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Hematological Studies on Malnad Gidda Breed of Cattle in Karnataka

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Abstract

The present study was conducted to establish the base line hematological values in Malnad Gidda cattle during winter and summer seasons under the agro-climatic condition of Western Ghats of Karnataka. Thirty healthy Malnad Gidda cattle divided into five groups based on age, sex and lactation. The mean values of TEC, Hb, PCV, ESR, TLC and eosinophil per cent were significantly ($P<0.05$) higher in adult animals than young animals in both sexes. But, MCV was significantly ($P<0.05$) higher in young compared to adult animals. The mean values of MCH, MCHC, neutrophil, basophil, monocyte and lymphocyte per cent did not vary significantly among the age groups and among the gender. The mean values of all the above parameters between sexes within age groups and between the seasons were not significantly different. The established hematological values in present study could be used as reference values in Malnad Gidda breed reared under similar climatic and environmental conditions.

Introduction

Indian subcontinent has a variety of indigenous breeds of cattle (*Bos indicus*) with wide genetic diversity. The preservation and conservation of the local germ plasm has gained priority in the recent past and attempts are being made to upgrade the indigenous cattle breeds. Among the local cattle breeds, Malnad Gidda is a dwarf breed of cattle with the home tract of Shivamogga, parts of Chickmagalur and Hassan, North and South Canara and Belgaum districts of Karnataka. The animals are harsh, sturdy, small to medium in size with light body, short horns with sturdy legs. They are well known for their tenacity to cope-up with adverse climatic conditions of the hilly terrain of Western Ghats (Ramesha *et al*., 2013). The complete blood count plays important role in monitoring responses to therapy, evaluation of health status, managemental practices, nutritional and physiological status of animals, diagnosis of several pathophysiological and infectious disorders in cattle (Kaneko *et al*., 1997: Osman and Al-Busadah, 2003: Opera, *et al*., 2006:). The hematological parameters of cattle are influenced by many factors like breed, age, sex, seasons, lactation, pregnancy, health and nutritional status of the animal (Sattar and Mirza, 2009). In order to establish breed specific reference ranges in indigenous cattle (Conradie *et al*., 2013) and paucity of information on such parameters, the present study was undertaken in Malnad Gidda cattle to establish reference values of hematological parameters during winter and summer seasons.

Materials and Methods

The study was conducted during winter season (November and December months of 2011) and summer season (April and May months of 2012). Thirty Malnad Gidda cattle with good body condition score were selected from the Rayarakoppalu village, Magge Hobli, Alur taluk, Hassan district, Karnataka, India, were utilized in the present study. Selected animals were divided into five groups according to the age, sex and lactation, with six animals in each group. Group I and Group II consisted of male Malnad Gidda cattle aged between one to three years and four to five years, respectively. Group III, Group IV and Group V consisted of female Malnad Gidda cattle aged between one to three and four to five years lactating and nonlactating, respectively. Male and female animals selected for the study were uncastrated and non pregnant respectively.

Approximately 10 ml of blood was collected aseptically by jugular venipuncture in to the vacutainer containing EDTA twice at an interval of one week during the winter and summer months. The collected blood samples were transported to the laboratory in refrigerated condition (4 °C) within one hour of collection. The hematological parameters such as Total erythrocyte count (TEC), Total leukocyte count (TLC), Packed cell volume (PCV), Hemoglobin (Hb) content, Erythrocyte sedimentation rate (ESR), Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH) and Mean corpuscular hemoglobin concentration (MCHC) were determined with the help of automatic hematological analyzer (Make (ERMA INC®, Japan). The differential leukocyte count (DLC) was performed manually as per the standard procedure described by Jain (1986). Data obtained were analyzed by GraphPad Prism version 5.01 (2007) by application of two way ANOVA with Tukey's post test and the significance was determined at P value of 0.05.

Results and Discussion

Mean ± SE values of all the hematological parameters during winter and summer seasons are depicted in Table 1. The values of total erythrocyte count, hemoglobin levels, packed cell volume, erythrocyte sedimentation rate and eosinophil per cent were significantly ($P < 0.05$) higher in adult animals compared to young animals in both sexes. But, MCV was significantly ($P < 0.05$) higher in young animals of group I and III compared to their adult counterparts in group II, IV and V during both the seasons. The MCH, MCHC, neutrophil per cent, basophil per cent, monocyte per cent and lymphocyte per cent did not differ significantly ($P > 0.05$) between the groups. The mean values of all the above parameters within age groups did not differ significantly ($P > 0.05$) between the sexes. Also, there was non-significant ($P >0.05$) difference between the winter and summer seasons among all the groups for all the above parameters.

The mean values of hemoglobin levels and packed cell volume (PCV) were within normal physiological range for cattle as reported by Jain (1986). The present findings are in agreement with the reports of Deshpande and Sawant (1995) in Deoni cattle, Sripad *et al*. (2014) in Khillar cattle and Kumar *et al.* (2017) in Hardhenu, Sahiwal and Hariana breed of cattle. The significantly lowered TEC count recorded in prepubertal male and females in the present study could be due to the reduced hormonal production at prepubertal stage. This apparent increase in RBC number during summer could be due to adoptative mechanism of a breed to improve the oxygen carrying capacity of the blood during hot environment (El-Nouty *et al*., 1986). The significantly lower Hb level in prepubertal male and females observed in the study could be attributed to reduced production of erythropoietic and sex hormones involved in erythropoiesis during young age. The numerically higher levels of Hb during summer could be due to higher total iron binding capacity of during summer season (Srikhande *et al*., 2008) or could be due to hemoconcentration resulting from the loss of water through excessive sweating in an effort to lose heat from the body during stressful climate (Gadariya *et al*., 2008).

The erythrocyte sedimentation rates recorded in present study were within normal physiological range. The significantly lower ESR in prepubertal male and females observed in the study could

Table 1. Hematological values (Mean SE) of different age groups in Malnad Gidda cattle during winter and summer seasons

Groups	Prepubertal males (aged 1 to 3 years)		Pubertal males (aged > 4 to 5 years)		Prepubertal females (aged 1 to 3 years)		Lactating females (aged > 4 to 5 years)		Nonlactating females (aged > 4 to 5 years)	
Seasons / Blood Entities	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
TEC (millions per cumm)	8.14 ± 0.50[a]	8.43 ± 0.25[a]	10.26 ± 0.38[b]	10.36 ± 0.20[b]	7.22 ± 0.41[a]	7.49 ± 0.59[a]	10.10 ± 0.21[b]	10.21 ± 0.45[b]	10.12 ± 0.27[b]	10.27 ± 0.48[b]
Hb (g %)	8.80 ± 0.26[a]	9.02 ± 0.20[a]	11.37 ± 0.53[b]	11.80 ± 0.66[b]	8.30 ± 0.14[a]	8.45 ± 0.34[a]	10.61 ± 0.70[b]	11.43 ± 0.57[b]	11.07 ± 0.56[b]	11.37 ± 0.35[b]
PCV (%)	35.62 ± 1.27[a]	35.77 ± 1.84[a]	39.45 ± 1.35[b]	40.47 ± 1.49[b]	33.33 ± 1.58[a]	33.93 ± 1.08[a]	38.03 ± 0.86[b]	40.18 ± 0.50[b]	38.57 ± 1.52[b]	38.15 ± 1.90[b]
ESR (mm/24hr)	2.22 ± 0.27[a]	2.43 ± 0.44[a]	3.43 ± 0.35[b]	3.45 ± 0.49[b]	2.33 ± 0.18[a]	2.63 ± 0.21[a]	3.83 ± 0.17[b]	3.58 ± 0.50[b]	3.77 ± 0.25[b]	3.25 ± 0.90[b]
MCV (fl)	43.76 ± 0.12[a]	42.43 ± 0.48[a]	38.45 ± 0.11[b]	39.06 ± 0.49[b]	46.16 ± 0.58[a]	45.30 ± 0.28[a]	37.65 ± 0.26[b]	39.35 ± 0.50[b]	38.11 ± 0.25[b]	37.15 ± 0.90[b]
MCH (pg)	10.81 ± 0.27	10.70 ± 0.43	11.08 ± 0.25	11.38 ± 0.39	11.50 ± 0.58	11.28 ± 0.24	10.50 ± 0.84	11.19 ± 0.50	10.93 ± 0.52	11.07 ± 0.90
MCHC (g/dL)	24.70 ± 1.54	25.21 ± 1.84	28.82 ± 1.32	29.15 ± 1.37	24.90 ± 1.72	24.90 ± 1.43	27.90 ± 0.86	28.44 ± 0.50	28.70 ± 1.34	29.80 ± 1.71
TLC (thousands per cumm)	9.32 ± 0.39[a]	9.72 ± 0.32[a]	11.55 ± 0.63[b]	11.78 ± 0.72[b]	8.58 ± 0.32[a]	8.97 ± 0.24[a]	11.10 ± 0.38[b]	11.57 ± 0.34[b]	11.43 ± 0.60[b]	11.73 ± 0.79[b]
Lymphocyte (%)	55.40 ± 0.19	55.76 ± 1.41	54.04 ± 0.83	55.03 ± 0.57	55.36 ± 0.15	56.73 ± 0.23	54.79 ± 0.18	55.94 ± 0.11	54.99 ± 0.93	55.90 ± 0.19
Neutrophil (%)	37.01 ± 0.09	37.03 ± 0.07	35.32 ± 0.07	35.56 ± 0.05	37.29 ± 0.06	36.99 ± 0.03	35.13 ± 0.06	35.52 ± 0.07	35.52 ± 0.07	35.46 ± 0.06
Eosinphil (%)	1.60 ± 0.02[a]	1.44 ± 0.01[a]	3.03 ± 0.02[b]	2.46 ± 0.01[b]	1.96 ± 0.02[a]	1.64 ± 0.01[a]	2.97 ± 0.01[b]	2.59 ± 0.01[b]	2.70 ± 0.02[b]	2.44 ± 0.02[b]
Basophil (%)	0.42 ± 0.01	0.51 ± 0.01	1.09 ± 0.01	1.01 ± 0.01	0.69 ± 0.01	0.67 ± 0.01	0.90 ± 0.02	0.77 ± 0.01	0.81 ± 0.03	0.78 ± 0.02
Monocyte (%)	5.57 ± 0.04	5.26 ± 0.02	6.32 ± 0.05	5.94 ± 0.02	5.66 ± 0.05	4.97 ± 0.08	6.21 ± 0.04	5.18 ± 0.04	5.98 ± 0.04	5.42 ± 0.03

Values with different superscripts in a row differ significantly (P<0.05)

be attributed to the reduced total erythrocyte count on account of reduced production of erythropoietic hormones during young age.

The values of MCV were within normal physiological range and the variation in the MCV between the groups could be attributed to variable erythrocyte size and differences in oxygen carrying capacity in relation to age and physiological states (Farooq *et al*., 2012).The low value of MCH in the present study could be attributed to concomitant decrease in Hb concentration or PCV value as ascertained by Lateef *et al*. (2014). The low level of MCHC in the present study could be due

to less quantity of hemoglobin in each RBC and also less weight of hemoglobin and volume of cell as opined by Ahmad *et al*. (2003).

The mean values of packed cell volume (PCV) and total leukocyte count recorded in the current study were within normal physiological range reported for cattle (Jain 1986) and were significantly ($P<0.05$) lower in young animals of group I and III compared to their adult counterparts in group II, IV and V during both the seasons. The present findings are in accordance with the observations in indigenous breeds of cattle by Deshpande *et al*. (1987) in Red Kandhari cattle, Roy *et al*. (2010) in Sahiwal cows, Naik *et al*. (2013) in Punganur cattle, Mahima *et al*. (2013) in Hariana cattle, and Lankesh *et al*. (2015) in Hallikar cattle. The apparent increase in PCV during summer can be ascribed to the high temperature and humidity in the environment resulting in sweating causing loss of water leading to hemoconcentration (Piccione *et al*., 2010). The TLC values in the present study were persistently higher in adult groups and this higher count in Malnad Gidda breed could be attributed to the higher resistance to various diseases and better immune status.

In the present study, there was no significant ($P>0.05$) variation in lymphocyte and neutrophil percentage and the values were within the normal range established for cattle. However, the per cent eosinophils were significantly ($P<0.05$) higher in adult group (group II, group IV and group V) compared to the younger counterparts in group I and group III. The significantly higher eosinophil percentage in adult animals indicates increased phagocytic activity and better disease resistance capacity in Malnad Gidda cattle. Further, the values of basophil were within the established range. The monocyte per cent was little above the established range for cattle that could be due to animal response to stress and several inflammatory conditions in ruminants (Tornquist and Rigas, 2010).

The hematological values established in Malnad Gidda cattle of Western Ghat region could serve as base line data of respective groups to study the hematological alterations during different physiological status, pathological conditions, metabolic disorders and nutritional deficiencies and could be utilized for diagnostic and / or therapeutic purpose.

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Conflict of Interest: All authors declare no conflict of interest.

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