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Body Condition Score with Relation to Various Physiological Blood Parameters for Postpartum Cyclicity of Crossbred Cows

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Abstract

A total of ten numbers of apparently healthy crossbred cows of 1st to 4th parity with normal calving history and free from any immediate post-parturient complications were selected to study the body condition score with relation to certain blood biochemical parameters for establishment of cyclicity during postpartum periods. Body condition score of all of the selected numbers of cows were evaluated on every fortnightly interval from the day of parturition upto eight (8) weeks on the basis of Body Condition Scoring System (5 scale) and 50 numbers of blood samples were collected from 10 numbers of cows for estimation of blood biochemical profile. The study revealed that the BCS, level of serum total protein, cholesterol, BUN, calcium, phosphorus and magnesium differed significantly ($P<0.01$) at different days of postpartum i.e., day 0, 15, 30, 45, 60. In conclusion, it was observed that the level of serum glucose, total protein, cholesterol, BUN, calcium, phosphorus and magnesium had a positive relation with BCS and postpartum cyclicity of the crossbred cows.

Keywords: Cattle, postpartum, cyclicity, BCS, blood biochemical

Body condition scoring (BCS) is a subjective estimate of the energy reserves in adipose tissues of a dairy cow. It is an acceptive, non-invasive, quick and inexpensive method to estimate degree of fatness. The changes of BCS had been associated with the resumption of estrous cycle during postpartum period (Pryce *et al.* 2001). The lactation phases affect significantly the metabolic profile and so the variation recorded during different physiological phases is expected. The transition from gestation to lactation is a period of great metabolic stress for dairy cows (Rollin *et al.* 2010). In fact, the milk production and its composition are found to profoundly influence the metabolical status of dairy cows (Heck *et al.* 2009). The observations on body condition status of animal will help the manager to adopt corrective management measures, thus enabling to improve the production profile of an animal. Hence, body condition scoring may be used as an efficient tool in this regard. Although many may consider this as a nutritional management practice, but changing BCS have implications on milk yield, health, reproduction, longevity and overall profitability of an animal (Mishra *et al.* 2016).

MATERIALS AND METHODS

Ten numbers of apparently healthy crossbred cows of 1st to 4th parity with normal calving history and free from any immediate post-parturient

complications were selected for the study. All the experimental cows were maintained under standard feeding and managemental conditions. The study was carried that at the Department of Animal Reproduction, Gynaecology and Obstetrics, College of Veterinary Sciences & Animal Husbandry, Central Agricultural University, Selesih, Mizoram, India. Body condition score of all of the selected numbers of cow were evaluated on every fortnightly interval from the day of parturition upto eight (8) weeks on the basis of Body Condition Scoring System (5scale) provided by Elanco Animal Health (Lilly Corporate Center, Indianapolis, IN 46285).

A total of 50 numbers of blood samples were collected from 10 numbers of cows for estimation of blood biochemical profile. Ten (10) ml of blood sample was collected into a vacuum clot activator vial containing no additives by jugular puncture with a sterile 18 gauge needle fitted with a plastic syringe, from the day of calving at fortnightly interval up to 8weeks of postpartum. Following standing at room temperature for 20 minutes, the clot activator vials were centrifuged at 3000 rpm for 10 minutes. Then the obtained sera were kept at -20°C until pending analysis.

The serum levels of different biochemical parameters such as glucose, cholesterol, total protein, blood urea nitrogen (BUN), creatinine, alanine aminotransferase (ALT), aspartate amino transferase (AST), calcium (Ca), phosphorus (P) and magnesium (Mg) were analysed by using commercial diagnostic kit in FUJIFILM (DRI CHEM 4000i) autoanalyzer. The data were subjected to statistical analysis as per Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The Body condition scoring (BCS) and the level of glucose, total protein, cholesterol, BUN, creatinine, AST, ALT, calcium, phosphorus, magnesium in postpartum cycliccrossbred cows were presented in Table 1.

In the present study it was observed that the BCS in cyclic cows from day of parturition (day 0) to 60 days of postpartum was ranges from 2.17-3.22. The present finding was agreement with the finding of Damptey *et al.* (2014); Veena *et al.* (2015) in cyclic animal. The BCS was differed significantly (P<0.01) at different days of postpartum i.e., day 0,15,30,45,60. The changes of BCS from day 0 to 60 days of postpartum might be due to negative energy balance (NEB) in which there may be increase lipolysis in adipose tissue, increase gluconeogenesis and glycolysis in liver, protein mobilization in muscle tissue, mineral mobilization in bone and increasing capacity and activity of GI tract. Veena *et al.* 2015 had observed that a loss of 1 unit of BCS following calving is equivalent to about of 400 mcal cumulative energy. Moreover, Domecq, 1997 observed that changes in BCS during first month of lactation has a stronger influence on milk yield than those at parturition and thus loss of body condition has been associated with increased milk yield (Anitha*et al.* 2007) as the animals under this group were producing 15-20 litres of milk per day(Mishra *et al.* 2016).

The serum glucose level in cyclic cows from day of parturition (day 0) to day 60 of postpartum was ranges from 58.30-64.50 mg/dl. The level of glucose was non-significantly decreased from day 0 to day 60 of postpartum and the level was significantly correlated with BCS at r = 0.405 which might be due to production stress as massive energy demand to support milk production is largely made through gluconeogenesis (Piccione *et al.* 2012).

In the present study the serum total protein level from the day of parturition (day 0) to day 60 of postpartum was ranges from 7.74-9.48 g/dl. The serum level of total protein was significantly increased (P<0.01) at different days of postpartum i.e., day 0,15,30,45,60. The variations reflect the maternal requirements of proteins need for milking and providing immunoglobulins (Mohri *et al.* 2007; Roubies *et al.* 2006; Bell *et al.* 2000). The higher concentrate-to-forage ratio provided during the lactation is generally associated with lower

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Table 1: Body Condition Score and level of certain blood biochemicaland mineral profilein postpartum cyclic crossbred cows (Mean ± SE)

Parameter	Days					Overall mean	F value
	0	15	30	45	60		
BCS (5point scale)	$3.22^{a} \pm 0.05$	$3.12^{a} \pm 0.04$	$2.82^{b} \pm 0.06$	$2.42^{c} \pm 0.06$	$2.17^{d} \pm 0.05$	2.75 ± 0.06	61.367**
Glucose (mg/dl)	64.50 ± 2.16	60.60 ± 2.11	58.30 ± 2.29	58.40 ± 3.07	58.40 ± 3.70	59.8 ± 1.05	1.563
Total protein (g/dl)	$7.74^{b} \pm 0.20$	$8.04^{ab} \pm 0.18$	$8.20^{ab} \pm 0.19$	$9.48^{a} \pm 0.33$	$9.48^{a} \pm 0.33$	8.44 ± 0.12	9.194**
Cholesterol (mg/dl)	$90.40^{c} \pm 3.86$	$108.70^{c} \pm 4.46$	$150.40^{b} \pm 6.46$	$204.70^{a} \pm 7.40$	$204.70^{a} \pm 7.40$	148.28 ± 6.71	66.007**
BUN (mg/dl)	$9.75^{b} \pm 0.57$	$10.10^{b} \pm 0.70$	$12.56^{a} \pm 1.26$	$12.54^{a} \pm 0.90$	$12.54^{a} \pm 0.90$	11.94 ± 0.49	5.283**
Creatinine (mg/dl)	1.06 ± 0.08	1.10 ± 0.07	1.17 ± 0.10	1.32 ± 0.15	1.32 ± 0.15	1.19 ± 0.04	1.214
AST (U/L)	$69.00^{c} \pm 3.45$	$78.10^{c} \pm 3.27$	$98.50^{b} \pm 4.27$	$90.40^{ab} \pm 3.19$	$95.00^{a} \pm 3.58$	86.2 ± 2.17	11.864**
ALT (U/L)	26.00 ± 3.82	18.30 ± 1.35	17.80 ± 2.24	22.60 ± 2.71	21.50 ± 2.62	21.24 ± 1.21	1.575
Calcium (mg/dl)	$6.40^{a} \pm 0.29$	$7.97^{ab} \pm 0.61$	$10.35^{ab} \pm 0.70$	$10.53^{c} \pm 0.60$	$10.63^{c} \pm 0.54$	8.92 ± 0.32	9.308**
Phosphorus (mg/dl)	$5.11^{a} \pm 0.36$	$5.86^{a} \pm 0.28$	$6.66^{ab} \pm 0.49$	$7.01^{ab} \pm 0.48$	$6.98^{c} \pm 0.52$	6.32 ± 0.21	3.473*
Magnesium (mg/dl)	$1.81^{a} \pm 0.29$	$2.07^{a} \pm 0.16$	$2.79^{ab} \pm 0.33$	$2.76^{a} \pm 0.18$	$2.72^{ab} \pm 0.17$	2.43 ± 0.11	3.626*

Means bearing different superscript in a row differed significantly.

**P< 0.01, *P< 0.0.5

levels of fibre and higher levels of starch in the diet, which gives rise to an increased production of propionic acid in the rumen and an increased microbial protein supply (Heck *et al.* 2009). This is reflected, in the present study, by an increase of total serum protein during the period and the level was significantly correlated with BCS at r= - 0.494.

As the parity and postpartum intervals have a significant effect on serum cholesterol concentration. The serum cholesterol concentration is comparatively higher in multiparous cows. The serum cholesterol concentration was found to be steadily increases after parturition. In the present study it was observed that the serum cholesterol level was found to be significantly increased (P<0.01) from day 0 to day 60 of postpartum (ranges from 90.40 to 204.70 mg/dl) which might be due to fat mobilization that occurs during this time (Heck *et al.* 2009). The cholesterol level was significantly correlated with BCS at r = - 0.827.

In the present study the serum BUN level in cyclic cows from day of parturition (day 0) to day 60 of postpartum was ranges from 9.75-12.54 mg/dl which was significantly increased from the day of parturition upto 60 days postpartum which might be due to lactational stress and protein metabolism (Piccione *et al.* 2012). Though the level was increased significantly but there was no effect on cyclicity of the animal as observed in the present study. Thus, the level was negatively correlated with BCS, r = -0.403.

The serum creatinine level in cyclic cows from day of parturition (day 0) to day 60 of postpartum was ranges from 1.06-1.19 mg/dl which was no significantly increased from the day of parturition upto 60 days postpartum which might be due to lactational stress and protein metabolism Piccione *et al.* (2012) but it has no effect on cyclicity of animal which was also supported by Damptey *et al.* (2014) but the level was significantly correlated with BCS at r = -0.332.

ALT and AST were used to assess liver function associated with hepatic lipidosis during postpartum (Gonzalez *et al.,* 2011; Stengarde *et al.* 2011). In the present study the serum ALT and AST levels was ranges from 17.80-26.00 and 69.00-98.50 U/l respectively which was within

the normal range (Talukdar and Talukdar, 2017). Though there was significant increase in AST level but there was no relation with the cyclicity of the cow (Jeong *et al.* 2015). The ALT and AST level were negatively correlated with BCS at r = -0.018 and -0.525 respectively.

In the present study the serum calcium level ranges from 6.40-10.63 mg/dl which was within the normal range (Talukdar and Talukdar, 2017). The Ca level was significantly increased from day 0 to day 60 of postpartum which might be due to lactational stress as the milk production was increased day by day (Piccione *et al.* 2012). The level was significantly correlated with BCS at r = -0.489.

In the present study the serum phosphorus level ranges from 5.11-7.01 mg/dl which was within the normal range (Talukdar and Talukdar, 2017). The Phosphorus level was significantly increased from day 0 to day 60 of postpartum which might be due to lactational stress as the milk production was increased day by day (Piccione *et al.* 2012).The level was significantly correlated with BCS at r = -0.372.

The serum Magnesium level ranges from 2.98-3.55 mg/dl which was within the normal range (Talukdar and Talukdar, 2017). The Magnesium level was significantly increased from day 0 to day 60 of postpartum which might be due to lactational stress as the milk production was increased day by day (Piccione *et al.* 2012). The level was significantly correlated with BCS at r= -0.395.

CONCLUSION

The study has concluded that the BCS ≥3.25 (on a scale of 5) at calving had a normal postpartum oestrus within two months. There was positive relation between level of serum glucose, total protein, cholesterol, BUN, calcium, phosphorus and magnesium with BCS and postpartum cyclicity of the crossbred cows.

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