Research Paper

SUBCLINICAL METABOLIC DISORDERS IN POST-PARTUM CROSS BRED HF CATTLE IN CENTRAL PART OF NEPAL

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Assessments of blood metabolic profile have widely been used in veterinary medicine as a part of a multidisciplinary approach to identify metabolic disorders in dairy herds. Our goal was to identify subclinical metabolic disorders in crossbred HF herds and set up baseline hematologic and serum biochemical values. The values were determined in post-parturient cross bred Holstein Friesen (HF) cattle of Nepal. The study was carried out in 50 post-parturient cross bred HF Cattle in Central part of Nepal. Animals ranging 5-8 years old running in first week of post parturient stage were selected for this purpose. A complete blood count, assays associated to liver and kidney function and macro minerals were estimated. The blood samples were drawn from juglar vein using vacutainer tubes. All the hematologic and biochemical variables were determined using automated analyzers and routine laboratory techniques. Glucose, BUN, Creatinine, AST, ALT, total serum Protein and albumin level were found very close to pre-defined ranges in the literature for similar breeds. Similarly hematologic indices associated with RBC series, i.e., Hb, PCV, Platelet counts, MCV, MCH, and MCHC were also found within normal limits. WBC counts along with differential counts were corresponded well within the reference range but, eiosinophil and monocyte counts were significantly ($p<0.05$) increased suggesting parasitic infestation. However, mineral profiles particularly Calcium (6.42±0.40 mg/dl) and Phosphorus (3.23±0.13) levels were found significantly ($p<0.05$) low. This suggests that cross HF cattle were at subclinical metabolic disorders and corrective measures should be employed for better production. This is recommended that all the estimated values of hematologic indices and serum biochemical components can be used as a baseline value except the values which are significantly outside the common reference limits.

Keywords: Blood metabolites, Hematology, Serum-biochemical, Sub-clinical, Reference value and crossbred HF cattle

INTRODUCTION

The importance of hemato-biochemical indices in animal husbandry is well-acknowledged. Cattle are more susceptible to metabolic derangements

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during peri-partum stage due to the tumultuous endocrine and metabolic changes that accompany parturition and the initiation of lactation (Adewuyi *et al.*, 2005). Veterinary clinical laboratory is an important tool that helps practitioners monitor transition cow health at the individual and herd levels (Herdt *et al.*, 1983). Reference values are influenced by age, sex, nutrition, physical activity, etc. These values are also affected greatly by management factors.

Postpartum period is more critical during which the cattle is most likely to render the metabolic disorders and also has sequel in postpartum like milk fever, hypomagnesemia, retained placentas, downer cow syndrome, mastitis, udder edema, ketosis, hepatic lipidosis, and displaced abomasum (Bell, 1995). The study of blood metabolites can help in understanding the peculiar features of animals in many different physiological, environmental and management conditions in order to adjust farming and feeding systems to the animals' needs (Awodu *et al.*, 2002).

Due to the changes that take place during the transition period, it is necessary to determine different blood metabolites for both the pre-calving and post-calving periods. Pre-calving limits in cross HF cattle in Central part of Nepal has already been documented by Pal *et al.* (2013). Research since the time of CMP development has clarified many metabolic issues of the transition cow and its relationship to periparturient disease (Bell, 1995; Grummer, 1995; Drackley, 1999). Additionally, the shift to increasing herd size and recognition of the adverse consequences of periparturient disease has led to increased interest in a revised metabolic profile application

in monitoring transition cow health and disease risk (Herdt *et al.*, 2001).

Estimations for blood metabolites for post calving cross HF cattle have not been recorded in Nepal. Due to lack of standard hemato-biochemical data on post-parturient cattle, several subclinical forms of metabolic disorders have been ignored by concern stakeholders leading to severe economic loss in dairy industry. Therefore this study was aimed to determine the standard reference limits for hematological and biochemical parameters for cross HF cattle at post parturient state.

OBJECTIVES

This study was aimed to determine hematologic and serum biochemical to know the subclinical form of metabolic derangements.

MATERIALS AND METHODS

Blood samples were taken from 5 to 8 years old 50 apparently healthy post parturient cattle. The blood samples were collected from jugular vein using vacutainer tubes. Haematological parameter were determined on the same day using automated analyzer and Serum samples were collected in a sterile vial for biochemical analysis and preserved at -20 °C until analysis. All the biochemical parameters were estimated using auto Analyzer. The statistical data was interpreted by descriptive statistical tool (computer software Microsoft Excel 2010, beta) and expressed at 95% level of confidence as Mean, Standard Error and Standard Deviation.

RESULTS

There were altogether 13 hematoloigc variables analyzed. Out of those variables, eosinophil and monocyte counts were significantly ($p < 0.05$) increased (Table 1). Rest of the values was found

within the normal assortment. Similarly, out of 10 serum biochemical examined, calcium and phosphorus levels were recorded significantly reduced ($p < 0.05$) (Table 2).

Table 1: Estimated Values for Hematologic Indices					
Variables	Unit	Mean± Standard Error	SD	Confidence Level (95.0%)	RR (Jain)
Hb	gm/dl	10.03±0.11	1.12	0.33	10-15
PCV	%	33.63±0.51	02.72	1.02	33-48
Platelets	×1000/mm	466.33±20.24	9.85	19.29	300-800
MCV	fl	49.37±0.29	1.31	0.40	40-60
MCH	Pg	14.33±0.15	0.64	0.366	11-17
MCHC	%	32.90±0.22	1.28	0.41	26-34
RBC	×10^6/mm^3	7.33±0.10	0.45	0.31	6.32-11
WBC	×10^3/mm^3	10.33±20.36	11.31	26.19	8.2-13.8
Neutrophils	%	33.2±1.39	8.60	2.44	25-40
Lymphocytes	%	52.60±1.64	8.33	2.31	39-67
Eosinophil	%	19.83±.82*	5.48	1.13	10-14
Monocytes	%	5.4±0.53*	3.10	1.18	2-3
Basophils	%	0.22±0.13	0.83	0.21	0-2
Note: RR: Reference Range; * : Significant variation.					

Table 2: Estimated Values For Serum Biochemical					
Variables	Unit	Mean± Standard Error	SD	Confidence Level (95.0%)	RR (Jain)
Glucose	gm/dl	38.31±1.22	7.23	2.02	36-52
BUN	mg/dl	9.77±0.39	1.41	0.87	6-27
Creatinine	mg/dl	1.82±0.02	0.21	0.23	1.2-1.93
Ca	mg/dl	6.42±0.40 *	1.21	0.21	8-11
P	mg/dl	3.23±0.13 *	0.86	0.22	4-6
Mg	mg/dl	2.75±0.10	0.41	0.24	2.4-3
AST	U/L	143.13±5.42	42.01	23.22	56-165
ALT	U/L	66.68±2.30	17.21	4.62	29-74
TP	gm/dl	6.13±0.12	1.31	0.41	6-7
Albumin	gm/dl	0.73±0.06	0.19	0.05	0.52-1.5
Note: * Significantly differed values; RR: Reference Range.					

DISCUSSION

Hematology

This study recorded an increase in eosinophil counts (19.83±.82). This change was previously reported and may result from the stress (cortisol mediation) associated with parturition stress (El-Ghoul *et al.*, 2000). We assumed, some parasitic internal and external parasitic infestation might have played the role in increasing values for eosinophil. Other typical changes of acute stress in cows like neutropenia or lymphopenia (Jain *et al.*, 1978) were not observed. Monocyte values (5.4±0.53) were equal to (Canfield *et al.*, 1984), higher than (Patil *et al.*, 1992). This finding was to some extent in contrast with results of previous studies. This extent of variation is affected by a variety of factors. The higher value suggests intestinal and/or liver parasite. Rest components of blood were found within the normal range recorded for similar species of animal in different part of world. Flores *et al.* (1990) found non-significant difference in Complete Blood Count (CBC) values during late gestation and early lactation. But, present study showed lowered range than that of Canfield *et al.* (1984). The results obtained in the present study are in agreement with the reports of several other researchers (Olotu *et al.*, 1998, Bozdogan and Baysal, 2003). The values trending towards lowers range could be due to the dilution of blood which occurs as consequence of increase of plasma volume (Singh *et al.*, 1991). Similar logic may apply in the present study. Although, the difference is insignificant the lowered trend is attributable to dietary supplements and management as well as study pattern.

Serum Biochemical

We observe significant drop in calcium level (6.42±0.40 mg/dl) than the normal values recorded for healthy cattle (8.19±0.83 mg/dl). The depressed trend in Ca++ levels could be a result of the impaired absorption of food metabolites from the gastrointestinal precursor, excessive losses through urine and more importantly overload of supplying mineral component to fetus. As the pregnancy advances the serum calcium level depletes which corroborates with the finding of Rowlands *et al.* (1975) and Nale (2003). Drop in Calcium intake of 100 to 125 g/day results in a higher incidence of milk fever than lesser amounts (Jorgensen, 1970). Low calcium, high phosphorus diets increase mobilizable calcium to 60% of body total compared to 37% for high calcium, low phosphorus diets (Wasserman, 1960). The incidence of milk fever can be reduced by prepartum feeding of diets low in calcium but more than adequate in phosphorus (McCullough, 1969). The serum phosphorus level at post calving stage in this study was recorded to be (3.23±0.13 mg/dl) which was significantly ($P<0.05$) lower than the values recorded in the literatures for normal healthy dairy cattle. Moderate depression in the levels of phosphorus might be due to its necessity for the colostrums synthesis (Roussel, 1982) and enhanced carbohydrate metabolism. Mean value for rest of the serum biochemical tested in this study (Table 2) were found within the referential range reported by Kaneko (1989).

CONCLUSION

The study concluded that the studied population is at high risk of metabolic diseases particularly to calcium and phosphorus entities. Therefore, corrective measures should be applied during post partum stage of animal. We are thankful to university grants commission, Nepal for providing financial assistance to this work.

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