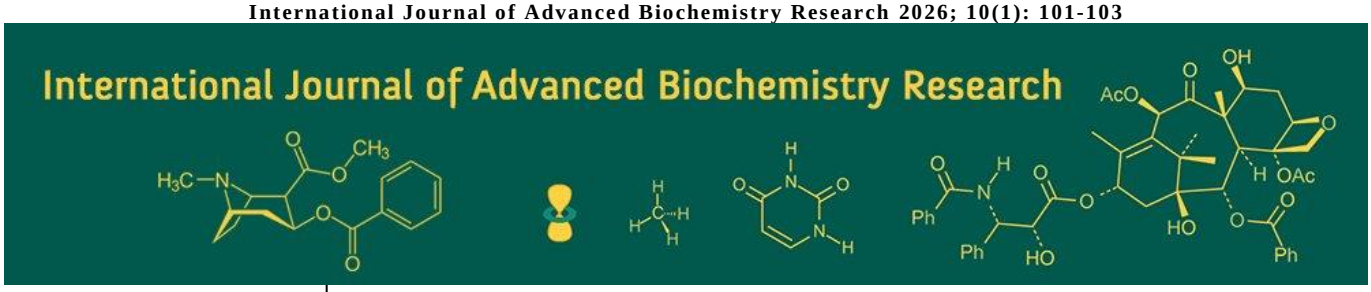

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Effect of parity in serum biochemical and antioxidant parameters in dry pregnant and non-pregnant lactating cross bred HF cows

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Abstract
The Production and reproduction in dairy cows influence the serum biochemical parameters and the difference in serum biochemical parameters of primiparous and mutliparous animals is influenced by negative energy balance, plane of nutrition, metabolic stress and adaptation to the conditions by the individual animals. Serum biochemical parameters namely Glucose, Albumin, Globulin, Total Protein, Albumin : Globulin, Triglycerides, Total Cholesterol, Creatinine, Aspartate Amino Transferase, Calcium, Magnesium and Phosphorus and antioxidant parameters namely Reduced Glutathione and Super Oxide Dismutase levels were analyzed in Non-Pregnant lactating cows and Dry Pregnant cows in second and third parity cross bred HF Cows. Serum glucose, Magnesium levels were elevated and Total protein level was decreased in Lactating third parity cows compared to dry pregnant cows of third parity. Triacyclglcerol level was elevated significantly in dry pregnant cows compared to lactating cows of both parity. No significant difference was observed statistically in Serum albumin, Globulin, Cholesterol, Creatinine and AST activities between the groups. Reduced Glutathione was elevated in Pregnant cows compared to lactating cows in both parity, while elevation of Superoxide Dismutase was evident in third parity cows alone. Hence in the current study significant changes in serum biochemical parameters and antioxidant levels were observed in certain parameters namely Glucose, Total Protein, Magnesium and Super Oxide Dismutase in third parity cows of different physiological states but not in second parity.

Keywords: Biochemical parameters, antioxidant, pregnant cows, Lactatating cows

Introduction
The Physiological status of farm animals can be evaluated by assessing the Serum biochemical parameter and in addition it may be used as a diagnostic tool for analyzing productive and reproductive disorders. Thus the serum biochemical parameters are helpful in diagnosing various metabolic disorders resulting in economic losses to farmers [1].
Pregnancy is characterized by increased metabolic demand owing to the requirements of the growing foetus [2] and favours oxidative stress due to the imbalance between antioxidant defense system and oxidant production [3]. Metabolic stress is associated with negative energy balance that occurs in the postpartum period and during peak lactation resulting in metabolic consequences [4].
Discrepancy in serum biochemical parameters do occur between different parity [5] and in dairy herd, the lactation and dry period are two important physiological states considered to influence the serum biochemical parameters in cows because of difference in demand and supply of nutrients [6]. Hence in the present study the serum biochemical parameters and antioxidant status were assessed in lactating and dry pregnant cows of second and third parity to asses the physiology difference in subsequent parity.

Materials and Methods
All chemicals used were of analytical grade. Chemicals for antioxidant assay were purchased from M/s Merck chemicals, Mumbai, India. The commercial diagnostic kits for Glucose, Total Protein, Albumin, Total Cholesterol, Triacylglycerol, Creatinine, Aspartate aminotransferase, Calcium, Magnesium and Phosphorus were purchased from span diagnostics.

Thirty two cross bred HF cows in a farm of 100 animals were randomly selected based on lactation and pregnancy status and grouped into four groups. Non-Pregnant Lactating animals of second and third parity served as Group 1 and 2 respectively. Dry Pregnant animals of second and third parity served as Group 3 and 4 respectively.

The blood samples (5 mL) were drawn by venepuncture from jugular vein into vacuum blood collection tubes. Serum was separated by centrifugation at 3000 rpm for 15 min. Serum biochemical parameters were analysed using commercial diagnostic kits using Spectrophotometer Hitachi 6300. Superoxide dismutase (SOD) activities and Reduced glutathione levels were assayed as per the standard methods [7, 8].

The data obtained were analysed using one-way ANOVA using SPSS software version 29.0. Results are presented as means with standard error.

Results and Discussion

Concentration of different serum biochemical parameter and AST Activity are depicted in Table 1. Serum glucose concentration was significantly elevated in lactating cows of third parity compared to dry pregnant cows of the third parity and no significant difference was observed between dry pregnant and non-pregnant lactating cows of second parity. Similar result was observed by Sarker *et al.* [9] However, Peterson *et al.* [10] reported that glucose was higher in dry cows than lactating cows in winter due to differences in type of feed available to dry cows relative to lactating animals and also reported that glucose increased with age. In the present study among the lactating cows, serum glucose concentration increased non-significantly in third parity cows compared to second parity. Cattaneo *et al.* [11] stated that postpartum negative energy balance was more severe the during the second lactation and plasma glucose was lower. Glucose level of third lactation often reflects energy status.

Serum Total Protein concentration was significantly decreased in lactating cows of third parity compared to dry pregnant cows of third parity and in case of second parity cows its level was decreased non-significantly in non-pregnant lactating cows compared to the dry pregnant cows. It is similar to the findings of Peterson *et al.* [10] and Sarker *et al.* [9] Bobbo *et al.* [12] reported that the older cows had greater total protein and globulin concentrations, while albumin concentration seemed to be not particularly affected by age. In the present study globulin concentration was maximum in third parity pregnant cows compared to all other cows. No significant difference was observed in levels of Albumin and Albumin : Globulin.

Serum Triacylglycerol concentration was significantly elevated in dry pregnant cows of second and third parity compared to lactating non-pregnant cows of second and third parity respectively. This finding is similar to that of B. Pysera and A. Opalka [13] and Yamamoto *et al.* [14] and the decrease in triacylglycerol after calving is attributable to the increased demand of mammary gland for the lipids [15].

Serum total cholesterol levels were elevated non significantly in lactating cows compared to dry pregnant cows in both the parity, which may due to the requirement of cholesterol for steroid hormone synthesis [15, 16].

No significant difference was observed statistically in the serum creatinine and AST activities between the groups. Serum calcium and phosphorus concentrations were similar between the groups. However, serum magnesium concentration was significantly elevated in non-pregnant lactating cows of third parity compared to dry pregnant cows of third parity and no significant difference was observed between dry pregnant and non-pregnant lactating cows of second parity. Similarly Hagawane *et al.* [17] and Jagtap *et al.* [18] observed no significant difference in magnesium concentrations between pregnant and non pregnant lactating animals.

Table 1: Mean (± SE) Serum Biochemical Parameters of cross bred HF cows of different parity and pregnancy status

	Group 1	Group 2	Group 3	Group 4
Glucose	37.56^{ab}±3.27	48.29^{b}±5.12	38.57^{ab}±2.87	36.55^{a}±2.17
Total protein	6.55^{ab}±0.09	6.43^{b}±0.34	6.68^{ab}±0.28	7.34^{a}±0.34
Albumin	2.75±0.09	2.79±0.11	2.91±0.8	2.98±0.06
Globulin	3.80±0.17	3.64±0.35	3.76±0.33	4.36±0.38
Albumin : Globulin	0.74±0.06	0.80±0.08	0.82±0.10	0.72±0.07
Triacylglycerol	14.73^{a}±1.11	13.95^{a}±1.27	19.64^{b}±3.09	26.36^{b}±3.96
Total Cholesterol	110.08±12.79	101.94±9.04	91.67±12.86	80.43±9.59
Creatinine	1.30±0.18	1.44±0.16	1.25±0.16	1.46±0.11
AST	28.97±2.56	29.41±1.55	31.54±3.86	30.41±3.35
Calcium	7.67±0.29	7.85±0.29	7.65±0.26	7.64±0.24
Magnesium	2.85^{ab}±0.34	3.11^{a}±0.27	2.80^{ab}±0.37	2.12^{b}±0.15
Phosphorus	5.72±0.23	6.05±0.22	6.43±0.39	6.13±0.36

Means with different superscripts in same row differ significantly (p<0.05)

Table 2: Mean (± SE) Serum Antioxidant level of cross bred HF cows

	Group 1	Group 2	Group 3	Group 4
GSH	694.40^{b}±98.97	716.10^{b}±93.59	976.50^{a}±55.75	954.80^{a}±179.99
SOD	316.48^{b}±77.44	247.95^{b}±34.00	394.04^{b}±96.26	514.51^{a}±101.99

Means with different superscripts in same row differ significantly (p<0.05)

Concentration of Reduced Glutathione and Superoxide Dismutase Activity is depicted in Table 2. Concentration of GSH was significantly elevated in Dry Pregnant cows of both second and third parity compared to Non Pregnant lactating cows of Second and third parity. It is similar to the findings of G. Singh *et al.* [19] and Prabhakaran *et al.* [20] and increased level in GSH could be due to compensatory response to the increased strees during pregnancy.

However, SOD level was significantly elevated in Dry Pregnant cows of third parity compared to all other groups. The current findings is similar to that of Prabhakaran *et al.* [20] and G. Singh *et al.* [19]. It is attributable to protection against oxygen toxic radicals [21].

Conclusion

Hence in the current study significant changes were observed in Serum Glucose, Total Protein, Magnesium and SOD levels in third parity cows of Lactating non pregnant cows and Dry pregnant cows which is not evident in second parity cows and in other parameters.

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