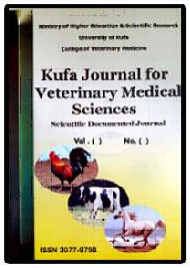
Kufa journal for Veterinary Medical Sciences Vol.(13) No.(1)

Kufa journal for Veterinary Medical Sciences

Kj.vs@uokufa .edu.iq

www.uokufa .edu.iq\journals\index.php\kjvs



Comparative Estimation of Serum Biochemical Profile During Estrus, Pregnancy and Calving Periods for Dairy Cows in Thiqar Province

Ashwaq Jabbar F. Al-Miahy * Ban Abdulhussain Saleh **

[1,2]* Department of Physiology and Pharmacology /Faculty of Veterinary Medicine/ University of Thiqar

** Teaching Veterinary Hospital of Thiqar province.

E-mail: Ashwaq.jabbar@utq.edu.iq banabd47@gmail.com

Received date:6 May **2022 Accepted:(485)**31 May 2022 **page:** (22-28) **Published:**30 Jun 2022

Abstract

Testing of blood biochemical parameters is a pre-symptomatic diagnostic appliance to determine the nutritional status of any dairy herd and other disorders such as productivity and reproduction. these parameters are influenced by both intrinsic and extrinsic factors like breed, age, sex, lactation, pregnancy, health and nutrition status of the cows in dairy herd. The present study was undertaken to estimate the selected nutritional status of dairy cows by using biochemical tests in Thiqar province in relation to reproductive status of estrus, pregnancy and lactation. The study was conducted on 40 local breed clinically healthy cows in the teaching veterinary hospital of Thiqar province, they were divided into four groups (estrus group , pregnant group between 2-8 months, lactating group for 1 to 2 months and heifer (dry cows) group of 10 animals for each group basis of reproductive status. Blood samples were collected aseptically from each animal of all groups for biochemical analysis. lactating (calving) cows showed a significant increase in blood Glucose, protein and globulins concentrations compared to other groups. Urea levels in estrus cows were significantly increasing compared to other groups. Cholesterol concentrations of lactating cows was significantly decrease compared to other groups, serum Triglyceride in estrus cows showed a significant increase when compared with those of heifer and other groups. However, there were a significant decrease of AST levels in estrus group when compared to those in heifer and other groups. ALT levels were significantly decreased in all cows of all groups when compared with the heifer cows. In conclusion biochemical values are an efficient tool for evaluation of physiological status, metabolic disorders, and management problems of the farm which have a great relation to health status of the animal.

Key words: Estrus, Pregnancy, Calving and Heifer cow; Biochemical; Thiqar Province

Introduction

Testing of blood biochemical parameters is a pre-symptomatic diagnostic appliance to determine the nutritional status of any dairy herd and other disorders such as productive and reproductive [1] . Metabolite levels in blood serum also indicate the extent of body metabolism, such as energy, proteins and other biochemical parameters [2]. These parameters are influenced by both intrinsic and extrinsic factors like breed, age, sex, lactation, pregnancy, health and nutrition status of the cows [3,4,5]. Changes in biochemical constituents are important prerequisites to assess the physiological or pathological state of the animal [6,7]. Blood tests from farm animals are routinely used to extract pertinent information relative to herd

nutrition and help to diagnose metabolic disease problems in dairy cows [8] . On the other hand, in advanced animal husbandry practice the importance of hematological and biochemical parameters or indices are well documented, acknowledged and improving day by day [9] . In the dairy herd, it is important to realize that lactation and the dry period are two important physiological statuses considered to modify the biochemical variables in cows because of the pattern of demand and supply of the nutritional plan [10,11] . Feeding of non-lactating cows with low essential energy and supplements food leads to disserve homeostatic mechanisms, rendering these animals ready for withdraw further production. This is relevant since blood constituent's has been changed in relation to the physiological conditions of animals [12], in this regard, it may be difficult to formulate a universal blood metabolic profile test for animals. These differences have underlined the need to establish appropriate physiological baseline values for various breeds, farming and environmental condition of livestock. Therefore, the present study was undertaken to estimate some biochemical parameters of dairy cows in Thiqar province in relation to reproductive status as estrus, pregnancy and lactation.

Materials and Methods

Animals and Study design

This study was conducted on 40 local healthy cows from the teaching veterinary hospital of Thiqar province, with different ages and reproduction status, they were divided into four groups (G1: pregnant cows between 2-8 months), (G2: estrus cows), G3: lactating (calving) cows for 1 to 2 months and G4: heifer (control). Cows were grouped into the previous four categories on the basis of reproductive history; the study lasted for 5 months (from the period of 25th January to 20th June, 2021). All animals were fed both roughages and concentrates according to the owners for examples barley, bran and dry braed.

Collection of blood samples

Blood samples were collected in the morning aseptically from each animal of all the four groups by jugular vein puncture into collection tubes without anticoagulants for biochemical analysis.

Biochemical analysis

The blood samples were allowed to clot and after clotting, the samples were centrifuged properly, then clear blood serum were separated into a clean test tube. Then the serum samples were analyzed by spectrophotometer for different biochemical parameters including:

- Glucose by (RANDOX/GLUC-PAP kit, U K),
- Blood Urea Nitrogen (BUN) by (SPECTRUM-Urea kit-Egypt),
- Total protein, globulins by (BIOLABO/ TP and globulin kits , France),
- Cholesterol by (BIOLABO/cholesterol Kit , France),
- Triglyceride by (BIOLABO/ TG kit , France),
- Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) by RANDOX/ALT-PAP, AST-PAP kits UK).

Data analysis

The results were statistically analyzed using one-way ANOVA by statistical program SPSS (21.0) the level significant set on ($P \leq 0.05$) [13].

Results

Glucose, protein and globulins concentrations in pregnant and estrus groups did not show any significant difference as compared with those of heifer group. However, there was a significant ($P \leq 0.05$) increase in levels of those biochemical parameters in a

group of lactating (calving) cows as compared to those in the heifer group **(Table 1)**. Urea levels in estrus cows showed a significant (P≤0.05) increase as compared to urea levels in other cows of the other three groups **(Table 1)**.

Table 1: Serum Glucose, Urea, Protein and Globulins concentrations in all groups, n=10

Groups	Glucose mg/dl (Mean± SD)	Urea (BUN) mg/dl (Mean± SD)	Tot. protein g/dl (Mean± SD)	Globulins g/dl (Mean± SD)
G1 (pregnant cows)	**83 ± 2.10 b**	**26.2 ± 3.42 b**	**5.56 ± 0.69 b**	1.48 ± 0.18 b
G2 (estrus cows)	**85.8 ± 9.39 b**	**33.6 ± 3.43 a**	**5.36 ± 0.46 bc**	1.44 ± 0.64 b
G3 (lactating cows)	**104.6 ± 7.01 a**	**24.8 ± 3.15 b**	**6.16 ± 0.35 a**	2.14 ± 0.61 a
G4 (dry cows)	**83.2 ± 10.50 b**	**27.3 ± 2.62 b**	**5.9 ± 0.30 ab**	1.79 ± 0.08 ab
LSD	**7.201**	**2.88**	**0.434**	0.415

*Different letters refer to the significant differences at P ≤ 0.05., n=10

Cholesterol concentrations in serum of lactating cows was significantly (P≤0.05) decreased as compared to pregnant and estrus groups, serum Triglyceride in estrus cows showed a significant (P≤0.05) increase when compared with those of heifer and other groups. However, there were a significant (P≤0.05) decrease of AST levels in estrus group when compared to those in heifer and other groups **(Table 2)**. ALT levels were significantly (P≤0.05) decreasing in all cows of all groups when compared with the heifer cows **(Table 2)**.

Table 2: Serum Cholesterol, Trigluceride, AST and ALT enzymes concentrations in all groups, n=10

Groups	Cholesterol Mg/dl (Mean± SD)	TG Mg/dl (Mean± SD)	AST U/L (Mean± SD)	ALT U/L (Mean± SD)
G1 (pregnant cows)	**132.6 ± 24.84 ab**	**98.8 ± 11.82 b**	**20 ± 4.10 a**	17.6 ± 4.14 b
G2 (estrus cows)	**150.2 ± 36.24 a**	**139.2 ± 27.51 a**	**16 ± 4.85 b**	16.6 ± 8.75 b
G3(lactating cows)	**109.2 ± 4.07 b**	**102.5 ± 5.52 b**	**20.2 ± 6.33 a**	14.2 ± 7.87 b
G4 (heifer cows)	**155.8 ± 40.22 a**	**104.8 ± 15.41 b**	**25.6 ± 3.02 a**	26.7 ± 2.04 a
LSD	**27.079**	**15.477**	**9.565**	5.736

*Different letters refer to the significant differences at P ≤ 0.05., n=10

Discussion

It is well known that common metabolites of plasma glucose, cholesterol, and urea are the positive indicators of the body energy balance [14]. In this search the results of glucose, protein and cholesterol for pregnant and estrus cows were similar in terms with the results by [15], who proved that the plasma concentrations of protein and cholesterol, did not differ between pregnant and non-pregnant cows. in lactating cow's glucose levels were not matched with the results of [16], who proved that there was low plasma glucose in calving compared with non calving cows, due to an extra need for glucose during lactation, to serve as a precursor for lactose synthesis, which is reflected this result.

While results of serum glucose in lactating cows in this search were matched with results of [17] , who showed that glucose level in lactating was found higher than the non lactating cows, because the blood glucose level is regarded as one of the indicators of energy status in the cow, for this reason results of glucose in the recent study may be due to high energy diet feeding during lactation period and also for taking the extra amount of feed than the requirement of animal for milk production and maintenances.

Results of total protein and globulins levels in this search were not agree with the results of [17] when they proved that the variation in total protein was insignificant between the lactating and dry group of cows. While the results of total protein in this search were matched with [18] when proved that the total serum protein in lactating cow was slightly higher than the other cows. In another study, the value of total protein in Holstein dairy cows was mentioned by [19] [20] ,they stated that biochemical parameter of blood serum was higher in non-lactating cow than in lactating cows, that could be due to the general modification in animals in serum proteins with advancing age and in the very old cows [21] .

The Urea or BUN values observed in the present study of lactation were higher than those of other groups even than the heifer. Urea levels in this search were not agreed with [22] , when they proved that the mean blood urea value in lactating buffalo was significantly lowered as compared to the heifer healthy control, this could be either due to increased deamination or increased protein intake [23] and [24] found that serum urea concentration was significantly influenced by the lactation stage. It has been shown that the utelizing efficacy of metabolic protein in dairy cows is less than the utelizing efficacy of protein that used for maintenance [25] . So, as the milk production increases, the overall protein utilization efficiency decreases, which consequently leads to more drainage of nitrogen in terms of urea through urine and milk [26] . Results of cholesterol in lactating cows in this stydy were not matched with the results of [22] , when they proved there was higher level of cholesterol during lactation, that could be due to a physiological adjustment to meet the lactation requirements. Results of AST and ALT of this search were differ from results of Ling *et al*. when they proved, there was no statistically significant variation observed in the concentration of AST and ALT in lactating cows. [27] . An increase in ALT and AST activity in the blood of ewes during lactation is indicative of increase in hepatic metabolism [28] .

AST considered to be an effective biomarker to detect liver injury and energetic activity , changes in activities of this enzyme may also be related to hepatic lipidosis and alter the normal function of the liver [29] . However, no indications were found in the literature to explain the relationship of the recorded trends of variations in the concentrations of this enzyme with the stage of estrus, pregnancy and lactation results of these enzymes in the recent study were not agree with the results of .[30] , when proved that Aspartate aminotransferase (AST) and Alanine aminotransferase (ALT) were not varied in lactating cows. The concentration of AST was found highest in the mid lactation stage. However, there is no statistically significant variation observed in the concentration of AST and ALT amongst the groups. [27] , who observed that the blood concentration of AST increases in mid stage of lactation in Holstein cow which is not in accordance with the present findings. An increase in ALT and AST activity in the blood of ewes during lactation is indicative of increase in hepatic

metabolism [28] . Data generated during the current study may be useful as reference values for the scientific community.

Conclusion: Biochemical values are an efficient tool for evaluation of physiological status, metabolic disorders, and management problems of the farm which have a great relation to health status of the animal and diagnosis of some pathos-physiological disorder in animals.

Acknowledgement

This work was supported by Assist Lecturer Wessam Husein Abd Ali to conduct the statistical analysis and this contribution is highly appreciated.

References

- **[1] Pathan MM, H Das, JZ Md, GM Siddiquee, A Latif, HR Parsani and GA Sastry, 2011.** Comparative studies on haemato-biochemical profile of cyclic and non-cyclic Holstein Friesian cross-bred cows. Wayamba Journal of Animal Science. pp.69-70.

- **[2] Ndlovu T, M Chimonyo, AI Okoh, V Muchenje, K Dzama, JG Raats, 2007.** Assessing the nutritional status of beef cattle: current practices and future prospects. Afr. J. Biotechnol., 6 : 2727-2734.

- **[3] Aengwanich W, 2002.** Effect of age on hematological values and blood profile of Holstein Friesian crossbred in Northeastern Thailand. Suranaree J. Sci. Technol., 9: 289-292.

- **[4] Al-Shami SA, 2007**. Comparative study of haematological and blood biochemical components in milk-fed and conventionally-reared hassawi breed calves. Sci. J. King Faisal Univ. Basic Applied Sci., 8:99-106.

- **[5] Mohammed AK, G Mohammed, OO Akerejola, 2007**. Haematological and serum biochemical changes in Bunaji work bulls after farmland ridging exercise in Kaduna State, Nigeria. J. Anim. Vet. Ad., 6: 576-579.

- **[6] Ahmed I, A Gohar, N Ahmed, M Ahmed, 2009.** Haematological profile in cyclic and non- cyclic and Endometritic Cross breed Cattle. Int. J. Agr. Biol., 27: 83-91.

- **[7] Hassan MM, MA Hoque, SKMA Islam, SA Khan, MB Hossain, Q Banu, 2012.** Efficiency of anthelmintics against parasitic infections and their treatment effect on production and blood indices in Black Bengal goats in Bangladesh.Turk. J. Vet. Anim. Sci., 30: 400-408.

- **[8] Van Saun RJ, M Wustenberg, 1997.** Metabolic profiling to evaluate nutritional and disease status. Bovine Pract., 1:37-42.

- **[9] Opara MN, KA Ike, IC Okoli, 2006.**Haematology and Plasma Biochemistry of the Wild Adult African Grasscutter (Thryonomysswinderianus, Temminck). J. Am. Sci., 2: 17-22.

- **[10] Iriadam M, 2007**. Variation in certain haematological and biochemical parameters during the peri-partum period in Kilis does. Small Ruminant Res., 73:54-57.

- **[11] Tanritanir P, S Dede, E Ceylan E, 2009.** Changes in some macro minerals and biochemical parameters in female healthy siirt hair goats before and after parturition. J. Anim. Vet. Adv., 8: 530-533.

[12] Etim NN, GU Enyenihi, U Akpabio, EE Offiong, 2014. Effects of nutrition on haematology of rabbits: a review. Eur. Sci. J., 10: 413-424.

- **[13] Bryman, A. and Cramer, D. (2012).** Quantitative Data Analysis

With IBM SPSS (21): A Guide For Social Scientists Rutledge.

- **[14] Reist M, Erdin D, von Euw D, Tschuemperlin K, Leuenberger H, Chilliard Y, Hammon HM, Morel C, Philipona C, Zbinden Y et al. (2002).**Estimation of energy balance at the individual and herd level using blood and milk traits in high-yielding dairy cows. J. Dairy Sci 2002; 85: 3314-3327.

- **[15] ABDULLAH, M.; MOHANTY, T.; BHAKAT, M.; KUMARESAN, A.; PATBANDHA, T.; MADKAR, A.; MOHANTY, A. (2017).** Metabolic indicators for early pregnancy in zebu and crossbred dairy cows reared in a subtropical climate Turkish Journal of Veterinary and Animal Sciences Turk J Vet Anim Sci.41: 407-413.

- **[16] Hasab E.; Mohamed, Ahmed Alhaidary and Anton C. Beynen.(2011).** Ascorbic acid status of female camels during different phases of reproduction *Trop Anim. Health Prod*., 43, 279-281 .

- **[17] Samun Sarker, Ahaduzzaman, Abu Sayeed, Rajib Sarker, Minhazul Abedin Nanno, Abdul Mannan and Mohammad Belayet Hossain.(2015)** Comparison of some serum biochemical parameters between lactating and non-lactating dairy cows in selected dairy farms of Chittagong district of Bangladesh Asian J. Med. Biol. Res. 1 (2), 259-264.

- **[18] Giuseppe P, M Vanessa, M Simona, C Stefania, G Claudia, F Francesco, 2012.** Changes of some haematological parameters in dairy cows during late gestation, post-partum, lactation and dry periods. Vet. Zootech. Lith. T., 58: 80.

- **[19] Cozzi G, L Ravarotto, F Gottardo, AL Stefani, B Contiero, L Moro, P Dalvit, 2011.** Short communication: Reference values for blood parameters in Holstein dairy cows: effects of parity, stage of lactation, and season of production. J. Dairy Sci., 94: 3895-3901.

- **[20]**Manzoor R, A Zahoor, SI Pampori, IA Javeed, MA Bhat, AK Manzoor, 2008. Hemato-Biochemical Indices of cross breed Cows during different stages of pregnancy. Indian J. Dairy Sci., 3: 154-159.

- **[21] Kaneko JJ, JW Harvey, ML Bruss, 1997**. Clinical biochemistry of domestic animals (Academic Press 5th Ed. San Diego, London, Boston, New York, Sydney, Tokyo Toronto); 5:117-138.

- **[22] Hagawane S.D.; Shinde S.B. and Rajguru D.N. (2009).** Haematological and Blood Biochemical Profile in Lactating Buffaloes in and around Parbhani city .Veterinary World, Vol.2(12):467-469.

- **[23] Oliva, G., Tranquillo, A. and Persechino,A.(1991):** Blood chemistry of primiparous and pluriparous buffalo cows in late pregnancy and at the start of lactation. *Acta Medica Veterinaria* 35(2): 207-217.

- **[24] Reinartz, M. and W. Hofmann. 1989**. Serum urea estimation in dairy herds. Praktische Tierarzt 70:22-28 (Cited: Dairy Sci. Abst. 52: 752).

- **[25] McDonald P, R.A Edwards, JFD Greenhalgh and CA Morgan, 1995.** Animal Nutrition, 5th ed. Addison Wesley Lonman, Efinburgh Gate, Harlow, Essex CM202JE, United Kingdom.

- **[26] Roy BR, K Mehla and SK Sirohi, 2003.** Influence of Milk Yield, Parity, Stage of Lactation and Body

Weight on Urea and Protein Concentration in Milk of Murrah Buffaloes. Asian Austral. J. Anim., 16: 1285-1290**.**

- **[27] Ling K, H Jaakson, J Samarutel and A Leesmae, 2003.** Metabolic status and body condition score of Estonian Holstein cows and their relation to some fertility parameters. Veterinariaja Ir. Zootechnika. T., 24: 94- 100.

- **[28] Antunovic ZJ, H Novoselect, M Sauerwein, M Speranda1 and V Pavic, 2011**. Blood metabolic profile and some of hormone concentration in ewes during different physiological status. Bulg. J. Agric. Sci., 17: 687-695.

- **[29] Greenfield RB, MJ Cecava, TR Johnson and SS Donkin, 2000.** Impact of dietary protein amount and rumen degradability on intake, peripartum liver triglyceride, plasma metabolites and milk production in transition dairy cattle. J. Dairy Sci., 83: 703-710.

- **[30] Sajibul Hasan1, Mohammad Alam Miah and Md. Kamrul Islam.(2021).**Haemato-biochemical profile during different stages of lactation in local Sahiwal crossbred dairy cows at Savar area of Dhaka district of Bangladesh Asian J. Med. Biol. Res., 7 (1), 1-5.