatkis, A. and B.A. Zakb, 1953. A new method for the direct determination of serum cholesterol. *J. Lab. Clin. Med.*, 41(3): 486-492.