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Research Article

BLOOD BIOCHEMICAL PROFILE OF MURRAH BUFFALOES DURING PERI-PARTURIENT PERIOD

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ABSTRACT

The peri-parturient period is the critical phase in the life of buffaloes affecting future productive and reproductive performance. The present study was undertaken to evaluate how different physiological stages (during the peri-parturient period) in the life of buffaloes affects their blood biochemical profile. The study was performed by selecting eleven healthy Murrah buffaloes during their advanced stage of gestation i.e. from 56 days prior to expected date of parturition. Buffaloes were maintained on farm's standard feeding practices and blood samples were collected at day -56th, -28th, at the day of parturition and thereafter at day 28th and 56th after parturition and subjected to plasma separation and estimation of blood biochemical profile. Highly significant ($P<0.001$) variation was observed in values of plasma glucose, total protein, globulin, urea, total cholesterol and high-density lipoprotein in buffaloes during different physiological stages. Except for the values of albumin, variation ($P<0.01$) was also observed in values of low-density lipoprotein and triglycerides during different peri-parturient stages in the life of buffaloes.

Key words: Blood biochemical, buffalo, pre-partum, post-partum, peri-parturient

The peri-parturient period is very important and critical period for health and subsequent performance of dairy animals, during this period animals get exposed to drastic physiological changes and metabolic stress and how animal facing this challenge, will decide her future productivity and performance. This period is dominated by a series of adaptations to the demands of lactation, which is termed as 'Homeorhetic' process (Bauman and Currie, 1980). A Homeorhetic process is the long-term adaptations to a change in state, such as from being non-lactating to lactating, and involves an orchestrated series of changes in metabolism that allow an animal to adapt challenges of the altered state. It has been hypothesized that an involvement of oxidative stress during the peri-parturient period is the etiology of some diseases and disorders in a dairy animal. Levels of variable blood biochemical parameters change abruptly during the peri-parturient period in the dairy animals. The aim of the present study was to find out variations in blood biochemical profile of Murrah buffaloes from 56 days pre-partum to 56 days post-partum.

MATERIALS AND METHODS

Location of the study

The study was performed on Murrah buffaloes maintained at Animal farm section, ICAR-Central Institute for Research on Buffaloes (CIRB), Hisar, Haryana, India, from Sept 2016 to April 2017. The farm is located 212 meters above mean sea level.

Experimental animals, management, and study design

Before starting the experiment, prior approval was obtained for conducting the experiment from the Institute level Animal Ethical Committee (IAEC). The animal experimentation was scheduled to be carried out on peri-parturient animals from 56 days prior (-56 day) to parturition, till 56 days after parturition (+56 day). Thus buffaloes in an advanced stage of pregnancy (56 days prior to expected date of parturition) were selected for the study. Eleven pre-partum Murrah buffaloes maintained at Animal farm of ICAR-CIRB were selected for the present study. Buffaloes were fed normal feed ingredients as per schedule for ICAR-CIRB farm, having concentrate mixture, wheat straw and green fodder as per individual buffalo's requirement (ICAR, 2013).

Blood sampling

Blood sampling was done on 56^{th} and 28^{th} days before expected date of parturition, at the day of parturition as well as again at 28^{th} and 56^{th} day after parturition in heparinised vacutainer under aseptic conditions from the jugular vein of buffalo. Blood samples were collected from jugular vein 3-5 hours post offering concentrate mixture at morning. The blood was centrifuged at 700×g for 15 minutes to separate the plasma completely. The plasma was pipetted out to centrifuge tubes and stored in deep freeze at -20^{o} C until further analysis.

Blood biochemical analysis

Levels of glucose, total proteins, albumin, urea, total cholesterol, high-density lipoprotein, low-density lipoprotein, and triglyceride were estimated in plasma using commercially available kits (Transasia Biomedical Ltd. India). Serum globulins concentrations were calculated from values obtained by subtracting albumin

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from total protein values.

Statistical Analysis

All the data were analysed using Statistical Package for Social Sciences (SPSS) software (version 16, SPSS, Inc, Chicago, IL, USA). The comparison was made on average (56 and 28 days) values of pre and post-partum observations to that of just after parturition following General Linear Model with Tukey's HSD.

RESULTS AND DISCUSSION

Blood biochemical profile (including total proteins, albumin, globulins, cholesterol, LDL, HDL, urea, glucose, and triglycerides) at pre-partum and post-partum at 28 and 56 days and at the day of parturition as well as overall mean values are presented in the Table.

The values of total proteins and globulins remained variable (P<0.001) at different point of observation during the peri-parturient period. These values remained lower (P≤0.001) after parturition as compared to pre and post-partum values. Similar to present findings, Yousuf *et al* (2016) and Kalasariya *et al* (2017) also reported reduced levels of total protein at the day of parturition as compared to their values at pre as well as post-partum days. Pandey *et al.* (2016) also reported the reduced level of plasma total proteins and globulins after parturition. The decline of total protein and globulin at

Table 1
Blood biochemical profile of Murrah buffaloes during peri-parturient period

Days	Pre-partum	At Parturition	Days	Post-partum	SEM	P value[#]		
						-1*0	-1*1	0*1
Total protein (g/dl)								
-56	8.26±0.33		28	8.09±0.13				
-28	8.05±0.17		56	9.19±0.22				
Overall Mean	8.16±0.19	7.12±0.24	Overall Mean	8.64±0.13	0.112	0.001	0.088	<0.001
Albumin (g/dl)								
-56	2.75±0.10		28	3.04±0.12				
-28	2.98±0.09		56	2.97±0.11				
Overall Mean	2.87±0.07	3.00±0.08	Overall Mean	3.01±0.08	0.044	0.220	0.206	0.967
Globulin (g/dl)								
-56	5.50±0.33		28	5.04±0.13				
-28	5.07±0.18		56	6.21±0.23				
Overall Mean	5.29 ± 0.20	4.12±0.25	Overall Mean	5.63 ±0.15	0.118	<0.001	0.245	<0.001
Glucose (mg/dl)								
-56	55.11 ± 2.44		28	67.70 ± 3.16				
-28	68.99 ± 1.83		56	72.98 ± 2.19				
Overall Mean	62.05 ±1.67	75.25 ±2.28	Overall Mean	70.34 ± 2.32	1.22	<0.001	0.009	0.111
Urea (mg/dl)								
-56	22.10±2.44		28	33.91±1.58				
-28	20.29±1.31		56	32.63±2.59				
Overall Mean	21.20 ± 1.74	33.11±2.45	Overall Mean	33.27 ± 1.24	1.084	<0.001	<0.001	0.952
Cholesterol (mg/dl)								
-56	61.37±4.60		28	102.31±9.31				
-28	68.51±4.98		56	106.56±5.92				
Overall Mean	64.94 ±4.28	57.73±3.18	Overall Mean	104.44 ± 6.83	2.89	0.316	<0.001	<0.001
LDL (mg/dl)								
-56	29.17±3.20		28	75.78±13.02				
-28	32.00±5.21		56	47.68±5.24				
Overall Mean	30.59 ± 2.71	39.96±4.80	Overall Mean	61.74 ± 8.26	3.31	0.257	0.001	0.012
HDL (mg/dl)								
-56	13.17±1.08		28	22.72±2.01				
-28	14.07±1.52		56	24.03±1.76				
Overall Mean	13.62 ± 1.18	15.23±1.33	Overall Mean	23.38 ± 1.68	0.816	0.427	<0.001	<0.001
Triglyceride (mg/dl)								
-56	16.14±2.48		28	7.98±0.88				
-28	18.44±3.06		56	9.94±0.97				
Overall Mean	17.29 ± 2.31	9.00±1.10	Overall Mean	8.96 ± 0.65	0.881	0.001	0.001	0.984

[#]P values are represented for comparison between overall mean values of pre-partum (-1), overall mean values of postpartum (1) and at parturition (0)

time of parturition indicated their high maternal requirements to get transfer towards colostrum synthesis (Mohri *et al,* 2007).

The values of albumin although remained comparable (P>0.01) at different point of observations in the present experiment. In contrast, post-partum reduction and subsequent rise in plasma albumin was also reported by Al-Mujalli (2008) and Yousuf *et al* (2016), while similar to present findings, Pandey *et al.* (2016) also did not report any significant effect on plasma albumin levels between day of parturition values and pre/post-parturient values.

The values of glucose remained higher on the day of parturition as compared to its pre (P<0.001) and post-partum (P=0.111) values (Table). The sudden rise in the values of glucose is due to the stress of parturition, which leads to cortisol secretion and ultimately leads to more glucose in plasma (Jacob *et al.*, 2001). A similar type of observation was also seen by Moreira *et al* (2015); Pandey *et al.* (2016); Kalasariysa *et al.* (2017). Enhanced glucose level at the day of calving, fall down after few hours post-partum (Aquino Neto, 2012). It remains a physiological process which leads to increased concentration of glucagon, catecholamines, and glucocorticoids which ultimately divert glucose to the mammary gland (Park *et al.,* 2010).

The values of plasma urea remained high (P<0.001) at the day of parturition as well as at post-partum period as compared to its pre-partum values (Table). Similar observations were also reported by Pandey *et al.* (2016) in Sahiwal cows. Likewise, Jaakson *et al.* (2007) and Piccione *et al* (2012) also reported enhanced levels of urea during lactation as compared to pregnancy and Ate *et al.* (2009) reported comparable values of urea during lactation and at the day of calving. Lower values of blood urea during pregnancy may be a reason of increased efficiency of protein synthesis due to either reduced catabolism of amino acids (Bell, 1995), more efficient urea recycling (Jaakson *et al.,* 2007) or high rate of gluconeogenesis by degradation of amino acids (Eryavuz *et al.,* 2008) during high energy demand of early lactation.

Levels of total cholesterol, low-density lipoprotein (LDL) and high-density lipoprotein (HDL) showed a common trend and values of all these parameters were significantly high (P<0.01) during lactation as compared to either at the day of calving or pre-partum values. To meet out the lactation demand, the concentration of cholesterol and related lipoprotein increases by increasing the uptake of lipids in the liver through high tissue mobilization, food intake and synthesis of steroid hormones and lipoproteins (Kaneko *et al.*, 2008). Similar observations for values of cholesterol were also seen by Dhami *et al.* (2015) in crossbred cows and Kalasariya *et al.* (2017) in buffaloes. The observed trend of increasing plasma total cholesterol after calving might be associated with the initiation of ovarian activity and establishment of post-partum ovarian cyclicity as cholesterol serves as a precursor for the synthesis of steroid hormones by ovarian theca and luteal cells (Kalasariya *et al.,* 2017).

Plasma triglyceride levels showed improved (P=0.001) values in pre-partum period as compared to the day of parturition or post-partum values. Similar to present findings, gradual decline in plasma triglyceride levels from pregnancy to calving stage was also reported by Jaakson *et al.* (2007) and Moreira *et al* (2015) in crossbred and Estonian Holstein peri-parturient cows, respectively. The reason behind the reduction in triglycerides levels just after parturition may be due to the removal of triglycerides from the bloodstream through mammary glands as milk fat precursors (Karapehlivan *et al,* 2007) and by the liver in lactating cows (Reynolds *et al,* 2003). This is in concurrence with the reports of analogous studies (Dann *et al.,* 2006 and Douglas *et al.,* 2006). However, findings of Ashmawy (2015) and Chalmeh *et al*. (2015) were contradictory to the present findings.

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