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Original Article

The Hematological Parameters in Clinically Healthy Iraqi Awassi Sheep

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ABSTRACT

The aim of the present study was to determine the range and mean of hematological parameters in clinically normal Awassi sheep. The study was conducted on 200 sheep 80 males; 40 ram lambs and 40 rams and 120 females; 40 ewe lambs, 40 pregnant and 40 lactating ewes, aged 7 months-4 years in Baghdad governorate / Iraq. Results showed that the range and mean ± SE as following; Packed Cell Volume (PCV) 28-45and 33.2±0.27%, Hemoglobin (Hb) 8.6-15.1 and 10.8±0.09g/dl, Red Blood Cell count (RBC) 8.88-14.2and 10.54±0.083×10^6/ µL, Mean Cell Volume (MCV) 27.54-37.1 and 31.6±0.18 fl, Mean Cell Hemoglobin (MCH) 8.51-12.5 and 10.31±0.07 pg , Mean Cell Hemoglobin Concentration (MCHC) 30.44-36.41 and 32.5±0.10 g/dl , platelets 122-860 and 277.8± 8.92×10^3/µL, Erythrocyte Sedimentation Rate (ESR) 2-17 and 8.82±0.27 mm/24 hrs, White Blood cell Count (WBC) 3900-13000 and 10032.7±184/µL, differential leukocytes counts; Lymphocytes (L) 1579-9271 and 5410±122/µL, Neutrophils (N) 1008-8288 and 4167.5±107/µL, monocytes 19-756 and 181.3±10.3/µL, eosinophils 0-1125 and 229.6±16.4/µL and basophils 0-188 and 31.3±3.17/µL and L/N ratio 0.42-3.3 and 1.44±0.04. However the means of following parameters; PCV, Hb, RBC and neutrophils count were significantly different between males and females ($P<0.05$). Moreover the results revealed significant difference ($P<0.05$) in some hematological values of different subgroups. In conclusion, this study recorded and established the normal reference range and Mean±SE of hematological parameters in clinically healthy Iraqi Awassi sheep.

Keywords: Hematological parameters, Clinically healthy, Iraqi, Awassi Sheep.

INTRODUCTION

The reference hematological values are useful tools for diagnosis and prognosis of many diseases, and some main laboratory hematological parameters included packed cell volume, hemoglobin, red blood cell count, mean cell volume, mean cell hemoglobin and mean cell hemoglobin concentration (Munoz *et al.*, 2010). Akinyemi *et al.* (2010) studied digestibility, nitrogen balance and hematological profile of West African dwarf sheep fed on *Moringaoleifera* as supplement to Panicum maximum and fixed the normal hematological values in 20 sheep. Weiss and Wardrop (2010), Radostits *et al.* (2007) and Kahn (2005) have documented the normal hematological values. Aatish *et al.* (2007) measured the ESR through one hour in 400 sheep, 54 were infected with external and internal parasites and 346 clinically normal in Pakistan. While, Kozat*et al.* (2006) studied hematological parameters in 60 pregnant Akkaraman ewes normal and infected with internal parasite in Turkey. Scott *et al.* (2006) enumerated WBC count in normal sheep. Egbe *et al.* (2000) noted the influence of age and sex on the hematological values of goats and sheep in the arid zone of Borno state of Nigeria.

In Iraq, AL-Izzi and AL-Jalili (1985) were studied the hematological values in 36 clinically normal Awassi sheep both sexes aged 6 months - 5 years in Baghdad governorate. Madhloum (1995) reported hematological values of 120 Awassi sheep in Baghdad governorate, these were selected for meat and twin production.

Many of the above mentioned studies were conducted on smaller number or fewer hematological parameters; therefore, this investigation was carried out on a larger number of animals as well as a wide range of hematological parameters in Iraqi Awassi sheep.

MATERIALS AND METHODS

Blood samples were collected into EDTA tubes from the jugular vein of 200 clinically normal sheep (80 males and 120 females) in Baghdad governorate- Iraq. Males were divided into two groups; 40 ram lambs aged 7-12 months and 40 rams aged 1.5-4 years, while normal females subdivided into 40 ewe lambs aged 7-12 months, 40 pregnant ewes aged 1-4 years and 40 lactating ewes aged 1.5-4 years. The blood used directly for Complete Blood Picture (CBP) by

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Vet. Scan HM5 hematology system. Moreover, blood specimens estimated for ESR using Westergrentubes, blood withdrawn to mark (0) and the tubes stand vertically on the rake (Maghsoodi *et al.*, 2005). The ESR values recorded in mm after 24 hrs. Blood films were made and stained using Giemsa stain according to Coles, (1986). 200 leukocytes used for the differential leukocyte counts. The results obtained were statistically analyzed by using SAS program. Data were subjected to Analysis of Variance (ANOVA) and significant means were compared by T-test at a level ($P<0.05$).

RESULTS

The ranges and means ± SE of hematological parameters in total sheep are presented in table (1) as follows; PCV 28-45 and 33.2 ± 0.27%, Hb 8.6-15.1 and 10.8± 0.09 g/dl, RBC 8.88-14.2 and 10.54± 0.083×10^6/µL, MCV 27.54-37.1and 31.6± 0.18 fl, MCH 8.51-12.5 and 10.31± 0.07 pg, MCHC 30.44-36.41and 32.5± 0.10 g/dl, platelets 122-860 and 277.8± 8.92 ×10^3/µL, ESR 2-17 and 8.82± 0.27mm /24hr. The hematological values according to sex are presented in table (1), females showed a significantly lower ($P<0.05$) in PCV, Hb and RBC compared to normal males. On the other hand, there were no significant differences ($P>0.05$) in MCV, MCH, MCHC, platelets and ESR between males and females.

The WBC and Differential Leukocyte Counts (DLC) are presented in table (1), and means of the absolute number were used for comparison of results. The WBCs and DLC ranges and means ±SE were as follows; WBC 3900-13000 and 10032.7± 184/µL, lymphocytes 1579-9271 and 5410 ±122/µL, neutrophils 1008-8288 and 4167.5±107/µL, monocytes 19-756 and 181.3±10.3/µL, eosinophils 0-1125 and 229.6± 16.4/µL and basophils 0-188 and 31.3± 3.17/µL, L/N ratio 0.42-3.3 and 1.44± 0.04. The neutrophils counts was significantly increased ($P<0.05$) in females compared to males.

The hematological values in subgroups are presented in table (2). The PCV in pregnant and lactating ewes was significantly decreased ($P<0.05$) compared to rams and ram lambs. The significantly decreased Hb value ($P<0.05$) was observed in pregnant ewes compared to other groups except lactating ewes. Also, Hb in lactating ewes was significantly ($P<0.05$) lower than that of ram lambs. On the other hands, RBC count showed a significant decrease ($P<0.05$) in pregnant and lactating ewes compared to ram lambs. Moreover, MCV, MCH, MCHC and ESR showed no significant differences between subgroups. While the platelets count was significantly decreased ($P<0.05$) in pregnant and lactating ewes compared to rams.

The WBC counts and differential leukocyte counts (DLC) in normal subgroups are presented in Table 2. The WBC was significantly increased ($P<0.05$) in lactating ewes compared to the rams. The DLC showed a significant increase ($P<0.05$) in neutrophils of lactating ewes compared to other normal groups, while the lymphocytes, monocytes and basophils showed no significant differences ($P>0.05$) between subgroups. Moreover, the L/N ratio was significantly decreased ($P<0.05$) in lactating ewes compared to rams and pregnant ewes (Table 2).

Table 1. The hematological parameters for normal Awassi sheep in Iraq

Parameters	Total sheep (n=200)	Males (n=80)	Females (120)
PCV(%)	28-45 33.2 ± 0.27	28-45 A 34.9±0.41	28-42 B 32.1± 0.32
Hb (g/dl)	8.6-15.1 10.8± 0.09	8.8-15.1 A 11.5± 0.14	8.6-13.9 B 10.3± 0.11
RBC (×10^6 / µL)	8.88-14.2 10.54± 0.083	8.9-14.2 A 10.92± 0.14	8.8-13.3 B 10.29± 0.096
MCV (fl)	27.54-37.1 31.6± 0.18	27.9-36.9 32.1± 0.30	27.5-37.1 31.3± 0.23
MCH (pg)	8.51-12.5 10.31± 0.07	8.6-12.5 10.61+ 0.11	8.5-12 10.11+ 0.08
MCHC (g/dl)	30.44-36.4 32.5± 0.10	30.4-36.4 33 ± 0.17	30.5-36 32.2± 0.12
Platelets (×10^3/µL)	122-860 277.8± 8.92	133-860 312.2 ± 16.6	122-723 270.8± 10.2
ESR (mm/24hr)	2-17 8.82± 0.27	3-17 8.95± 0.39	2-17 8.73± 0.37
WBCs (/µL)	3900-13000 10032.7±184	3900-13000 9518.6± 314	3950-13000 10375± 221
Lymphocytes (/µL)	1579-9271 5410± 122	1620-9271 5476.3± 216	1579-9171 5367± 144
Neutrophils (/µL)	1008-8288 4167.5± 107	1125-7337 B 3687.2± 147	1008-8288 A 4487.1±143
Monocytes (/µL)	19-756 181.3± 10.3	19-672 153±15.6	20-756 200.2±13.5
Eosinophils (/µL)	0-1125 229.6± 16.4	0-1071 188.4± 24.3	0-1125 257.1± 21.8
Basophils (/µL)	0-188 31.3± 3.17	0-188 25.2± 4.68	0-134 35.3± 4.25
L/N ratio	0.42-3.3 1.44± 0.04	0.64-3.3 1.59± 0.07	0.42-3.2 1.34± 0.05

Range and mean± SE. with different letters horizontally refer to presence of significant differences ($P<0.05$).

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Table 2. The hematological values of normal Awassi sheep subgroups in Iraq

Parameters	Ram lambs (n=40)	Rams (n=40)	Ewe lambs (n=40)	Pregnant ewes (n=40)	Lactating ewes (n=40)
PCV (%)	28-45 a35.5± 0.62	28-43 a34.2± 0.53	28-42 ab33.6±0.59	28-38 c31.1± 0.42	28-40 bc31.7±0.58
Hb (g/dl)	8.9-14.8 a11.76± 0.21	8.8-15.1 ab11.3± 0.19	8.6-13.9 b10.85± 0.20	8.6-13.2 c10± 0.16	8.6-13.5 bc10.28± 0.20
RBC ($\times 10^6$ / µL)	8.92-14.2 a11.09± 0.21	8.92-14.1 ab10.74 ± 0.19	8.89-13.31 ab10.58± 0.17	8.88-12.43 b9.98± 0.13	8.89-13.32 b10.29± 0.17
MCV (fl)	28-36.9 32± 0.43	27.9-36.8 32.1± 0.42	27.6-35.9 31.8± 0.42	27.9-37.1 31.2± 0.34	27.5-36.9 30.9± 0.44
MCH (pg)	8.89-12.33 10.56± 0.16	8.64-12.5 10.65± 0.17	8.51-12.07 10.29± 0.15	8.6-12.06 10.04± 0.14	8.61-11.98 9.99± 0.15
MCHC (g/dl)	31-35.45 32.9± 0.19	30.44-36.41 33.1± 0.29	30.68-36.06 32.3 ± 0.22	30.58-35.29 32.1± 0.23	30.52-35.75 32.3± 0.20
Platelets ($\times 10^3$/µL)	133-860 ab288.1± 23	163-806 a336.3± 23.3	122-723 ab309.8± 22.2	132-455 b234.6± 11.9	141-683 b268.3± 15.7
ESR (mm/24hr)	3-16 8.02± 0.59	5-17 9.8± 0.49	2-17 7.5± 0.74	3-17 9.9± 0.53	3-17 8.7± 0.58
WBCs (/µL)	4000-13000 ab10016± 439	3900-13000 b9021± 439	3950-12950 ab9311± 453	3950-12950 ab10683.7 ± 355	6650-13000 a11131.2± 264
Lymphocytes (/µL)	2064-9065 5070.4± 284	1620-9271 5882.2±316	1579-8449 4868.5±294	2686-9171 6047.8±226	3038-8329 5185.8±183
Neutrophils (/µL)	1125-7337 b3641± 224	1912-6527 b3733.4± 192	1352-6111 b3946.4± 217	1008-7511 b4089.7± 222	1629-8288 a5427.1± 240
Monocytes (/µL)	19-575 138.8± 18.8	20-672 167.1± 24.9	20-756 207.9± 26.4	42-448 171± 17.1	49-699 221.9 ± 25.5
Eosinophils (/µL)	0-878 165.7± 32.2	0-1071 211.1± 36.3	0-999 231± 37.1	0-1125 347.6± 43	0-712 191.9± 28.2
Basophils (/µL)	0-188 29.2± 7.6	0-127 21.3± 5.4	0-132 43.3± 8.4	0-127 26.6± 6.5	0-134 35.9± 6.9
L/N ratio	0.64-3.11 ab1.51± 0.09	0.66-3.3 a1.67± 0.109	0.5-2.95 ab1.31± 0.08	0.68-3.02 a1.66± 0.10	0.42-3.25 b1.07±0.09

Range and mean± SE. with the different letters horizontally refer to presence of significant differences (P<0.05).

DISCUSSION

The values were obtained from clinically normal and healthy Awassi sheep to provide the lower and upper limits for that specific animal. The normal reference range of PCV, Hb, RBC, WBC and platelets obtained in the present study agreed with the range of healthy sheep by Weiss and Wardrop, (2010); Radostits *et al.* (2007) ; Scott *et al*. (2006) and Kahn, (2005). Although some hematological parameters were different from the reference range of these studies, this may be attributed to one or the following; nutritional, geographical, physiologic status and genetic factors (Alonso *et al.*, 1997). While the mean of PCV, RBC and WBC in clinically normal Awassi sheep of AL-Izzi and AL-Jalili (1985) study were 89%, 94% and 96% of our values respectively, Moreover, Hb value was similar to what we found and the platelets count varied from that of present study.

The MCV, MCH and MCHC of our data were in line with data obtained by Weiss and Wardrop (2010); Radostits*et al.*, (2007) and Kahn, (2005). Egbe *et al.*, (2000) reported the L/N ratio of males and females as well as in different age groups of normal sheep, which is in line with our observation.

The ESR showed no significant difference between normal males and females in present study. Coles (1986) reported ESR in sheep between 3-8.5mm / 24 hours, the differences of the ESR values between Coles (1986) and our study may be due to one of the following; type of feeding, health condition, geographical area, age, sex, drug therapy and genetic privacy. While Aatish *et al.* (2007) measured ESR after one hour in 400 clinically normal and parasitic infected sheep, which was significantly higher in infected sheep. Results of differential leucocyte counts registered by Weiss and Wardrop, (2010); Radostits *et al*. (2007) and Kahn, (2005) were similar in monocytes and eosinophils counts but narrower range in lymphocytes and neutrophils counts and a wider range in basophils counts compared to that of present data. This may be attributed to the type of feed or genetic factor and health condition.

The differences in hematological values between males and females may be due to the negative influence of estrogen on erythropoiesis of females and the positive influence of androgen in males (Weiss and Wardrop, 2010). Similar results were also documented by AL-Izzi and AL-Jalili (1985) whom there study revealed significant increase (P<0.05) in PCV of males compared to females. On the other hand, their study showed a significant increase (P<0.05) in MCHC of females compared to the males this differences may be implicated to variation in number of sheep studied.

The mean values of PCV, Hb and RBC recorded by Madhloum (1995) were significantly decreased in females compared to males, which was lowered in comparison with our study; this could be due to variation in the environment, management and hematological methods.

The hematological differences between males and females of present study agreed with Egbe *et al*.(2000) which they noted the effect of age and sex on hematological values of sheep studied in the arid zone of Borno State in Nigeria and they found a significant increase (P<0.05) in males compared to females except in WBC count. Moreover, the

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hematological values of males marginally but was not significantly increased (P>0.05) with age, which disagreed with Egbe *et al*. (2000) who registered a significant increase (P<0.05).

The neutrophil in normal sheep was significantly increased (P<0.05) in females compared to males, the differences present in neutrophil counts possibly due to the hormonal effect or susceptibility to infection. As the inflammatory response release CSF which increase the lactating ovine to produce strong inflammatory response against udder infection. Persson *et al*. (1996) explained that when CSF increased lead to attraction of large numbers of neutrophils to the udder tissue.

The differences between lactating and pregnant ewes compared to other subgroups occurred perhaps due to the effect of gestation and lactation on hematological parameters, as well as, increased requirements for progressive growth of fetus throughout pregnancy and production of milk during lactation that was agreed with (Antunovic *et al.*, 2011).

In contrast, Kozat *et al*., (2006) recorded PCV, WBCs count, and MCV values lower than our results, while Hb, RBCs count and MCHC values higher than our limits in pregnant ewes.

The WBC count increase in lactating ewes may be attributed to increase Serum Lactic Dehydrogenase (LDH) in lactating ewes which may produce leukocytosis (Kornberg and Polliack, 1980). Increased neutrophils of lactating ewes compared to other normal groups could be due to suspect that lactating ewes were more susceptible to systemic and local infection through the udder and also, the role of neutrophils as a defense mechanism against infection, or due to increased serum LDH levels in lactating ewes (Antunovic *et al.*, 2011). The increase in absolute neutrophils count in normal lactating ewes in present study may be due to the synergistic role of antibody and neutrophils to prevent local infection in healthy ewes and normal secreted neutrophils into the mammary gland (Watson, 1987).

CONCLUSION

It is concluded that the results of this study revealed an increase in PCV, Hb and RBCs and a decrease in neutrophils count of males compared to that of females. Also, pregnant and lactating showed a decrease in some hematological values. While lactating ewes have a marked increase in WBC and neutrophils count with a lower L/N ratio.

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