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Relationship of Different Body Weight on Some Biochemical Parameters Gender, Metabolic Hormones of Blood Serum in Female Arabi Sheep

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ABSTRACT
This study was conducted in the animal field of the research station of the College of Agriculture - University of Basrah, where 24 Arabi females' sheep were randomly selected and divided into 3 weight groups 26-15, 27-38 and above 39 kg. Blood samples were taken from the jugular vein and centrifuged to separate blood serum to study the effects of body weight on some biochemical parameters (cholesterol, total protein, glutamic oxaloacetic transaminase (GOT), glutamate-pyruvate transaminase (GPT) and alkaline phosphatase (ALP) enzymes) and some sex hormones (estrogen, progesterone, follicle-stimulating hormone (FSH) and luteinising hormone (LH) and metabolic hormones (growth hormone, insulin-like growth factor 1 (IGF-1) and leptin). The results showed a significant increase ($P<0.05$) in the concentration of cholesterol, total protein and ALP enzyme in blood serum when body weight increased. There was also a significant increase in the concentration of sex hormones and some metabolic hormones when body weight increased from 15 to more than 39 kg. Growth hormone did not show a significant difference compared to other weight groups. While the level of IGF and leptin increased for the 27-38and above 39 kg groups compared to the 26-15 Kg group.

العلاقة بين وزن الجسم المختلفة على بعض المعلمات البيوكيميائية الجنس ، والهرمونات الأيضية من مصل الدم في الإناث الأغنام العربي

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الخلاصة:

أجريت هذه الدراسة في حقل الحيوان التابع لمحطة أبحاث كلية الزراعة – جامعة البصرة، حيث تم اختيار اربع وعشرون رأساً من الأغنام العربية بطريقة عشوائية وقسمت إلى ثلاث مجموعات وزنية (26–15) و(27–38) و(فوق 39) كغم. وتم أخذ عينات الدم من الوريد الوداجي وفصلها بجهاز الطرد المركزي لفصل مصل الدم لدراسة تأثير وزن الجسم على بعض المعايير البيوكيميائية (الكولسترول والبروتين الكلي وأنزيمات GOT و GPTو (ALPوبعض الهرمونات الجنسية) الإستروجين والبروجسترون و FSHو (LHوالهرمونات الأيضية) هرمون النمو و IGF–1واللبتين). وأظهرت النتائج زيادة معنوية ($P<0.05$) في تركيز الكوليسترول والبروتين الكلي وأنزيم ALP في مصل الدم عند زيادة وزن الجسم. كما كان هناك زيادة معنوية في تركيز الهرمونات الجنسية وبعض الهرمونات الأيضية عند زيادة وزن الجسم من 15 إلى أكثر من 39 كغم. ولم يظهر هرمون النمو أي فرق كبير مقارنة بمجموعات الوزن الأخرى. بينما ارتفع مستوى هرمون IGF واللبتين في المجموعات من 27-38 كجم فأكثر من 39 كجم مقارنة بالمجموعة من 26-15 كجم.

INTRODUCTION

Blood components, such as metabolic substances, compounds, or hormonal secretions, are affected by metabolic changes that occur before and during puberty, which in turn influence body growth and development, as indicated by body weight as a general indicator (Siervogel *et al*., 2003). Cholesterol is a fat compound that is present in most tissues, either in its free form or in esters. It is mainly synthesised in the liver and intestines, and is associated with lipoproteins. (Idoko *et al*., 2020). Proteins have many functions, including maintaining blood viscosity and the balance of amino acids, contributing to the synthesis of enzymes and most hormones in the body, except steroid hormones. They are involved in the synthesis of keratin and collagen, which are essential in building joints and cartilage. They also have a role in the immune response, as antibodies and immunoglobulins are considered one of the most important parts of the immune system (Lodish *et al*., 2004; Plewczynski and Ginalski, 2009). The increase in activity of the hypothalamic-pituitary axis is a clear sign of the association between elevated concentrations of gonadotropin hormones during early life and changes in body weight until puberty, as reported by (Ashley and Robert, 2019).

The growth hormone (GH) has a significant impact on tissue development by being a key biomarker for assessing tissue growth efficiency, as its serum concentration is associated with overall body weight gain. Together GH and IGF-1 promote somatic cell proliferation and facilitate the comprehensive mechanism of body growth (Laron, 2001). (Towhidi *et al*., 2006) reported a linear relationship between leptin hormone concentration in ewe serum and body weight, indicating that 25% of the variation in hormone concentration depends on body weight changes.

Therefore, this study aimed to determine the contribution of body weight in Arabi ewes to some biochemical parameters and reproduction and metabolic hormones.

MATERIALS AND METHODS

The study was conducted in the animal field of the Agricultural Research Station at the College of Agriculture, University of Basrah, using 24 female lambs of the Arabi sheep breed. Animals were randomly divided into three body weight groups: 15-26, 27-38 and more than 39 kg. After fasting the animals for 8 hours, blood samples of 9 ml were taken from the jugular vein and kept into test tubes without any anticoagulant to allow the blood to clot. After transporting the samples to the laboratory, the serum was separated by centrifuge at 3000 rpm for 15 minutes. The serum was stored in a freezer at -20°C until laboratory tests were conducted, which included: Cholesterol, alkaline phosphate (ALP), glutamic oxaloacetic transaminase (GOT) and glutamate-pyruvate transaminase (GPT) concentrations were measured using a kit provided by Bio Merieux, (France). The total protein concentration was determined using the Biuret Method, as specified in the analytical procedure included with the kit from Randox, (UK). Estrogen, follicle-stimulating hormone (FSH), and luteinizing hormone (LH) concentrations were measured using the method provided by Biochemuce, (Germany). The concentration of progesterone was determined by using the method provided in the Monobind Inc., (USA). kit. Growth hormone (GH) concentration was determined by utilizing the method outlined in the kit provided by BioCheck, Inc., (the Netherlands). The kits provided by DRG International, (Germany) were used to determine the concentrations of insulin-like growth factor 1 (IGF-1) and leptin. Data were subjected to one-way analysis of variance (ANOVA) and least significant difference (LSD) test, and differences were considered significant if P was < 0.05. Data analyses were performed using SPSS software (SPSS, 2021). The following mathematical model was used to statistically the data: $Yij = \mu + Ti + ei$.

Where: yij is the value observed j in transaction I, μ is the overall mean of the trait, Ti is the effect of weight groups (3) of i (i coefficients), ei is the effect of experimental observational error j which is assumed to be normal, and standard distribution, a mean of zero and a variance of σ2e.

RESULTS AND DISCUSSION

As shown in Table 1, weight had a significant impact ($P<0.05$) on some biochemical parameters. The cholesterol concentration decreased in the 26-15 kg weight group compared to the higher weight group (more than 39 kg). The reason for the decreased cholesterol concentration in the lower weight might be that the body depends on cholesterol to provide the necessary energy for metabolic activities, which are essential for bodybuilding and weight gain (Al-Helou 2005). The possibility of obesity could explain the elevated cholesterol in the higher weights. The significant decrease in cholesterol concentration in the medium weight sheep (27-38 kg), which fall within the range of sexual maturity weights for the Arabi sheep breed, might be due to cholesterol depletion in the synthesis of steroid hormones that become active when the animals reach their puberty weights, these results are consistent with those of (Antunovic *et al*., 2004).

The total protein concentrations and alkaline phosphatase enzyme levels significantly (P<0.05) increased with the increase in weight from 15 to more than 39 kg. (Kassim, 2012) attributed the increase in protein concentration to the increased metabolic activities of the body for growth purposes in early ages associated with weight gain, which increases serum protein levels to meet the requirements of these activities. (AL-Hellou, 2005) reported that the increase in alkaline phosphatase concentration may be due to its role as a primary enzyme that the body depends on for cell building and division. The findings of (Antunovic *et al*., 2004 and Al-Hayali, 2005) agree with those the present study. The enzymes GOT and GPT decreased as weight increased, but they did not reach significance.

Table (1) The Effect of weight (kg) on Some biochemical parameters of female Arabi lambs (n=24) (mean ± standard error).

Group weight / Parameters	15-26	27-38	>39
Cholesterol (mg/ml)	74.00±2.19 a	62.61±1.88 b	78.11±2.76 a
Total Protein (g/ml)	6.50±0.14 b	7.10±0.30 ab	7.42±0.45 a
ALP (UI/L)	79.4±3.94 c	111.1±2.15 b	155.0±3.86 a
GOT (UI/L)	45.03±2.11	44.07±2.22	42.91±2.30
GPT (UI/L)	12.83±0.81	12.56±0.13	12.08±0.45

ALP = Alkaline Phosphate; GOT= Glutamic Oxaloacetic Transaminase; GPT = Glutamate-Pyruvate Transaminase; Different letters include the row mean that there are significant differences between the weight groups (P<0.05).

The concentrations of steroid hormones and gonadotropin hormones are significantly affected by body weight, as indicated in Table 2. The concentrations of estrogen, progesterone, LH, and FSH hormones increased as the animals' weights increased from 15 to more than 39 kg. This could be due to the fact that there is a relationship between increasing body weight and the growth of tissues and organs, including endocrine glands, nervous system, and its appendages, as well as the increased weights of the ovaries and uterus, all of which contribute positively to increased of gender hormones secretion (Wilkinson and Imran, 2019). (Astuti *et al*., 2008) suggested that some hormones such as estrogen can be balanced with improvements in body condition and weight in female lambs. These results are consistent with the those of (Sakurap *et al*., 2004; Recabarren *et al*., 2005 and Al-Hayali, 2005), who studies the ewe weights of different breeds.

Table (2) The Effect of weight (Kg) on gender hormones of female Arabi lambs (n=24) (mean ± standard error).

Group weight / Parameters	15-26	27-38	>39
Estrogen (pg/ml)	19.15±1.57 b	44.75±3.13 a	39.36±3.06 a
Progesterone (ng/ml)	0.68±0.03 c	2.11±0.08 b	5.74± 0.12 a
LH (ng/ml)	0.99±0.13 b	1.81± 0.23 ab	2.33±0.17 a
FSH (ng/ml)	0.28±0.01 b	1.85±0.12 a	2.40±0.16 a

LH = Luteinizing Hormone; FSH = Follicle-Stimulating Hormone; Different letters include the row mean that there are significant differences between the weight groups (P<0.05).

In the lower weight class (15-27 kg), GH concentration was statistically higher than in the higher weight classes (27-39 kg and above). The concentrations of IGF-1 and leptin hormones significantly increased (P<0.05) with the increase in the weights of female lambs from 15 to more than 39 kg (Table 3). (Sakurap *et al*., 2004) reported that IGF-1 and growth GH increased the growth and development of villi in the epithelial tissue of the digestive system (rumen), improving the absorption of digestive products, raising the energy levels necessary in the processes of building tissues and increasing body weight. (Chilliard *et al*., 2005) explained that heavier ewes have an increase in leptin hormone concentration because their body weight increases, which causes obesity and fat deposition, leading adipose tissue cells enhance mRNA-leptin synthesis and hormone production. These results are consistent with those of (Towhidi *et al*., 2006).

Table (3) The Effect of weight (Kg) on some metabolic hormones of female Arabi lambs (n=24) (mean ± standard error).

Group weight / Parameters	15-26	27-38	>39
Growth hormone (ng/ml)	11.06±2.11	10.58±2.01	10.32±2.56
IGF-1 (ng/ml)	37.06±1.11 b	65.89±4.65 a	72.04±3.88 a
Leptin (ng/ml)	1.33±0.11 b	2.76±0.16 a	2.63±0.10 a

IGF-1= Insulin Growth Factor 1; Different letters include the row mean that there are significant differences between the weight groups (P<0.05).

CONCLUSION

Based on the results of this study, it can be concluded that increasing the weight of Arabi ewes may contribute to improving the growth and development of the digestive system, increasing metabolism and utilization of feed, and later in improving biochemical and metabolic indicators and the growth and development of the reproductive glands.

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