



Evaluation of some hematological values and ferritin concentration in normal and emaciated Iraqi sheep

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Abstract:

The effect of emaciation and body condition scores on the plateletcrit (PCT %), mean platelet volume (MPV fl), platelets distribution width (PDW %), red blood cell distribution width (RDW %) and serum ferritin concentration were studied on the 60 emaciated sheep and compared these animals with 60 normal sheep. The animals were divided into 20 emaciated males, 40 emaciated females (20 lactating and 20 pregnant ewes), the control divided to 20 normal males and 40 normal females (20 lactating and 20 pregnant ewes), the study was conducted in Baghdad governorate and animals aged between 1.5-4 years. The results displayed a significant increase ($P<0.05$) in PCT of emaciated compared to normal sheep and in lactating ewes compared to pregnant ewes, also PDW show a significant increase ($P<0.05$) in lactating ewes compared to pregnant ewes, as well as, RDW a significant increase ($P<0.05$) in emaciated sheep compared to normal sheep. On the other hand, the ferritin concentration was a significant decrease ($P<0.05$) in both emaciated males and females compared to normal males and females sheep, in addition to, no significant differences ($P>0.05$) between lactating and pregnant ewes in ferritin concentration.

Keywords: PCT, MPV, PDW, RDW, Ferritin, Iraqi sheep.

تقييم بعض القيم الدموية وتركيز الفيريتين في الاغنام العراقية الطبيعية و الهزيلة

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الخلاصة:

تأثير الهزال و درجة الحالة الجسمية على حجم الصفيحات الدموية المرصوفة (PCT) ومعدل حجم الصفيحة الدموية (MPV) و التباين في عرض الصفيحة الدموية (PDW) و التباين في عرض خلايا الدم الحمراء (RDW) و تركيز فرتين المصل , حيث تم دراسة هذه القيم في 60 رأس غنم هزيل و مقارنة النتائج مع 60 رأس اخرى طبيعية. قسمت الاغنام الى 20 ذكر هزيل و 20 ذكر طبيعي, و الى 40 أنثى هزيلة تتضمن (20 حوامل و 20 حلوب) و 40 أنثى طبيعية تتضمن (20 حوامل و 20 حلوب). أجريت الدراسة في محافظة بغداد و كانت اعمار الحيوانات ما بين 1.5-4 سنوات , اظهرت النتائج وجود فرق معنوي ($P<0.05$) في

(PCT) للاغنام الهزيلة مقارنة بالطبيعية و في النعاج الحلوبات مقارنة بالنعاج الحوامل, كذلك و جد زيادة معنوية ($P<0.05$) في (PDW) في النعاج الحلوبات مقارنة بالحوامل, ووجد ايضا ارتفاع معنوي ($P<0.05$) في (RDW) في الاغنام الهزيلة مقارنة بالطبيعي. من جانب اخر وجد نقص معنوي ($P<0.05$) في تركيز الفيريتين في كل من الذكور و الاناث الهزيلة مقارنة مع الاغنام من الذكور و الاناث الطبيعية, فضلا عن ذلك لم يسجل اي فرق معنوي ($P>0.05$) بين النعاج الحلوبات و المرضعات في تركيز الفيريتين

Introduction:

New parameters associated with platelets and erythrocytes may be measured by blood analyzers, parameters associated with platelets are plateletcrit (PCT), mean platelet volume (MPV), platelet distribution width (PDW), while new value associated with erythrocytes is red blood cell distribution width (RDW) (1), the plateletcrit is parameter used to evaluate the total platelets mass in the blood and consider as platelets percentage out of the blood (2). The MPV is average size of platelets when is decreased indicate the platelets smaller than normal, however increase MPV occurred with large platelets, these conditions affecting on platelets production in the bone marrow (3). Also, the PDW is the percentage of platelets variation in size may be called platelet anisocytosis (4). As well as, the RDW is degree of the variation in the red blood cell diameter, which is occurred in some disorders and not characteristic of all anemia cases, this variation also called anisocytosis (5). On the other hand, ferritin is a major iron storage protein form, is very important to the blood synthesis and physiologic statues, serum ferritin affected by many pathological cases (6). The lethargy, emaciation and slow growth are the firstly clinical signs of iron deficiency and serum ferritin has relationship with tissue iron stores in animals (7). The studies about PCT, MPV, PDW, RDW and ferritin in sheep was very low, whereas (8) studied the effect colour genes in the PCT, MPV, PDW and RDW, also (9)

estimated hematological values (PCT, MPV, PDW and RDW) in pregnant and postpartum ewes as well as rams; others measured the PCT and MPV in sheep infected with ovine babesiosis (10). The Complete Blood Count (CBC) reference ranges in sheep which included PCT (0.13-0.42%), MPV (3.6-6.5fl), PDW (29-96%) and RDW (16-22%) which were estimated by (11). The effect iron loaded on the spleen ferritin in sheep was studied by (12), while developmental changes in serum ferritin concentration of dairy calves recorded by (13), the serum ferritin concentration changes in goat before and after parturition noted by (14), moreover (15) reported the serum ferritin in cattle if serum ferritin deficient, adequate or high. The studies about sheep serum ferritin in world were very little, my study is studied the PCT, MPV, PDW, RDW and serum ferritin concentration in normal and emaciated sheep with correlation in these parameters in normal sheep.

Materials and Methods:

The study was included on 120 (60 clinically healthy sheep and 60 emaciated sheep); the emaciation detected according to body condition scoring chart of Edmonson cited by (16); page 1625. The 60 healthy sheep and 60 emaciated sheep which subdivided into 40 females and 20 males of each group, while 40 females divided into 20 pregnant ewes and 20 lactating ewes. The study was conducted in Baghdad governorate and animals aged between 1.5-4 years. Blood samples were accumulated from

jugular vein into the EDTA tubes (2ml) and plain tubes (8ml). The hematological parameters examined were (PCT %), (MPV fl), (PDW %) and (RDW %), these parameters determined by Auto Hematology Vet. Analyzer. On the other hand, the ferritin concentration is estimation by (ELISA) commercial kits.

SPSS version 20 program was software for statistical analysis, analysis of variance were used compare means and students t-test and one-way ANOVA, the level of significance was ($P < 0.05$), also the Pearson Correlation is valued at the 0.01 significant level (2-tailed) and is at the 0.05 significant level (2-tailed).

Results:

The results in (table 1) represent PCT, MPV, PDW, RDW and ferritin concentration in normal and emaciated sheep with a significant decrease ($P < 0.05$) in ferritin concentration of emaciated sheep compared to normal sheep and a significant increase ($P < 0.05$) in PCT and RDW in emaciated compared to normal sheep.

Moreover, the hematological values and ferritin concentration of the

present study in (table 2) represent the data of normal males, normal females, emaciated males and emaciated females, the results recoded no significant differences ($P > 0.05$) between normal males and females sheep, as well as a significant increase ($P < 0.05$) in PCT, RDW and a significant decrease ($P < 0.05$) in ferritin concentration of emaciated males compared to normal males sheep, while the ferritin concentration a significant decrease ($P < 0.05$) in emaciated females compared to normal females sheep.

The PCT, MPV, PDW, RDW and ferritin concentration in normal lactating and pregnant ewes are presented in (table 3), the PCT and PDW a significant increase ($P < 0.05$) in lactating ewes compared to pregnant ewes and no significant differences ($P > 0.05$) in MPV, RDW and ferritin concentration between lactating and pregnant ewes.

On the other hand, the importance results revealed in (table 4), the ferritin has positive correlation with RDW and negative correlation with PDW, also RDW has positive correlation with PCT and negative correlation with PDW.

Table (1): Some hematological values and ferritin of normal and emaciated sheep; range and mean \pm SE.

Groups	No.	PCT (%)	MPV(fl)	PDW (%)	RDW (%)	Ferritin ng/ml
Normal sheep	60	0.02-0.35 0.12 \pm 0.008 b	4.7-7.4 5.47 \pm 0.06 a	23.5-36.6 28.49 \pm 0.39 a	14.6-25.5 19.90 \pm 0.32 b	6.7-32 11.38 \pm 0.64 a
Emaciated sheep	60	0.01-0.46 0.16 \pm 0.011 a	4.4-6.8 5.43 \pm 0.05 a	20.7-36.8 29.17 \pm 0.37 a	16.4-28.4 21.73 \pm 0.33 a	0.4-8.4 3.77 \pm 0.34 b

The different small letters vertically indicate to presence of significant differences at level ($P < 0.05$).

Table (2): Some hematological values and ferritin of males and females in normal and emaciated sheep; range and mean \pm SE.

Gender	No.	PCT (%)	MPV(fl)	PDW (%)	RDW (%)	Ferritin ng/ml
Males	20	0.04-0.24 0.12 \pm 0.013 b	4.90-7.40 5.50 \pm 0.118 a	23.9-36.6 28.2 \pm 0.67 a	17.1-24.8 20.41 \pm 0.58 b	17.1-24.8 11.07 \pm 0.58 a
Females	40	0.02-0.35 0.12 \pm 0.011 b	4.70-6.40 5.46 \pm 0.071 a	23.5-36 28.6 \pm 0.48 a	14.6-25.5 19.65 \pm 0.38 b	14.6-25.5 11.54 \pm 0.38 a
Emaciated males	20	0.01-0.46 0.17 \pm 0.023 a	4.70-6.00 5.35 \pm 0.084 a	23.5-31.2 28 \pm 0.63 a	18.7-28.4 23.12 \pm 0.43 a	18.7-28.4 3.81 \pm 0.43 b
Emaciated females	40	0.01-0.39 0.16 \pm 0.012 b	4.40-6.80 5.47 \pm 0.069 a	20.7-36.8 29.7 \pm 0.43 a	16.4-27.9 21.04 \pm 0.41 b	16.4-27.9 3.74 \pm 0.41 b

The different small letters vertically indicate to presence of significant differences at level (P<0.05).

Table (3): Some hematological values and ferritin of physiologic status in normal sheep; range and mean \pm SE.

Groups	No.	PCT (%)	MPV(fl)	PDW (%)	RDW (%)	Ferritin ng/ml
Pregnant ewes	20	0.02-0.17 0.09 \pm 0.01 b	4.7-6.4 5.37 \pm 0.09 a	23.5-31.2 27.1 \pm 0.57 b	16.7-24.5 19.49 \pm 0.53 a	6.7-32 12.35 \pm 1.45 a
Lactating ewes	20	0.03-0.35 0.14 \pm 0.01 a	5-6.4 5.54 \pm 0.1 a	25.8-36 30.1 \pm 0.63 a	14.6-25.5 19.82 \pm 0.57 a	7.6-22.7 10.73 \pm 0.86 a

The different small letters vertically indicate to presence of significant differences at level (P<0.05).

Table (4): The correlation between some hematological values and ferritin in normal sheep.

Correlations		PCT	MPV	PDW	RDW	Ferritin
PCT	Pearson Correlation	1	.042	.428**	.354**	.002
	Sig. (2-tailed)		.752	.001	.006	.986
MPV	Pearson Correlation	.042	1	.698**	-.254-	-.149-
	Sig. (2-tailed)	.752		.000	.050	.256
PDW	Pearson Correlation	.428**	.698**	1	-.297*	-.310*
	Sig. (2-tailed)	.001	.000		.021	.016
RDW	Pearson Correlation	.354**	-.254-	-.297*	1	.699**
	Sig. (2-tailed)	.006	.050	.021		.000
Ferritin	Pearson Correlation	.002	-.149-	-.310*	.699**	1
	Sig. (2-tailed)	.986	.256	.016	.000	
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Discussion:

The results revealed a significant increase ($P<0.05$) in plateletcrit (PCT) of emaciated compared to normal sheep, the plateletcrit is represent total circulating platelets mass (17), the PCT not related with body condition and sometimes increased in unhealthy compared to healthy cases (18), while the PCV and RBC count more connected with emaciation (19) in the same time not present relationship of the PCT with Packed Cell Volume (PCV) and Red Blood Cells (RBC) count because of the erythrocytes series different from platelets series (20), the increase PCT in emaciated sheep of present study occurs due to decrease blood masses with normal platelets count lead to increase the platelets percentage compared to the other cell in the blood samples.

On the other hand, the PCT a significant increase ($P<0.05$) in lactating ewes compared to pregnant ewes and the platelets distribution width (PDW) a significant increase ($P<0.05$) in lactating ewes compared to pregnant ewes; the PDW is the degree of variation in platelets size (2), the PDW is definite indication of platelets activation (21), the PCT and PDW in pregnancy decreased due to clinical syndrome in pregnancy subsequent in a decrease number of circulating platelets (immune thrombocytopenic purpura) (22).

In addition, the red cell distribution width (RDW) a significant increase ($P<0.05$) in emaciated compared to normal sheep, the increase RDW indicate increase of anisocytosis (23), the increase RDW and anisocytosis happened with first stage of anemia (24) which may be occurred in emaciated animals.

Also, the ferritin concentration a significant decrease ($P<0.05$) in both emaciated males and females compared to others normal, the positive relationship between emaciation and deficiency diseases (25), this reason lead to the ferritin decreased in emaciation animals.

As well as, no significant differences ($P>0.05$) between lactating and pregnant ewes in ferritin concentration, the major iron stores is liver ferritin, it is very important during pregnancy for fetus growth, persistent the gestation and parturition (26), also in lactating ewes the iron sources was required for colostrum and milk production (27).

The means of MPV and RDW in multiple groups were estimated by (8) within total normal reference range of the present study, although some hematological parameters such as PCT and PDW were different from the reference range of my study. Some studies are documented non-significant differences between pregnant, lactation ewes and rams (9), while the present study recognized significant increase in the PDW in lactation compared to pregnant ewes. The normal reference ranges of PCT, MPV, PDW and RDW in the conducted study very near to wide normal ranges of (11). The ferritin results revealed by (14) was (1.5 ± 0.01 ng/ml in pregnant goat and 1.61 ± 0.1 ng/ml in lactation goat) these results very low compared to results of present study, while (15) shown ferritin in cattle and considered serum ferritin (2-10 ng/ml) was deficient this result near from range of emaciated group in my study (0.4-8.4 ng/ml).

The positive correlation between ferritin and RDW indicate ferritin has partial effect on the erythrocyte variation in size. The negative correlation between RDW and PDW

indicate no relationship between platelets and erythrocyte series this result is agreed with (28) which were studied correlation between RDW and PDW in camels.

In conclusions, these study detected the means \pm SE and range of studied parameters and a significant differences ($P<0.05$) between emaciated and normal groups, as well as the effect pregnancy and lactation on the studied values. Also, study recorded some positive and negative correlation between the PCT, MPV, PDW, RDW and ferritin concentration.

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