

Original Research Article

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Assessment of Haematological and Biochemical Changes in Postpartum Anoestrous Ongole Cattle of Andhra Pradesh

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ABSTRACT

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The present study was aimed to assess the hemato-biochemical changes in postpartum anoestrous Ongole cattle. A total of 12 animals of same age and body weight were randomly selected and divided in to two groups, G I: postpartum anoestrous (PPA, n=6) and G II: cyclic animals (n=6). Blood samples were collected by jugular vein puncture and analyzed for hematological parameters. Further, the serum was separated from another aliquot of blood sample and utilized for biochemical parameters. The mean RBC, Hb, PCV, glucose, total protein and cholesterol values were significantly ($p < 0.05$) lower in PPA compared to cyclic animals. In contrast, no significant ($p > 0.05$) difference was observed in MCV, MCH, MCHC, WBC, lymphocyte and monocytes between groups. From the present study, it was concluded that hematological and biochemical parameters are reliable indicators of postpartum anestrus.

Introduction

The state of Andhra Pradesh is well known for the famous Ongole breed of cattle across the world. Interest of cattle breeding especially of Ongole breed has tremendously increased in world especially in India due to the fundamental role played by them in much climatically disadvantaged agricultural system

(Kumar *et al.*, 2015). However there are certain reproductive impediments that are limiting the future prospects of the breed (Malik *et al.*, 2011). Among the various factors reducing the reproductive efficiency, postpartum anestrus (PPA) is a vital anomaly. Many factors contributing individually or in concert were recognized to be responsible for postpartum infertility and

anestrous making it a complex phenomenon. These factors include

mineral deficiencies, nutrients (khan *et al.*, 2014), Feed quality, infection (Nishi *et al.*, 2018), season (Perera *et al.*, 2011), body condition, suckling (Montiel and Ahuja, 2005), and parity (Pouilly *et al.*, 1994), etc. There were reports of high incidence of anestrous associated with deficiencies of cholesterol (Kumar *et al.*, 1991) glucose (Jani *et al.*, 1995) and total protein (Arosh *et al.*, 1998) etc. Haematological profiles also play a key role in diagnosis of certain reproductive disorders. Lower haemoglobin (Hb) levels might influence the tissue oxygenation of reproductive tract and there by affect the cyclicity of the animal (Kumar *et al.*, 1991). On this background we hypothesize that the physiological status varies with reproductive efficiency of the animal. The present study was designed to explore the changes in hematological and biochemical parameters in cyclic and PPA Ongole cattle.

Materials and Methods

Experimental animals

The present study was carried out at a local farm in Tanuku, West Godavari (16° 45' 25.8264" North latitude and 81° 40' 47.8632" East Longitude), Andhra Pradesh. A total of 12 multiparous cows between 4-8 years and weighing between 250 to 500 kg were used in the experiment. The animals were divided in to two groups based on herd record. The cows that had known anestrous for more than 120 days were selected in PPA group (n=6) and animals coming in estrus before 65 days of postpartum were selected in normal cyclic group (n=6) for the study. The experiment was conducted in the month of March, 2020. The animals were maintained as per the standard feeding and management conditions practiced at the farms.

Estimation of haematological and biochemical parameters

Blood samples were collected by jugular vein puncture from all the animals and used for determination of various hematological variables such as red blood cell count (RBC), total leucocyte count (TLC), differential leukocyte count (DLC) using standard protocols (Schalm *et al.*, 1975), Hb by using Drabkins method (Drabkin, 1994), packed cell volume (PCV) by micro haematocrit method, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC). Other aliquots of blood drawn in to the tubes with clot activators were allowed to clot at ambient temperature for 20 to 30 minutes and then subjected to centrifugation at 3500 rpm for 10 minutes and serum was stored at -20 °C. The serum was used for estimation of biochemical parameters such as glucose, total protein and cholesterol. The serum glucose was estimated by glucose oxidase (GOD/POD) method (Barham and Trinder, 1972), total plasma proteins by Biuret method (Doumas *et al.*, 1971), and cholesterol by phenol amino antipyrine method (Richmond, 1973). The average mean values of the two groups were compared using unpaired t-test (Snedecor and Cochran, 1994). The whole data was analyzed using computerized software programme SPSS Ver.20.0.

Results and Discussion

Hematology and biochemical profiles are commonly used as indicators of health status of the animals and for the diagnosis of various livestock diseases (Cetin *et al.*, 2009). Postpartum anoestrous is one common disorder that negatively affects reproductive efficiency in cattle and buffaloes. As a general rule any deviation from normal physiology would reflect hematological and

biochemical parameters. The existing research evidences an alteration in hemato-biochemical profile in PPA animals. Thus a detailed examination of hemato-biochemical profile would help us understand the pathophysiology of underlying disease/disorder and adopt strategies for improvement of health and production. The mean RBC, Hb, and PCV observed in the present study was significantly ($p < 0.05$) lower in PPA group compared to control (Table 1). Similar findings were reported in Buffaloes where RBC, Hb and PCV were significantly lower in PPA animals compared to cyclic animals (Ali *et al.*, 2012; Kumar *et al.*, 2015; Ghani *et al.*, 2017; Saikiran *et al.*, 2020). The low Hb concentration in anestrus cows indicates long term protein deficiency which influences tissue oxygenation of the reproductive tract and reflects as irregular cyclicity (Ramakrishna, 1997). Also, lower Hb in blood is responsible for reduced oxygen transport to the vital tissues, that causes reduced oxidation of nutrients, as a result of which the entire cellular metabolism in gonadal cells is affected (Swenson and Reece, 1993). A decreased PCV generally means red blood cell loss from any variety of reasons like cell destruction, blood loss, and failure of bone marrow production. An increased PCV generally indicates dehydration or an abnormal increase in red blood cell production (Kalsotra *et al.*, 2016). Lower Hb and PCV are indicative of anemia in anestrus cows. Although the importance of Hb has not been directly implicated in disorders of reproduction, but still decrease in Hb value is indicative of certain systemic disorders which indirectly might affect the reproductive organs functioning. In the present study, both the Hb and PCV were lower in anestrus cows which may be attributed to above mentioned reasons. No significant difference ($p > 0.05$) was found between PPA and control group for MCV, MCH, and MCHC (Table 1) and these hematological parameters might not

be indicators as these are secondary indices derived from the primary parameters. No significant difference ($p > 0.05$) was found between PPA and control group for WBC concentration, lymphocyte and monocyte percent (Table 1). The non-significant change in lymphocyte and monocyte count indicates that the body defence mechanism was not compromised and that the reproductive tract is free from infections.

The serum glucose was significantly ($p < 0.05$) higher in control compared to PPA cows (Table 2). The present findings were in accordance with the report of Saikiran *et al.*, (2020) with low glucose values in PPA buffaloes. Singh *et al.*, (2007) observed that plasma glucose was not a metabolic regulator responsible for initiation of ovarian cyclicity. However, the hypoglycemic state would reduce the hypothalamic-hypophyseal-ovarian axis signal transmission leading to anestrus condition. Significantly lower glucose in PPA might be attributed to lactation stress where there is increased glucose utilization for milk production (Saikiran *et al.*, 2020). The total protein concentration in control animals was found to be significantly ($p < 0.05$) higher than PPA group (Table 2). Our results were in accordance with Vohra *et al.*, (1995), Tandle *et al.*, (1997), Arosh *et al.*, (1998), Kavani *et al.*, (2005), Modi *et al.*, (2017), whereas Singh *et al.*, (2007) and Kumar *et al.*, (2009) found contradictory results that the normal cyclic animals had a significantly lower concentration of serum total protein as compared to anoestrus cows. The variation could be due to differences in breeds, environment and level of nutrition (Ahmed *et al.*, 2004). Low levels of total proteins might cause deficiency of certain amino acids required for gonadotropins synthesis (Vohra *et al.*, 1995). In the present study deficiency of total proteins might have affected the biosynthesis of gonadotropins and gonadal hormones in acyclic cows. The serum total

cholesterol was significantly ($p < 0.05$) higher in control compared to PPA cows (Table 2). Our results were in agreement to Jayachandran *et al.*, (2013) and Saikiran *et al.*, (2020) who reported significantly higher plasma cholesterol in cyclic than anoestrus bovines. The changes in plasma cholesterol

levels were negatively associated with gonadal steroidogenesis in cattle (Ghani *et al.*, 2017). As the cholesterol is the precursor of sex steroids, estradiol and progesterone, the low cholesterol concentration would negatively affect the ovarian activity and may induce PPA in animals.

Table.1 Mean±SE values of hematological parameters in control and PPA Ongole cows (n=6)

SNO	PARAMETER	CONTROL(N=6)	PPA(N=6)
1	RBC ($\times 10^{12}/L$)	6.96 ^a ±0.36	4.67 ^b ±0.26
2	HGB (g/dl)	11.18 ^a ±0.86	7.95 ^b ±0.14
3	HCT (%)	31.92 ^a ±0.71	23.35 ^a ±0.49
4	MCV (fl)	46.27 ^a ±1.81	50.54 ^a ±1.86
5	MCH (pg)	16.01 ^a ±0.71	17.35 ^a ±1.19
6	MCHC (g/dl)	35.00 ^a ±0.24	34.1 ^a ±0.11
7	WBC ($\times 10^9/L$)	7.57 ^a ±0.85	7.13 ^a ±0.29
8	LYMPOCYTE ($\times 10^9/L$)	4.50 ^a ±0.47	5.70 ^a ±0.32
9	MONOCYTE ($\times 10^9/L$)	0.57 ^a ±0.15	0.52 ^a ±0.09

Means with different superscript (a,b) differ significantly ($P < 0.05$)

Table.2 Mean±SE values of biochemical parameters in control and PPA Ongole cows (n=6)

SNO	PARAMETER	CONTROL(N=6)	PPA(N=6)
1	GLUCOSE (mg/dl)	63.59 ^a ±1.74	50.14 ^b ±1.04
2	TOTAL PROTEIN (g/dl)	7.93 ^a ±0.05	6.00 ^b ±0.14
3	CHOLESTEROL (mg/dl)	153.87 ^a ±3.44	97.80 ^b ±9.30

Means with different superscript (a,b) differ significantly ($P < 0.05$)

In conclusion, anestrus is one of the commonly occurring impaired reproductive condition. It is therefore important to understand the physiological status through hemato-biochemical parameters estimation which could help us to adopt strategies for improvement of reproductive function. From the present study, we observed significantly, lower RBC, Hb, PCV, glucose, total protein and cholesterol, in PPA compared to control animals. Low RBC, Hb and PCV is suggestive of reduced oxygen delivery to reproductive tissues. Low glucose is suggestive of hypoglycemia and lowered total

protein and cholesterol is indicative of lack of precursors for protein and steroid hormone synthesis. Hence, it may be concluded that PPA significantly reflects marked changes hemato-biochemical parameters. These changes could be used as markers of PPA. Since PPA is associated with production and income, addressing this issue is of paramount importance. Thus early diagnosis by complete hemato-biochemical and hormonal assay would help us to identify PPA animal in advance and adopt strategies to improve the reproductive efficiency.

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Conflict of Interest

The authors declare that there is no any conflict of interest for this manuscript.

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