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STUDY ON SOME BIOCHEMICAL INDICES IN EWES IN RELATION TO PHYSIOLOGICAL AND NUTRITIONAL STATUS

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ABSTRACT:

A study was conducted to study the variation in some blood biochemicals in ewes under different nutritional plans during peri-partum period. 40 healthy Corriedale ewes in the last month of gestation (day 120) were selected randomly and allotted to 4 groups (control, T1, T2 and T3) of 10 animals each such that the average body weights between the groups did not differ significantly. The ewes were maintained under stall feeding conditions and offered a daily ration consisting of oats hay @ 1.25kg/head/day and commercial pelleted feed @ 500g/head/day during peri-partum period (one month pre-partum to one month post-partum). Ewes in treatment groups T1, T2 and T3 were offered an additional supplement of concentrate (pelleted feed) @100, 200 and 300g/head/day while as no additional supplement was offered to control ewes. Serum glucose increased during the last month of gestation and then showed a decline. Level of glucose was significantly ($p<0.05$) higher in T3 than control both on the day of parturition (57.05 vs. 52.44 mg/dl) and on day 30 post-partum (53.58 vs. 46.80 mg/dl). Blood total protein continued to drop throughout the peri-partum period and was significantly ($p<0.05$) higher in T3 (6.31g/dl) and T2 (5.83g/dl) than control (4.97g/dl) on day 30 post-partum. Serum albumin level was significantly ($p<0.05$) higher in T3 than control both on the day of parturition (3.30 vs. 3.06 g/dl) and on day 30 post-partum (2.46 vs. 2.12 g/dl) while as the serum globulin did not vary significantly. It is concluded that blood biochemical

parameters of the ewes show variation during different physiological states of the animal which could be suitably utilized to predict the nutritional status of the animal.

KEY WORD: *Ewes, Blood, Biochemical, Indices.*

INTRODUCTION:

Sheep and goats sustain food and economic security in hilly areas (Khan *et al*., 2011) where it is difficult for other livestock species to perform.The last month of gestation and early lactation is the most critical period in ewe's nutrition as the nutritional requirements of the lamb are dependent on the dam during this period. Approximately 70 percent of the foetal growth occurs during late gestation. A negative energy balance during the transition period around birth is regarded as the primary cause for the development of the ketosis/ hyperketonemia in ewes (Lacetera *et al*., 2001) resulting in decreased performance or even mortality. Most of the blood biochemical parameters experience a variation during this critical period around birth. Such variations may occur due to increasing nutrient requirements of the animal because the latter has to support the growth of foetus/newborn in addition to its own requirements. Blood metabolic profile is increasingly being used for estimation of nutritional status in sheep (Antunovic *et al*. 2007). Besides this, it can also be utilized for assessing the health status of the animal (Herdt *et al*., 2000). The determination of metabolic blood profiles, including serum mineral and biochemical parameters is necessary to study ruminant metabolism disorders (Balikci *et al*., 2007). These variations in the blood biochemical parameters might be possibly utilized to predict the nutritional status of the animal. Thus the present study was conducted to study the variation in some blood biochemical parameters of ewes during different physiological stages in relation to nutrition.

MATERIALS AND METHODS:

The present study was conducted on Corriedale sheep at Sheep Research Station (SRS) of Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir from Feb. 2010 to April 2010. The state of Jammu and Kashmir lies between 32.17"-36.58" North latitude and 37.26"-80.30" East longitude and the area is about 1700 meters above sea level. Temperature of the area ranges from -7°C during winter (Dec. to Feb.) to 35°C during summer months (June to Aug.) with an average annual rainfall of 650.5mm. The area remains covered with snow during most part of the winter. The animals are bred from September to November when the temperature ranges from 15-25°C. The average daily sunshine during September, October and November are 13 hrs, 12 hrs and 11 hrs respectively.

40 healthy Corriedale ewes represented the experimental animals. The animals were selected in their last month of gestation as per the records maintained at the farm. All these animals had previously been maintained under same managemental conditions. The selected animals were divided into four groups (T1, T2, T3, and Control) of 10 animals each. This grouping was based on the body weight and parity of the animals. These animals were allotted to different groups in such a way that between group average body weight differences were statistically non-significant. All the managemental conditions except the feeding schedule of the different groups of experimental ewes during the trial period (February to April) remained the same. The control ewes were provided a basic ration comprising of commercial pelleted feed @ 500 gram of concentrate/head/day (89% DM, 20% CP, 72% TDN) in addition to Oats hay (88% DM, 5% CP, 55% TDN) @ 1.25Kg/head/day during the peri-partum period. The treatment groups T1, T2 and T3 were offered additional concentrate @ 100, 200 and 300gram/head/day respectively during the trial period. Blood samples were taken from the jugular vein of the animals at 15 days interval during the peri-partum period (one month pre-partum to one month post-partum). The serum so obtained was subjected to estimation of glucose, total protein and albumin by glucose oxidase-peroxidise method (Kirschner and Woods, 2001), biuret and bromocresol green method (Johnson *et al*., 1999, respectively. Serum globulin was estimated by subtracting the albumin level from the total protein. The data obtained was subjected to statistical analysis by one-way ANOVA using the General Linear Model procedure of Statistical Package for the Social Sciences, Base 10.0, 1999 (SPSS Software products, Marketing Department, SPSS Inc. Chicago, USA). To test the significance of difference between means post-hoc analysis by LSD (least significant difference) was done.

RESULT AND DISCUSSION:

The changes in serum glucose levels in ewes during peri-partum period have been presented in table-1. Serum glucose level continued to increase during the last month of gestation and was maximum on the day of parturition in all the four groups of experimental ewes. On the day 0 of parturition, the glucose level (mg %) was significantly ($p<0.05$) higher in both T2 (56.97±1.89 mg%**)** and T3 (57.05±1.02 mg%**)** than the control (52.44±1.68 mg%). Comparisons between other groups were non-significant. This increasing trend in serum glucose is suggestive of metabolic changes taking place during the late stage of gestation. These findings are in agreement with earlier reports (M-El Sheriff., 2009; Khatun *et al.*, 2010). Contrary to this, Marai *et al.* (2006) reported a decline in serum glucose during the last week of gestation.

After parturition, serum glucose level showed a decline in all the four groups although this decline was lesser in treatment groups (T1, T2 and T3) than the control. This finding is in agreement with an earlier finding which also revealed a decreasing trend in serum glucose after parturition (M.El Sheriff,

2009). The glucose level (mg %) was significantly ($p<0.05$) higher in T3 than control both at day 1(56.44±1.09 vs. 51.66 ± 1.34 mg%) and day 15 (54.76 ± 1.12 vs. 49.56 ± 0.80 mg%). On day 30, serum glucose (mg %) in T3 was significantly ($p<0.05$) higher than both control (53.58±0.99 vs. 46.80±1.04 mg%) and T1 (54.76 ± 1.12 vs. 49.48±1.62 mg%). The overall decreasing trend in serum glucose after parturition can be explained on the basis of heavy demand of glucose for lactose synthesis (constituent of milk) during this period as the latter coincides with the lactation period. Glucose demand remains high during late stage of gestation also but it is far less compared to that in early lactation. In the present study, significantly ($p<0.05$) higher levels of serum glucose were observed in T3 than control throughout the post-partum period. This may be attributed to supplementation during peri-partum period in T3 which could have more or less sufficed the high demands of glucose during this period resulting in lesser decline in serum glucose. Shetaewi and Ross (1991) also reported higher level of serum glucose in concentrate supplemented group.

The changes in serum protein in experimental ewes during peri-partum period have been presented in table-2. Serum total protein showed a downward trend throughout the peri-partum period in control while as it started to increase at day 30 post-partum in T1 and T2. In T3, serum total protein showed a decline as the parturition approached but an upward trend was recorded from the day of parturition upto the end of study period (one-month post-partum). In case of control, T1 and T2, the level of serum total protein was highest at day 30 pre-partum while as it was highest at day 30 post-partum in T3.

Although the group averages of serum total protein levels of T1, T2 and T3 were higher than control but these did not differ significantly on day 120, day 135 and day of parturition. However, on day 1 post-partum, the levels (g/dl) were significantly($p<0.05$) higher in T3 (6.15±0.03 g/dL) than control (5.68±0.02 g/dL), T1 (5.74±0.23 g/dL) and T2 (5.75±0.08 g/dL).The results were similar on day 15 post-partum and serum total protein levels (g/dl) were significantly ($p<0.05$) higher in T3 than control, T1 and T2. On day 30 post-partum, the serum total protein levels (g/dl) in T1, T2 and T3 were found to be significantly ($p<0.01$) higher than the control. Also T3 was significantly ($p<0.01$) higher than both T1 and T2. This drop in serum total protein is in agreement with an earlier finding (M-El Sheriff, 2009). Marai *et al. (*2006) also reported that serum total protein and albumin show a decline from day 90 of gestation which continues upto the last week of gestation. However, another finding in this aspect has revealed an upward trend in serum total protein with the advancement of pregnancy (Khatun *et al.,* 2010). Reduction in the amount of maternal serum proteins during the last stage of gestation can be attributed to the increase in uterine weight and contents of the foetus, foetal fluids and the foetal membranes at this stage. Similarly, an increasing trend in serum total protein and albumin in T3 might be possibly due to supplementation.

The changes in serum albumin and globulin in ewes during peri-partum period have been presented in table-2. Like serum total protein, both serum albumin and globulin showed a decline as the parturition approached. While as the globulin continued to decline after parturition, albumin started to increase at day 30 post-partum. The decline in globulin was more during post-partum period. However, after an initial slow decline, serum albumin level showed an upward trend in T3 from the day of parturition till the end of study period. Serum albumin levels of different groups did not differ significantly on day 120 and day 135 of gestation. However, the level (g/dL) was significantly ($p<0.05$) higher in T3 (3.30±0.04) than control (3.06±0.04) and T2 (3.09±0.08) on the day of parturition. On day 1 after parturition, serum albumin level (g/dl) in T3 was significantly ($p<0.05$) higher than all the other three groups. Similarly, on day 15 post-partum, serum albumin level (g/dl) in T3 was significantly ($p<0.01$) higher than in control, T1 and T2. On day 30 post-partum, serum albumin levels (g/dl) in T1, T2 and T3 were significantly ($p<0.05$) higher than in control. Also albumin level (g/dL) in T3 was significantly ($p<0.05$) higher than in T1. Highest serum albumin levels (g/dl) were recorded at day 120 of gestation in control (3.27±0.04), T2 (3.37±0.08) and day 135 in T1 (3.29±0.12) than at any other stage during peri-partum period. However, in case of T3, highest serum albumin level (g/dL) was recorded at day 30 post-partum (3.85±0.07) than at any other stage during peri-partum period.

Although the serum globulin level showed a downward trend during the peri-partum period but the results of comparison between the different groups were statistically non-significant during most part of the study period. However, the globulin level (g/dL) was significantly ($p<0.05$) higher in T1 (2.63±0.16), T2 (2.59±0.04) and T3 (2.46±.07) than control (2.12±0.08) on day 30 post-partum. The drop in serum proteins during post-partum period can be possibly attributed to lactation. Similarly, an increasing trend in serum total protein and albumin in T3 might be possibly due to supplementation.

CONCLUSION:

The study reveals that blood biochemical parameters of the ewes show variation during different physiological states of the animal. This study also shows the variation of these parameters in relation to nutritional status of the animal. These variations could be suitably utilized to predict the nutritional status of the animal so that the feeding management could be suitably changed in case the levels of these parameters vary beyond the normal range in otherwise healthy animals.

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Table-1: Variation in serum glucose (mg %) in ewes during peri-partum period (M±S.E)

Stage	Control	T1	T2	T3
Day -30	49.70±1.66	48.35±0.33	48.47±1.49	49.22±1.04
Day -15	50.29±1.98	50.46±0.62	52.05±2.0	52.87±1.45
Day 0	52.44±1.68 ^{a}	55.49±1.48 ^{abc}	56.97±1.89^{b}	57.05±1.02^{bc}
Day +1	51.66±1.34^{a}	54.00±1.50 ^{ab}	54.98±1.96^{ab}	56.44±1.09^{b}
Day+15	49.56±0.80^{a}	51.57±1.40^{ab}	51.78±1.08^{ab}	54.76±1.12^{b}
Day+30	46.80±1.04^{a}	49.48±1.62^{a}	50.15±1.12^{ab}	53.58±0.99^{b}

Means with different superscripts within a trait in a row are significant at P<0.05; (-) and (+) signs indicate corresponding days before and after parturition respectively. Day 0 indicates expected day of parturition.

Table-2: Variation in serum total protein, albumin and globulin (g/dl)

Stage	Parameters	Control	T1	T2	T3
Day -30	Total protein	6.21±0.03	6.18±0.09	6.22±0.05	6.24±0.07
	Albumin	3.27±0.04	3.26±0.09	3.37±0.08	3.36±0.06
	Globulin	2.94±0.03	2.91±0.03	2.84±0.07	2.88±0.04
Day -15	Total protein	6.05±0.02	6.07±0.08	6.07±0.07	6.08±0.09
	Albumin	3.13±0.02	3.29±0.12	3.17±0.09	3.26±0.06
	Globulin	2.92±0.01	2.77±0.13	2.90±0.09	2.82±0.06
Day 0	Total protein	5.87±0.04	5.89±0.23	5.94±0.05	6.13±0.08
	Albumin	3.06±0.04^{a}	3.15±0.09^{ab}	3.09±0.08^{a}	3.30±0.04^{b}
	Globulin	2.81±0.07	2.74±0.15	2.85±0.07	2.82±0.11
Day +1	Total protein	5.68±0.02^{a}	5.74±0.23^{ab}	5.75±0.08^{ab}	6.15±0.03^{c}
	Albumin	2.97±0.04^{a}	3.13±0.09^{a}	3.13±0.09^{a}	3.51±0.08^{b}
	Globulin	2.71±0.05^{a}	2.62±0.08	2.72±0.06	2.64±0.11
Day +15	Total protein	5.31±0.02^{a}	5.52±0.19^{ab}	5.53±0.09 ^{ab}	6.19±0.03^{c}
	Albumin	2.83±0.05^{a}	3.03±0.11^{a}	3.05±0.08^{a}	3.67±0.08^{b}
	Globulin	2.48±0.06	2.49±0.10	2.49±0.11	2.52±0.08
Day +30	Total protein	4.97±0.05^{a}	5.84±0.13^{b}	5.83±0.07^{b}	6.31±0.04^{c}
	Albumin	2.85±0.04^{a}	3.21±0.12^{b}	3.24±0.08^{b}	3.85±0.07^{c}
	Globulin	2.12±0.08^{a}	2.63±0.16^{bc}	2.59±0.04^{bc}	2.46±.07^{bc}

Means with different superscripts within a trait in a row are significant at P<0.05; (-) and (+) signs indicate corresponding days before and after parturition respectively. Day 0 indicates expected day of parturition.