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RESEARCH ARTICLE

An Investigation on Body Condition Score, Body Weight, Calf Weight and Hematological Profile in Crossbred Dairy Cows Suffering from Dystocia

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ABSTRACT

The knowledge of hematological values is useful in diagnosing various pathological and metabolic disorders, which can adversely affect reproductive performance of cows. The aim of this study was to investigate body condition score (BCS), body weight, calf weight, blood erythrocyte parameters and total and differential leukocyte count changes in dystocia-affected crossbred dairy cows. Values of mean corpuscular volume (MCV) and neutrophil count were markedly increased (P<0.001) in the dystocia group compared to normal calving group. The levels of mean corpuscular haemoglobin concentration (MCHC) and hematocrit in dystocia-affected cows were significantly lower (P<0.001) than normal control group. However, in cow suffering from dystocia, counts of the white blood cells (WBC), red blood cells (RBC), haemoglobin concentration, mean corpuscular haemoglobin (MCH), eosinophils, basophils, lymphocytes and monocytes were not different from the normal parturient group. In cows with dystocia, BCS, age and parity of dams did not show significant difference compared to normal parturition. However, body weight in cows with difficult calving was lower (P<0.05) than spontaneous calving cows. These results suggest that hematocrit, MCV, MCHC and neutrophil counts were significantly affected due to dystocia in cattle. BCS, age and parity of the cow had no affect on the occurrence of dystocia.

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INTRODUCTION

The dystocia has been a long-standing problem in both beef and dairy industry, occurring in 3 to 25% of cattle pregnancies. It is one of the most serious complications of pregnancy in cattle and buffaloes and is associated with numerous factors such as pelvic area of the cow, birth weight of the calf, age of dam, twin pregnancy, presentable disposition, gestation length, sex of the calf, body condition of the cow at calving, hormonal status and nutrition of dam (Noakes *et al*., 2001). Calving difficulty can lead to increased post parturient disorders such as retained placenta, uterine infections, increased veterinary costs, reduction of milk production, failure to conceive, long calving intervals, and reduced health of cows and survival of calves (Bellows and Lammoglia, 2000).

There are a number of factors that can affect the metabolism of animals. These include: stress in high-producing cows during pregnancy, parturition and post parturient periods (Klinkon and Zadnik, 1999), as well as puerperal disorders such as retained placenta, dystocia, milk fever, genital prolapse, hormonal imbalance and metritis (Farzaneh *et al.,* 2006; Pandey *et al*., 2007; Amer *et al.,* 2008; Ahmed *et al*., 2009). The erythrocyte parameters and total and differential leukocyte counts are affected by various physiological determinants (Klinkon, 1992) as well as factors from the environment. However, there is no information available concerning hemato-logical parameters in cattle with dystocia.

Therefore, the present study was planned to determine the hematological profile in crossbred cows with or without difficulties during parturition. The second goal was to investigate possible effects of weight and sex of calf, body condition score (BCS), body weight and age of dams on dystocia.

MATERIALS AND METHODS

The study was performed on 55 parturient crossbred (Brown Swiss X Simmental crosses) cows, 3-8 years old, brought to the Clinic of Obstetrics and Gynaecology, Faculty of Veterinary Medicine, University of Firat, Turkey between September 2007 and October 2008. The cow weight was recorded before parturition, by using the chest girth (circumference of the thoracic cavity immediately behind the fore limbs) measurement (Bures *et al.,* 2008). The assessments of the BCS were made as described by Edmonson *et al.* (1989). The scores were assigned using a five-point scale (0=very thin to 5=grossly fat). It was based on the palpation of the transverse processes of the loin vertebrae, cranial coccygeal vertebrae, and tuber ischii. The body conditioning was always performed by the same person.

All the cows were pluripara and were under almost similar breeding and feeding management. Out of these animals, 20 cows gave normal birth with no assistance was required, while 35 cows were admitted with dystocia for assistance at calving. This study did not include animals subjected to Fetotomy or Caesarian section. Moreover, epidural anaesthesia was not used for the cows which needed mechanical extraction.

Blood collection

Blood samples were taken after a gynaecologicl examination, before the obstetrical manipulation to correct dystocia. Similarly, normally calved cows were sampled before delivery. The blood (5 ml with added EDTA) was taken from the jugular vein.

Hematological measurements

Hematological values were determined according to the standard procedures (Jain, 1993). The red blood cell counts (RBC) and total white blood cell (WBC) counts were performed by the improved Neubauer hemocytometer (Fisher Scientific, Loughborough, UK). The hematocrit (Hct) values were determined by the microhematocrit method, centrifuging samples at 12,000 rpm for 10 minutes. Acid-hematin method was used to determine hemoglobin (Hb) concentration using Sahli-Helling's hemoglobinometer (Fisher Scientific, Loughborough, UK). The blood smears were stained with Giemsa's stain to calculate the differential leukocyte percentages, counting 200 leukocytes. Wintrobe indices including mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were calculated from values of RBC count, PCV percentages and Hb concentration via the conventional method (Jain, 1993; Sabri *et al*., 2009).

Statistical analysis

All the data were expressed as mean ± standard deviation (SD). The independent-samples t-test was applied in order to compare the normal and dystocia groups for each evaluated parameter. To determine the significance of interactions between variables in each group, Pearson's correlation coefficients were computed. All analyses were performed using the Statistical Package for Social Sciences software (SPSS 12.0, Chicago, IL; 2003).

RESULTS

In this study, the duration of the obstetrical procedures was recorded as 25 to 30 min for dystocia affected cows. All the animals were able to stand after delivery and no complication was seen. Majority of dystocia cases were due to fetal causes such as birth weight of calf, head or limb deviations and carpal and hock flexion. Some cases were due to maternal causes (uteruine inertia, inadequate size of birth canal). Calves of dystocia-affected cows were delivered by traction from birth canal after correction of the presentation, position and posture.

The body weight and condition were correlated ($r=0.40$; $P<0.05$), and the body weight and the age of the cows were also correlated with dystocia ($r=0.39$; $P<0.05$). Moreover, a similar correlation was observed between parity and the age of cow in both groups ($r=0.64$, $P<0.01$; $r=0.50$ $P<0.05$). The mean live weight at calving in cows of difficult parturition was lower than those with normal parturition ($P<0.05$). The age, BCS, parity of dam, sex of calf and birth weight of calves in cows calving with assistance did not differ from cows without dystocia (Table 1).

Hematological parameters in cows suffering from dystocia and normal calvers are summarized in Tables 2 and 3. In cows suffering from dystocia, white blood cells (WBC), red blood cells (RBC), haemoglobin concentrations, mean corpuscular haemoglobin (MCH), eosinophils, basophils, lymphocytes and monocytes were non significantly different from the normal group. Mean corpuscular volume (MCV) and neutrophils markedly increased ($P<0.001$) in the dystocia group as compared to normal birth group. However, mean corpuscular haemoglobin concentration (MCHC) and the hematocrit in dystocia-affected animals was lower ($P<0.01$) than in normally calving cows.

DISCUSSION

In general, dystocia in cattle is of great economic importance due to the cost of treatment and veterinary care (Lo pez de Maturana *et al*., 2007). Body condition scoring is being used as a management tool to assess the energy reserves and nutritional status of dairy cattle. BCS must be optimal to ensure an easy calving. Over-conditioned cows have been reported to have a higher risk of dystocia and metabolic disorders (Schroeder and Staufenbiel, 2006). Scott (2002) reported that heifers requiring assistance at calving had significantly higher BCS compared to those with normal calvings. Change in BCS is related to both changes in live weight and body composition in dairy cattle (Wright and Russel, 1984). In this study, BCS in cows with and without dystocia were recorded as 2.87±0.53 and 2.90±0.38, respectively, and there was no difference between the two groups. These findings are consistent with earlier observations of Ruegg and Milton (1995) and Berry *et al*. (2007), who did not observe any significant effect of BCS on dystocia in the perinatal period.

Body condition score effects were significant for cow body weight, accounting for 16% of the variability in weight. The correlative coefficient for the relationship between body weight and body condition score in cows calving with assistance was $r=0.40$ ($P<0.05$). Similar correlations were also recorded by Nesamvuni *et al*. (2000) in Nguni-type cattle (0.47), Northcuttz *et al*.

(1992) in Angus (0.48) and Nelsen *et al*. (1985) in Hereford and crossbred cows (0.31). Body weight in cows tended to increase until 6 years of age. Older cows tended to be lighter than cows 6 to 10 years of age (Northcuttz *et al*., 1992). In the present study, mean live weight at calving in cows with difficult parturition was lower than in cows with normal parturition ($P<0.05$). A similar observation was made by Hoffman and Funk (1992) showing that the greater cow body weight at calving the lower is the rate of dystocia. A positive correlation ($r=0.39$, $P<0.05$) was recorded between body weight and the age of cow in difficult calving group. This is in agreement with findings of Northcuttz *et al*. (1992) that for body weight of cows, the effects of cow age were highly significant ($P<0.0001$) sources of variation. In addition, similar positive correlations between age and body weight in buffaloes were reported by Naz and Ahmad (2006).

Table 1: Age, body weight, parity and BCS of the cows with and without dystocia and birth weight of their calves (mean ± SD)

Parameters		Normal parturition (n=20)	Dystocia (n=35)	P value
Live weight (kg)		538.00±112.06	465.28±116.53	0.05
Body condition score		2.90±0.38	2.87±0.53	
Age (year)		4.65±1.69	4.68±1.95	
Weight of calves (kg)/	Male	42.00±5.58	44.45±4.95	
	Femal	41.72±8.11	40.92±4.60	
	Total	41.85±6.59	43.14±5.06	
Parity		2.60±1.18	2.85±1.80	
Stillborn (n)		2	5	

Table 2: Erythrocytic parameters of cows with dystocia and normal parturition (mean±SD)

Parameters	Normal parturition (n=20)	Dystocia (n=35)	P value
RBC (10^6/μl)	7.51±0.31	7.52±0.69	
Hb (g/dl)	10.59±0.66	10.27±0.66	
HCT (%)	35.37±4.26	32.40±4.91	0.01
MCV (fl)	53.35±7.67	58.66±6.22	0.001
MCH (pg)	17.46±0.95	17.09±1.55	
MCHC (g/dl)	33.18±3.60	29.41±3.72	0.001

Table 3: Total and differential leukocytic counts in dystocia-affected and normally calving cows (mean±SD)

Parameters	Normal parturition (n=20)	Dystocia (n=35)	P value
WBC (10^3/μl)	6.07±0.32	6.03±0.47	
Neutrophils (%)	26.05±3.51	28.25±1.75	0.001
Eosinophils (%)	2.85±2.25	2.37±1.33	
Basophils (%)	0.90±1.02	1.11±0.67	
Lymphocytes (%)	66.25±3.69	65.20±2.92	
Monocytes (%)	2.45±1.39	3.02±1.67	

Birth weight of calves is the most important factor leading to difficult calving. The calves delivered with assistance had 43.14±5.06kg weight. In contrast, the calves, which were born without assistance had the body weight by 1.29kg lower. Moreover, male calves were delivered with more difficulty, which was due to their bigger size and greater birth weight. However, Nix *et al.* (1998) reported no effect of calf sex on dystocia rates. Although the mean birth weight of male calves in cows with calving difficulty was 2.44kg higher than calves of spontaneously calving dams, no significant difference between two groups was observed. This indicates that birth weight at parturition is critical for spontaneous calving. However, Nix *et al.* (1998) reported that calving difficulty rates increased by 0.23% for each kg of increased birth weight.

RBC count, eosinophils, monocytes and basophils in buffaloes having retention of fetal membranes (Pandy *et al*., 2007), WBC count, eosinophils, monocytes and basophils in cows with retained placenta (Farzaneh *et al*., 2006) and normal parturient animals were non–significantly different. Similarly, RBC, eosinophils and basophils remained unchanged in animals of prolapsed and control groups (Ahmed *et al*., 2005). In the present study, WBC and RBC counts, haemoglobin concentrations, MCH, eosinophils, basophils, lymphocytes and monocytes did not differ between the dystocia and normally calving groups. Data obtained in the study are in accordance with results of Pandey *et al*. (2007) and Amer *et al*. (2008). However, erythrocytes, total and differential leukocyte counts for both groups were within the normal ranges (Ahmed *et al*., 2005; Ferzaneh *et al*., 2006; Pandey *et al*., 2007; Amer *et al.*, 2008).

Values of MCV in buffaloes with uterine torsion (Amer *et al.*, 2008) did not differ from controls. Likewise, although the values of MCV in buffaloes with genital prolapse (Ahmed *et al.*, 2005) were higher than those of the controls, the difference was statistically non significant. In addition, Klinkon and Zadnik (1999) reported that the peri-parturient period in cattle did not significantly affect MCV values. Our findings regarding MCV values are in close agreement with those of Ahmed *et al*. (2005). Significantly higher MCV in dystocia as compared to normal labor might be due to regenerative anemia because immature RBC, which are released from the bone marrow into the peripheral blood at times of increase demand, are bigger in size than mature red blood cells (Jain, 1986). Moreover, estradiol-17ß hormone plays an important role in the erythrocytic picture, which leads to hydraemia in the circulation (El-Baghdady, 1979). In addition, in our study, the increase in MCV and the decrease in MCHC values in dystocia affected cows indicate macrocytic hypochromic anemia. This type of anemia may be due to relatively more loss of blood during labor or acute hemolytic anemia (Coles, 1986).

In the present study, a significant increase in neutrophils count was recorded in dystocia-affected animals as compared to normal control. Tarjinder and Singh (1993) and Ahmed *et al*. (2005) reported an increase in neutrophils count in prolapsed animals. This increase in the neutrophil count may be due to increased level of cortisol because of stress (Amer *et al*., 2008). However, neutrophilia has also been reported during excitement, exercise, adrenaline and ACTH release (Rakuljic-Zelov and Zadnik, 2002).

It has been shown that hematocrit values in buffaloes with retained placenta (Ahmed *et al*., 2009), prolapse (Ahmed *et al*., 2005) and uterine torsion (Amer *et al.,* 2008) were lower compared to control animals. In this study, blood hematocrit values were lower in cows suffering from dystocia. This decrease might be due to possible release of antidiuretic hormone as a result of stress, anorexia and toxemia (Kinney, 1967). Similar findings have been reported by Amer *et al*. (2008) and Ahmed *et al*. (2005, 2009).

Consequently, we think that the increased blood MCV and neutrophil counts and the decreased values of MCHC and hematocrit are a consequence of dystocia. BCS, parity and age of dams at parturition did not significantly influence the risk of dystocia in the present study. A decrease in body weight of dams may be associated with dystocia in crossbred cows.

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