



RESEARCH ARTICLE

MONITORING OF HEMATOLOGICAL AND BIOCHEMICAL PARAMETERS IN SHEEP REARING IN NEW RECLAIMED LANDS IN EGYPT.

Mohamed Saied M.M*

PH.D., Veterinarian at GOVS (general organization of veterinary service) in Egypt.

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Abstract

Over 200 clinically normal desert Egyptians baladi sheep from multiple geographic areas were sampled. The goals of this study were to develop comprehensive reference intervals for hematologic and biochemical analytes. Because of the large sample size, wide geographic range, and uniform sample and handling protocoling this study, these reference intervals should be robust and applicable to other sheep populations.

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Introduction:-

Measurement of key hematological and biochemical values can provide objective information about the condition of an animal at the moment of sampling, revealing its nutritional status, disease conditions or stress it has been subjected to (Perez et al., 2003).

Serum bio-chemical and haematological references constitute important panels in the diagnosis, prognosis and treatment of livestock diseases via the investigations of myriads of parameters influencing blood and serum biochemical indices among which are packed cell volume (PCV), total blood (TBC), total protein (TP), urea, creatinine, uric acid, alanine transaminase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), concentration in livestock animals (Yokus et al. 2006).

Materials and Methods:-

Blood samples of **200 sheep (150 females and 50 males)** were collected from randomly selected clinically healthy herds. The sheep were bled through jugular vein and 10 ml of blood was collected from each animal, 4 ml of the blood was collected into plastic tube containing 0.5 M

Ethylene Diamine Tetra acetic Acid (EDTA) for haematological studies and the remaining 6 ml of blood samples was deposited in clot activating

tubes for biochemical studies and allowed to clot at room temperature within 3 hours of collection. The samples were stored at -20°C for analysis by Hitachi U-1800 spectrophotometer (using Egyptian Biochemical diagnostic kits)

Statistical Analysis:-

SPSS statistical package was used for statistical analysis. All the values were expressed as mean \pm Standard Deviation (SD). One way ANOVA was applied to compare various hematological and serum biochemical parameters. All the measurements were analyzed by generalized linear model results.

Results:-

The hematological values were: erythrocytes for Male sheep $9.8 \pm 1.5\% 10^6 \text{cm}^3$ and Female sheep $9.18 \pm 0.22\% 10^6 \text{cm}^3$. The haemoglobin for Male sheep $8.9 \pm 1.1 \text{g/dL}$ and Female sheep 9.09 ± 0.22 ; leukocytes for Male sheep $8.1 \pm 1.8\% 10^6 \text{cm}^3$ and Female sheep $9.11 \pm 0.61\% 10^6 \text{cm}^3$; and Packed cell volume (PCV) % for Male sheep 37.08 ± 0.1 and Female sheep 35.82 ± 0.88 . Neutrophils (%) 31.04 ± 0.85 for Male sheep and Female sheep 41.43 ± 0.84 . Lymphocyte (%) 4.06 ± 0.38 for Male sheep and Female sheep 3.93 ± 0.27 . Monocytes (%) for Male sheep 2.05 ± 0.15 and Female sheep 2.78 ± 0.16 . Eosinophils (%) for Male sheep 0.23 ± 0.07 and Female sheep 0.30 ± 0.05 . Basophiles (%) for Male sheep 0.20 ± 0.05 and Female sheep 0.36 ± 0.05 .

The values of biochemical parameters were: total protein for male sheep 6.5 ± 1.2 and female sheep 6.7 ± 1.5 , $76.4 \pm 6.1 \text{g/L}$; glucose for male sheep and female sheep $2.87 \pm 0.60 \text{mmol/L}$; total cholesterol $1.65 \pm 0.33 \text{mmol/L}$; aspartate aminotransferase (AST) for male sheep 115.5 ± 6.4 and female sheep $155.9 \pm 49.2 \text{U/L}$; alanine aminotransferase (ALT) for male sheep and female sheep 9.36 ± 0.05 . creatinine for male sheep 9.2 ± 0.05 and female sheep $102.0 \pm 2.1 \mu\text{mol/L}$; total calcium for male sheep and female sheep $2.53 \pm 0.25 \text{mmol/L}$; phosphorus for male sheep 2.39 ± 0.20 and female sheep $2.29 \pm 0.21 \text{mmol/L}$; magnesium for male sheep 36.08 ± 0.1 and female sheep $34.82 \pm 0.88 \text{mmol/L}$; sodium for male sheep 140.04 ± 0.85 and female sheep $141.43 \pm 0.84 \text{mmol/L}$; potassium for male sheep 5.20 ± 0.22 and female sheep 5.70 ± 0.26 , $99.66 \pm 0.70 \text{mmol/L}$; chloride for male sheep and female sheep 99.59 ± 0.75 , iron for male sheep 138.50 ± 0.15 and female sheep 140.50 ± 0.16 . copper for male sheep 10.39 ± 0.36 and female sheep 11.78 ± 0.37 .

Table 1:- Haematological values of male and female baladi sheep

Parameter	Male sheep (mean \pm SD) n=50	Female sheep (mean \pm SD) n=150
Total erythrocyte count (TEC) $10^6/\mu\text{l}$	8.19 \pm 0.41	9.18 \pm 0.22*
Haemoglobin (Hb) g/dl	8.79 \pm 0.41	9.09 \pm 0.22
Packed cell volume (PCV) %	35.08 \pm 0.1	37.82 \pm 0.88*
Total leukocyte count (TLC) $10^3/\mu\text{l}$	8.13 \pm 0.59	9.11 \pm 0.61
Neutrophils (%)	31.04 \pm 0.85	41.43 \pm 0.84
Lymphocyte (%)	4.06 \pm 0.38	3.93 \pm 0.27*
Monocytes (%)	2.05 \pm 0.15	2.78 \pm 0.16
Eosinophils (%)	0.23 \pm 0.07	0.30 \pm 0.05
Basophiles (%)	0.20 \pm 0.05	0.36 \pm 0.05

Values were expressed as mean \pm S.E.

* Means were highly significant at < 0.005

Table 2:- biochemical values of male and female baladi sheep.

Parameter	Male sheep (mean \pm SD) n=50	Female sheep (mean \pm SD) n=150
Calcium mg/dl	9.11 \pm 0.2	9.15 \pm 0.19
phosphorus (mEq/l)	2.39 \pm 0.20	2.29 \pm 0.21
magnesium (mEq/l)	36.08 \pm 0.1	35.82 \pm 0.88
copper (mEq/l)	10.39 \pm 0.36	11.78 \pm 0.37
glucose (mmol/L)	3.0 \pm 0.48	2.7 \pm 0.07
sodium (mEq/l)	140.04 \pm 0.85	141.43 \pm 0.84
chloride (mEq/l)	99.66 \pm 0.70	99.59 \pm 0.75
iron	138.50 \pm 0.15	140.50 \pm 0.16
potassium (mEq/l)	5.20 \pm 0.22	5.70 \pm 0.26
ALT/IU	9.36 \pm 0.05	9.2 \pm 0.05
AST/IU	115.5 \pm 6.4	116.3 \pm 6.5

total protein g/dl	6.5±1.2	6.7±1.5
Creatinine (mmo1/l)	101±2.6	100±2.1
urea(mmo1/l)	62.5±2.1	55.4±1.7

Values were expressed as mean ±S.E.

* Means were highly significant at < 0.005

Discussion:-

Hematological parameters:-

The RBC values was observed to be higher in the males than in the females. The difference due to age and sex is a signal of the health status of the various age groups and sex among the sheep breed studied which is in agreement with the findings of (Schalm et al. (1975) and Addas et al. (2010).

The values of leucocyte count (WBC) was higher in adult female sheep than the values obtained for male sheep. The WBC values of the adults are comparable to the young sheep. This finding is similar to the reports of (Egbe-Nwiyi et al. 2000) and (Addass et al. 2010), (Bani et al., 2008). The higher leucocyte count (WBC) is due to infections or toxic substances in the organism and a low count is an indication of pathogenic infection or presence of antigens in the organism (Bradbury et al., 1999) but the higher WBC in female adult sheep was not in agreement with (Schalm et al., 1975). Lymphocytes are slightly high in male than female and neutrophils levels are high in female than male comparable among the breed, age and sex groups of animals. There was significant influence of age, sex and breed on lymphocyte count. The lymphocytes constituted majority of the WBC counts and the cells increased with age in early life in both sexes of sheep and goats this agree with (Egbe-Nwiyi et al., 2000). The high lymphocyte counts in the animals in this study are favoured by the findings of (Milson et al., 1960) and (Wilkins and Hodges, 1962) and it might be attributed to stress and immune response to the environment (Cole, 1980), (Ganong, 2005).

Results present in Table (1) showing the effect of sex on hematological parameters. The PCV in adult female sheep were generally higher than in adult males while it was observed to be higher in the young males than in young females. The result generally showed adult sheep to have higher values in PCV than in lambs. In the sheep, age and sex exhibited remarkable influence on the PCV values.

The packed cell volume (PCV) obtained in the present study was higher in male than the female sheep (Baneejee, 2007). The increase in PCV might be attributed to high environmental temperature. These results were consistent with those obtained by (Pouliot et al. 2009), (Khan (2013).

On the other hand, there were no significant sex differences in HB, PCV and ESR. These results were in agreement with (Tibbo et al., (2004) and (Shumaila et al., 2012). While, (Egbe-Nwiyi et al., 2000) was reported the sex differences in HB and PCV of Nigeria sheep. This result was in agreement with (Tibbo et al., 2004). In contrast, (Egbe-Nwiyi et al., 2000) showed a higher value in male than female. stress and immune response the environment (Coles, 1980)

Biochemical parameters:-

Results present in Table (2)

Protein:-

In the present study variations in physiologic values due to gender were assessed. Total protein is an important factor for blood viscosity, acid-base balance, and supplying necessary enzymes (Keresan Bilal, 2008).

The mean total protein values obtained from sheep males and females used in this study were within). Plasma protein level was slightly higher in male lambs than ewe lambs but the difference was not statistically significant. This finding is in agreement with the results obtained by (Khan et al. (2013) who also reported higher total protein values in ram lambs.

Creatinine:-

Plasma creatinine concentration was slightly higher in males than females but the difference was not statistically significant. The amount of creatinine secreted daily is a function of the muscle mass and is not affected by diet, age, sex. Female excrete less creatinine than males because of their smaller muscle mass (Gray and Howarra, 1980) (Alex

and Laverne, 1983). The creatinine values in the present study were within normal range and no differ among male and females (Gray and Howarra, 1980).

AST and ALT:-

The results of the present study showed that the effect of gender on both plasma enzymes and electrolytes is not significant. Enzymes are protein catalysts synthesized by all living organisms. They are constantly and rapidly degraded but the supply is renewed by new synthesis (Coles, 1986). ALT is an enzyme found in the highest amount in liver and typically used to detect liver injury (Shumaila et al., 2012). ALT values were slightly higher in males than females. AST is found in practically every tissue of the body, the measurement of the AST levels is helpful for the diagnosis and following case of myocardial infarction, hepatocellular disease and skeletal muscle disorders (Njidda et al., 2013). AST values for males were lower (129.6 ± 47.8) than those of females (140.8 ± 31.9). Higher metabolism and functional status for males compared with females. (Rumosa Gwaze et al. 2012) found that higher plasma AST and female lambs, in male than in female.

Minerals:-

Concentrations in the blood of the animal were not influenced ($p > 0.05$) by sex whereas season has significant effect on blood minerals of sheep and goats. Mean mineral concentrations in the blood of the animals are within the normal range (mmol/l) of Ca, P, and K, respectively this agree with (Meyer and Harvey, 1998). (Ramprabhu et al. 2010), (Perez et al. 2003), (Devendran et al., 2008), (Pratt, 2010), but the magnesium of high values in male than females in the present study, this may be due to the increase of magnesium concentration in under water. The iron values in females is higher than males this agree with (Devendran et al., 2008), (Ramprabhu et al. 2010), (Jawasreh K et al. 2010), (Pratt D S (2010), (Piccione et al. 2010).

Electrolytes:-

Maintaining electrolytes in appropriate amounts is essential for normal biochemical and physiological functions of the body. Electrolytes are distributed in body fluids and play a key role in all parts of animal life (Kaneko et al., 2008). (Latimer et al., 2004).

The plasma potassium level was higher in females than males and sodium level was also higher in females (136.7 ± 9) than males (132.8 ± 5.5). While the values for chloride were higher in males (118.4 ± 5.8) than females (115.1 ± 1.6) but the difference for all three electrolytes between both genders was not statistically significant. (Al-Hadithy et al. 2012) (Sowande et al. 2008). The results also showed that main effect of sex and interaction between sex and season had no significant effect ($p > 0.05$) on blood plasma mineral concentration of sheep and goats (Sowande et al. 2008).

Glucose:-

Also no the results indicated there were significant differences for sex on glucose. The last effects were in agreement with values reported by (Shumaila et al., 2012) whose shows that the age and gender had no significant effects on serum glucose and cholesterol of sheep.

Urea:-

Plasma urea level was significantly higher in males than females. Similar observation was reported by (Borjesson et al. 2000), (Oduye and Adedevon 1976).

Conclusion:-

Haematological, biochemical parameters and its knowledge can be used to assess the health as well as physiological status of farm animals under consideration. Changes of these parameters have been studied in sheep. There is great variation in the haematological parameters as observed between sex. Moreover, it is important to establish a baseline indices for haematological parameters on the basis of the factors studied and also carry out further studies to determine the effects of other factors on these indices like breed, age and management systems.

References:-

1. Alex, K. and L S Laverne. (1983). Clinicalchemistry; interpretation and Techniques 2ndedition seattle, Washington pp:156-339.
2. AL-Hadithy, H AH, N M AL-Badawi, and M MM ahmood. (2012). Status of some serum electrolytes concentrations in Iraqi Awassi
3. Banerjee G.C. (2007). A text Book of AnimalHusbandry. 8th edn. Published by Raju primlanifor Oxford and IBH publishing Co. Pvt. Ltd. NewDelhi. Pp 1079.
4. Bani I Z A, Al-Majali A M, Amireh F and Al-Rawashreh O. F., (2008), "Metabolic Profilein Goat Does in Late Pregnancy with and Without Subclinical Pregnancy Toxemia", Vet Clin. Pathol., Vol. 37, pp. 434-437.
5. Borjesson, D L, M M Christopher, and W MBoyce,(2000). Biochemical and hematologic reference intervals for free-ranging desertbighorn sheep. Journal of Wildlife Diseases36:294–300.
6. Bradbury, M. G; Egan, S. V and Bradbury, J. H(1999). Determination of all forms of Cyanogen in cassava Roots and cassava Products Using Picrate paper kits. J.S. Clinical cases of Small ruminants in Zaria, Nigeria. Bulletin of Animal Heath andProduction in Africa 30, 111-116.
7. Coles, E H. (1986). Veterinary Clinical Pathology 4th ed,W.B.SaundersCo.,Philadelphia.
8. Devendran P, Jayachandran S, VishaP,Nanjappan K and Panneerselvam S (2008),"Hematology and Blood Profile ofCoimbatore Sheep", Indian J. Small Rumin.,Vol. 15, pp. 98-101.
9. during wet and dry seasons. Arch. Zootec57:275-278.
10. Egbe – Nwiyi, T. N; Nwaosu, S. C and salami, H. A.(2000). Haematological Values of ApparentlyHealthy sheep and goats as influenced by age andsex in Arid Zone of Nigeria. Afr J. Biomed. Res. 3:109-115
11. Ganong, W. F. (2005) Review of Medical Physiology22nd edition McGraw Hill Medical Publication Asias Pp. 459- 516-532.
12. Gray, C. H and Howarth, P.J.N. (1980) ClinicalChemical Pathology. 9th Edn. English LanguageBook Society and Edward Arnold (Publishers) Ltd;London.
13. Jawasreh K, Awawdeh F, Bani IZ, Al-Rawasreh O, Al-Magali(2010); A.Normal hematology and selected serum biochemical values in different genetic lines of Awassi Ewes in Jorden. Internet J VetMed 7: 124-129.
14. Kaneko J J, J W Harvey, and M L Bruss.(2008). Clinical biochemistry of domestic animals, sixth ed. Academic, London, pp 17–138.
15. Keser, O, and T Bilal. (2008). Effect of different dietary crude protein levels on performance, N digestibility and some blood parameters in
16. Khan K H, K A Ahmed, E H Ahmad, and C.AOmar. (2013). Study of some serum biochemical parameters of Karadi sheep inSulaimani city, Iraq. Res. Opin. Anim. Vet.Sci.3:443-446.
17. Khan K. M. H.(2013),Effect of sex on some growth performance and blood parameters ofHamdani lambs,Al-Anbar J.Vet. Sci., Vol.: 6 No. (1).
18. kivircik lambs. ActaVeterinaria (Beograd)58:87-498.
19. Latimer, K. S., Mahaffey, E.A and Prasse, K.W(2004). Clinical pathology: veterinary laboratorymedicine 4th Ed., Iowa state university press Ames,Iowa USA.
20. Midau, A and babale, D. M (2010).Haemato-biochemical findings of Indigenous GoatsinMubi Adamawa State Nigeria. J. Agric. Soc. Sci.6:14-16.
21. Meyer, D.J. and J.W. Harvey. 1998. Veterinarylaboratory medicine: Interpretation and diagnosis.2nd edition. W. B. Saunders Company. ElsevierScience. Philadelphia, Pennsylvania.
22. Milson, G. C West, L. C and Dew, S. M. (1960).Biochemical and Haematological Observations onthe Blood and cerebralspinal fluid of clinically healthy and scrapie affected goats. J. Camp Path.70:194.
23. Njidda, A A, I T Hassan, and E. A. Olatunji.(2013). Haematological and Biochemical Parameters of Goats of Semi Arid Environment Fed On Natural Grazing Rangeland of Northern Nigeria. IOSR Journal of Agriculture andVeterinary Science 3:1-8.
24. Oduye,O.O and Adedevon,B.K(1976).Biochemical Values of apparently Normal Nigerian Sheep. Nigerian Veterinary Journal 5(1):43-50.
25. parameters of apparently healthy small ruminants from Southern Punjab in Pakistan.Asian Pacific Journal of Tropical Biomedicine304-306.
26. Perez J M, Gonzalez F J, Granados F J,Perez M C, Fandos P, Sorigner R C et al.(2003), "Haematologic and BiochemicalReference Intervals for Spanish Ibex", J.Wildl. Dis., Vol. 39, pp. 209-215.
27. Perez, J., F. Ggozalez, J. Ggranados,. Perez M, P. Fandos, R. Sorigur, E.Serrano (2003): Hematologic and biochemical reference intervals for Spanish ibex. J.Wildl. Dis. 39, 209-215.
28. Piccione G, Casella S, Lutri L, Vazzana I, Ferrantelli V, CaolaG.Reference2010values for some hematological, hematochemical andElectrophoretic parameter in Girgentana goat. Turk J Vet Anim; 34: 197-20

29. Pouliot, E.; Garipey, C.; Theriault, M.; Avezard, C.; Fortin, J. & Castonguay, F. W. 2009. Growth performance, carcass traits and meat quality of heavy lambs reared in a warm or cold environment during winter. *Can. J. Anim. Sci.*, 89(2):229-239.
30. Pratt D S (2010), "Liver Chemistry and Function Test", in Feldman M, Friedman L and Brandt L J (Eds.), *Sleisenger and Fordran's Gastrointestinal and Liver Diseases*, pp. 118-124, Elsevier Publishers, Philadelphia.
31. Ramprabhu R, Chellapandian M, Balachandran S and Rajeswar J J (2010), "Influence of Age and Sex on Blood Parameters of Kanni Goat in Tamil Nadu", *Indian J. Small Rumin.*, Vol. 16, pp. 84-89.
32. Rumosa Gwaze, F., M. Chimonyo and K. Dzama, (2012). Effect of season and age on blood minerals, liver enzyme levels and faecal egg counts in Nguni goats of South Africa. *Czech J. Anim. Sci.*, 57(10):443-453.
33. Schalm, O. W, Jain, N. C and Caroll, E. I (1975) *Veterinary Haematology*. 3rd Edn. Lea and Febiger Philadelphia, P. 144-167. *sheep. I.J.A.B.R.* 2:540-544.
34. Shumaila, K, A M Bhutta, B A Khan, S Durrani, M Ali, M Ali, and F Iqbal. (2012). Effect of age and gender on some blood biochemical parameters of apparently healthy small ruminants from Southern Punjab in Pakistan. *Asian Pac J Trop Biomed.* 2012 Apr; 2(4): 304–306.
35. Sowande, O.S., E.B. Odunfowora, A.O. Adelakun and L.T. Egbeyale (2008), Blood minerals in Wad sheep and goats grazing natural pastures during wet and dry seasons, *Arch. Zootec.* 57 (218): 275-278.
36. Tibbo, M. Aragaw, K. Jibril, Y. Woldemeskel, M. Dawo, F. Rege, J.E.O (2004). Factors Affecting Hematological Profiles in three Ethiopian Indigenous Goat Breeds. *Intern. J. Appl. Res. Vet. Med.* 2(4):297-309.
37. Wilkins, J. H and Hodges, R.E.D.H. (1962). Observations on Normal Goats Blood. *Royal Army Vet. Corp. J.* 33:7.
38. Yokus, B., Cakir, D.U., Kanay, Z., Gulten, T. and Uysal, E. (2006) Effects of Seasonal and Physiological Variations on the Serum Chemistry, Vitamins and Thyroid Hormone Concentrations in Sheep. *Journal of Veterinary Medicine*, 53, 271-276.