Hematological and biochemical profile during gestation period in Sahiwal cows

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Abstract

It was demonstrated in this study that the mean values of the different red blood cell count and white blood cell parameters showed significant changes during gestation. RBC, PCV and Hb increased while total WBC and segmented neutrophils increased after the second gestation period in the second period. The numbers of total leucocytes and segmented neutrophils increased after the second period.

Keywords: Gestation, Cow, Haematology, Biochemistry

Introduction

To detect the metabolic status and blood chemistry is a vital diagnostic aid. It is well known fact that factors such as breed, sex, age, behavior, handling, physiological changes and the period of the day, can influence the cellular constituents and serum biochemistry of the blood (Taylor, 1997). Therefore, this study was aimed at examining hematological and biochemical parameters in healthy females of Sahiwal breed during the first, second and third period of pregnancy. Mean values obtained for each hematological variable during the different periods of pregnancy were compared for each breed to establish reference values during gestation, under specific handling conditions and grazing in a tropical climate.

Materials and methods

A total of 30 cows ranging between 3 to 9 years of age were selected for this study. Cows were divided into three groups, each consisting of 10 animals. The first group was considered to be 30-90 days of gestation, the second 91-180 days and the third 180 onwards.. Animals were routinely vaccinated and treated with anthelmintic twice a year. All animals were clinically healthy, and handled carefully to reduce any possible effects of stress on the parameters analyzed. Samples were taken from the animals between 7:00 and 9:00 a. m. prior to morning feeding. Blood was taken from the juglar vein into evacuated glass containers (Vacutainers, Becton Dickinson).

For serum collection we used tubes without anticoagulants. Blood samples for the determination of haematological values were taken into containers with ethylene diaminotetra-acetic acid (EDTA) as an anticoagulant. Erythrocyte count (RBC), haemoglobin concentration (Hb), mean corpuscular volume (MCV), Packed cell volume (PCV), mean corpuscular haemoglobin (MCH), and leukocyte count (WBC) and differential count were measured using an automated blood analyzer (MS-9). Sera samples were analysed by automated analyser Robonik ASP-1300 for aspartate aminotransferase (AST), alanine amino-transferase (ALT), glucose, total serum protein calcium (Ca), inorganic phosphorus (P).

Results and Discussion

In the present study, erythrocyte count, Hb, PCV and MCV were significantly decreased during pregnancy (Table 1) . According to Calvo et al. (1989) haemoglobin decreased significantly during first half of gestation time, with the lowest values in the second month. Haemoglobin values decrease during pregnancy not only due to the mobilization of the mother's haemoglobin into foetal circulation, but also due to dilution of blood which occurs as a consequence of plasma volume increase (Singh e t al., 1991). PCV and MCV were also significantly decreased during pregnancy. MCV showed significant difference in the first and second period of gestation. Red blood cells count (RBC), packed cell volume (PCV) and

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Table-1. Hematological and biochemical changes in different periods of gestation.

Analyte	Control	1st period 30-90 days	2nd Period 91-180 days	3rd period 181 days 0nwards
RBC ($\times10^6$/µl)	8.02±0.03	7.02±0.07	7.89±0.04	5.35±0.05*
WBC ($\times10^3$/µl)	11±0.24	14.63±0.41	16.55±0.33*	11.37±0.58
Hb (g/dl)	12.15±0.17	10.5±0.26	11.06±0.19	10.1±0.30*
PCV (%)	39±0.12	23±0.17*	30.48±0.15*	31.46±0.13
MCH (pg)	15.0±0.34	14.95±0.28	14.01±0.17	18.87±0.36*
MCV(fl)	48.75±0.11	32.76±0.17*	38.63±0.10*	39.21±0.13
Neutrophil (%)	42.75±0.42	48.21±0.31	50.24±0.23*	62.22±0.33*
Monocytes (%)	6.01±0.26	8.41±0.47	10.05±0.32*	7.14±0.22
Eosinophils (%)	2.04±0.13	1.41±0.10	1.5±0.16	1.23±0.19
Glucose (mg/dl)	58.43±1.64	57.22±2.41	58.22±1.89	56.35±2.30
Totalserum protein (g/dl)	9.65±2.42	8.48±0.44	7.78±1.48	7.04±2.13
AST (U/L)	168.54±4.41	164.03±6.30	162.17±3.26	160.30±5.62*
ALT (U/L)	64.52±1.21	66.08±2.52	70.22±1.44*	65.27±2.72
Calcium (mg/dl)	9.43±0.32	9.39±0.63	9.52±0.30	9.48±0.27
Phosphorus (mg/dl)	6.12±1.27	6.31±2.40	6.23±01.51	6.39±2.44

* Significant ($P<0.05$) as compared to control group

haemoglobin concentration (Hb) increased in the second period of pregnancy and decreased in the last period. An elevation in PCV appeared in the second gestation period, which was significantly different only compared to the third period. Hb concentration was also increased in the second period and differed significantly from the third period. MCV was higher in third period, differing significantly from the control group and the second gestation period. In the second period, MCV was significantly lower than the other periods. MCH was diminished during second gestation period and being significantly different from the control group and the other pregnant groups. Fetal growth that occurs in that period of pregnancy produces a greater oxygen demand. This greater need for oxygen is compensated by the endocrine system that stimulates the release of erythropoietin by the renal tissue (Plaschka et al., 1997). The secretion of this circulating glycoprotein stimulates increased production of erythrocytes in the bone marrow (Lurie, 1993). The reduction in RBC, hematocrit and haemoglobin, occurs in the third period of gestation, which represents the main cause of "pregnant physiological anemia" a clinical condition described in various species (Kim, 2002). This phenomenon was observed in this study, in which these hematological variables decreased during the last gestation period. The MCH increased during the third pregnant period. Similar observations were made by Morris (1998), who attributed these findings to the possible presence of immature erythrocytes in the peripheral blood.

There was a statistically significant increased in total leukocytes during the second period, whereas significant decrease in the third gestation period. In the advanced stage of gestation, there is an endogenous adrenaline release which induces the greater mobilization of neutrophils in the circulation resulting in an increase in total leucocyte count (Kramer, 2000). Segmented neutrophils were significantly increased in third period in relation to the other groups. Eosinophils were higher in the control group than in the different gestation groups. Monocytes increased significantly in the 1st and 2nd period of gestation, but less increased value was observed in the 3rd period. Work on this aspect of the problem is scarce in the literature.

Glucose concentration remained unchanged during pregnancy period. ALT increase in the first and second period but decrease in the third period Increased ALT might be due to the release of this enzyme from placenta and uterus and decreased AST activity through out the gestation period was due to uterine and hormonal changes during gestation period. The results are in conformity with the results of Talvekar et al. (2008). A non significant decrease in plasma total protein content from in first, second and third period respectively. Our results demonstrated no alterations in the calcium and inorganic phosphorus values during the research period, which suggests that homeostatic mechanisms were effective. Reese et al. (1984) obtained calcium and phosphorus level similar to our results during pregnancy.

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