

Assessment of Hematobiochemical Profile of Postpartum Crossbred Anestrous Cows Compared with the Cyclic Cows

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Abbreviations: RBC: Red Blood Cell; WBC: White Blood Cell; Hb: Hemoglobin; PCV: Packed Cell Volume; TEC: Total Erythrocyte Count; TLC: Total Leukocyte Count; AST: Aminotransferase; DLC: Differential Leukocyte Count; CI: Confidence Interval

ABSTRACT

Hemato-biochemical parameters are the key features of good physiological condition, where good physiological condition is the precursor of good production. For this reason the present study was aimed to assess the mean values of different hematological and biochemical profile of postpartum crossbred anestrous cows and determining differences among the mean values of different hematological and biochemical profile between cyclic and postpartum crossbred anestrous cows in the study areas. The study population was 30 crossbred cows. The animals were sampled purposively and divided into two groups. Group A which is the target group was suffering from post-partum anestrous of more than 90 days and group B which is the control group was cycling cows of crossbreed. Blood samples from cows with anestrous and cyclic were collected for hematological, biochemical and hormonal status analysis. T-test was performed to check the mean and standard error where confidence interval was 95%. All the analysis was performed at the 0.05 significance level. The Erythrocyte Sedimentation Rate was not significantly lower and Hemoglobin percentage was significantly higher in anestrous cows than normal cycling control cows.

Packed Cell Volume percentage in anestrous group of cows was significantly lower than that of control group of cows. The Total Erythrocyte Count was significantly higher in anestrous cows than normal cycling control cows. The Total Leukocyte Count in anestrous group of cows was significantly higher than that in the control group of cows. In Differential Leukocyte Count, neutrophil in anestrous group of cows was significantly higher showing the presence of an inflammatory process and eosinophil was significantly lower than that in the control group of cows. The mean total serum protein was not significantly lower in anestrous group of cows than that of control group of cows. The mean bilirubin concentration in anestrous group of cows was significantly higher than in control group of cows. The mean Alanine aminotransferase and Aspartate Aminotransferase was significantly higher in anestrous group of cows than that of control group of cows. The mean values of progesterone, Follicle stimulating hormone and Luteinizing hormone of anestrous cows were significantly lower than in control group of cows. It is suggested that there is no specific hematological and biochemical marker for anestrous in crossbred cows rather it may be hormonal cause for anestrous.

Introduction

Reproductive performance is one of the major indicators measuring the profitability of the dairy farmers Mondol et al. [1]. Now a day's dairy farming faces several constraints such as reproductive diseases, nutritional deficiency and improper management in Bangladesh. Anestrous is one of the

commonly occurring reproductive diseases in dairy cows affecting livestock productivity and economy Shirazet al. [2]. Anestrous is the major component of postpartum infertility and is affected by several factors: season, breed, parity, dystocia, nutrition etc Short et al. [3]. The hemato-biochemical profile may vary in normal cycling and

anestrous animals Geneser [4]. Since hematobiochemical profile changes during various reproductive states, it is imperative to study hematological constituents during these states. A significant increase of Red Blood Cell (RBC) and White Blood Cell (WBC) occurs during estrous phase in cattle Soliman et al. [5]. Hemoglobin (Hb) level decrease in anestrous than in cycling buffaloes and cows, respectively Dhoble et al. [6,7]. The total erythrocyte count (TEC), hemoglobin concentration (Hb) and Packed Cell volume (PCV) are decreased in anestrus and repeat breeder animals while mean corpuscular volume and total leukocyte count (TLC) are increased in these two groups Kumar et al. [8].

High incidence of repeat-breeding and anestrous are associated with the deficiencies of cholesterol Kumar et al. [8], glucose Jani et al. [9], protein, albumin and globulin Joe Arosh et al. [10]. Lower Aspartate Aminotransferase (AST) is associated with the anestrous condition of cows Arosh et al. [10]. Hemato-biochemical studies are important in diagnosis of healthy and diseased conditions of the animals. The knowledge of hematological values is useful in diagnosing various pathological and metabolic disorders, which can adversely affect the productive and reproductive performance of cows, resulting in great economic losses to dairy farmers Pyne et al. [11,12]. Therefore, aim of the present study was to investigate various hematological and biochemical profile and comparing the hematological and biochemical profile between cyclic and postpartum crossbred anestrous cows.

Materials and Methods

Study Area

The study was undertaken at six dairy farms in Sylhet Upazila Sadar, Sylhet, Bangladesh.

Study Population

The study population was 30 crossbred cows. The animal was sampled purposively and divided into two groups. Group A which is the target group (n=15) was suffering from post-partum anestrous of more than 90 days and group B which is the control group (n=15) was cycling cows of crossbred.

Results

Hematological Parameter

Table 1: Values of ESR, PCV, Hb, TEC, TLC and DLC of target group (postpartum crossbred anestrous cows) and control group (cyclic cows).

Parameters	Mean \pm SE		P-value	
	Target group (n=15)	Control group (n=15)		
ESR (mm in 1st hour)	0.118 \pm 0.004	0.120 \pm 0.005	0.785	
PCV (%)	31.20 \pm 0.611	40.07 \pm 0.784	0.000	
Hb (gm %)	12.466 \pm 0.336	9.073 \pm 0.291	0.000	
TEC (million/ μ l)	5.711 \pm 0.254	4.516 \pm 0.055	0.000	
TLC (thousand/ μ l)	9.160 \pm 0.145	6.340 \pm 0.097	0.000	
DLC	Neutrophil (%)	36.93 \pm 4.560	26.07 \pm 0.248	0.032
	Lymphocyte (%)	59.07 \pm 4.602	63.60 \pm 0.702	0.346
	Monocyte (%)	2.13 \pm 0.215	3.47 \pm 0.682	0.080
	Eosinophil (%)	1.87 \pm 0.091	6.87 \pm 0.551	0.000

Management of the Study Population

Proper balanced diets were supplied in those farms. The concentrated feed was containing Moisture (Maximum) -12-13 %; Crude protein (Minimum) - 21 %; Crude fat (Minimum) -4-4.5 %; Crude fiber (Maximum) -9-10 %; Total digestible nutrients (Minimum) -64 %; Calcium (Minimum) -1.5 %; Phosphorus (Minimum) -0.65 %. For fodder, straw and green grasses were used as 6kg/100 kg body weight of the cattle. Fresh and clean drinking water was provided as ad libitum. Proper vaccination schedule (For Anthrax, Black Quarter, Foot and Mouth Disease and Hemorrhagic Septicemia) and deworming (Regular basis on 3 months interval) were followed in those farms. Proper hygienic and strict sanitary measures were taken in the farm.

Sample Collection

Five (5) ml blood was collected from each cow by jugular vein puncture using ten (10) ml plastic syringe. The hematological studies were performed within two hours of the blood collection. Rest of the sample was taken in vials for collection of serum. Serum sample was kept at -200C until analyzed.

Methods

Estimations of Hemoglobin (Hb), Erythrocyte Sedimentation Rate (ESR), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC) were performed following the methods described by Lamberg et al. [13] at the physiology laboratory of Sylhet Agricultural University, Sylhet. Differential Leukocyte Count (DLC) and biochemical tests were performed by using Vitros-5600 Integrated Systems/ Vitros-250 Automated dry Biochemistry Analyzer at Popular Medical Centre Ltd., Sylhet, Bangladesh. Hormonal tests were performed at Institute of Nuclear Medicine and Allied Sciences, M. A. G. Osmani Medical College Campus, Sylhet, Bangladesh.

Statistical Analysis

T-test was performed to obtain the mean and standard error by using SPSS software where confidence interval (CI) was 95%. All the analysis was performed at the 0.05 significance level.

The mean values of ESR were 0.118 ± 0.004 and 0.120 ± 0.005 mm in 1st hour in anestrus and control group of cows, respectively (Table 1). The mean PCV in anestrus group and control group was 31.20 ± 0.611 and 40.07 ± 0.784 , respectively (Table 1). The mean Hb(gm%) in anestrus group and control group of cows was 12.466 ± 0.336 and 9.073 ± 0.291 , respectively (Table 1). The mean values of TEC of anestrus group of cows and control groups cows were 5.711 ± 0.254 and 4.516 ± 0.055 million/ μ l, respectively (Table 1). The mean values of TLC in anestrus and control

group of cows was 9.160 ± 0.145 and 6.340 ± 0.097 thousand/ μ l respectively (Table 1). In cows from anestrus group, neutrophils had an average value of 36.93 ± 4.560 %, compared to the control group (26.07 ± 0.248 %) showing the presence of an inflammatory process (Table 1). Lymphocytes had lower values in cows of the anestrus group (59.07 ± 4.602 %), compared to the control group of cows (63.60 ± 0.702 %) while eosinophil (1.87 ± 0.091 %) and monocytes (2.13 ± 0.215 %) have shown lower values compared to the control group (6.87 ± 0.551 % and 3.47 ± 0.682 %) (Table 1).

Biochemical Parameter

Table 2: Values of Total serum protein, Serum albumin, Serum globulin, Serum bilirubin, Alanine aminotransferase (ALT) and Aspartate Aminotransferase (AST) of target group (postpartum crossbred anestrus cows) and control group (cyclic cows)

Parameters	Mean \pm SE		P-value
	Target group (n=15)	Control group (n=15)	
Total serum protein (gm/dl)	5.549 ± 0.410	6.194 ± 0.255	0.195
Serum albumin (gm/dl)	2.470 ± 0.221	2.819 ± 0.121	0.182
Serum globulin (gm/dl)	3.062 ± 0.214	3.372 ± 0.155	0.255
Serum bilirubin (mg/dl)	0.636 ± 0.0160	0.323 ± 0.020	0.000
ALT (IU/L)	48.67 ± 2.806	22.67 ± 0.333	0.000
AST (IU/L)	73.33 ± 3.588	29.67 ± 0.333	0.000

The mean total serum protein in anestrus and control group of cows were 5.549 ± 0.410 and 6.194 ± 0.255 gm/dL, respectively (Table 2). The mean serum albumin in anestrus and control group of cows were 2.470 ± 0.221 and 2.819 ± 0.121 gm/dl, respectively (Table 2). The mean serum globulin in anestrus and control group of cows were 3.062 ± 0.214 and 3.372 ± 0.155 gm/dL, respectively (Table 2). The mean concentration of serum bilirubin in anestrus and control group of cows was 0.636 ± 0.0160 and 0.323 ± 0.020 mg/dl, respectively (Table 2). The mean ALT in anestrus and control group of cows were 48.67 ± 2.806 and 22.67 ± 0.333 IU/L, respectively

(Table 2). The mean AST in anestrus and control group of cows were 73.33 ± 3.588 and 29.67 ± 0.333 IU/L, respectively (Table 2).

Hormonal Parameter

The mean concentration of progesterone level in anestrus group was 8.188 ± 0.169 and in control group was 11.522 ± 0.197 nM/L (Table 3). The mean concentration of FSH in anestrus and control group of cows was 2.631 ± 0.080 and 10.771 ± 0.697 IU/L, respectively (Table 3). The mean concentration of LH in anestrus and control group of cows was 2.577 ± 0.062 and 16.892 ± 0.656 IU/L, respectively (Table 3).

Table 3: Values of Progesterone, Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH) of target group (postpartum crossbred anestrus cows) and control group (cyclic cows).

Parameters	Mean \pm SE		P-value
	Target group (n=7)	Control group (n=7)	
Progesterone (nM/L)	8.188 ± 0.169	11.522 ± 0.197	0.000
FSH (IU/L)	2.631 ± 0.080	10.771 ± 0.697	0.000
LH (IU/L)	2.577 ± 0.062	16.892 ± 0.656	0.000

Discussion

The mean difference of ESR between anestrus and control group is not significant (Table 1). The ESR is generally higher in anestrus cows than control cows. The ESR values of the present study are lower than the result of Pariza et al. [14] whereas Pariza et al. [14] reported that the mean values of ESR were significantly higher in anestrus group compared to the control group of cows. The ESR is increased in inflammation, pregnancy, anemia, autoimmune disorders (such as rheumatoid arthritis and lupus), infections, some kidney diseases and some cancers (such as lymphoma and multiple myeloma). The ESR is decreased in polycythemia, hyperviscosity, sickle cell anemia, leukemia, low

plasma protein (due to liver or kidney disease) and congestive heart failure. The mean PCV in anestrus group and control group was 31.20 ± 0.611 and 40.07 ± 0.784 , respectively (Table 1). The PCV % in anestrus group of cows is significantly lower than that of control group of cows (Table 1). The PCV % is the index of anemia Samad et al. [15,16]. The mean PCV in this study is agreed with the reports of Pariza et al. [1,14,17], but disagreed with the findings of Ahmad et al., 2003. The mean Hb (gm%) in anestrus group and control group of cows was 12.466 ± 0.336 and 9.073 ± 0.291 , respectively (Table 1).

The Hb concentration is significantly higher in anestrus group compared to control group of cows (Table 1). The hemoglobin content (gm%) in the present finding is disagreed by Pariza et al.

[1,18,14,17]. The mean values of TEC of anestrus group of cows and control groups cows were 5.711 ± 0.254 and 4.516 ± 0.055 million/ μl , respectively (Table 1). The difference in TEC between anestrus and control groups of cows is highly significant (Table 1). This is not similar with the finding of the study done by Pariza et al. [1,14,18]. The mean values of TLC in anestrus and control group of cows was 9.160 ± 0.145 and 6.340 ± 0.097 thousand/ μl respectively (Table 1). The TLC in anestrus group of cows is significantly higher than that in the control group of cows (Table 1). The finding of TLC of the present study is similar with the result of Pariza et al. [14,17,18]. Possibly bacterial infection was present in the anestrus cows. In cows from anestrus group, neutrophils had an average value of 36.93 ± 4.560 %, compared to the control group (26.07 ± 0.248 %) showing the presence of an inflammatory process (Table 1). Lymphocytes had lower values in cows of the anestrus group (59.07 ± 4.602 %), compared to the control group of cows (63.60 ± 0.702 %) while eosinophil (1.87 ± 0.091 %) and monocytes (2.13 ± 0.215 %) have shown lower values compared to the control group (6.87 ± 0.551 % and 3.47 ± 0.682 %) (Table 1).

The difference in eosinophil between anestrus and control groups of cows is highly significant whereas the difference in neutrophils, lymphocytes and monocytes between anestrus and control groups of cows is not significant (Table 1). This is not similar with the finding of the study done by Ruginosu et al. [17]. The mean total serum protein is not significantly lower in anestrus group of cows than that of control group of cows (Table 2). This is not similar with the finding of the study done by Pariza et al. [14] where it reported that the mean total serum protein was significantly lower in anestrus group of cows than that of control group of cows. The mean serum albumin is not significantly lower in anestrus group of cows than that of control group of cows (Table 2). This is similar with the finding of the study done by Mondal and Paul, 2012 but not similar with the finding of the study done by Amle et al. [19]. The mean serum globulin is not significantly lower in anestrus group of cows than that of control group of cows (Table 2). This is not similar with the finding of the study done by Mondal et al. [17,19]. The mean bilirubin concentration in anestrus group of cows is significantly higher than in control group of cows (Table 2).

This is similar with the finding of the study done by Pariza et al. [14] where it reported that the mean bilirubin concentration in anestrus group of cows was significantly higher than in control group of cows. The mean ALT is significantly higher in anestrus group of cows than that of control group of cows (Table 2). Serum level of ALT is increased in case of parasitic infection and liver damage. The mean AST is significantly higher in anestrus group of cows than that of control group of cows (Table 2). According to Keele et al. [20], serum levels of AST are significantly high under disease and morbid conditions involving injuries to large numbers of metabolically active cells. The difference of concentration of progesterone between anestrus and control group is significant (Table 3). This is not similar with the finding of the study done by Pariza et al. [14]. The mean FSH concentration in anestrus group of cows is significantly lower than in control group of cows (Table 3). The mean LH concentration in anestrus group of cows is significantly lower than in control group of cows (Table 3). The

Values of ALT and AST are significantly higher in anestrus cows than in cyclic cows. Higher level of AST indicates liver damage and proteinases substances are produced from liver. The hormones are proteinases substances. That's why higher level of AST resulting liver damage and hampering the hormonal balance. As a result, FSH, LH and progesterone level are significantly lower in anestrus cows than control group of cyclic cows and finally leads to anestrus condition.

Conclusion

This research work is carried out to investigate the hematological and biochemical profiles of postpartum crossbred anestrus cows and cyclic cows. The study results show the significant variation in some of the hemato-biochemical parameters [21]. The ESR values are non-significantly lower in anestrus cows; however, the Hb values are significantly higher and PCV values are significantly lower in anestrus cows. The difference in TEC between anestrus and control groups of cows is highly significant. The TLC is significantly higher in anestrus cows than in control cows. Possibly bacterial infection is present in the anestrus cows. Indeed, chronic microbial infection may cause endometritis that might be responsible for anestrus. In this study, eosinophil count is significantly lower in anestrus cows than in cyclic cows. In cows from anestrus group, neutrophil is showing the presence of an inflammatory process. Similarly, the values of lymphocytes and monocytes do not differ in between the anestrus and cyclic group of cows. Total serum protein is low in all anestrus cows than control cows. In the present investigation, total serum bilirubin is higher in anestrus cows than control cows whereas AST and ALT is significantly higher in anestrus group of cows than that of control group of cows. There is significant difference of progesterone, FSH and LH level in anestrus and cyclic cows. The study cows are reared under well balanced diet, proper vaccination as well as proper sanitation. So it can be concluded that there is no specific hematological and biochemical marker for anestrus in crossbred cows and the anestrus condition might be due to the hormonal cause.

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