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Haemato-biochemical alterations during different stages of lactation in Sirohi goats

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Abstract

The present study was carried out to investigate the haemato-biochemical profile of Sirohi goats with the intent of analyzing the physiological alteration under the influence of different lactation stages. Blood samples were collected from twenty clinically healthy female goats at the 1st, 8th and 15th weeks of lactation were compared. The blood was analyzed for hematology and serum for biochemical analysis. The hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), Mean corpuscular hemoglobin concentration (MCHC) were significantly ($P < 0.01$) was the highest at mid and lowest in the early stage of milk production. The neutrophil (%) significantly high level was found at early lactation. However, other leukocytes (%) and total leukocyte count (TLC) have not differed significantly irrespective of milk production stages. The glucose and triglyceride levels were recorded significantly ($P < 0.05$) lowest in the early stage of lactation; whereas, the total protein, albumin and urea (BUN) concentrations were higher in this stage. The serum enzyme variables aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphates (AP) exhibited a higher significant alteration ($P < 0.01$) in the initial stage. In conclusion, the present study shows marked changes in haematological and biochemical parameters likely to occur due to post-partum are indicative stress.

Keywords: lactation, haemato-biochemical parameters, Sirohi goats

Introduction

Blood biochemical and haematological parameters serve as a true reflection of the health status of animals and vary during different physiological stages of animals [1]. Pregnancy and lactation are physiological status considered to modify metabolism in animals [2]. Lactation is a very critical period for the animal and increased nutritional needs. The increased need for energy, protein and minerals for milk synthesis also leads to certain metabolic disorders. The milk components are directly and indirectly synthesized from blood and affect blood metabolites and enzymes' biochemical count [3]. Blood biochemical constituents including total protein, triglycerides, free fatty acids and urea are important indicators of the metabolic activity in lactating animals [4]. Sirohi is a very potent goat breed, being reared for both milk and meat having lactation period is about 120 days and produces 0.75 to 0.90 kg of milk per day [5]. Since there is no organized study with respect to the effect of lactation on blood profile in Sirohi Goats. Under these circumstances, the study was undertaken to determine the hemato-biochemical parameters subjected to alteration due to various lactation stages in Sirohi goats.

Materials and Methods**Experimental site**

The study was conducted at the goat farm in Gawali Palasia, Mhow, Indore district of Madhya Pradesh.

Experimental Animals

This investigation was conducted on twenty Sirohi does 2-3 years of age with a mean bodyweight of 20-25 kg. All animals maintained under standard nutritional management conditions and standard ration to meet their nutritional requirements. Apart from routine 5-6 hours grazing all the goats offered @ 200g concentrate mixture daily after grazing during the study period.

Blood collection

Blood samples were collected at the 1st, 8th and 15th week of lactation. About 10 ml of blood was collected from the jugular vein of each goat in the morning before feeding and watering, 8 ml of blood was transferred to the centrifuge tubes without anticoagulant for the harvesting of serum. The residual (2ml) blood sample is transferred to EDTA coated vacuumed tube for estimation of the haematological profile.

Methods

Hemoglobin and PCV were estimated in whole blood soon after the collection of blood by acid haematin method using sahli's haemoglobinometer (Benjamin, 1985) [6] and by Wintrobe's tube method using the macro- haematocrit (Hawk, 1965) [7], respectively. The method used to calculate TEC, MCV, MCHC, MCH, TLC and DLC as per Jain (1986) [8]. Serum was harvested from blood samples as per the standard procedure. The serum biochemical parameters like glucose, total protein, albumin, uric acid, creatinine, BUN, triglyceride, cholesterol, concentrations and serum enzyme variables (AST, ALT, & AP) were estimated by using a semi-auto biochemistry analyzer (Span diagnostic Ltd.) with standard kits of span diagnostic Ltd., Surat, India.

Statistical analysis

The data obtained were subjected to descriptive statistics analysis of variance in a completely randomized block design (CRD). Treatment means were ranked using tukey's range test (Snedecor and Cochran, 1995) [9] using SPSS version 20.

Results and Discussion

Haematological Profile

The results of the haematological parameter from the study are presented in Table- 1, indicates that blood constituents are also affected by the lactation stages. Total erythrocyte counts ($10^6/\mu\text{l}$) in early lactating animals were 9.27, which was significantly ($P<0.05$) improves in later stages although was within the normal range ($8-18/10^6/\mu\text{l}$) as reported by Kaneko [10]. Similarly, hemoglobin and hematocrit were also significantly ($P<0.01$) lowers at the beginning of lactation. The reduction in Hb, TEC and PCV at the early lactation might be due to the extended effect of "pregnant physiological anemia" a clinical condition in which blood volume expands to improved availability of nutrients for growing fetus [11]. The results of the present study corroborated the findings of earlier worker [12] observed that the Hb and PCV count significantly ($P<0.01$) lower in 1st week and improved from onwards of 2nd weeks of lactation attributed to the stress related to parturition [13]. Also, [14] reported erythrocyte count decreased during early lactating ewes. The higher value of Hb, TEC and PCV at mid-lactation

might be a higher demand of oxygen to meet the metabolic demand of peak lactation. The Neutrophil (%) were significantly ($P<0.05$) lower at 1st week indicating that lactating females were more susceptible to systemic and local infection at the onset of lactation. Our finding contradicts with [12] reported a significantly ($p<0.01$) low value of TLC on 0 days of kidding that may be due to low immunity or stress.

Biochemical parameter

The average serum biochemical parameters of goats at various stages of lactation were presented in Table-2. In our study, indicated that the mean concentration of blood glucose was lowest significantly ($P<0.01$) in the early-stage and increased subsequently as the lactation advances. This decrease in blood glucose level was probably due to negative energy balance and its utilization for blood sugar synthesis [3]. A similar effect was also seen in previous reports [15, 4, 12] suggesting fatty liver developed just after parturition characterized by depleted liver glycogen and lowered serum glucose levels. The significant ($P<0.01$) increase of serum glucose level at the mid-stage of lactation might be may be considered as a compensatory mechanism to meet the great demand of energy for milk synthesis. On the alike, other researchers stated that blood glucose level was significantly higher in middle and late lactation than the early lactation stage [16]. However, others reported no significant variation of blood glucose at different stages of lactation in Mehshani buffaloes [3].

The total protein and albumin were found to be significantly ($P<0.05$) higher while was non-significant for globulin in early lactation is due to the catabolism of protein for milk synthesis. The findings in the present study are in agreement with earlier workers [17] reported total protein shows a significant decrease ($P<0.05$) with the advancement of lactation. In this study BUN significantly ($P<0.05$) higher early and late lactation might be the relationship with protein. The decrease in serum BUN around parturition [12] may be associated with the decline in feed intake due to stress and hormonal changes during the kidding.

In this study, the significant drop in serum triglyceride in early lactation increased lipoprotein lipase activity consistent with the induction of the enzymes into mammary tissue to provide for milk fat synthesis during early lactation [18].

The highest value of total cholesterol was observed during early lactation and the lowest value during mid and intermediate values of cholesterol during late lactation however it did not differ significantly among the lactation period.

The serum enzyme variables (AST, ALT, & AP) level significantly ($P\leq 0.01$) in early lactation agreement with [14] suggesting increased hepatic metabolism during early lactation reflects its counts in the plasma level.

Table 1: Haematological parameter of Shirohi does during different stages of lactation

Attribute	Early lactation	Mid lactation	Late lactation	SEM	Significance
Haemoglobin (g/dl)	7.77 ^a	8.58 ^b	8.31 ^{ab}	0.23	($P<0.05$)
Hematocrit (%)	22.96 ^a	25.94 ^b	25.06 ^{ab}	0.69	($P<0.05$)
Red blood corpuscles ($10^6/\mu\text{l}$)	9.27 ^a	10.29 ^b	9.96 ^{ab}	0.27	($P<0.05$)
Mean corpuscles volume (fl)	24.80	25.20	25.17	0.19	NS
Mean corpuscular Hb (pg)	8.38	8.34	8.34	0.52	NS
Mean corpuscular Hb (g/dl)	33.85 ^b	33.09 ^a	33.14 ^a	0.15	($P<0.01$)
White blood corpuscles ($10^3/\mu\text{l}$)	10.24	9.59	9.91	0.33	NS
Neutrophil (%)	33.00 ^b	31.50 ^a	32.20 ^{ab}	0.37	($P<0.05$)
Eosinophils (%)	5.05	4.70	0.33	0.31	NS
Basophils (%)	0.85	0.95	0.95	0.17	NS

Monocyte (%)	57.40	59.10	57.80	0.49	NS
Lymphocytes (%)	3.70	3.75	3.95	0.24	NS

Table 2: Blood biochemical parameter of Shirohi does during different stages of lactation

Attribute	Early lactation	Mid lactation	Late lactation	SEM	Significance
Blood Sugar (mg/dl)	47.35 ^a	54.70 ^b	52.35 ^b	1.63	(<i>P</i> <0.01)
Total protein(g/dl)	9.36 ^b	7.78 ^a	8.16 ^{ab}	0.41	(<i>P</i> <0.05)
Albumin (g/dl)	5.23 ^b	4.21 ^a	4.24 ^{ab}	0.17	(<i>P</i> <0.05)
Globulin (g/dl)	4.12	3.36	3.92	0.30	NS
Albumin: Globulin	1.38	1.40	1.17	0.08	NS
BUN (mg/dl)	20.60 ^b	15.80 ^a	17.95 ^{ab}	1.08	(<i>P</i> <0.05)
Uric acid (mg/dl)	2.87	2.09	2.29	0.07	NS
Creatinine (mg/dl)	0.79	0.74	0.71	0.63	NS
Triglyceride (mg/dl)	17.46 ^a	22.84 ^b	20.82 ^{ab}	0.71	(<i>P</i> <0.01)
Cholesterol (mg/dl)	115.30	110.40	113.71	2.82	NS
AST (IU/l)	60.14 ^b	48.18 ^a	53.80 ^b	1.36	(<i>P</i> <0.05)
ALT (IU/l)	27.67 ^b	24.32 ^a	24.87 ^a	0.87	(<i>P</i> <0.05)
AP (IU/l)	95.80 ^b	81.42 ^a	92.27 ^b	1.42	(<i>P</i> <0.05)

Conclusion

It may be concluded that lactation has a significant influence on the haemato- biochemical traits of Shirohi goats due to the sudden demand for nutrients during early lactation there is a modification in the metabolism of animals. Based upon the evaluation of biochemical parameters, it may be possible to detect aberration in metabolism and thereby appropriate correction could be made to overcome the metabolic disturbances during lactation

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