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Assessment of alterations in some blood biochemical and mineral contents concentration before and during pregnancy period in Iraqi ewes of Salah-edin province

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Abstract

Thirty local Iraqi ewes reared in Tikrit – Salah-edin province from first the of October-2016 to the first of March-2017 were used in the current study to investigate the influence of pregnancy on levels of some biochemical and minerals contents in the blood serum. Blood samples were collected from ewes before and monthly during pregnancy (first, second, third, fourth and fifth month), serum separated and stored at 5 °C until samples analysis. All samples were analyzed by spectrophotometer with special kits for each parameter. Results demonstrate significant decrease ($P \leq 0.05$) in concentration of total protein, cholesterol and glucose as pregnancy advanced, while there is no effect of pregnancy on the concentration of creatinine and magnesium, however, there is a significant increase ($P \leq 0.05$) in calcium concentration as pregnancy proceed. In conclusion the pregnancy has clear influences on the concentration of total protein, cholesterol, glucose and calcium. The measurements of these parameters give best assessment for nutritional and health status of Iraqi ewes during pregnancy.

Keywords: Biochemical, Pregnancy, Local ewes, Mineral, Embryo development
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تقييم التغيرات الحاصلة في معايير بعض مكونات الدم من الكيموحياتية والمعادن قبل وخلال اشهر الحمل للنعاج العراقية في محافظة صلاح الدين

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الخلاصة

استخدمت في هذه الدراسة ثلاثون نعجة محلية متواجدة في محافظة صلاح الدين / تكريت في الفترة من الاول من تشرين الاول- ٢٠١٦ ولغاية الاول من اذار- ٢٠١٧ لمعرفة تاثير الحمل على مستوى بعض المعايير الكيموحيوية اضافة لعنصري الكالسيوم والمغنيسيوم في مصل الدم. تم سحب عينات الدم من النعاج قبل الحمل وشهريا خلال الحمل (الشهر الاول والثاني والثالث والرابع والخامس) تم عزل مصل الدم وحفظه في درجة حرارة ٥°م لحين تحليل العينات. تم تحليل العينات باستخدام طريقة المطياف الضوئي وباستعمال العدة الخاصة بكل معيار. اظهرت نتائج الدراسة انخفاضا معنويا ($P \leq 0.05$) في مستوى كل من البروتين الكلي والكولسترول والكلوكوز مع تقدم اشهر الحمل، في حين لم تؤثر على مستوى الكرياتينين ومستوى عنصر المغنيسيوم، بينما ارتفع مستوى عنصر الكالسيوم وبصورة معنوية مع تقدم اشهر الحمل. نستنتج من الدراسة ان لاشهر الحمل تاثيرا معنويا في مستويات البروتين الكلي والكولسترول في الدم اضافة لعنصر الكالسيوم وان قياس هذه المعايير يعطي تقييما جيدا للحالة التغذوية والصحية للنعاج اثناء فترة الحمل.

Introduction

Pregnancy considered as a one of the important physiological period during the female life which causes stress on the body and stimulates an alternative mechanism to maintain the natural homeostasis during pregnancy (1). The increased requirements of nutrition for fetal development lead to various metabolic changes in animal body (2-4). This changes that occurred in the biochemical and minerals are not only due to state of nutrition but breed, age, sex of embryo and reproductive status of dam like pregnancy are involved (5,6). Many alterations in mother body's composition, the contents of dietary energy and the metabolism occur during pregnancy are served to provide food for fetal development (7), these changes in turn alternate the chemical parameters of the blood serum contents (8,9). The biochemical parameters in blood, such as total protein and cholesterol are of the most important criteria which can be used to measure the metabolic state of animal energy in advanced pregnancy and lactation (10). Clear reductions in both glucose and cholesterol as well as total protein in the last period of pregnancy are found by (11).

Glucose is one of the most important sources of energy for reproductive function and production, its considered most important material utilized by fetuses in sheep during pregnancy (12), the requirements of energy in sheep are increased in the last period of pregnancy due to rapid increase in fetal growth (13), while cholesterol levels tend to decrease as pregnancy progresses (14-17). Creatinine is muscular byproducts metabolites and excreted from blood through kidney, so its level in blood is considers as a good indicator for measurement of kidney efficiency (18,19). Body bone tissue is the main storage of calcium, and its re-mobilization occurs near the end of pregnancy to maintain its blood level, in which, it is necessary for the ossification process of skeletal bone in fetus (20).

It is an important issue to know the natural levels of some biochemical and minerals and propagated an indicator for the normal and pathological condition during pregnancy in ewes, so this study was designed to determine the normal concentration of total protein, cholesterol, glucose and creatinine, as well as the calcium and magnesium elements in blood serum during different gestational period in local ewes.

Materials and methods

Experiment animals and blood collection

Thirty local ewes were used in this study aged 2-4 years, reared in Tikrit - Salah -edin province from the first of October-2016 to the first of March-2017, blood samples were taken from ewes in the period before and monthly during Pregnancy (1st, 2nd, 3rd, 4th and 5th month of pregnancy, respectively) by jugular vein aseptical aspiration. Blood samples were directly collected in tubes without anticoagulation, left for twenty minutes settlement at room temperature, then preserved in the refrigerator for 24 hours. Serum extracted by samples centrifugation (3000 rpm), for 10 min stored at -20°C until the time of analysis.

Biochemical analysis

Serum concentration of total protein, cholesterol, glucose, creatinine, as well as calcium and magnesium were conducted by spectrophotometer (21) with special kit (Biomeghrib Company, Maghrib) for each parameter in the clinical pathology Lab., at collage veterinary medicine, University of Tikrit.

Statistical analysis

The stigma stat program was used for the data analysis and finds the average and standard error, as well as the significant differences between the pre-pregnancy period and each month of pregnancy according to Friedman Repeated Measures Analysis of Variance on Ranks.

Results

Results in Table (1), showed that the most biochemical parameters in the ewes serum were significantly decreased ($P \leq 0.05$) during pregnancy as compared before pregnancy period. The concentration of total protein was significantly decreased as pregnancy advanced starting from third month and continues to fourth and last month (5.54 ± 0.09, 5.71±0.25, and 4.25±0.23 g/l respectively), compared before pregnancy period (0.3 ± 7.73 g / l), while the concentration of cholesterol was decreased ($P \leq 0.05$) earlier then gradual through pregnancy period toward the last month (53.08±2.49, 52.43±2.59, 52.03±1.46, 50.86±1.8, 50.74±0.95 mg/dl for each month respectively) as compared before pregnancy period (67.95± 2.17 mg / dl).

Glucose concentration was significantly decreased ($P \leq 0.05$) as pregnancy progressed starting from the first to last month of pregnancy (82.2 ± 1.49, 70.4 ± 2.88, 65.4± 2.5, 63± 1.35, 46.4 ± 1.04 mg/dl respectively) as compared before pregnancy (40.6±2.07 mg/dl), and this diminution in glucose level was higher in the last two months as compared with the other period (Table 1).

Results showed no differences in creatinine serum concentration before pregnancy period (0.97 ± 0.15 mg / dl) and during the five months of gestation (0.18 ± 0.03, 0.14 ± 0.02, 0.11 ± 0.005, 0.34 ± 0.22, 0.36 ± 0.15 Mg / dl, respectively).

Calcium concentration was showed in Figure (1) this concentration in pregnant ewes was significantly ($P \leq 0.05$) increased compared with non-pregnant period (8.81 ± 0.66

mg/dl) and this increasing was continued as pregnancy preceded to reach maximum value in last month of pregnancy (11.48 ± 0.28 mg/dl), while, the concentration of magnesium did not show any significant differences between any periods (Figure 2).

Table 1: Changes in the concentration of biochemical parameters before and during different months of pregnancy in ewes (mean ± SE)

Parameter	Period					
	Pre-pregnancy period	1st month	2nd month	3rd month	4th month	5th month
Total protein (g/l)	7.73±0.3 A	7.51±0.14 A	6.08±0.11 A	5.54±0.09 B	5.71±0.25 B	4.25±0.23 B
Cholesterol (mg/dl)	67.95±2.17 A	53.08±2.49 B	52.43±2.59 B	52.03±1.46 B	50.86± 1.8 B	50.74±0.95 B
Glucose (mg/dl)	82.2±1.49 A	70.4± 2.88 C	65.4±2.5 C	63± 1.35 C	46.4±1.04 B	40.6±2.07 B
Creatinine (mg/dl)	0.97±0.15 A	0.18± 0.03 A	0.14 ±0.02 A	0.11±0.05 A	0.34±0.22 A	0.36± 0.15 A

Different letters between columns mean significant differences at (P≤0.05).

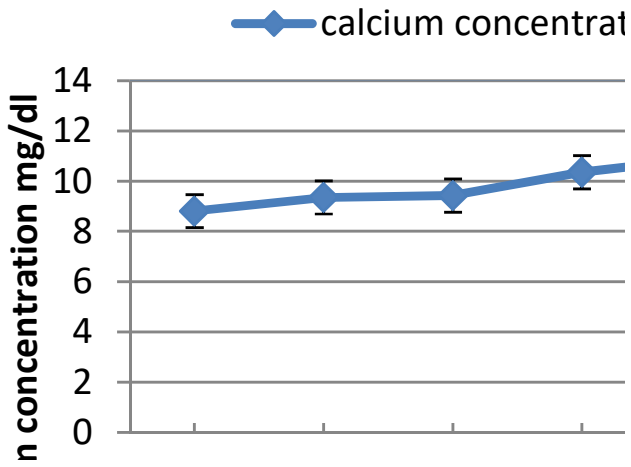

Figure 1: Calcium concentrations changes in non-pregnant period and during pregnancy in ewes.

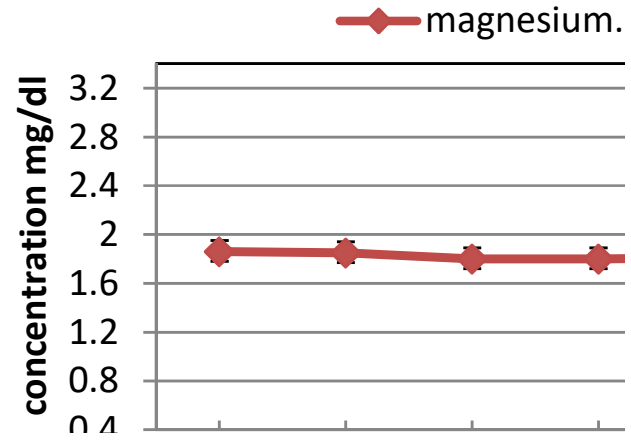

Figure 2: Magnesium concentrations changes in non-pregnant period and during pregnancy in ewes.

Discussion

The results showed that pregnancy had a clear effect on some serum biochemical criteria in the local ewes (Table 1). Total protein level was significantly decreased from the 3th to5th month of pregnancy compared to the non-pregnant period, This result was agreed with (22-24), that this decreasing is due to embryonic growth, which in turn leads to consumption of large amounts of Amino acids from the mother to maintain fetal protein and muscles development (6,23). Uterine growth during pregnancy to compensate fetal growth requires utilization a large amount of protein (25). Producing the immunoglobulin from blood plasma during last month and before birth when the formation of the colostrum in the mammary gland presents (26). These results was not agree with (27), who was not notice any effect of pregnancy on the concentration of total protein, and with (16,28) who observed a significant increase in total protein concentration as gestation progress in ewes. This may be due to the effect of age and season on total protein concentration in ewes (23,29).

Effect of Pregnancy on blood cholesterol concentration, demonstrated by a significant decrease in the level of cholesterol as pregnancy proceed compared to its level in non-pregnancy period, this result was compatible with (2,16), these outcomes may due to increased use of cholesterol during pregnancy to utilize steroid hormones needed to sustain pregnancy and develop lactation at the end of pregnancy (30,31).

Level of glucose in the blood serum of pregnant ewes had decreased significantly as pregnancy progresses, this may be due to increased metabolism of glucose by the fetus during its development in the uterus and its transmission from the mother to the circulatory system of the fetus (1), this findings are confirmed with (32-37).

There is no change in level of creatinine in the serum of ewes during pregnancy compared to non-pregnancy period, and this corresponds to (9,34,38) while they did not agree

with (22) who observed a significant increase in their level with progression of pregnancy, this may be due to differences in the breed or to the health status of animals during study.

Effect of pregnancy upon calcium concentration showed in (Figure 1), a clear effect of pregnancy on calcium concentration, with a significant increase in concentration as the gestation period advanced in local ewes. This is consistent with (39), this increase was due to increased fetal tissue requirements, thus increasing the absorption of calcium from the digestive system of pregnant ewes or to increase the secretion of parathyroid hormone as the pregnancy progresses then activates osteoclasts and thus increases the level of calcium in the blood (40), to maintain fetal skeleton requirements (41), While the results (Figure 2) did not showed any effect of pregnancy on blood concentration of magnesium in the local ewes.

We conclude from the study that pregnancy has a clear effect on the concentration of total protein, cholesterol and glucose in addition to the calcium element in blood of local ewes, and these parameters provide a good assessment of the nutritional status and health of pregnant sheep.

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