AGE RELATED CHANGES IN HAEMATOLOGY AND PLASMA BIOCHEMICAL PROFILE IN PURNATHADI BUFFALO

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ABSTRACT

Haematology and plasma profile was studied in young (N=108) and adult (N=144) Purnathadi buffaloes to investigate the age associated changes in blood constituents. Haemoglobin concentration (Hb), Packed cell volume (PCV), Total erythrocyte count (TEC), Differential Leukocyte count (DLC), Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH) and Mean corpuscular hemoglobin concentration (MCHC) were determined by using routine hematological procedures and total protein, albumin, globulin, albumin/globulin ratio, calcium, phosphorus and glucose were determined by using biochemical analyzer. Significant difference was recorded in most of the haematological and biochemical indices between two age groups, but Hb, PCV and TEC values were on lower side when compared with the reference values for buffalo. The results of this study showed that among hematological parameters Hb (9.30±0.14 g/dl), PCV (30.88±0.67%), TEC (5.73±0.11 x 10^6/µl), MCV (59.34±1.34 fg), TLC (12.64±0.38 x 10^3/µl), eosinophil (1.19±0.13%), and neutrophil (30.33±0.92%) were significantly (P<0.01) higher in adult buffaloes than those of young calves. On the other hand monocyte (2.39±0.15%) and lymphocytes (65.98±0.97%) were significantly (P<0.01) higher in young calves than adult buffalo. Compared with the biochemical parameters, total protein and globulin concentration was significantly (P<0.05) higher in adult buffaloes but A/G ratio, calcium, phosphorus and glucose concentration was significantly higher (P<0.01) in young calves. This knowledge on variation in hemato-biochemical parameters between calves and adult buffaloes may be important for interpretation of laboratory data.

Keywords: *Bubalus bubalis*, buffalo, Purnathadi buffalo, calves, hematology, plasma biochemical profile

INTRODUCTION

Purnathadi buffalo, a strain of well known Nagpuri buffalo of Vidarbha region is a prominent milch animal of Akola district of Maharashtra. This buffalo is commonly preferred by the farmers of this region as sole milch animal on account of the regular breeding and high fat content in milk. The buffalo

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withstand the hot summer of this region without any adverse affect on the milk production. The average milk yield of Purnathadi buffalo is 930 kg in 300 days (Baglane, 1998). As compared to other breeds of buffaloes, Purnathadi buffalo is a regular breeder and has better course fodder conversion efficiency. The knowledge of haematological and biochemical profile during different age groups is most important for assessment of their health and nutritional status. There has been no study on the physiology of Purnathadi buffalo. Keeping the importance of haematological and biochemical profile this study was undertaken in Purnathadi buffalo.

MATERIALS AND METHODS

The study was conducted in adult (5 to 6 years) and young (6 months to 12 months) Purnathadi buffaloes. Blood was collected from 12 adults and 9 young healthy animals every month for one year. After going through aseptic precautions blood from jugular vein was drawn in sterilized vial containing heparin as anticoagulant. Two ml blood was preserved for haematology whereas remaining blood was used for plasma separation. The tubes containing blood were centrifuged at 3000 rpm for 15 minutes. The plasma was separated and stored at -20^{o}C for further biochemical analysis.

The anticoagulant containing blood was subjected to various haematological tests. Haemoglobin (Hb) and packed cell volume (PCV) were estimated by cyanomethemoglobin method and microhematocrit method respectively. Total erythrocyte count (TEC) and total leukocyte count (TLC) were determined by using Neubaur's haemocytometer. The blood smears prepared and stained with Leishman's stain were studied for differential leukocyte count (DLC). Mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) was calculated.

Plasma was evaluated for total protein (TP), albumin (Alb), calcium (Ca) and phosphorus (P). The analysis was carried by auto analyzer using span diagnostic kits. Mean values and standard errors were calculated and statistical analysis of data was performed using 'z' test as per Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The comparative haematology and plasma biochemical profile of young and adult Purnathadi buffalo is presented in Table 1 and Table 2 respectively. In present study the haemoglobin concentration (7.97±0.16 g/dl and 9.30±0.14 g/dl), packed cell volume (25.88±0.55% and 30.88±0.67%) and total erythrocytes count (5.03±0.12 x 10^{6}/µl and 5.37±0.11 x 10^{6}/µl) in young and adult buffaloes, respectively were on lower side than the values for young and adult Murrah buffalo reported by Feldman *et al*. (2000); Mohan *et al*. (2009). The lower value for these parameters could be the tropical condition of this region. There was a significant difference ($P<0.01$) between young and adult buffalo for Hb, PCV and total erythrocytes with higher values in adult buffaloes than young. Higher erythrocyte count was responsible for increased PCV value in adult buffalo; apparently due to high basal metabolic rate, leading to increased rate of erythropoiesis and hence increases in erythrocyte count (Jabbar *et al*., 2012). The age related differences in Hb, PCV and TEC with high values in adults as compared

to young calves reported in present study are in agreement with the findings of Patil *et al*. (1992); Gomes *et al.* (2010); Jabbar *et al.* (2012).

The total leukocyte count reported in present study displayed significant (P<0.01) related differences, with lower values (9.91±0.29 x 10^3/µl) in young calves as compared to the adults buffaloes (12.64±0.38 x 10^3 µl). Present finding were equivocal to that of Jabbar *et al.* (2012) and Kumar *et al.* (1990), whereas, contradictory to the findings of Chandra Bhan *et al.* (2012). However, Swenson *et al.* (1996) reported no difference in total leukocyte count in young calves and adult buffaloes.

The differential leukocyte count reported in present study was comparable to the reference values for buffalo with more lymphocytes than neutrophil in circulation like other ruminants. However, results have shown significant (P<0.01) age related difference with neutrophil and eosinophil percentage high in adult buffaloes while lymphocyte and monocyte percentage high in young calves. These findings were in total agreement with findings of Beecher *et al.* (2009). The young animals are setting up their adaptive immune response and increase lymphocytes are typically observed in younger animals due to antigen presentation and response (Beecher *et al.*, 2009).

The haemoglobin indices, MCV, MCH and MCHC were determined an the values for MCH (16.60±0.49 and 17.64±0.43 pg) and MCHC (31.98±0.90 and 30.80±0.75 g/dl) recorded in young calves and adult buffaloes respectively does not differed significantly among the two age groups, whereas MCV (54.23±1.69 and 59.35±1.34 fg) differed significantly (P<0.01) among young and adult with a trend to increase with age. Similar trend was also reported by Beecher *et al.* (2009) and Shil *et al.* (2012). However Randawa *et al.* (2009) reported significant difference between young and adult for MCH, MCV and MCHC also.

The plasma biochemical study included total protein, albumin, globulin, albumin / globulin ratio, glucose, calcium and phosphorus and the values obtained for total protein, albumin and globulin was on higher side, while, albumin / globulin ratio, glucose, calcium and phosphorus were within range of reference values for the adult buffaloes (Prasad, 2006; Ellah, 2010). However, age associate differences were evident for many of the parameters in present study. Values for total protein (8.37±0.40 and 11.33±0.47 g/dl), globulin (3.71±0.33 and 6.72±0.39 g/dl), AG ratio (1.03±0.10 and 1.20±0.08), glucose (65.20±1.43 and 56.96±1.53 mg/dl), calcium (10.99±0.58 and 9.73±0.40 mg/dl) and phosphorus (8.12±0.31 and 7.20±0.23mg/dl) in young and adults, respectively differed significantly (P<0.01) except for albumin (4.74±0.23 and 4.63±0.16 g/dl) among the two age groups where total protein and globulin was higher in adult buffaloes whereas, AG ratio, glucose, calcium and phosphorus was higher in young calves of Purnathadi buffalo. Similar age associated results were reported by Kaple *et al.* (2008) in Gaolao cattle, Pampori *et al.* (2010) in Changthangi goats and Shil *et al.* (2012) in cross bred cows with same trend as recorded in present study.

In present study the values obtained for total protein, albumin, glucose and albumin/ gobulin ratio in young animals were higher than reported by Ravindra and Dass (2006) and also by Anil *et al.* (2006) and in agreement with the findings of Vishal *et al.* (2011). However the result obtained in adult animals was higher for total protein, albumin, and globulin and lower for albumin / gobulin ratio than reported by Vishe *et al.* (2011); Tajik *et al.*

Table 1. Comparative haematology of young and adult Purnathadi buffalo.

S. No.	Haematological parameters	Young calves	Adult buffalo
1	Haemoglobin (g/dl)	7.97^{a}±0.16	9.30^{b} ±0.14
2	Packed cell volume (%)	25.88^{a}±0.55	30.88^{b}±0.67
3	Total erythrocyte count (10^{6}/µl)	5.03^{a}±0.12	5.37^{b}±0.11
4	Mean corpuscular haemoglobin (pg)	16.60±0.49	17.64±0.43
5	Mean corpuscular volume (fg)	54.23^{a}±1.69	59.34^{b}±1.34
6	Mean corpuscular haemoglobin concentration (g/dl)	31.98±0.90	30.81±0.75
7	Total leukocyte count (10^{3}/µl)	9.91^{a}±0.29	12.64^{b}±0.38
8	Eosinophils (%)	0.86^{a}±0.10	1.19^{b}±0.13
9	Monocytes (%)	2.77^{b}±0.16	2.39^{a}±0.15
10	Lymphocytes (%)	70.49^{b}±0.92	65.98^{a}±0.97
11	Neutrophils (%)	25.91^{a}±0.85	30.33^{b}±0.92

Mean having different superscript in each row differ significantly.

Table 2. Comparative blood biochemical analytes of young and adult Purnathadi buffalo.

Sr. No.	Biochemical parameters	Young calves	Adult buffalo
1	Total protein (g/dl)	8.37^{a}±0.49	11.33^{b}±0.47
2	Albumin (g/dl)	4.74±0.23	4.63±0.16
3	Globulin (g/dl)	3.71^{a}±0.33	6.72^{b} ±0.39
4	AG ratio	1.93^{b}±0.10	1.29^{a}±0.08
5	Calcium (mg/dl)	10.99^{b}±0.58	6.73^{a}±0.40
6	Phosphorus (mg/dl)	8.12^{b}±0.31	7.20^{a}±0.23
7	Glucose (mg\dl)	65.20^{b}±1.43	56.90^{a}±1.53

Mean having different superscript in each row differ significantly

(2012) whereas the estimate for total protein was in agreement with findings of Shil *et al.* (2012) in cow.

The plasma concentration of glucose, calcium and phosphorus in young animals was higher than reported by Vishal *et al.* (2011) and within range of values reported by Shil *et al.* (2012) for crossbred cow. The plasma concentration of glucose, calcium and phosphorus in adult animals was in close agreement with that reported by Jayachandran *et al.* (2012) whereas glucose and calcium concentration was lower than reported by Ali and Shukla (2012); Hasanpour *et al*. (2008) respectively.

The results indicated that there was some haematobiochemical difference between calves and adult buffaloes. Discrepancies in values for various hematological parameters may be explained by differences in sampling interval, methods used, and/or degree of metabolic disturbances. Moreover, species differences and tropical conditions of the present study might have played a role for the differences with other studies. Finally hematological and biochemical values are an efficient tool for evaluation of physiological status, metabolic disorders, management problems of the farm which have great relation to health status of the animal.

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