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Evaluation of Some Minerals and Biochemical Traits of Awassi Sheep at Midand Late Pregnancy

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Abstract

The target of this experiment to evaluate the serum concentration of some parameters in pregnant Awassi ewes, the studied ewes divided into three groups each group contain six animals , blood collected from jugular vein, the first group (1st half) blood collected at mid period of pregnancy (day 75 of pregnant), in second group (2nd half) the blood collected at end period of pregnancy (few hours before birth) and the last group was control , the ewes in this group were not pregnant and blood collected randomly. Serum glucose, cholesterol, triglyceride, total protein, albumin, globulin, urea, creatinine and some minerals, calcium (Ca), sodium (Na) and potassium (K) and were tested. The results of this study there's non-significant ($p>0.05$) change between serum glucose in all three groups. The urea of studied animals serum was elevated significantly ($p\leq0.05$) in (1st half) group in comparison with other two groups and in (2nd half) was significant ($p\leq0.05$) elevation as compared to control (non pregnant) group while the serum creatinine in control group was significant ($p\leq0.05$) elevated as compared with the two other groups. The serum cholesterol and triglyceride found there's non- significant ($p>0.05$) changes of serum cholesterol in all groups of experiments but there's significant ($p\leq0.05$) elevation of serum triglyceride in (1st half) than other groups and there's significant ($p\leq0.05$) increase in (2nd half) group than (control) group. The total serum protein in (1st half) increased significantly compared to the two other groups but serum albumin in control group was significantly ($p\leq0.05$) reduced when compared with the two other groups while there's significant ($p\leq0.05$) decrease of this parameter in (2nd half) group than (1st half) and the serum globulin revealed no significant ($p>0.05$) change between control group and (1st half) group and significant ($p\leq0.05$) reduction in (2nd half) in comparison with the two others groups. Serum of some minerals, the serum sodium (Na) concentration was no significant ($p>0.05$) change between all groups in experiments, serum potassium (K) was significantly ($p\leq0.05$) decrease in(1st half) than control and (2nd half) while the serum calcium (Ca) concentration appeared significant ($p\leq0.05$) increase in (1st half) and (2nd half) groups in comparison to the control group while there's non-significant ($p>0.05$) difference between (1st half) and (2nd v half) groups.

Introduction:

The sheep are very important domesticated animals in various countries, this importance come from ability of these animals to grow and raised up under harsh situation with little cost. In addition, the Awassi breed has adaptation to difficult weather in Iraq, disease resistant and has high

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growth capability **(Galal *et al*., 2008)**. Animal husbandry affected by metabolic disorder which is result from unsuitable feeding with no appearance of clinical symptoms causing insufficient development of breeding **(Radostits *et al*, 2003).**

Therefore, the estimation of normal values of blood biochemical parameters are very important to clinical translation of laboratory data. These parameters may differ based on many factors like age, sex, stress, weather, season, physical exercise and pregnancy **(Nazifi, *et al.* 2003; Yokus and Cakir, 2006)**.The level of health and sickness position of animals can be evaluated by biochemical parameters **(Utlu *et al*., 2004; AL-Absawi and AL-safi, 2021).**

During pregnancy, ewes metabolism used generally to provide energy to fetus to develop and grow (**Mohammadi *et al*., 2016)** and milk yielding after gestation **(Piccione *et al*., 2009).** There are various researches and studies about the influences of different stages of reproductive cycle of ewes on biochemical parameters and its relationship to pregnancy, also the pregnancy is physiological status can change animals metabolism **(Iriadam 2007)**. The maternal tissues in gestation period act to provide energy for reproduction processes, so the biochemical values of serum may be changed or influenced. In addition to pregnancy, age, baby growth, malnutrition, breed and season may be affect the biochemical parameters **(Swanson *et al*. 2004 and Yokus *et al*. 2006).**

This research aimed to give a complete imagination to studied biochemical parameters in pregnant ewes during conception in order to equipping the normal level of the most ordinarily utilized biochemical parameters in the first and second half of pregnancy to help for the management of ewes during farming condition to estimate the metabolic needs of ewes and decreased the economic coast.

Materials and methods

Study subject.

Three groups of adult (Awassi) sheep, each group contain six ewes, Two groups were contain pregnant ewes, and the last group contain empty ewes (not pregnant) as control group. Blood samples had been collected at first half at days75 of pregnancy called (1^{st} half) group and at second stage of pregnancy (few hours before birth) this group called (2^{nd} half) group while the samples collected randomly from last group which called (control) group.

The samples are collected from jugular vein of ewes and then transported to gel tub and the Centrifugation of blood sample occur immediately to serum separation at (3000 rpm) for (10 minutes) and stored at(-20°C) till used for analysis.

Laboratory analysis

Eleven parameters were monitored, serum glucose **(Sandip *et al*. (2009).** total protein **(Doumas *et al*., 1981)**, serum albumin (**Rosenfeld and Surgenor, 1952**), serum globulin **(Doumas *et al*., 1981)** , serum triglycerides (**Randrup, 1960)** serum cholesterol (**Artiss and Zak. 1997)**, serum creatinine (**Heinegard and Tiderström ,1973)** , serum urea **(Fawcet and Scott, 1960)** and finally three minerals, serum Sodium (Na), serum Calcium (Ca) and serum Potassium (K**) (Bold et al., 1965)** had been tested.

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Statistical analysis.

Statistical analysis of data was conducted on the basis of One-Way Analysis of Variance (ANOVA) using a significant levels of ($P<0.05$). Specific group changes were determined utilizing Least Significant Differences (LSD) as portrayed by **(Snedecor and Cochran 1973)**

Resultes

Table (1): The concentrations of blood sugar, urea. creatinine, cholesterol and triglyceride.
Different letters refer to significant ($p\leq0.05$) differences between the groups.

Parameter / Groups	S.Glucose Mg/dl	S.Urea Mg/dl	S.Creatinine Mg/dl	S. Cholesterol Mg/dl	S.Triglycerides Mg/dl
control	68.66±5.64a	17.50±1.37 c	0.83±0.10 a	60.66±3.93 a	25.83±3.18 c
1st half	65.66±7.28a	32.33±0.81 a	0.66±0.08 b	62.66±2.06 a	66.66±1.75 a
2nd half	66.00±4.38a	29.16±1.66 b	0.66±0.12 b	63.33±2.06 a	59.00±2.96 b

Table (2): The concentrations of total protein, albumin and globulin .
Different letters refer to significant ($p\leq0.05$) differences between the groups.

Parameter / Groups	S.T.P g/dl	S.Albumin g/dl	S.Globulin g/dl
Control	5.88±0.40 b	2.96±0.20 c	2.91±0.29 a
1st half	6.85±0.52 a	3.45±0.16 b	3.40±0.62 a
2nd half	5.83±0.05 b	3.81±0.13 a	2.03±0.10 b

Table (3): The concentrations of Na, K and Ca.
Different letters refer to significant ($p\leq0.05$) differences between the groups.

Parameter / Groups	S.Ca Mmol/L	S.Na Mmol/L	S.K Mmol/L
control	2.61±0.05 a	157.83±1.94 a	4.76±0.31 a
1st half	2.32±0.05 b	157.16±0.75 a	4.00±0.06 b
2nd half	2.36±0.02 b	157.50±2.07 a	4.85±0.41 a

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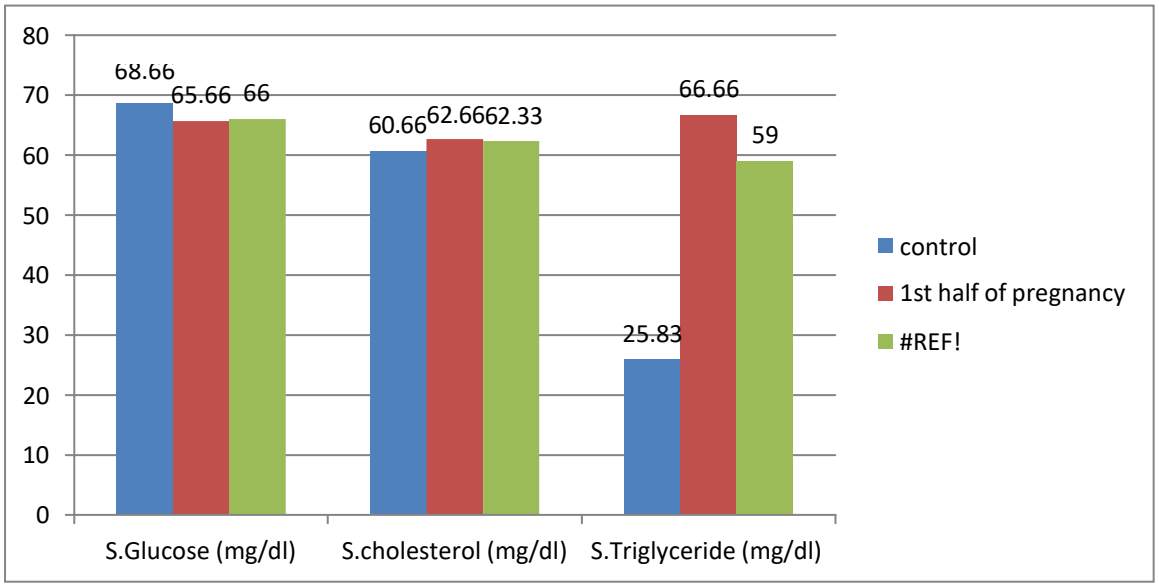

Figure (1): represent to serum glucose, cholesterol and triglyceride concentration in control (blue color), first half of pregnancy (red color) and second half of pregnancy (green color).

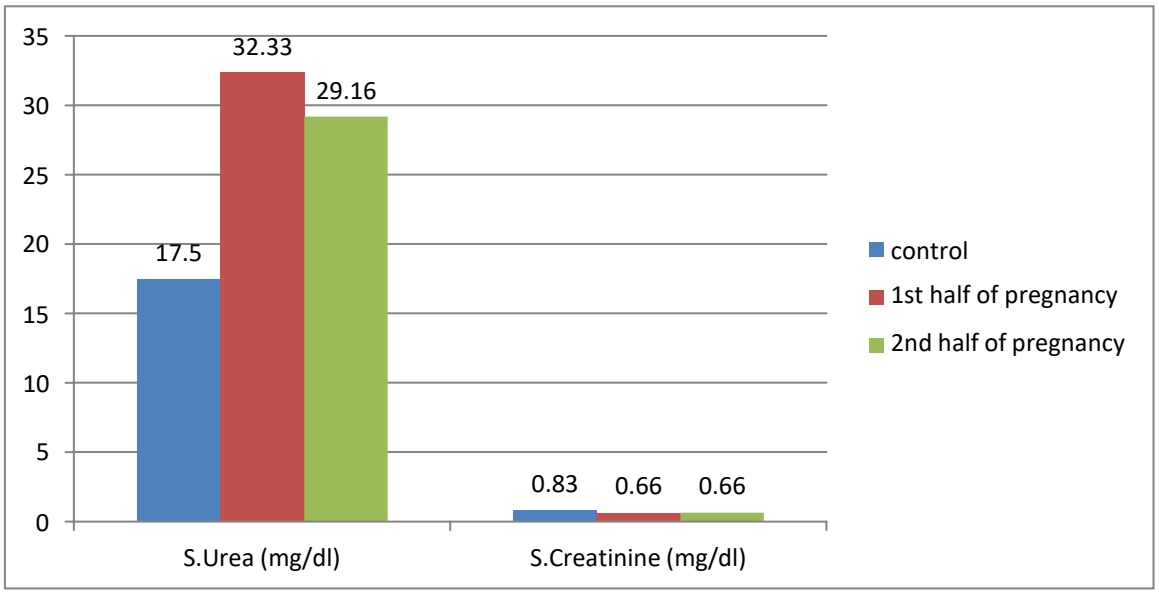

Figure (2): represent to serum urea and creatinine concentration in control (blue color), first half of pregnancy (red color) and second half of pregnancy (green color).

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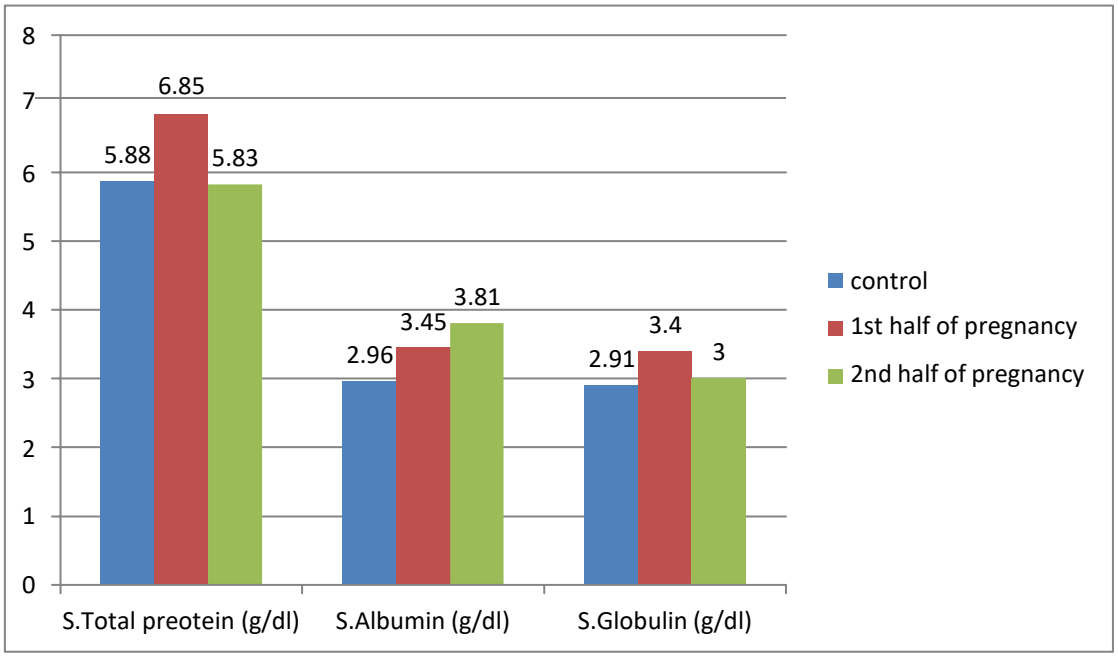

Figure (3): reveal to serum total protein, albumin and globulin concentration in control (blue color), first half of pregnancy (red color) and second half of pregnancy (green color).

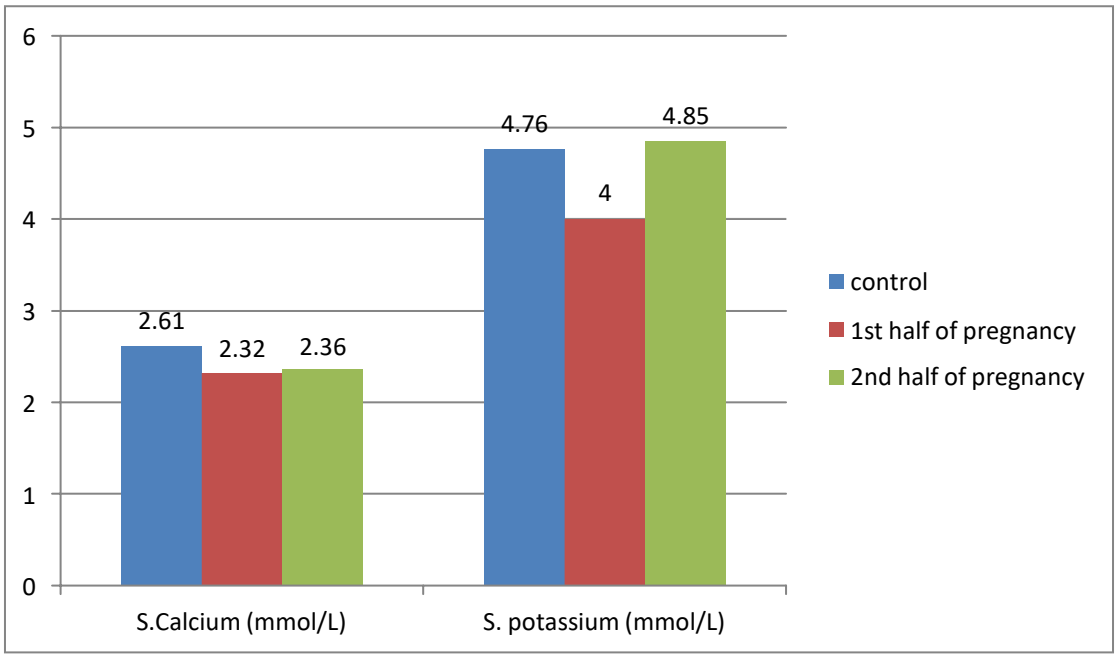

Figure (4): represent to serum potassium (K) and calcium (Ca) concentration in control (blue color), first half of pregnancy (red color) and second half of pregnancy (green color).

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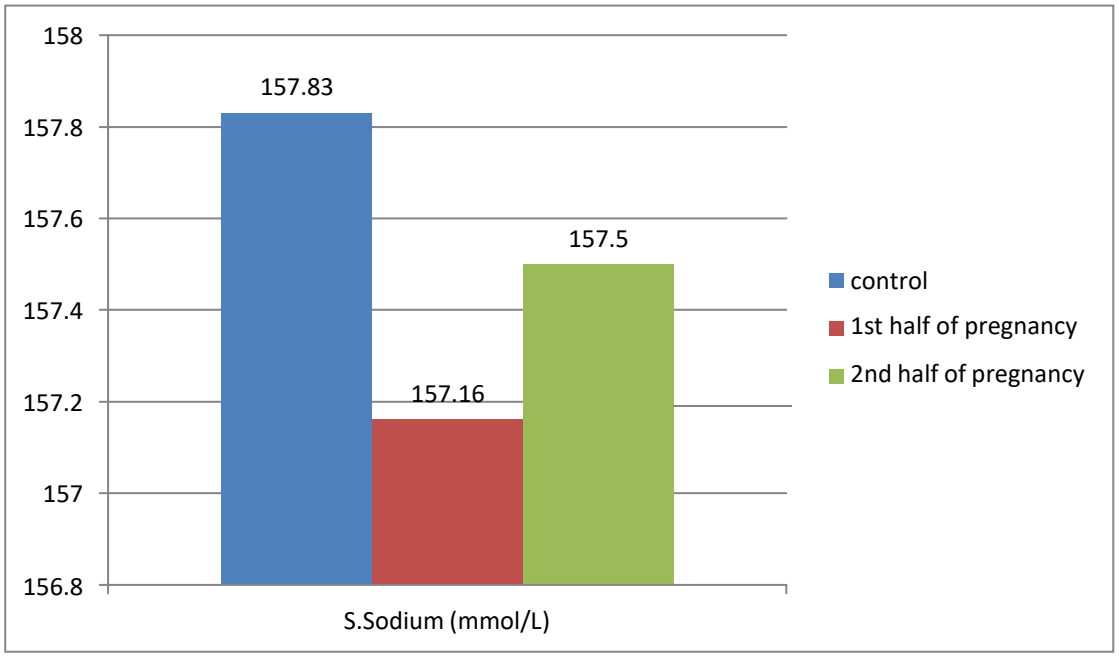

Figure (5): represent to serum Sodium (Na) concentration in control (blue color), first half of pregnancy (red color) and second half of pregnancy (green color).

In this study there's non-significant ($p>0.05$) changes between serum glucose concentration in all three groups (table 1) and (figure 1). The concentration of serum urea was elevated significantly ($p\leq0.05$) in (1^{st} half) group compared with other two groups and in (2^{nd} half) was significant ($p\leq0.05$) elevation as compared to (control) group whilst the serum creatinine concentration in control group was significant ($p\leq0.05$) elevated in comparison to the two other groups as in (table 1) and (figure 2).

The present results in (table1) and (figure 1), show the serum cholesterol and triglyceride concentration non- significant ($p>0.05$) changes of serum cholesterol in all groups of experiments but there's significant ($p\leq0.05$) elevation of serum triglyceride in (1^{st} half) than other groups and there's significant ($p\leq0.05$) elevation in (2^{nd} half) group than (control) group.

Plasma proteins also tested in this study and the result explained the total serum protein in (1^{st} half) increased significantly compared to the two other groups but albumin serum concentration in control group was significant ($p\leq0.05$) reduced as compared with the two other groups while there's significant ($p\leq0.05$) decrease of this parameter in (2^{nd} half) group than (1^{st} half) and the last plasma protein that detected in this experiment was globulin revealed non-significant ($p>0.05$) changes between control group and (1^{st} half) group and significant ($p\leq0.05$) reduction in (2^{nd} half) in comparison with the two others group as in (table 2) and (figure 3).

In (table3) and figures 4 and 5) represent to serum concentrations of some minerals, the serum sodium (Na) concentration was non-significant ($p>0.05$) changes between all groups in experiments, serum potassium (K) was significantly ($p\leq0.05$) decrease in(1^{st} half) than control and (2^{nd} half) while the serum calcium (Ca) concentration appeal significant ($p\leq0.05$) increase in (1^{st} half) and (2^{nd} half) groups as compared with the control group while there was non-significant ($p>0.05$) difference between (1^{st} half) and (2^{nd} half) groups

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Discussion:

In dairy ruminant, the incorporation between increasing nutrients request and low decreasing food intake during pregnancy and lactation lead to negative energy balance, which causing many metabolic disorder **(Chilliard *et al*., 2000)**. The Present study results reviled that non-significant ($p \leq 0.05$) change of concentration of serum glucose in early and late conception period when compared to non pregnant ewes as control group. This means that glucose concentrations in all studied ewes in our work were within the physiological level for ewes, this results agreed with **(Antunovic *et al*., 2017)(Kassim and Al-Hellou, 2018)** This suggests that management of nutrition on the studied farm was suitable **(Pesántez-Pacheco *et al*., 2019).**

As documented in this study, the plasma urea concentration increase significantly ($p \leq 0.05$) during early and late stage of pregnancy in studied ewes when compared with non pregnant animals as control. This is increase due to ability of ruminants to recycle of endogenous urea partly into the forestomach to synthesize microbial protein **(Rodriguez *et al*., 1996)**, In which, during decrease intake of protein in the period of gestation, The kidney reduce urea excretion to maintain a high entry of urea to rumen, the conservation of urea by kidney occur by decrease of renal plasma flow (RPF) and glomerular filtration rate (GFR) causing reduction in filtration of urea by glomeruli and increase reabsorption of urea from tubules to blood **(Cirio, 1989)**. Also, **Benlamlih and de pomyers (1989)** reviled that simultaneous decrease in renal excretion of urea and elevation in urea ruminal recycling during gestation and lactation period of does. In addition, **(El-Sherif and Assad 2001)** recorded that increasing of plasma urea level at week 10 of pregnancy and high peak happened at parturition as result of cortisol effect which catabolized the protein in the body **(Silanikove 2000)**.

Serum creatinine level reduced significantly ($p \leq 0.05$) in first and second half of pregnancy as compared with non pregnant ewes, and this results agreed with **(Piccione *et al*., 2009)** who said that the amount of formed creatinine depend on content of creatine in the body, which related to muscles mass, feed intake and synthesis rate of creatine. In ewes, **Piccione *et al*., (2009)** suggest that mobilization of proteins begin with starting of pregnancy and its peak occur in late conception. Creatinine concentration remained beneath reference levels for ewes during conception and lactation time.

Serum cholesterol and triglycerides represent the most important parameters when lipid profile studied, both increased in early and late stages of pregnancy as compared with control group but cholesterol concentration was increase non significantly ($p \leq 0.05$) and significant ($p \leq 0.05$) increase appear in triglycerides concentration. This result agreed with **(Schlumbohm *et al*. 1997)** who documented increase in serum total cholesterol and triglyceride during conception of sheep due to decrease action of insulin on target tissues. Also, the elevation of fatty acid mobilization from adipose tissues consider as good source to growth of fetus, and this change in lipid concentration showed in oestrus and gestation in sheep because lipids considered as precursor to synthesized steroid hormones **(Iriadam, 2007)**. In addition, the triglycerides contributed in synthesis of fat of milk **(Nazifi *et al*. 2002)**.

This results, the serum total protein elevated significantly ($p \leq 0.05$) at early stage of gestation in comparison to non pregnant ewes (control) and there was no change with control group at late

stage. This is may be due to using of amino acids to synthesize protein of fetus muscles **(Antunovic *et al*. 2002)**. Serum albumin level elevated significantly ($p \leq 0.05$) when compared with control group and this result agreed with results of **(Piccione *et al*., 2009).** Who explained this results by attributed to low intake of protein and dehydration, also, the increase total blood volume in late pregnancy cause elevation of GFR which is responsible on elevation of albumin concentration in serum during late stage of gestation **(Yokus *et al*. 2006)**.In addition, growth of fetus need to high energy provided by elevation of albumin concentration in ewes serum **(Durak and Altiner 2006).** Relative to serum globulin, **Karapehlivana, *et al.* (2007)** mentioned that higher elevation of plasma globulin occur in mid stage of conception when compared to very early or late stage of pregnancy, and this similar to our study results.

Minerals required by animals to grow, reproduce and lactate its newborn, also the minerals play important role as structural components of enzymes and regulate a lot of metabolic reactions in the animal body **(Ahmed *et al*., 2000)**.

Calcium level in serum of pregnant ewes was decrease significantly ($p \leq 0.05$) as compared to control group, this results agreed with **(Yildiz *et al*. , 2004)** and **(Inayat *et al*., 2013)** who estimated the concentration of serum calcium in pregnant with comparing to non-pregnant ewes, he noticed that decreasing occur after 3rd month of gestation to the end of it. This is due to start formation of skeleton of fetus in second period of pregnancy and elevation movement of calcium out of maternal blood, and do not equalize with calcium absorption rate from bone or gut **(Sansom *et al*., 1982).** In addition, with progress of pregnancy there is increase in endogenous loss of calcium because the calcium absorption rate is more in early period than late period of gestation **(Braithwaite, 1982).**

Sodium concentration in pregnant ewes serum was not change along studied pregnancy periods in comparison to non-pregnant ewes because sodium retention in kidney occur during pregnancy to elevate the extracellular volume to maintain of the mother and growing of foetus **(Davison and Lindheimer, 1989)**. Sodium and potassium have important role as electrolyte in maintaining acid-base balance and osmotic pressure. Both are change slightly in the pregnancy and lactation period **(Mbassa and Poulsen, 1991).** Also**, Yokus *et al.*, 2004** documented that no significant ($p \leq 0.05$) differences in concentrations of sodium and potassium of Sakiz-Ivesi crossbreed (sheep) during both pregnancy and lactation periods. At same time, similar finding appear in goats at different times and varied physiological situations **(Krajnicakova *et al*., 2003)**. The little significant ($p \leq 0.05$) decrease in potassium concentration which was occur at first half of pregnancy may be due to action of aldosterone effect to maintain the level of sodium by maintaining the discharge of potassium by renal tubules (**Akhtar et al., 2015).**

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