SERUM MINERALS PROFILE AT DIFFERENT INTERVALS POSTPARTUM IN SURTI BUFFALOES RETAINING AND NOT RETAINING THEIR FETAL MEMBRANES

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ABSTRACT

A study was made to compare serum minerals profile between healthy normal parturient buffaloes (Control, n=15) and buffaloes affected with retained fetal membranes (RFM) following abortion (RFM/AA, n=10) or parturition (RFM/AP, n=12). The serum calcium, inorganic phosphorus, magnesium and trace minerals levels were estimated on day 0, 30 and 45 of calving. The pooled mean serum calcium level observed in control group was significantly ($P<0.05$) higher than that obtained in RFM/AP and RFM/AA groups. Serum levels of none of the other macro-micro minerals studied varied significantly between groups. The calcium level at day 45 was significantly ($P<0.05$) higher than that observed on day 0, but did not differ significantly from that recorded on day 30. The pooled serum inorganic phosphorus level on day 45 was significantly ($P<0.05$) higher than that observed on day 30 and 0, and the latter two also differed significantly ($P<0.05$). However, the group and period effect was found non-significant for serum magnesium and Ca:P ratio. The evaluation of serum micro-minerals revealed that the pooled mean serum zinc level was significantly ($P<0.05$) higher on day 45 than that observed on day 30 and 0. The pooled mean serum manganese level on day 0 was significantly ($P<0.05$) lower than that observed on day 30 and 45. However, no significant difference was observed in mean serum iron and copper contents among groups and periods studied. Though the minerals profile in RFM groups was not much different from control group, it significantly deteriorated the breeding efficiency of buffaloes by increasing the service period and number of services per conception in affected animals.

KEY WORDS: Buffaloes, Serum, Minerals profile, Retained fetal membrane.

INTRODUCTION

Retention of fetal membranes (RFM) is one of the most common disorders affecting reproduction of dairy cattle (Stephen, 2008). Various causes of RFM have been identified i.e. uterus paresis, abortion, stress, late or premature birth, dystocia, twinning, infections, nutritional, seasonal and hormonal disorders. Significant alterations in biochemical and mineral profile have also been documented in cows and buffaloes affected with retained fetal membranes by some workers (Tiwari et al., 2001; Gupta et al., 2009; El-Malky et al., 2010). This study was planned to evaluate the status of macro-micro mineral constituents in serum of Surti buffaloes calved without and with RFM under field conditions.

MATERIALS AND METHODS

The study was carried out on 22 Surti buffaloes affected with RFM (12 after parturition and 10 after abortion) and 15 healthy normal parturient (control) animals managed by farmers at their door step in Amul milk shed area of Anand district. Blood samples were collected aseptically with sterile needle from jugular vein on day 0, 30 and 45 of parturition/ abortion. Samples were allowed to clot for 6 hrs and the serum samples separated out by decanting the vials/tubes were centrifuged and stored at –20°C until analyzed.

The levels of macro-minerals, viz., calcium, inorganic phosphorus and magnesium were determined using standard procedures and assay kits supplied by Crest Biosystems, Goa, with the help of Chemical Analyser (BS 120).

The blood sera samples (1 ml each) were wet digested with 5 ml volume of di-acid mixture (Perchloric acid : Nitric acid 1:4) on a hot plate according to the method of Krishna and Ranjhan (1980). The clear transparent residues were diluted in double glass distilled water and final volume was made to 5 ml. These aliquots were then used for estimation of trace elements, viz., zinc, iron, copper and manganese on an Atomic Absorption Spectrophotometer (Elements AS AA54141, ECIL).

The animals were followed at least for 6 months postpartum to record occurrence of first estrus and fertile estrus as well as number of services per conception, and breeding efficiency of three groups was compared. The data generated on serum analysis were analyzed statistically using 2 factors factorial completely randomized design (Snedecor and Cochran, 1986).

RESULTS AND DISCUSSION

The pooled mean serum calcium level was significantly ($P<0.05$) higher in control group as compared to that of RFM/AA and RFM/AP groups. Further, the pooled value obtained on day 0 was significantly ($P<0.05$) lower as compared to that obtained on day 45, though it did not vary significantly from that of day 30 (Table 1). The gradual and significant rise in pooled serum calcium level at day 45 over day 0 and 30, suggested activation of calcium homeostatic mechanism postpartum. Our findings are in agreement with those of Mandali et al. (2002), Gupta et al. (2009) and El-Malky et al. (2010), who reported low calcium levels in buffaloes with RFM. Mohanty et al. (1994) and Tiwari et al. (2001) observed low calcium levels in cows with retained fetal membranes. The disturbance in the calcium metabolism and its utilization by the tissue results in the atony of the internal organs. During pregnancy, especially at the last stage, there is excessive mobilization of calcium, resulting in its less availability to the uterine tissue causing atony of uterus and retention of fetal membranes (Mohanty et al., 1994).

The mean serum inorganic phosphorus values obtained on day 0, 30 and 45 including pooled one were non-significantly higher in control group than those of RFM/AP and RFM/AA groups (Table 1). However, the pooled mean serum inorganic phosphorus levels on day 0, 30 and 45 differed significantly ($P<0.05$) from each other. The serum inorganic phosphorus profile in general showed gradual and significant rise with advancement of postpartum period in buffaloes. Similar observations have been made by Gupta et al. (2009) and El-Malky et al. (2010) in buffaloes and by Sabry et al. (1997) and Semacan and Sevinc (2005) in cows with retained fetal membranes. However, Mutiga et al. (1993) found that plasma phosphorus did not influence the incidence of retention of placenta. Tillard et al. (2008) opined that low phosphorus values peripartum predispose the dam to retain fetal membranes. This may also be attributed to the decreased contraction of uterine muscles due to low phosphorus levels.

The pooled mean Ca : P ratios neither varied significantly between periods nor between groups. The interaction effect of group × period was also non-significant (Table 1). Tiwari et al. (2001) and Ray et al. (2004) found low Ca : P ratio in cows with retained fetal membranes. The Ca : P ratio is a direct indication of the serum calcium and phosphorus levels and it varied from 1.73 to 2.19 in our study, which is within the normal range.

The serum magnesium values obtained on day 0, 30 and 45 including pooled one were non-significantly higher in control group as compared to RFM/AP and RFM/AA groups (Table 1). Further, the postpartum period and group × period interaction effect was non-significant for this trait, although the value on day 30 postpartum was apparently lower than those on day 0 and 45 postpartum. Similar results were reported by Sabry et al. (1997) in cows affected with RFM. However, Mandali

et al. (2002) noted that the magnesium concentrations in the cases of retention of fetal membranes and control group of buffaloes were almost the same.

The serum zinc concentrations obtained on all three days were non-significantly higher in control group than those of RFM/AP and RFM/AA groups (Table 2). Pooled zinc value was significantly

Table 1: Mean (±SE) serum macro-minerals profile on different days postpartum in Surti buffaloes with and without retained fetal membranes

Parameter	Group	Days after parturition/abortion			Pooled
		0	30	45	
Calcium (mg/dl)	RFM/AP	7.97±0.42	8.57±0.41	9.07±0.45	$8.54±0.24^{B}$
	RFM/AA	7.65±0.46	8.21±0.44	8.79±0.49	$8.22±0.27^{B}$
	Control	9.37±0.37	9.47±0.36	9.53±0.40	$9.46±0.22^{A}$
	Pooled	**$8.45±0.26^{X}$**	**$8.83±0.24^{XY}$**	**$9.18±0.25^{Y}$**	**8.82±0.15**
Inorganic Phosphorus (mg/dl)	RFM/AP	4.36±0.27	4.71±0.25	5.21±0.27	4.76±0.15
	RFM/AA	3.94±0.30	4.63±0.28	5.18±0.29	4.58±0.17
	Control	4.50±0.24	4.96±0.23	5.29±0.24	4.92±0.13
	Pooled	**$4.30±0.15^{X}$**	**$4.79±0.14^{Y}$**	**$5.23±0.15^{Z}$**	**4.78±0.09**
Ca:P ratio	RFM/AP	1.94±0.17	1.86±0.14	1.81±0.14	1.87±0.09
	RFM/AA	2.03±0.19	1.88±0.15	1.73±0.16	1.88±0.09
	Control	2.19±0.16	1.96±0.12	1.89±0.13	2.01±0.08
	Pooled	**2.06±0.10**	**1.91±0.07**	**1.82±0.08**	**1.93±0.05**
Magnesium (mg/dl)	RFM/AP	3.23±0.21	3.04±0.23	3.29±0.21	3.19±0.12
	RFM/AA	3.30±0.23	3.12±0.25	3.23±0.23	3.25±0.14
	Control	3.60±0.19	3.21±0.20	3.40±0.19	3.40±0.11
	Pooled	**3.40±0.12**	**3.13±0.13**	**3.34±0.12**	**3.29±0.07**

Means with different superscripts (A, B and X, Y, Z) vary significantly for a trait ($P<0.05$).
RFM/AP, Retained fetal membranes after parturition (n=12), RFM/AA,
Retained fetal membranes after abortion (n=10),
Control, normal parturient buffaloes (n=15).

(P<0.05) higher on day 45 than on day 0 and 30, although there was no significant variation in zinc levels between groups, irrespective of days. These observations are on the line of Markiewicz et al. (2001), Galdhar et al. (2004), Akar and Yildiz (2005), and Tillard et al. (2008) in cows and of Ahmed et al. (2009) in buffaloes. At parturition, the loss of blood and tissues cause the serum

Table 2: Mean (±SE) serum trace minerals profile on different days postpartum in Surti buffaloes with and without retained fetal membranes

Parameter	Group	Days after parturition/abortion			Pooled
		0	30	45	
Zinc	RFM/AP	1.26±0.06	1.29±0.11	1.67±0.09	1.41±0.05
	RFM/AA	1.24±0.07	1.25±0.12	1.64±0.10	1.38±0.06
	Control	1.47±0.05	1.38±0.10	1.71±0.08	1.52±0.04
	Pooled	**1.34±0.04^{X}**	**1.31±0.06^{X}**	**1.68±0.05^{Y}**	**1.45±0.03**
Iron	RFM/AP	1.39±0.08	1.40±0.13	1.38±0.09	1.39±0.06
	RFM/AA	1.34±0.09	1.39±0.14	1.37±0.10	1.37±0.06
	Control	1.60±0.07	1.43±0.11	1.40±0.08	1.48±0.05
	Pooled	**1.46±0.05**	**1.41±0.07**	**1.38±0.05**	**1.42±0.03**
Copper	RFM/AP	1.35±0.10	1.20±0.10	1.34±0.09	1.30±0.06
	RFM/AA	1.31±0.12	1.18±0.11	1.30±0.10	1.26±0.06
	Control	1.42±0.09	1.31±0.09	1.39±0.08	1.37±0.05
	Pooled	**1.37±0.06**	**1.24±0.05**	**1.35±0.05**	**1.32±0.03**
Manganese	RFM/AP	1.58±0.13	1.62±0.09	1.70±0.21	1.60±0.07
	RFM/AA	1.57±0.15	1.61±0.10	1.64±0.13	1.54±0.06
	Control	1.65±0.12	1.69±0.08	1.77±0.10	1.66±0.06
	Pooled	**1.45±0.08^{X}**	**1.65±0.05^{Y}**	**1.71±0.06^{Y}**	**1.60±0.04**

Means with different superscripts (X, Y, Z) vary significantly (P<0.05).
RFM/AP, Retained fetal membranes after parturition (n=12), RFM/AA,
Retained fetal membranes after abortion (n=10),
Control, normal parturient buffaloes (n=15).

levels of minerals to decline. This was slowly recouped and increased as indicated by higher levels on day 45 after parturition in the present study.

The mean serum iron values obtained on all three days/phases were non-significantly higher in control group as compared to those of RFM/AP and RFM/AA groups (Table 2). The effects of group, period (days) and group × period interaction were found to be non-significant. The present findings are in accordance with those reported by Sabry et al. (1997) and Ahmed et al. (2009). They reported a decrease in iron level in cows and buffaloes retaining their fetal membranes.

The mean serum copper values obtained on all three days including pooled one were non-significantly higher in control group as compared to RFM/AP and RFM/AA groups (Table 2). Moreover, the serum copper concentration was observed to be non-significantly lower at day 30 as compared to day 0 and 45 in all the groups including pooled values. Similar findings were also recorded earlier by Markiewicz et al. (2001), Galdhar et al. (2004), Gaikwad et al. (2007) in cows and by Ahmed et al. (2009) in buffaloes.

The mean serum manganese levels were non-significantly higher in control group than those of RFM/AP and RFM/AA groups at all three days/phases (Table 2). However, the serum manganese level on day 0 was significantly ($P<0.05$) lower than those observed on day 30 and 45. This is mainly due to the loss of minerals during loss of tissue and fluid at parturition.

Though the mineral profiles studied did not provide significant clue as a cause of RFM, the later condition significantly ($P<0.05$) increased in number of services per conception (2.33 vs 1.64) and service period (147.83 vs 93.82 days) in RFM/AA group and non-significantly increased in RFM/AP group as compared to that of control group suggesting that RFM suppresses breeding efficiency of buffaloes.

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