

# HAEMATO CHEMICAL CHANGES IN VARIOUS STAGES OF LACTATION IN THE NON DESCRIPT COWS OF CUDDALORE DISTRICT, TAMIL NADU

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**Abstract:** Fifty cows in early, mid and late lactation, dry cows along with a reference group were screened for haemato chemical analysis using standard procedures. At early lactation, the mean haemoglobin concentration was  $8.16 \pm 0.31$  g% which showed lowered trend as compared to other recorded means of lactating cows. The Packed Cell Volume was  $30.1 \pm 1.60$  % in the early lactation which was increased to  $37.0 \pm 1.48$  % during late lactation. Erythrocyte count was higher in the reference group with  $6.43 \pm 0.41 \times 10^6/\mu\text{l}$  cells when compared to the lactating groups. The blood glucose content in the early lactation was  $36.44 \pm 3.24$  mg/dl. The pregnant dry animals recorded the lowest total cholesterol value of  $14.19 \pm 5.75$  mg/dl and the reference group value is  $88.35 \pm 3.13$  mg/dl. Total Serum Protein was less ( $7.40 \pm 0.50$  g/dl) in late lactation than early and mid lactations. The blood urea nitrogen values differ significantly ( $P < 0.05$ ) amongst different groups of lactating cows. The Calcium level in the early lactation was  $8.1 \pm 0.93$  mg/dl. The serum phosphorus content of the reference group is higher  $5.57 \pm 0.29$  mg/dl than the other cows of various stages of lactation. The serum magnesium concentration in various groups of cows did not differ significantly in this study.

**Index Terms -** Haematology, Lactation, Glucose, Total proteins, Blood Urea Nitrogen, cholesterol, calcium, phosphorus and magnesium.

## I. INTRODUCTION

Hematologic analysis is not only relevant for diagnosing disorders of the hematologic system but also helpful in the diagnosis of many organ and systemic diseases ( Jones and Allison, 2007). The blood biochemical profiles are considered important in evaluating the health status of animals. Total protein concentration has a significance in this study because, the value increased with parity, mainly because of an increase in globulin concentration. This is expected, as the immune system of older cows has been in contact with more pathogens and their antibodies are elevated (Eckersall, 2008). The estimates of biochemical constituents are the prerequisites to diagnose several pathophysiological and metabolic disorders in cattles. The present study was undertaken to study the hematological and some of the blood biochemical alterations according to various stages of lactation in non-descript cows belonging to Cuddalore District of Tamil Nadu, India.

## II. RESEARCH METHODOLOGY

Cows in various stages of lactation with a history of reduced milk production were examined for haemogram and cases identified from non-descript cows belonging to Sholadharam village of Cuddalore District, Tamil Nadu were selected for the study. Detailed clinical examination of fifty cows in various stages of lactation was performed. The procedure included anamnesis in relation to breed, age, stage of lactation, number of lactation and feeding strategy. Clinical parameters were also recorded. Then the cows were divided into four groups with 10 animals each in their early lactation, mid lactation, late lactation and dry pregnant group. A fifth group comprising of 10 lactating cows was observed as reference group and for the comparison of data. The most accessible and commonly used vessels for blood collection in cattle is the external jugular vein and the same was used for this procedure. Animals were calmed to avoid stress-related changes of the hemogram. Blood samples were collected in vials and haemato chemical parameters were determined on the same day as per the procedure detailed by Benjamin (2001). Serum samples were collected in a sterile vial for biochemical analysis. All the blood biochemical parameters were estimated using Auto Analyzer. Complete Randomized Design was the statistical tool used to analyse the data.

## III. RESULTS AND DISCUSSION

### Haematological changes

There were no significant differences in haematological parameters among groups of lactating cows as given in Table - 1. The most appropriate reference range is generated from a group of animals from various stages of lactation with environmental and physiological characteristics as similar to other species. At early lactation, the mean haemoglobin concentration was  $8.16 \pm 0.31$  gm% which showed lowered trend as compared to other recorded means of lactating cows. This value is coinciding with the findings of Tambare (2005) in a study conducted in lactating buffaloes. The Packed Cell Volume was  $30.1 \pm 1.60$  % in the early lactation which was increased to  $37.0 \pm 1.48$  % during late lactation. Pregnant dry animal recorded a value of  $39.8 \pm 3.77$  %. In the early lactation, the Total Leucocyte Count was  $9.13 \pm 0.36 \times 10^3/\mu\text{l}$  and in the late lactation, it was increased to  $9.25 \pm 0.80 \times 10^3/\mu\text{l}$ . Whereas, the reference group maintained a value of  $8.12 \pm 0.53 \times 10^3/\mu\text{l}$ . Deshpande et al, (1987) also recorded a similar trend in the TLC value. The Total Erythrocyte count was higher in the reference group  $6.43 \pm 0.41 \times 10^6/\mu\text{l}$  when compared to the lactating groups. In general, beef cattle breeds have higher RBC counts than dairy cattle, bulls have greater RBC counts than cows, and non-lactating cows have higher RBC counts than lactating cows as reported by Wood and Quiroz-Rocha (2010).

### Blood Biochemistry

The Blood biochemical changes were given in Table – 2.

#### Blood Glucose

The blood glucose content in the early lactation was  $36.44 \pm 3.24$  mg/dl. This value was increased to  $47.12 \pm 2.82$  mg/dl in the mid lactation and further increased significantly to  $50.44 \pm 5.11$  mg/dl during late lactation. The pregnant dry animals recorded an increase in value of  $51.71 \pm 4.12$  mg/dl and this value is almost similar to that of the reference group which was  $51.03 \pm 0.56$  mg/dl. The changes in values were significant as stated by Oliva, *et al* ( 1991 ) and Mulei and Daniel ( 1989).

#### Cholesterol

The Total Cholesterol content in the early lactation was  $23.07 \pm 3.51$  mg/dl. This value was increased to  $43.27 \pm 7.37$  mg/dl in the mid lactation and further decreased significantly to  $37.43 \pm 7.98$  mg/dl during late lactation. The pregnant dry animals recorded the lowest value of  $14.19 \pm 5.75$  mg/dl and the reference group value is  $88.35 \pm 3.13$  mg/dl. This fluctuating trend is noticed due to the energy depletion during various stages of lactation. (Rowland , 1975).

#### Total Proteins

Blood serum proteins are significant indicators of animal health. Changes in serum proteins were observed through lactation. serum proteins are characterized by species-specific variability, and possibly by variation within species, separate reference values for beef and dairy cattle as determined by Alberghina *et al.*, ( 2011). Total protein reached the highest concentration during the 4th month of lactation. It is observed that in the early stage of lactation, the total serum protein value was slightly elevated to  $9.28 \pm 0.47$  g/dl than the reference group ( $8.10 \pm 0.52$  g/dl). Total Serum Protein was less ( $7.40 \pm 0.50$  g/dl) in late lactation than early and mid lactations. Higher serum total protein concentration might be associated with infectious diseases like mastitis, metritis or might be due to high intake of concentrates. Total protein contents usually used as an appraisal of nutritive status of an animal reflecting food intake and metabolism. This increase in total protein concentration following parturition might be attributed to the haemo concentration and water losses occurred following parturition.

#### Blood Urea Nitrogen

The blood urea nitrogen values differ significantly ( $P < 0.05$ ) amongst different groups of lactating cows. The value in the reference group recorded the highest content of  $27.73 \pm 0.35$  mg/dl. The blood urea value in early lactating stage ( $16.93 \pm 0.69$  mg/dl) was significantly lowered as compared to the cows of other stages of lactation. Poso and Lindberg (1994) revealed lowered urea concentration after parturition which concurs with the present findings.

#### Calcium

The Calcium level in the early lactation was  $8.1 \pm 0.93$  mg/dl. This value was decreased to  $8.05 \pm 0.79$  mg/dl in the mid lactation and further decreased significantly to  $7.73 \pm 0.50$  mg/dl during late lactation. The pregnant dry animals recorded the  $8.81 \pm 1.01$  mg/dl and the reference group value is  $11.51 \pm 0.29$  mg/dl which was higher among the all the other groups. This fluctuating trend is noticed due to the energy depletion during various stages of lactation. The decreased trend in calcium content in blood could be a result due to the impaired absorption of minerals from the gastrointestinal tract, excessive losses through urine, colostrums as it was much more drained in the colostrums during excessive milking and due to insufficient mobilization from the skeleton. As the stage of lactation progresses the serum calcium level decreased which corroborates with the findings of Nale (2003).

#### Phosphorus

The serum phosphorus content of the reference group is higher  $5.57 \pm 0.29$  mg/dl than the other cows of various stages of lactation. The serum phosphorus level in dry cows was  $4.15 \pm 0.50$  mg/dl which was significantly ( $P < 0.05$ ) less than the reference group and other group of cows. Moderate depression in the levels of phosphorus might be due to the necessity of it for the growing foetus as stated by Rook and Thomas ( 1983 ) and might be due to progressive energy metabolism.

#### Magnesium

Magnesium from bone mineral occurs in response to a need for calcium to maintain blood calcium levels in cows during calving time and it plays a vital role in the metabolism of carbohydrates, lipids, nucleic acids and proteins. In the present investigation serum magnesium concentration in various groups of cows did not differ significantly. However in dry cows, the value reduced to  $2.79 \pm 0.29$  mg/dl than the reference group as recorded by Rao (1981).

**Table - 1. Mean± S.E.values of haematological parameters in various stages of lactation.**

Groups	Hb (gm %)	PCV (%)	TLC ( $10^3/\mu\text{l}$ )	TEC ( $10^6/\mu\text{l}$ )
Early lactation	$8.16 \pm 0.31$	$30.1 \pm 1.60$	$9.13 \pm 0.36$	$5.59 \pm 0.33$
Mid lactation	$9.12 \pm 0.15$	$34.6 \pm 3.33$	$10.89 \pm 0.09$	$5.46 \pm 0.33$
Late lactation	$9.13 \pm 0.78$	$37.0 \pm 1.48$	$9.25 \pm 0.80$	$5.53 \pm 0.10$
Pregnant Dry	$9.26 \pm 0.40$	$39.8 \pm 3.77$	$10.00 \pm 0.69$	$6.30 \pm 0.56$
Reference group	$9.90 \pm 0.31$	$34 \pm 0.89$	$8.12 \pm 0.53$	$6.43 \pm 0.41$
CD	1.46	7.11	1.55	1.07
F-value	1.06 NS	0.98 NS	1.66 NS	1.14 NS

Table-2. Mean± S.E.values of Blood biochemical parameters in various stages of lactation.

Group	Glucose (mg/dl)	Total Cholesterol (mg/dl)	Total Proteins (gm/dl)	BUN (mg/dl)	Calcium (mg/dl)	Phosphorus (mg/dl)	Magnesium (mg/dl)
Early lactation	36.44±3.24a	23.07±3.51a	9.28±0.47	16.93±0.69a	8.1±0.93a	4.54±0.57a	3.01±0.36
Mid lactation	47.12±2.82b	43.27±7.37b	8.00±0.51	18.62±1.51a	8.05±0.79a	5.17±0.34a	3.11±0.26
Late lactation	50.44±5.11a	37.43±7.98b	7.40±0.50	21.82±1.33 b	7.73±0.50a	4.66±0.38a	3.21±0.86
Dry (Pregnant)	51.71±4.12a	14.19±5.75a	8.19±0.62	25.08±0.81c	8.81±1.01a	4.15±0.50a	2.79±0.29
Reference Group	51.03±0.56a	88.35±3.13c	8.10±0.52	27.73±0.35 b	11.51±0.29 b	5.57±0.29b	3.49±0.16
CD	9.65	15.95	1.56	2.86	2.01	1.19	0.81
F-value	2.92 S	14.87 HS	0.33 NS	12.21 HS	3.34 S	3.26 S	0.47 NS

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