

Effect of gender on some plasma biochemical parameters of sheep from Southern Al Jabal Al Akhdar in Libya

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Abstract: The aim of the present study was to determine some biochemical parameters in plasma of sheep (less than 12 months) from Sulunta province in Al Jabal Al Akhdar district and to investigate the effect of gender on these biochemical parameters. Blood samples were collected from 21 males and 17 females and their plasma biochemical parameters were determined. The results revealed variation in blood urea nitrogen and low density lipoprotein (LDL) concentrations ($P \leq 0.05$) between females and males, whereas the effect of gender on all other plasma parameters examined; i.e. total bilirubin, triglycerides, cholesterol, plasma proteins (total protein, albumin, globulin) creatinine, alkaline phosphatase (ALP), aspartate aminotransaminase (AST), alanine aminotransaminase (ALT), sodium (Na), potassium (K), chloride (Cl), high density lipoprotein (HDL), and very low density lipoprotein (VLDL) was not statistically significant ($P > 0.05$).

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1. Introduction:

Blood is an important and reliable medium for assessing the health status of an individual animal (Ramprabhu *et al.*, 2010). Variations in blood parameters of animals are due to several factors such as altitude, feeding level, age, sex, breed, season, temperature and physiological status of animals (Mbassa and Poulsen, 2003). The significance of determining haematological and biochemical indices of domestic animals has been well documented (Oduye and Adadevoh, 1976). The hematological and biochemical values are very important for evaluation of normal physiological status of animal and in helping for evaluation of the management practice, nutrition and diagnosis of health condition (Opara *et al.*, 2010).

Small ruminants (sheep and goats) play an important role in the animal agriculture sector in Libya. Sheep production plays a major role both as income to farmers and as an important source of meat which come first before cattle meat in this country (Akraim *et al.*, 2008). About 95% of sheep in Libya belong to the fat-tailed, coarse-wooled Barbary breed, which characterized by multi-colored, large framed with pendulous fat-tail (Magid *et al.*, 1992). No information is available regarding the plasma biochemical profile of sheep in Libya, the objective of this study therefore was to provide information on some biochemical parameters of sheep from Al Jabal Al Akhdar district in Libya and to investigate the effect of gender on these parameters.

2. Material and methods

The study was carried out during February on twenty one males and seventeen females of sheep lambs (less than one year) from a herd in Suluntah province in Al Jabal Al Akhdar district, northeastern of Libya with an altitude of 500 meters above Mediterranean Sea. The animals were apparently healthy and fed by free grazing with the addition of hay and grain. Blood samples were collected from the jugular vein in tubes containing heparin as an anticoagulant. Plasma was separated by centrifugation at 3000 rpm for 10 minutes (Centurion Scientific Ltd, England) and frozen at -20°C until further analysis. Blood urea nitrogen concentration was determined by using an automated analyzer (Bun Analyzer 2, Beckman Coulter Ltd, USA). An automated electrolytes analyzer (AVL 9180, Roche Ltd, Switzerland) was used for determination of electrolytes concentration. The concentration of all other plasma biochemical parameters was determined by using an automated chemistry analyzer (Vitalabs Selectra E, Vital scientific Ltd, France) and using commercial kits supplied by Analyticon[®] Biotechnologies AG (Germany) and LINEAR[®] Chemicals (Spain).

Statistical package Mini Tab (Version 16) was used for statistical analysis. All the values were expressed as mean \pm standard deviation (SD). One way ANOVA was applied to compare various biochemical parameters between males and females. Differences were considered significant when $P \leq 0.05$.

3. Results

Sheep plasma parameters, including total bilirubin, triglycerides, cholesterol, plasma proteins (total protein, albumin, globulin) Creatinine, Urea, HDL, LDL, VLDL, ALP, AST, ALT, Na, K, Cl, were measured. Sheep plasma samples were divided on the basis of their gender into two groups and

plasma biochemical parameters were compared between males and females. Blood urea nitrogen and LDL concentrations differed significantly between males and females ($P \leq 0.05$). comparison of all other parameters between the two genders revealed statistically non significant differences (Table 1).

Table 1: effect of gender on plasma biochemical parameters in sheep

Parameters	Male (n=21)		Female (n=17)	
	Mean±SD	Range	Mean±SD	Range
Total bilirubin (mg/dl)	0.1±0.1	0-0.7	0.2±0.2	0-0.6
Cholesterol (mg/dl)	81.3±12.3	64-104	92.2±26.6	44-126
Triglycerides (mg/dl)	36.6±9.2	24-53	40.7±10.2	18-56
HDL (mg/dl)	46.1±11.2	26-71	48.3±12.6	26-74
LDL (mg/dl)	27.9±12.8	6.6-52.6	38±16.9*	8-65.8
VLDL (mg/dl)	43.3±19.7	4.8-77.4	43.6±24.3	5.8-81.4
Total protein (g/dl)	8.1±0.9	6.5-10	7.9±0.8	5.7-9
Albumin (g/dl)	2.5±0.1	2.2-2.9	2.4±0.2	2.1-2.8
Globulin (g/dl)	5.5±1	4.1-7.4	5.5±0.6	3.6-6.4
ALP (U/L)	454±484	17-1411	237.4±151.9	13-477
AST (U/L)	129.6±47.8	12.2-229	140.8±31.9	72-202
ALT (U/L)	18.3±11.9	3-47	18.1±11.2	5-41
Blood urea nitrogen (mg/dl)	60.5±28.1	18-150	46.4±9.7*	26-59
Creatinine (mg/dl)	0.9±0.5	0.4-3	0.7±0.1	0.5-1.2
Na (mmol/l)	132.8±5.5	123.9-148.2	136.7±9	114.7-147.2
K (mmol/l)	5.7±0.5	5-7.6	6.9±3.7	5.3-19.4
Cl (mmol/l)	118.4±5.8	112.7-134.4	115.1±1.6	111.5-117.5

*: $P \leq 0.05$ compared to male

4. Discussion

In the present study variations in physiologic values due to gender were assessed. Total protein is an important factor for blood viscosity, acid-base balance, and supplying necessary enzymes (Keser and Bilal, 2008). The mean total protein values obtained from sheep males and females used in this study were within the range of 5.5-10.0 g/dl reported for various ruminant species (Kaneko, 1989). Plasma protein level was slightly higher in ram lambs (8.1±0.9) than ewe lambs (7.9±0.8) but the difference was not statistically significant. This finding is in agreement with the results obtained by Khan (2013) who also reported higher total protein values in ram lambs (8.32 ± 0.38) than in ewe lambs (8.18 ± 0.37) of Hamdani sheep.

Urea is an important metabolite synthesized from ammonia in the liver during protein metabolism (Keser and Bilal, 2008). Plasma urea level was significantly higher in males (60.5±28.1) than females (46.4±9.7). similar observation was reported by Borjesson *et al.* (2000) in their study on desert bighorn sheep. comparable urea values were reported by Keser and Bilal (2008) in their study for investigation the effect of dietary protein on blood parameters in kivirick lambs. The correlation between plasma urea level and dietary protein level in

sheep has been reported (Lindberg and Jacobsson, 1990).

The synthesis of albumin and globulin is in the liver. Albumin is an important metabolite for plasma oncotic pressure, it can decrease in the case of malnutrition, hepatic diseases, protein deficiency, starvation and malignancy (Keser and Bilal, 2008). Albumin values were almost the same for males (2.5±0.1) and females (2.4±0.2). Similarly, mean plasma Globulin was close in both genders with values of (5.5±1) in males and (5.5±0.6) in females. There was no gender effect on these two plasma parameters. Similar finding was reported in the study conducted by Khan (2013).

Bilirubin is the main bile pigment in the plasma of animals derived from haemoglobin breakdown. Icterus index, a reflection of total bilirubin level in plasma, is a tool used for disease diagnosis and prognosis (Coles, 1986). The value of bilirubin was slightly higher in case of females (0.2±0.2) than that of males (0.1±0.1) and the difference was not statistically significant. Mostagni *et al.* (2005) reported similar finding in captive wild sheep.

Lipids play an important role in the body. they serve as hormones or hormone precursors, aid in digestion, provide energy, storage and metabolic

fuels, act as functional and structural components in biomembranes and form insulation to allow nerve conduction and prevent heat loss. any significant alteration in their plasma levels could lead to a variety of clinical disorders (Anonymous, 2006).

Cholesterol concentration was higher in females (92.2 ± 26.6) than in males (81.3 ± 12.3) but the difference was not statistically significant. Khan (2013) reported lower cholesterol level in ewe lambs (61.54 ± 5.07) than in ram lambs (68.04 ± 7.13) but his finding was in agreement with my result concerning the effect of gender on plasma cholesterol level. similar high cholesterol level in sheep was reported by Devendra *et al.* (2008) in Coimbatore sheep (81.81 ± 5.17) and by Jawasreh *et al.* (2010) for Awassi sheep (87.00 ± 3.40).

Sheep females in the present study tend to have higher values for triglycerides (40.7 ± 10.2) than males (36.6 ± 9.2). HDL level was also higher in females (48.3 ± 12.6) than males (46.1 ± 11.2) but the difference was not statistically significant. Mean plasma values of VLDL in females (43.6 ± 24.3) were comparable to those in males (43.3 ± 19.7) with no gender effect on this parameter. On the other hand, plasma LDL level reported in this study was significantly higher in females (38 ± 16.9) than males (27.9 ± 12.8).

Plasma creatinine concentration was slightly higher in males (0.9 ± 0.5) than females (0.7 ± 0.1) but the difference was not statistically significant. The amount of creatinine secreted daily is a function of the muscle mass and is not affected by diet, age, sex. Female excrete less creatinine than males because of their smaller muscle mass (Alex and Laverne, 1983).

The results of the present study showed that the effect of gender on both plasma enzymes and electrolytes is not significant. Enzymes are protein catalysts synthesized by all living organisms. They are constantly and rapidly degraded but the supply is renewed by new synthesis (Coles, 1986). ALT is an enzyme found in the highest amount in liver and typically used to detect liver injury (Shumaila *et al.*, 2012). ALT values were slightly higher in males (18.3 ± 11.9) than females (18.1 ± 11.2). AST is found in practically every tissue of the body, The measurement of the AST levels is helpful for the diagnosis and following case of myocardial infarction, hepatocellular disease and skeletal muscle disorders (Njidda *et al.*, 2013). AST values for males were lower (129.6 ± 47.8) than those of females (140.8 ± 31.9). The level of ALP obtained in this study was higher in males (454 ± 484) than females (237.4 ± 151.9). Earlier report in desert bighorn sheep (Borjesson *et al.*, 2000) showed higher alkaline phosphatase activity in young male sheep less than one year old. The high activity and wide range of

ALP in young sheep as can be observed from this study have been reported by other studies. Duncan *et al.* (1994) and Kock *et al.* (1987a) suggested that the multiple isoenzymes of ALP and its wide reference range in domestic ruminants rendering it an insensitive clinical indicator of disease.

The activity of ALT, AST, and ALP reported in the present study was not significantly influenced by gender. this finding is in agreement with the results reported by (Mostaghni *et al.*, 2005; Khan, 2013).

Maintaining electrolytes in appropriate amounts is essential for normal biochemical and physiological functions of the body. Electrolytes are distributed in body fluids and play a key role in all parts of animal life (Kaneko *et al.*, 2008). The plasma potassium level was higher in females (6.9 ± 3.7) than males (5.7 ± 0.5) and sodium level was also higher in females (136.7 ± 9) than males (132.8 ± 5.5), While the values for chloride were higher in males (118.4 ± 5.8) than females (115.1 ± 1.6) but the difference for all three electrolytes between both genders was not statistically significant. AL-Hadithy *et al.* (2012) reported in a study on Iraqi Awassi sheep higher blood sodium and potassium levels than the values reported in the present study, while the chloride level in that study was comparable to my reported values. The gender effect on blood electrolytes level in that study was significant with levels higher in males than females. Similar observation to the findings reported in the present study for gender effect on blood electrolytes in sheep has been reported by Sowande *et al.* (2008) Who found no significant difference between males and females for blood electrolytes.

Conclusion:

Based on these findings, gender did not significantly influence the biochemical parameters of local sheep studied, except for the significantly difference between males and females for Blood urea nitrogen and low density lipoprotein levels.

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