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Variation in hematology and blood biochemical profile during pregnancy in Sirohi goats

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Abstract
A study was carried out to record the variation in haematological and biochemical parameters of Sirohi goats in different pregnancy stages. Blood samples were collected from twenty healthy female goats before pregnancy and 4, 12 & 20 weeks of pregnancy were compared. The whole blood was analyzed for hematology and serum samples for biochemical analysis. The hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), mean corpuscles volume (MCV) were significantly ($P<0.01$) lower and Mean corpuscular hemoglobin concentration (MCHC), total leukocyte count (TLC), neutrophil (%) increased as the advancement of pregnancy. However, other leukocyte counts have not differed significantly irrespective of pregnancy stages. Biochemical constituents blood sugar, total protein and albumin concentration were lower significantly ($P<0.01$) while triglyceride, cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL) were showed the opposite trends during the advancement of the gestation period. The serum enzyme variables aspartate aminotranseferase (AST), alanine aminotransferase (ALT) and alkaline phosphates (AP) exhibited a higher significant difference ($P<0.01$) in the later stage of pregnancy. In conclusion, the present study shows marked changes in haematological and biochemical parameters likely to occur during pregnancy in Sirohi goats.

Keywords: pregnancy, haemato-biochemical parameters, Sirohi goats

Introduction
The goat is a versatile animal and can be maintained on marginal or undulating land, unsuitable for other types of livestock. India comprises of 148.88 million goat population out of which 7.42% belongs to Madhya Pradesh as per the 20th livestock census of the year (2019). Sirohi is a very potent goat breed, confined to the middle to the eastern part of Rajasthan and western part of Madhya Pradesh. Goats have a unique ability to adapt and maintain themselves in harsh environments and elicit great variation in hematological and biochemical parameters based on the physiological phase of life even within the same breed [1]. Blood biochemical and haematological parameters serve as indicators of physiological state and a true reflection of the health status of animals, predisposed by age, sex, breed, environmental factors and stressful condition such as pregnancy and lactation [2]. Similarly, Zulkifli reported blood metabolites and enzymes biochemical count having strong relationships with physiological events in goats [3]. Under these circumstances study was conducted to compare hematological, biochemical parameters on various pregnancy stages in Sirohi goats.

Materials and Methods
The experiment was conducted on twenty-five Sirohi does 2-3 years of age with a mean bodyweight of 20-25 kg at the Indore district, Malwa region of Madhya Pradesh. All animals were in proper health and alert in appearance and dewormed at regular intervals. Animals were maintained on an extensive system of management, apart from routine 6-7 hours grazing all the goats offered @ 150g concentrate mixture daily after grazing during the study period. At the beginning of the experiment, all non-pregnant animals were selected for blood collection. Later on, goats were naturally served and non-return to service was considered an indication of conception. Among these pregnant animals, blood samples were collected from twenty goats at the 4th, 12th and 20th week of gestation. About 10 ml of blood was collected from the jugular vein of each goat in the morning before feeding and watering, 8 ml of blood was transferred to the centrifuge tubes without anticoagulant for the harvesting of serum. The residual (2ml) blood sample is transferred to EDTA coated vacuumed tube for estimation of the haematological profile.

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Hemoglobin and PCV were estimated in whole blood soon after the collection of blood by acid haematin method using sahli's haemoglobinometer [4] and by Wintrobe's tube nethod using the macro- haematocrit [5], respectively. The method used to calculate TEC, MCV, MCHC, MCH, TLC and DLC as per Jain [6]. Serum was harvested from blood samples as per the standard procedure. The serum biochemical parameters like glucose, total protein, albumin, globulin, uric acid, creatinine, BUN, triglyceride, cholesterol, HDL, LDL concentrations and serum enzyme variables (AST, ALT, & AP) were estimated by using a semi-auto biochemistry analyzer (Span diagnostic Ltd.) with standard kits of span diagnostic Ltd., Surat, India. The data obtained forms pregnant animals before and after pregnancy were subjected descriptive statistics to analysis of variance in a completely randomized block design (CRD). Treatment means were ranked using tukey's range test [7] using SPSS version 20.

Results and Discussion
Haematological Profile
The results of the haeamatological parameter from the study are presented in Table- 1, indicates that blood constituents are also affected by the gestation stages. Total erythrocyte counts (106 /μl) in the nonpregnant animals were 10.34, which was significantly ($P<0.01$) lover to 9.74 in 12th and 9.06 in the 20th week of pregnancy although were within the normal range (8-18/106 /μl) as reported by Kaneko [8]. Similarly, hemoglobin and hematocrit were also significantly ($P<0.01$) lovers with the advancement of pregnancy. The reduction in Hb, TEC and PCV at the end of gestation might be due to "pregnant physiological anemia" a clinical condition in which blood volume expands to improved availability of nutrients for growing fetus [9]. The results of the present study corroborated the findings of earlier workers. Iriadam, observed that the RBC count significantly ($P<0.01$) decreased from 4th, 11th & 18th weeks of gestation attributed to the haemodilution effect resulting from an increase in plasma level of RBC [10]. Also, Azab and Abdel-Maksoud reported erythrocyte count and PCV significantly ($P<0.01$) decreased during the last three weeks of pregnancy [11]. The dilution of blood in pregnant animals increases relatively higher blood flow in placental capillary vessels resulted from the increased availability of oxygen and nutrients to developing fetus [12].
The white blood cell count (TLC) and Neutrophil (%) were significantly ($P<0.05$) lower at the 12th & 20th weeks indicating that a later stage of pregnancy has some adverse effect on the immune system and animal apparent health. The observed leucocytosis and neutropilosis were similar to those reported by Waziri *et al.* which might be pregnant females were more susceptible to systemic and local infection [13].

Biochemical parameter
The average serum biochemical parameters of goats at various stages of pregnancy were presented in Table-2. In our study, serum glucose concentration decreased significantly ($P<0.01$) as pregnancy advanced. This decrease in blood glucose level was probably due to the higher energy requirement of growing foetus or the effect of foetal insulin [14]. Similar observations of decreased blood glucose level due to pregnancy were reported by [15, 13, 16] Our finding contradicts with Abdul-Rahaman, *et al.,* [9] reported blood glucose level was significantly ($P<0.05$) higher in pregnant animals suggesting glucose immobilized by the use of adrenergic alpha-2 anaesthetics, which inhibit the release of insulin and increase glucose output from the liver [17, 9]. The total protein and globulin were having a similar effect of gestation; a significant ($P<0.01$) decrease in serum concentration may be due to increased foetal growth and especially the utilization of amino acids from the maternal circulation for protein synthesis in the foetal muscles [9]. In this study BUN significantly ($P<0.05$) decreases after 12th week of pregnancy might be a reduction of amino acid catabolism subsequently fall in urea production. The findings in the present study are in agreement with earlier workers. Abdul-Rahaman, *et al.* reported Plasma urea was significantly greater ($P≤0.05$) in non-pregnant, and lesser in pregnant goat. However overall mean values of serum uric acid and creatinine were found to be similar ($P<0.05$) in respect to pregnancy stages [9].
A gradual increase ($P≤0.01$) in serum triglyceride, cholesterol, HDL and LDL were recorded during pregnancy. The increased level lipid profile attribute from mid to late pregnancy might be due to diminished responsiveness of target tissue toward insulin together with increased mobilization of fatty acids from adipose tissue required for foetal growth. These findings of our study were supported by [10, 13, 9]

The serum enzyme variables (AST, ALT, & AP) level increases significantly ($P≤0.01$) in mid-pregnancy to late pregnancy agreement with [13, 9] suggesting increased intracellular levels of ALT and AST during pregnancy are reflects its counts in the plasma level.

Table 1: Haematological parameter of Shirohi does during the pregnancy and dry period

Attribute	NP	4 weeks	12 weeks	20 weeks	SEM	Significance
Haemoglobin (g/dl)	8.67[b]	8.49[ab]	8.13[ab]	7.53[a]	0.26	$P<0.05$
Hematocrit (%)	26.17[b]	25.67[b]	24.01[ab]	21.92[a]	0.79	$P<0.01$
Red blood corpuscles (10^6 /μl))	10.34[b]	10.18[ab]	9.74[ab]	9.06[a]	0.30	$P<0.05$
Mean corpuscles volume (fl)	25.30[b]	25.20[ab]	24.67[ab]	24.12[b]	0.26	$P<0.05$
Mean corpuscular Hb (pg)	8.38	8.34	8.35	8.30	0.04	NS
Mean corpuscular Hb (g/dl)	33.14[a]	33.09[a]	33.85[ab]	34.49[b]	0.28	$P<0.01$
White blood corpuscles (10^3/μl)	9.04[a]	9.58[ab]	10.14[ab]	10.42[b]	0.30	$P<0.05$
Neutrophil (%)	31.35[a]	31.50[ab]	32.20[b]	32.25[b]	0.76	$P<0.05$
Eosinophils (%)	5.04	4.70	5.10	4.45	0.32	NS
Basophils (%)	0.85	0.95	0.95	0.75	0.18	NS
Monocyte (%)	3.70	3.75	3.95	3.85	0.25	NS
Lymphocytes (%)	59.15	59.10	57.80	58.70	0.47	NS

Table 2: Blood biochemical parameter of Shirohi does during the pregnancy and dry period

Attribute	NP	4 weeks	12 weeks	20 weeks	SEM	Significance
Blood Sugar (mg/dl)	57.35[c]	56.20[bc]	51.50[b]	45.85[a]	1.45	*P<0.01*
Total protein(g/dl)	9.72[b]	9.12[ab]	8.47[ab]	7.42[a]	0.45	*P<0.01*
Albumin (g/dl)	5.71[c]	5.06[b]	4.62[ab]	4.17[a]	0.16	*P<0.01*
Globulin (g/dl)	4.00	4.06	3.84	3.25	0.42	NS
Albumin: Globulin	1.62	1.64	1.48	1.85	0.20	NS
BUN (mg/dl)	21.35[b]	21.65[b]	19.95[ab]	17.60[a]	0.95	*P<0.05*
Uric acid (mg/dl)	2.39	2.37	2.19	2.04	1.00	NS
Creatinine (mg/dl)	0.90	0.88	0.83	0.81	0.03	NS
Triglyceride (mg/dl)	16.10[a]	15.14[a]	20.88[b]	22.14[b]	0.72	*P<0.01*
Cholesterol (mg/dl)	107.79[a]	110.40[ab]	124.67[bc]	136.58[c]	4.03	*P<0.01*
HDL (mg/dl)	70.19[a]	69.95[a]	81.62[b]	83.34[b]	2.84	*P<0.01*
LDL (mg/dl)	32.70[a]	32.46[a]	39.22[a]	47.33[b]	1.84	*P<0.01*
AST (IU/l)	41.90[a]	44.10[a]	57.72[b]	67.33[c]	1.66	*P<0.01*
ALT (IU/l)	21.91[a]	24.25[ab]	25.85[bc]	29.47[c]	1.00	*P<0.01*
AP (IU/l)	86.50[a]	83.30[a]	95.30[b]	94.20[b]	1.33	*P<0.01*

Conclusion

It may be concluded that pregnancy has a significant influence on the haemato- biochemical traits of Shirohi goats due to the high demand for nutrients for foetus there is a modification in the metabolism of animals. During pregnancy, maternal tissues are involved in providing energy for reproduction processes, which may affect different serum biochemical parameter.

Acknowledgement

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