

Study of some serum biochemical parameters of Karadi sheep in Sulaimani city, Iraq

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Abstract

This study was conducted at three private herds around Sulaimania city on a total of 75 Karadi sheep of both sexes (18 ram and 57 ewes) randomly selected for blood sampling to establish mean values of some biochemical parameters as reference values for Karadi sheep. The serum biochemical parameters measured in the study included total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL), triglycerides, total protein (TP), serum albumin, serum globulin, calcium (Ca), phosphorus (P), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) activities. Results revealed that some serum biochemical values were within the reference range. However, higher concentration of LDL, VLDL, triglycerides, serum albumin, serum globulin and ALT activity in Karadi sheep were detected than those published earlier. However, lower concentration of TP was recorded when compared to references range.

Keywords: Biochemical parameters; serum levels; LDL; TP; Karadi sheep

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Introduction

Kurdistan region has an important role in animal production in Iraq. In this region, the herds are mainly composed of local breed of animals, which are characterized by gorgeous adaptation to environmental conditions but lower productivity rates when compared to the exotic breeds. In Kurdistan region of Iraq, the sheep breeding makes a major contribution to the agrarian economy, with a population of 3,500,000 heads (Animal Production and Veterinary Directorate, 2011). Karadi sheep is a dominant breed in Kurdistan region of Iraq, especially in mountainous areas and nearby plains. It is considered as the most important farm animal, for its contribution to the production of meat, milk, wool and leather. In Iraq, Karadi sheep constitute about 18-20% of the total sheep population (Al-Doori, 2006). The Karadi sheep are fat-tailed animals, white with a black open face with no roman profile and pendulous ears (Alkass et al., 1993).

All over the world, there is a great number of breeds of sheep, that makes up a great variation in the

haematological and biochemical parameters between breeds of sheep, and thus it may be difficult to formulate a universal metabolic profile for sheep. These differences have further underlined the need to establish appropriate physiological baseline values for various breeds of livestock in Kurdistan, which could help determine the management practice, nutrition and diagnosis of disease conditions. Studies on the serum biochemical attributes have not been well documented in Karadi sheep and specific physiological references are needed for appropriate interpretation of serum biochemical results. The present work is the first of its kind in Karadi sheep and could serve as a baseline reference of biochemical values for Karadi sheep in Kurdistan region of Iraq and the other countries having similar climate and nutritional conditions.

The aim of this study was to estimate the baseline information on biochemical parameters of Karadi sheep and to compare the recorded values with those reported by other researchers in sheep.

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Materials and Methods

This study was conducted at three private herds reared on three different regions around Sulaimania city (Arbat-27Km, Qaradax-40Km and Bakrajo-10Km from Sulaimani city centre). A total of 75 Karadi sheep of both sex (18 ram and 57 ewes) were randomly selected for blood sampling to establish overall mean reference values of biochemical parameters for Karadi sheep. All animals were apparently healthy and were fed on pasture.

The blood samples were withdrawn from jugular vein from each sheep by using a disposable syringe into 10 ml plain tubes. The test tubes were left to clot and then centrifuged at 3,000 rpm for 20 min, for serum separation and stored at -20°C until assayed for total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL), triglycerides, total protein (TP), serum albumin, serum globulin, calcium (Ca), phosphorus (P), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) using (PZ CORMAY S.A., Poland) reagent kit with Auto Chemistry Analyzer (Model Polimak M10/2, Italy). The data were analyzed by standard methods of statistical analysis which perform using XLSTAT-PRO (version 7.5).

Results

Serum biochemical parameters

The mean values (\pm SE) of serum biochemical parameters cholesterol, HDL, LDL, VLDL, triglyceride, TP, albumin and globulin in Karadi sheep (N=75) are shown in Table 1. The total cholesterol concentration of Karadi sheep was 1.81 ± 0.04 mmol/L and ranged from 1.18-2.91 mmol/L, which was within the references range (1.5-2.28 mmol/L) as reported by Kaneko et al. (1997). The high density lipoprotein (HDL) concentration (1.69 ± 0.05 mmol/L), ranged from 0.71–2.71 mmol/L and the HDL concentration was higher than the reference range according to Antunovic et al. (2011). The concentration of low density lipoprotein (LDL) was 0.51 ± 0.07 mmol/L and it ranged from 0.07–2.19 mmol/L, which was higher than the reference range (0.5–0.90 mmol/L) which are similar to the findings of Antunovic et al. (2011). The VLDL and triglyceride concentrations were 0.04 ± 0.00 and 0.2 ± 0.01 mmol/L (range 0.00–0.11 and 0.01–0.58 mmol/L), respectively.

The mean value of TP was 55.90 ± 5.56 g/dL ranging from 40.7-74.67 g/dL, which was lower than the reference value that ranged from 60–79 g/dL as reported by Kaneko et al. (1997). The Serum albumin and globulin concentrations in the current study for Karadi sheep were 35.22 ± 0.57 and 20.33 ± 3.18 g/dL, respectively and ranged from 21.22–40.61 g/dL and (4.38–32.71 g/dL),

respectively. The values were higher than those published earlier.

Serum minerals

The levels of some serum mineral concentrations for Karadi sheep are showed in Table 2. The mean value of Ca in this study was 2.64 ± 0.02 mmol/L ranging from 2.13–3.39 mmol/L, and the value for Ca was higher than the reference range of sheep (Kaneko et al., 1997). The P and Mg concentrations in the present study were 1.31 ± 0.03 mmol/L and 1.21 ± 0.04 mmol/L, respectively ranging from 0.51–1.91 mmol/L and 0.66–1.96 mmol/L, respectively, which were lower than reference range (1.62–2.36 mmol/L). Similar findings were reported by Kaneko et al. (1997).

Na level was 137.78 ± 0.86 mmol/L, and ranged from 100–147 mmol/L, which was lower than the reference range (139–152 mmol/L) as reported by Kaneko et al. (1997). The serum K and Cl in the present study were 4.70 ± 0.05 mmol/L and 107.24 ± 0.58 mmol/L and their ranges are from 2.5–5.7 mmol/L and 83–114 mmol/L, respectively. However, Cl levels in this study were lower than the reference range (Table 2).

Serum enzymes activity

Table 3 presents the mean values of some serum enzyme activities in Karadi sheep. According to the results, the activities of AST and ALT were 174.54 ± 6.17 U/L and 35.45 ± 1.16 U/L, ranging from 79–323 U/L and 23–61 U/L, respectively, which were higher than the reference range (60–280 U/L and 6–20 mmol/L) as reported by Kaneko et al. (1997). The mean value of ALP activity was 199.27 ± 10.27 U/L, ranging from 68-343 U/L, and was in the reference range (63–387 U/L) for sheep (Kaneko et al., 1997).

Discussion

The total cholesterol concentration of Karadi sheep was in agreement with the results of Al-Fartosi et al. (2010) who recorded 1.61 and 1.72 mmol/L cholesterol concentration for male and female sheep, respectively, for the marshes in the south of Iraq. Also Osman and Al-Busadah (2003) reported that a mean value for cholesterol was 69.6 ± 5.7 mg/dL for ewes in Saudi Arabia and even higher cholesterol concentrations were reported for different breeds of goats in Northern Nigeria (Njidda et al., 2013). It was reported that cholesterol concentration is influenced by the degree of stress (Shaffer et al., 1981). However, a higher HDL concentration has been reported for Saanen male (65.10 ± 4.40 mg/dL) and female (64.80 ± 4.12 mg/dL) goats (Elitok, 2012). The higher concentration of LDL was recorded in the blood of Saanen goats in Afyonkarahisar Province near Kutahya Border (Elitok, 2012).

Table 1: Mean \pm SE of some serum biochemical parameters of Karadi sheep

Parameters	Mean \pm SE	min - max	Reference Range
Cholesterol (mmol/L)	1.81 \pm 0.04	1.18–2.91	1.5–2.28 ¹
HDL (mmol/L)	1.69 \pm 0.05	0.71–2.71	1.26–1.86 ²
LDL (mmol/L)	0.51 \pm 0.07	0.07–2.19	0.50–0.90 ²
VLDL (mmol/L)	0.04 \pm 0.00	0.00–0.11	-
Triglyceride (mmol/L)	0.21 \pm 0.01	0.01–0.58	0.00–0.2 ¹
TP (g/dL)	55.90 \pm 5.56	50.34–61.47	60.0–79.0 ¹
Serum Albumin (g/dL)	35.22 \pm 0.57	34.65–35.80	24–30 ¹
Serum Globulin (g/dL)	20.33 \pm 3.18	17.15–23.51	-

¹Kaneko et al. (1997), ²Antunovic et al. (2011)**Table 2: Mean \pm SE of some serum mineral parameters in Karadi sheep**

Parameters (mmol/L)	Mean \pm SE	min - max	Reference Range ¹
Ca	2.64 \pm 0.02	2.13– 3.39	2.88–3.20
P	1.31 \pm 0.03	0.51– 1.91	1.62–2.36
Mg	1.21 \pm 0.04	0.66–1.96	-
Na	137.78 \pm 0.86	100–147	139–152
K	4.70 \pm 0.05	2.50–5.70	3.90–5.40
Cl	107.24 \pm 0.58	83–114	95–103

¹Kaneko et al. (1997)**Table 3: Mean \pm SE of some serum enzyme activities in Karadi sheep**

Parameters (U/L)	Mean \pm SE	min - max	Reference Range ¹
AST	174.54 \pm 6.17	79–323	60–280
ALT	35.45 \pm 1.16	23–61	6–20
ALP	199.27 \pm 10.27	68–343	68–387

¹Kaneko et al. (1997)

The very low density lipoprotein (VLDL) and triglyceride concentrations results indicated slightly higher concentration of triglycerides compared with the reference range (Kaneko et al., 1997). Antunovic et al. (2011) also reported that triglyceride concentration was higher in Dubrovnik sheep. Antunovic et al. (2011) reported that TP concentration reference range of Dubrovnik sheep was 72.70–86.70 g/dL. However, a higher concentration of TP has been reported for sheep by Osman and Al-Busadah (2003) and Kaneko (1989). But lower TP concentration has also been reported for West African Dwarf sheep (6.30 \pm 0.70 g/dL) (Oduye and Adadevoh, 1976). Elitok (2012) has reported mean value of TP for male and female Saanen goats as 76.45 \pm 2.28 g/dL and 75.76 \pm 2.33 g/dL, respectively. Lower serum albumin concentration (3.7 \pm 0.1 g/dL) for sheep in Saudi Arabia was reported by Osman and Al-Busadah (2003). Oduye and Adadevoh (1976) reported still lower serum albumin level for West African Dwarf sheep (2.5 \pm 0.3 g/dL).

The values of Ca was lower than values reported by Osman and Al-Busadah (2003) (9.9 \pm 0.1 mEq/L) for sheep in Saudi Arabia. But higher Ca concentration (9.6 \pm 1.6 mmol/L) has been reported in West African Dwarf sheep (Oduye and Adadevoh, 1976). Ca levels in this study was higher than levels of male (1.76 \pm 0.26 mmol/L) and female (1.70 \pm 0.23 mmol/L) sheep in south of Iraq (Al-Fartosi et al., 2010). The results of P and Mg were similar to that reported by Osman and Al-Busadah

(2003). However, Mg levels were lower in comparison with Mg concentrations (2.84 \pm 0.11 mEq/L) obtained in sheep in Saudi Arabia. Antunovic et al. (2004) reported that P concentration was 2.74 \pm 0.19 mmol/L for Merinolandschaf ewes. While, higher P concentration was recorded (5.7 \pm 3.2 mmol/L) in West African Dwarf sheep by Oduye and Adadevoh (1976). Oduye and Adadevoh (1976) reported that Na concentration was 138.8 \pm 5.2 mmol/L for West African Dwarf sheep. English et al. (1969) recorded Na level of 149.9 \pm 4.9 mmol/L for sheep in the temperate climate. The Na value in the present study was lower than the value reported by Osman and Al-Busadah (2003) (162 \pm 1.5 mEq/L). The K concentration varied in a larger range than the reference range (Kaneko et al., 1997). However, mean K concentration was lower than the values reported by Osman and Al-Busadah (2003) for Saudi Arab sheep (5.3 \pm 0.1 mEq/L). Oduye and Adadevoh (1976) also reported that K level was 5.3 \pm 1.6 mmol/L for West African Dwarf sheep.

Our values for AST and ALT were higher than those established earlier. Lower AST (141.6 \pm 25.4 U/L) and ALT (21.0 \pm 1.4 U/L) activities were reported for breed of sheep in Saudi Arabia (Osman and Al-Busadah, 2003). Similarly, Oduye and Adadevoh (1976) reported lower AST (67.9 \pm 4.9 U/L) and ALT (10.0 \pm 1.1 U/L) activities in West African Dwarf sheep. While Al-Fartosi et al. (2010) reported 67.9 \pm 4.9 U/L and 10.0 \pm 1.1 U/L as AST and ALT activities, respectively, for sheep of the marshes in

the south of Iraq. Conversely, the ALP was higher than the mean ALP (112.4 ± 25.1 U/L) for ewe reported by Osman and Al-Busadah (2003) and was not in agreement with Al-Fartosi et al. (2010) who reported lower ALP for male (9.43 ± 1.2) and female (8.23 ± 0.6 U/L) sheep in south of Iraq. Oduye and Adadevoh (1976) recorded lower ALP activities (10.7 ± 7.3 U/L) for West African Dwarf sheep. Moreover, variability in age, physical status of the animal, feeding pattern, geological location of the farm and different laboratory protocol adopted can also influence the results (Awolaja et al., 1997).

Conclusions

It was concluded that higher concentrations of LDL, VLDL, triglycerides, albumin, globulin and ALT activity and lower concentration of TP concentration was recorded in Karadi sheep than those published earlier.

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