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Plasma lipid and haematological profile during transition period in Murrah buffaloes supplemented with prilled fat

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ABSTRACT

Fourteen apparently healthy advanced pregnant Murrah buffaloes at 35 day prepartum were either maintained as per routine management practices (control group) or fed prilled fat (treatment group) @100g/d during the prepartum and @ 150g/d for a period of 95 days during the postpartum period. Blood samples were collected at weekly intervals during different periods *i.e*. prepartum, day of parturition and postpartum by day 35 and thereafter at fortnightly intervals till day 120 of lactation. Haematological parameters, plasma glucose and lipid profile were analyzed by standard method of analysis. Red blood cell (RBC) number declined on the day of parturition and increased after the parturition ($P<0.01$) in both the groups, however RBC count varied non - significantly between the groups. Haemoglobin (Hb) level was significantly more before parturition ($P< 0.05$) and was low on the day of parturition. Mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) in the treatment group was higher ($P<0.01$) on day of parturition in comparison to before and after parturition. Total leukocyte count (TLC) ($P<0.01$) varied significantly before, during and after parturition. However, between group changes were non-significant ($P>0.05$). Plasma glucose increased in the treatment group ($P<0.01$) over the control group. Plasma cholesterol and HDL were increased in treatment group ($P<0.05$) as compared to control group. However, triglyceride and VLDL cholesterol levels varied non-significantly ($P>0.05$) between the groups. It was concluded that supplementation of prilled fat did not influence haematological parameters; however treated buffaloes had higher blood glucose, HDL and cholesterol levels.

Key words: Glucose, Haematological parameters, Lipid profile, Murrah buffaloes, Prilled fat.

INTRODUCTION

The period of transition between late pregnancy (-3 weeks) and early lactation (+3weeks) exerts physical, biological and physiological stress on the animal to compensate for the endocrine changes and additional requirements of the foetus, mammary growth and onset of lactogenesis (Khan and Ludri, 2002; Mondal *et al*., 2014). Several metabolic processes provide energy and precursors required for synthesis of milk constituents around the time of parturition (Overton *et al*., 2004; Djokovic *et al*., 2013). In consequences such a state caused high mobilization of lipids from body fat reserves leading to a state of negative energy balance in early lactation (Reist *et al*., 2002). Lipo-mobilization starts in late pregnancy reaching its maximum in the early lactation and is characterized by high free fatty acids in the blood (Djokovic *et al*., 2013). Free fatty acids are re-esterified and accumulated in the form of triacylglycerols in the liver, primarily due to a decreased capacity of hepatocytes to transport lipids by very low density lipoproteins (VLDL). Lipomobilization intensifies lipogenesis in the liver and as a consequence lower concentrations of glucose, triacylglycerols and total cholesterol in the blood (Reist *et al*., 2002; Sevinc *et al*., 2003). Under this condition animals have to draw upon their body reserves to support the lactogenesis and milk production resulting in metabolic disorders and sub-optimal milk yield. These changes can be minimized by enriching energy content of diet through bypass fat feeding during the transition period (Sirohi *et al*., 2010). Supplementation of bypass fat have been found effective to augment the overall productivity without affecting feed intake in cows and buffaloes (Ganjkhanlou *et al*., 2009; Karcagi *et al*., 2010; Shelke *et al*., 2012). Prilled fat, a bypass fat contains saturated fatty acids that did not affect feed intake, and enhance milk production performance in early lactation cows and buffaloes (Rajesh, 2013; Singh *et al*., 2015). Feeding of bypass fat also increased different blood cell counts in Egyptian buffaloes (Abd-El Moty *et al*., 2012). However information on the effect of prilled fat feeding on lipid and haematological profiles in buffaloes is lacking. Consequently, present study was carried out to evaluate the effect of prilled fat supplementation on haematological and lipid profile of transition Murrah buffaloes.

MATERIALS AND METHODS

Fourteen apparently healthy advanced pregnant Murrah buffaloes at 35 day prepartum were selected for the

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experiment on the basis of most probable production ability (1903-2218kg). The Institute Animal Ethics Committee duly approved the experimental protocol and allotted the buffaloes. Buffaloes were individually stall fed and managed in an asbestos roof shelter with brick floor. These were divided as control (C- group) and treatment group buffaloes (T-group) and fed green fodder (berseem/sorghum/maize), wheat straw and concentrate mixture as per feeding requirements (Kearl, 1982). Treatment group buffaloes also received prilled fat @100g/d during the prepartum and @ 150g/d for a period of 95 days postpartum. Blood samples were collected from jugular vein during prepartum on days -35, -28, -21, -14, -7, on day 0 (day of parturition), and postpartum on +7, +14, +21, +28, +35, +50, +65, +80, +95, +120 days. Haematological parameters viz., RBC, Hb, PCV, MCV, MCH and TLC were determined immediately by BC-2800 auto haematological blood analyser (Mindray). Plasma glucose was estimated by GOD-PAP Trinder's kit. Plasma lipid profile viz., cholesterol, triglyceride, HDL cholesterol and VLDL cholesterol level was analysed by GPO-PAP Trinder's kits. The analysis of variance was carried out using Sigma stat32 programme. Mean and standard error was calculated and Pearson correlations among various parameters were determined.

RESULTS AND DISCUSSION

The feeding of prilled fat did not influence the RBC, Hb, MCV, MCH, PCV and TLC parameters in the treatment group in comparison to control (P>0.05). However these parameters varied during different periods of experiment in both the groups (P<0.01), except MCV which did not vary in the control group buffaloes. RBC number declined on day of parturition and increased after the parturition (P<0.01). Hb level was significantly more before parturition (P< 0.05) and was lower on day of parturition. The values of MCV and MCH were more (P<0.01) in treatment group on day of parturition in comparison to before and after parturition. TLC (P<0.01) varied significantly before, during and after parturition in both the groups. The values of different haematological parameters varied between fortnight (P<0.01) and animal (P<0.05; Table 1). Plasma cholesterol and HDL was higher (P<0.01) in treatment group (Table 1; Fig. 1) as compared to control group at all stages. Plasma cholesterol, triglyceride and VLDL changes were non-significant on day of parturition (P<0.01) between the groups. Plasma triglyceride and VLDL varied non-significantly (P>0.05) in both the groups. Also plasma glucose varied significantly (P<0.01) between the groups and fortnights of study (Fig. 1). Plasma glucose level decreased (P<0.01) during the prepartum period in treatment group than the control. However, glucose level was higher on day of parturition and postpartum period (P<0.01) in the treatment group.

Prepartum RBC was positively correlated with prepartum Hb and TLC (r = 0.612; r = 0.0.703, P< 0.01) and negatively correlated with MCV and MCH (r = -0.427; r = -0.834). Prepartum PCV was negatively correlated with prepartum MCH (r = -0.545, P < 0.01) and positively correlated with TLC (r = 0.561, P<0.01). Prepartum Hb was positively correlated with prepartum PCV (r = 0.819). Prepartum MCV was positively correlated with prepartum MCH (r = 0.752, P<0.01) and negatively correlated with prepartum TLC (r = -0.433, P<0.01). Prepartum MCH was negatively correlated with prepartum TLC (r = -0.759, P<0.01). Postpartum RBC was positively correlated with Hb, PCV and TLC (r = 0.741; r = 0.861; r = 0.661, P<0.01) and negatively correlated with MCV and MCH (r = -0.262; r = -0.658, P< 0.01). Postpartum Hb was positively correlated with postpartum TLC (r = 0.299, P<0.01). Postpartum PCV was positively correlated with postpartum MCV (r = 0.264, P<0.01) and negatively correlated with MCH (r = -0.496, P<0.01). Postpartum MCV was positively correlated with postpartum MCH (r = 0.312, P<0.01). Prepartum plasma

Table 1: Haematological and biochemical parameters of Murrah buffaloes in transition stage.

	Prepartum		Day of parturition		Postpartum	
Particulars	**C-group**	**T-group**	**C-group**	**T-group**	**C-group**	**T-group**
RBC ($\times10^6$/µl)	5.74^{a} ± 0.21	5.73^{a} ±0.21	5.35^{b}±0.01	5.34^{b}±0.01	5.67^{c} ±0.10	5.67^{c} ±0.10
Hb (g/dl)	10.98^{a} ±0.21	10.96^{a} ±0.23	10.81^{b} ±0.03	10.88^{b} ±0.04	11.13^{c} ±0.18	11.15^{c} ±0.18
PCV (%)	35.71^{a} ±1.17	35.56^{a}±1.18	33.59^{b} ± 0.18	33.28^{b} ±0.16	34.39^{bc} ±0.31	34.41^{bc} ±0.58
MCV(fl)	62.31^{a} ±0.99	61.50^{a} ±1.26	62.71^{a}±0.37	62.3^{b}±0.31	62.57^{a} ±0.24	60.79^{bc}±0.32
MCH (pg)	19.21^{a} ±0.54	19.21^{a}±0.54	20.19^{b}±0.05	20.36^{b} ±0.07	19.64^{bc} ±0.13	19.70^{bc}±0.14
TLC ($\times10^3$/µl)	10.29^{a} ±0.65	10.26^{a}±0.68	8.14^{b} ±0.02	8.13^{b}±0.04	9.14^{bc} ±0.24	9.14^{bc}±0.22
Glucose (mg/dl)	60.97^{a} ±1.35	59.49^{a}±0.68	62.86^{b} ± 0.50	66.57^{b}±0.71	59.51^{b} ±1.31	63.91^{bc}±0.65
Cholesterol (mg/dl)	148.89^{a} ±3.72	158^{a}.65±5.17	131.42^{b}±0.75	133.29^{b} ±0.61	175.14^{bc} ±12.4	181.95^{bc}±11.84
Triglyceride (mg/dl)	55.71^{a}±2.27	57.57^{a}±2.16	33.29^{b}±1.40	34.14^{b} ±0.63	43.54^{bc}±1.7	45.5^{bc} ±1.8
HDL Cholesterol (mg/dl)	41.49^{a} ±2.1	50.89^{a}±2.7	34.14^{b}±1.0	39.28^{b} ±1.8	94.07^{bc}±13.5	107^{bc} ±14.5
VLDL Cholesterol (mg/dl)	96.26^{a} ±1.81	96.25^{a}±2.19	90.63^{b}±1.37	87.17^{b} ±2.11	72.36^{bc}±4.2	64.94^{bc} ±4.6

Different superscripts ^{a,b,c} differ (P<0.01) in a row.

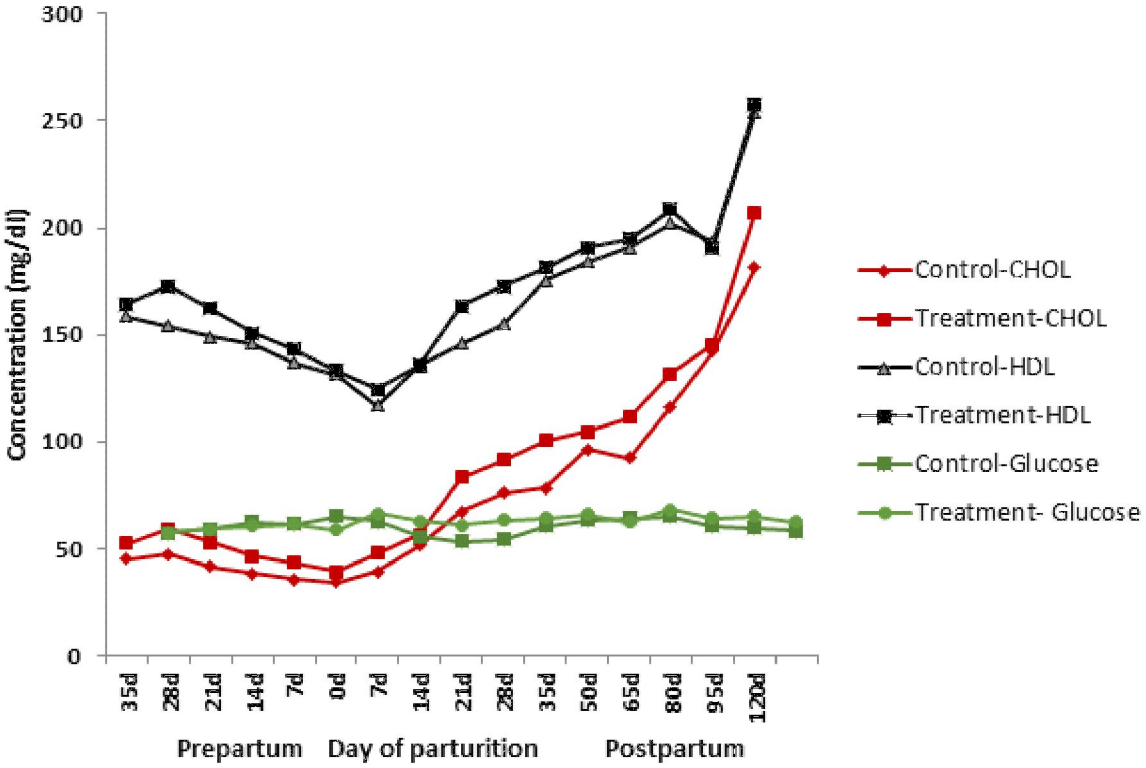

Fig 1: Effect of prilled fat supplementation on plasma cholesterol, HDL- cholesterol, glucose levels during different periods of experiment in Murrah Buffaloes

cholesterol was positively correlated with prepartum triglyceride (r = 0.534, P<0.01) and negatively correlated with prepartum plasma glucose (r = -0.732, P<0.01). Prepartum triglyceride was positively correlated with prepartum HDL cholesterol (r = 0.401, P<0.01) and negatively correlated with prepartum plasma glucose (r = -0.574; P<0.01). Prepartum HDL cholesterol was negatively correlated with prepartum VLDL cholesterol (r = -0.441). Prepartum VLDL cholesterol was negatively correlated with prepartum glucose (r = -0.601, P<0.01). Postpartum plasma cholesterol was positively correlated with postpartum triglyceride and HDL cholesterol (r= 0.683; r = 0.561, P<0.01). Postpartum triglyceride was positively correlated with postpartum HDL and VLDL cholesterol (r = 0.385; r = 0.571, P<0.01). Postpartum HDL cholesterol was positively correlated with postpartum glucose (r = 0.488; P<0.01).

The higher plasma glucose levels observed in this study in the treatment group were due to glucose sparing effect of prilled fat (Yadav *et al*., 2015). The increase in plasma glucose on the day of parturition in comparison to pre and postpartum is attributed to the parturition stress and higher cortisol levels (Vannucchi *et al*., 2015). The higher plasma cholesterol and HDL levels in transition buffaloes was due to the positive energy balance of animals associated with prilled fat feeding (Ranjan *et al*., 2012). Fat supplementation is generally associated with higher plasma cholesterol level (Son *et al*., 1996). In the present study, plasma cholesterol level and HDL cholesterol was higher (P<0.05) in treatment group as compared to control group due to enhanced uptake of dietary fatty acids (Fahey *et al*., 2002; Kumar *et al*., 2007). However, Tyagi *et al*. (2010) did not find any change in plasma cholesterol level in cows supplemented with 2.5 % bypass fat. There was no significant change (P>0.05) in the haematological parameters *viz*., RBC, Hb, MCV, MCH and TLC in treatment group supplemented with prilled fat over the control group. A significant increase in MCH, glucose and decline in RBC, Hb, TLC, PCV, plasma cholesterol, triglyceride, HDL and VLDL parameters on day of parturition were normal physiological changes that occur during the transition period.

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