Study of level glucose during the pregnancy period in single and twin bearing Libyan goats

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دراسة مستوى سكر الدم أثناء فترة الحمل (المفرد والتوأم) في الماعز الليبي

الملخص:

تهدف الدراسة الحالية إلى تقييم مستويات الجلوكوز في الدم أثناء الحمل وبعد الولادة في الماعز الليبي الحامل بتوأم وجنين مفرد ومقارنتها مع مستويات الجلوكوز في غير الحامل حيث تم رصد مستويات الجلوكوز في الماعز الحامل للجنين المفرد والماعز التوأم. أجريت هذه الدراسة خلال موسم التكاثر على 24 ماعز حامل و 5 ماعز غير حامل. في بداية الدراسة، تم تحديد الحمل وعدد الأجنة عن طريق التصوير بالموجات فوق الصوتية، وتم جمع عينات الدم خلال أشهر مختلفة من الحمل، وشهر واحد بعد الولادة، ومن الحيوانات غير الحوامل (المجموعة الضابطة) لتحليل مستوى الجلوكوز في الدم. أظهرت نتائج الدراسة وجود انخفاض تدريجي معنوي في مستويات قيم الجلوكوز خلال أشهر الحمل والشهر الأول بعد الولادة مقارنة بغير الحوامل. كما أظهرت النتائج أن القيم المتوسطة لمستويات الجلوكوز في الدم في الماعز التوأم أظهرت انخفاضًا معنويًا مقارنة بالماعز ذات الحمل الواحد. وهذا يدل على أن التوأمة تزيد من الضغط الواقع على الماعز الحوامل ، خاصة في حالات نقص التغذية التي تحتاج إلى مزيد من الرعاية والاهتمام.

الكلمات المفتاحية: *الماعز، مصل الجلوكوز، الحمل.*

Abstract:

The present study aimed to evaluate serum glucose levels during pregnancy and postpartum in twin and single-fetus-bearing Libyan goats and compare it with nonpregnant values glucose levels were monitored in single-fetus-bearing and twin-fetus-bearing goats. This study was carried out during the breeding season on 24 pregnant and 5 non-pregnant goats. At the start of the study, pregnancy and the number of fetuses were determined by ultrasonography, blood samples were collected during different months of pregnancy, one month postpartum, and from non-pregnant animals (control group) for analysis of serum glucose level. The results of the study showed that there was a significant gradual decrease in the levels of glucose values during the months of pregnancy and the first month postpartum compared to non-pregnant. The results also showed that the mean values of serum glucose levels in twin-bearing goats showed a significant decrease compared to single-bearing goats. This indicates that twinning increases stress on pregnant goats, especially in cases of undernourishment that need more care and attention.

Keywords: *Goat, serum glucose, pregnancy.*

Introduction:

Goats are domesticated throughout the world for the production of milk, meat; fiber, and skin and are also used in biomedical research (Khan et al., 2020). There are several

breeds or strains of Libyan goats, local goats (Mahali) represent more than 90% of the total goat population, also there are other breeds like Tarki, Kardi, and Tibawi in the south in small numbers which probably have their origin in Chad and Niger(Ahtash et al., 2010). Glucose is used as fuel or an indicator for energy production. Concerning nutrition, the last third of gestation and early lactation are of interest because they are periods of high maternal energy demand to support the growth of fetuses and the newborn (Pulina et al., 2005). The fetus requires 30 to 40 grams of glucose per day to meet their development requirements during the prepartum period, the blood glucose was higher in single than in twin-bearing goats, and the values were minimum on the day of kidding in both the groups(Khan & Ludri, 2002). Blood components like glucose can be considered a marker to assess the energy, health, and nutritional status of animals(Gamit et al., 2019). The mean values of glucose in the serum of non-strained sheep and goats, during pregnancy, and the lactation period (lactation) were 3.86 – 3.51 – 3.26 mmol/L, respectively (Antunović et al., 2011).

Goats with multiple (twin or triple) fetuses are often susceptible to metabolic disturbances in late pregnancy, such as pregnancy toxemia(Lima et al., 2016). The biochemical parameters of serum glucose have a significant role in the body's homeostasis and thus provide pivotal signs on the body's response to the disease and production (Parmar et al., 2017). The focus of this paper was on trying to establish reference values for glucose levels in Libyan goats during pregnancy and early lactating as well as the effect of these values on the number of fetuses.

Materials and methods:

Study area and experimental animals:

The study was carried out on 29 healthy goats (2-6 years and their body weight ranged from 30 to 50 kg.) and selected from a private farm in DERNA city, north Libya during the breeding season starting from September 2022 until February 2023. All animals were kept under the same environmental and nutritional conditions during the period of study. Animals were fed on natural grazing in addition to concentrates (1 kg for each goat). Pregnancy and fetus numbers were determined by ultrasonographic examination on the 25th day of post-mating (DP 50 VET, Mindray Ltd. China) according to the method of **(**Medan et al., 2004**).** This study was designed as follows:- - Group 1: Primiparous and single-fetus bearing (8goats),

- Group 2: Primiparous and twin-fetus bearing (4 goats).
- Group 3: Pluriparous and single-fetus bearing (8 goats).
- Group 4: Pluriparous and twin-fetus bearing (4goats).
- Group 5: non-pregnant (5 goats).

Blood samples and glucose analysis:

All whole blood was collected in the morning from all goats by venipuncture of the jugular vein in tubes without anticoagulant, blood samples were centrifuged at 3000 rpm for 15 minutes, and Serum from clotted blood was separated and stored at -20°C in deep freeze until analyzed. Glucose was evaluated by spectrophotometry method using commercially available kits supplied by Biomed Diagnostics (Egypt), according to the manufacturer's instruction.

Statistical analysis:

The obtained data were statistically processed and expressed as mean ± standard error of the mean of each analyzed group. The differences between the obtained values were statistically analyzed by Student's t-test in case of comparing between two groups or one-way ANOVA in case of comparing between more than two groups and using Duncan's multiple range test as a posthoc. The differences between groups were considered significant when $P < 0.05$. SPSS statistical package software was used for statistical analysis (SPSS 23).

Results:

The mean serum glucose level in pregnant and non-pregnant goats*:*

The mean serum glucose levels in non-pregnant and pregnant goats during the period of study are shown in Fig (1). Nonpregnant and the first month of pregnancy, as well as nonlactating goats, expressed higher significant levels for serum glucose level, then glucose level begins to decrease with significant differences from second to third, fourth, and fifth months pregnant goats. On the contrary serum glucose level begins to increase in early lactating goats with significantly ($P<0.01$) higher in comparison to the fifth month of pregnancy.

Effect of the fetal number on glucose level in pregnant goats:

The data presented in Table 1 showed serum glucose levels in single-fetus-bearing and twin-fetus-bearing goats. In addition, changes in glucose levels in primiparous and pluriparous pregnant goats are shown in Fig (2). Serum glucose level was statistically lower ($P<0.05$) in Pluriparous twin-fetus bearing compared with other groups (Table 1), also mean serum glucose level was higher in primiparous single-fetus bearing goats than Pluriparous single-fetus bearing goats. As shown in Fig.3, the mean serum glucose levels were slightly higher in primiparous goats than in pluriparious goats except at early lactation.

Table 1: serum glucose level (mean ± SE) during pregnancy and early lactating in primiparous (single bearing & twin bearing) and pluriparous (single-bearing & twin bearing) goats.

Months of pregnancy	Primiparous		Pluriparous	
	Single-bearing	Twin-bearing	Single-bearing	Twin-bearing
1_{st} month	46.36 ± 0.30 a	44.52± 0.50 a	45.57 ± 0.43 a	44.4 ± 0.68 a
2_{nd} month	44 ± 0.24 b	39.32 ± 0.63 a	40.79 ± 0.33 a	39.55 ± 0.37 a
3_{rd} month	40.75 ± 0.40 c	34.15 ± 0.64 a	38.00 ± 0.38 b	31.95 ± 0.64 a
4_{th} month	29.63 ± 1.5 ab	26.27 ± 0.62 ab	32.33 ± 0.45 b	22.85 ± 0.50 a
5_{th} month	29.63 ± 0.37 b	22.35 ± 0.85 b	27.57 ± 0.41 b	20.37 ± 0.21 a
Early lactation	40.07 ± 0.41 a	38.67 ± 0.67 a	39.66 ± 0.47 a	37.97 ± 0.55 a

a,b,c Means with different superscripts are significantly different ($P<0.05$) within the same row.

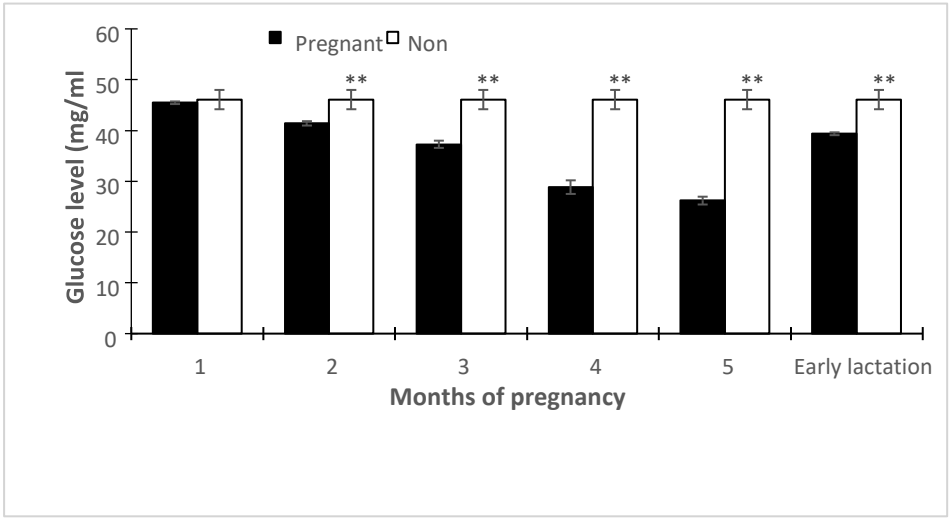

Fig 1: Changes in serum glucose level (mean ± SE) in pregnant and non-pregnant goats.
**Indicates significant differences (P<0.01) between mean serum glucose levels in pregnant and non-pregnant goats.

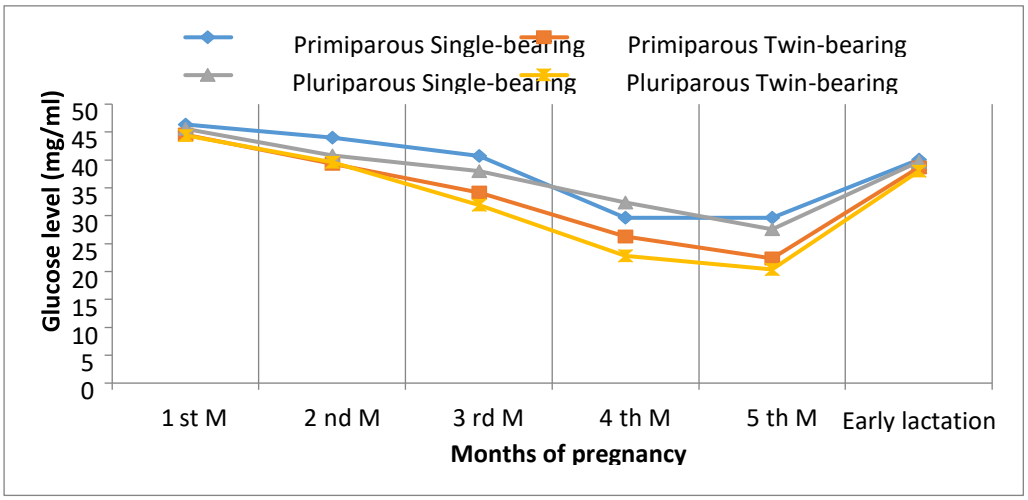

Fig 2: Serum glucose level (mean ± SE) in primiparous and pluriparous pregnant goats.

Discussion

The last 6 weeks of gestation and the first 2 weeks of the postpartum period in goats are critical periods because approximately 80% of the fetal growth occurs during this period. Studies in sheep and goats have shown that they synthesize about 100 g a day, but during late pregnancy, this basal rate can go up to about 180 g a day(Lima et al., 2012). Hypoglycemia is caused by a dietary deficiency of energy intake along with the increased demand for energy in the latter part of pregnancy due to twins or triplets, which resulted in ketonemia following lipid lysis(Gekara et al., 2012). According to (Balikci et al., 2009), goats having blood glucose concentrations lower than 27mg/dl are suffering from hypoglycemia. However, the glucose level obtained in this study was low in the twin-fetus-bearing goats, which indicates that pregnancy in twins may be a physiological stress on the mother and needs special attention and care. The significantly decreased glucose

level of the present study was in agreement with the result of many authors such as (Al-Qudah, 2011; Hefnawy et al., 2010), However, it is incompatible with the present study, report of(Lima et al., 2012; Souto et al., 2013). In general, hypoglycemia might indicate that the fetuses are alive and hyperglycemia that the fetuses are dead so must avoid any starvation and/or deviation in food in the advanced stages of pregnancy in goats. In the present study, serum glucose level was low in pluriparous goats carrying twins, this indicates that twining is considered as a physiological stress on the mother especially in pluriparous, and needs more attention and care.

Conclusions:

Define reference values of serum glucose level as abases for clinical diagnosis and to identify some metabolic problems in single and twin pregnant Libyan goats, balanced nutrition is very necessary for the maintenance of animal health during pregnancy and early lactation. The number of fetuses greatly affects glucose level changes, especially in pluriparous; this requires more attention and veterinary care.

Recommendations:

The use of ultrasound is important in the early identification of pregnant goats, especially those who are pregnant with twins, as they are numbered and isolated so that appropriate nutritional care is provided. The fourth and fifth months of pregnancy will be a gradual increase in the quantities of food provided daily to meet the growing needs of the fetuses in the form of concentrated, high-energy fodder, down to the minimum amount of filling materials in the meal at birth. Blood profile tests including measuring blood glucose levels are considered one of the most accurate methods for early diagnosis of subclinical metabolic diseases, especially pregnancy toxemia.

It was clear from this study that balanced nutrition and health care are very necessary to avoid negative effects on the level of performance of the mother during the various stages of production and the newborn during the growth stage and the following stages of production.

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