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Comparison of Normal Hematological and Biochemical values in Male and Female Buffaloes

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ABSTRACT

The present study was undertaken to evaluate the effect of difference in gender on some hematological and serum biochemical constituents in buffaloes. In total, 30 healthy buffaloes (1–2 years old) of both sexes were examined at various buffalo farms in Assiut, Egypt. Two blood samples were collected from the jugular vein. The first blood sample was used for biochemical analysis. The second blood sample was used for hematological analysis. The results revealed significant increases in serum levels of most of the measured biochemical parameters in male than in female buffaloes, except serum albumen and blood urea nitrogen levels, which were significantly higher ($P < 0.01$) in female buffaloes. In addition, no significant changes were observed in serum total proteins and globulins levels, and in serum gamma glutamyl transferase and alkaline phosphatase activities. There were significant increases in hematocrit % ($P < 0.01$) and mean corpuscular volume ($P < 0.05$) in female than in male buffaloes. Mean corpuscular hemoglobin concentration was significantly lower ($P < 0.01$) in female than in male buffaloes. No significant changes were reported in leucocytes and platelets. It could be concluded that hematological and serum biochemical constituents are varied between male and female buffaloes, which necessities the importance of using separate groups from male and female buffaloes in research studies.

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Introduction

Water buffaloes (*Bubalus bubalis*) are originally from Asia and they are mainly distributed in tropical and subtropical Asia. Buffaloes are used for draught power and are found in countries that include the Indian sub-continent and the Mediterranean countries. Buffaloes are used mainly as a source of meat and milk (Cockril 1977, 1980). Water buffaloes can compete very successfully with and even surpass cattle in their ability to adapt to hot climates and swamp lands (Webster and Wilson, 1980). Water buffalo are therefore of special importance in milk and meat production (GOVS, 2005).

Animal health can be defined as the absence of disease determined by clinical examinations combined with various diagnostic tests (Theodossi *et al.* 1981; Klinkhoff *et al.*, 1988; Bailey *et al.*, 1989, Pattinson and Theron 1989,). Blood is an important and reliable medium for assessing the health status of individual animal (Ramprabhu *et al.*, 2010). Variations in blood parameters of animals are due to several factors such as altitude, feeding level, age, sex, breed, diurnal and seasonal variation, temperature and physiological status of animals (Mbassa and Poulsen, 2003). Hematological and serum bio-

chemical tests are widely used for the diagnosis of serious animal diseases which can lead to economic losses like reduced fur, wool and milk production (Bani *et al.*, 2008). It is very important to assess the differences in blood constituents between male and female buffaloes, especially in research studies that require the presence of male and female animals in the same group. The present study aimed to investigate the effect of gender on some biochemical and hematological constituents in buffaloes.

Materials and methods

In total, 30 Buffaloes (1–2 years old) of both sexes were examined at various buffalo farms, namely Land of Kheir, Valley of Sheeh and Bani Sanad, all belonging to Assiut Governorate, Assiut, Egypt,

Animals were examined carefully based on a number of inclusion criteria (Table 1). Only animals that met the inclusion criteria were included in the study. The buffaloes were identified by their ear tags.

The ear tag number of the individual animal was recorded on an examination sheet. A serial number was assigned to each individual animal. Tubes used for collection of blood and cups used for faecal samples were assigned the same serial number that was recorded on the examination sheet.

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Table 1. Inclusion criteria for the buffaloes in this study

Inclusion criteria
Male and female buffaloes (1-2 Years old)
Clinically healthy
General attitude: alert
No loss of skin elasticity
Normal mucous membrane
No diarrhea
No urogenital abnormalities
No muscular abnormalities
No medication
Absence of skin lesions or alopecia
Absence of intestinal and blood parasites

Samples

Two blood samples were collected from the jugular vein. The first blood sample was collected in a plain Vacutainer tube (10 mL plain vacuum tubes, Biomedica Alex Co., Egypt), which was used for obtaining serum. The second blood sample was collected in Vacutainer tube (BD Vacutainer Tubes, Becton Dickinson, Rutherford, NJ) containing EDTA as an anticoagulant and used for hematological analysis. Faecal samples were collected from the rectum of all animals in clean, dry cups. Samples were transported on ice directly after collection to the research laboratory (Department of Animal Medicine, Faculty of Veterinary Medicine, Assiut University, Egypt).

Samples were prepared and analyzed by the research laboratory immediately upon arrival. Blood samples in plain tubes were centrifuged at 3000 rpm for 15 min and serum was harvested in Eppendorf tubes according to standard methods (Coles, 1986). Serum samples were stored at -20°C and used for measuring serum biochemical constituents. Samples with haemolysis were excluded from the study. Serum samples were analyzed within a maximum period of two weeks.

Biochemical analysis

Spectrophotometric measurements of serum total proteins, albumin, blood urea nitrogen (BUN) and creatinine levels, and activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma glutamyl transferase (GGT), lactate dehydrogenase (LDH), alkaline phosphatase (ALP) and creatine phosphokinase (CK) were measured using commercial kits supplied by Spinreact (Spinreact, GIRONA, Spain), using UV spectrophotometer (Optizen 3220 UV, Mecasys Co. Ltd, Korea).

Hematological analysis

An air-dried smear of fresh blood was prepared directly after blood collection, fixed and stained with Giemsa stain (Coles, 1986) and examined for blood parasites and for differential leucocyte counts. Manual differential leucocyte counts were performed to calculate the relative and absolute counts for individual white blood cells (neutrophils, band cells, eosinophils, basophils, monocytes and lymphocytes).

Hematological analysis was performed by Medonic Vet. Hematology Analyzer (Medonic CA 620, Sweden) directly after the samples were received by the research laboratory. Hematological variables measured were red blood cell count (RBCs), hemoglobin concentration (Hb), red blood cell distribution width (RDW), hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC). Other parameters included the platelet count (PLT), mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT).

Leucocytes measured were total and differential white blood cells count (WBCs).

Parasitological analysis

Parasitological analyses of faecal samples were done on the day of collection using sedimentation and floatation techniques according to Soulsby (1982). Animals harbouring parasites were excluded from the study. The parasitological findings were reported to the farms to recommended control measures.

Data analysis

Data from the present study were compared by Analysis of Variance using SPSS 16.0 software package program (SPSS, Chicag, IL) according to Borenstein *et al.* (1997). Probability level (P-value) was assumed significant at 0.05 and highly significant at 0.01. P-value was considered non-significant if more than 0.05.

Results

Serum biochemical findings

There were significantly higher serum levels for most of the measured biochemical parameters in male than in female buffaloes, except serum albumen and BUN levels, which were significantly higher ($P < 0.01$) in female buffaloes. In addition, no significant changes were observed in serum total protein and globulins levels, and in serum GGT and ALP activities (Table 2).

Hematological findings

There were significant increases in HCT % ($P < 0.01$) and MCV ($P < 0.05$) in female than in male buffaloes. MCHC was significantly lower ($P < 0.01$) in female than in male buffaloes. No significant changes were reported in leucocytes and platelets (Table 3).

Discussion

Clinical chemistry and hematology are considered important tool for diagnosis. It provides veterinarians with variable data that serve to diagnose diseases and to monitor their progression, response to therapy and to screen for the presence of underlying disease in apparently healthy animals (Hendrix, 2002). Veterinarians frequently use the laboratory assays in conjunction with other diagnostic methods as case history and complete physical examination to identify or classify pathologic states that develop in domestic mammals (Stockham and Scott, 2002).

This study aimed to compare the levels of some hematological and biochemical parameters in male and female buffaloes. Results revealed that serum AST, ALT, CK and LDH activities were significantly higher in male than female. Serum AST, ALT and CK activities is a good indicator for the health of skeletal and cardiac muscles (Kraft and Dürr, 2005). Higher level of serum AST, ALT CK and LDH in male buffaloes than in female buffaloes may be attributed to higher muscular mass in male than in female buffaloes, these findings are supported by the higher serum creatinine level in male than in female buffaloes (Table 2). The amount of creatinine secreted daily is a function of the muscle mass and is not affected by diet, age or sex. Female excrete less creatinine than males because of their smaller muscle mass (Alex and Laverne, 1983).

Table 2. Serum biochemical constituents in male and female buffaloes.

	Total protein (g/dl)	Albumin (g/dl)	Globulins (g/dl)	AST (U/l)	ALT (U/l)	GGT (U/l)	CK (U/l)	LDH (U/l)	ALP (U/l)	Creatinine (mg/dl)	BUN (mg/dl)
Male (n=15)	6.73±.75	3.06±.25	3.67±.77	89.46±21.36	43.43±13.98	11.12±2.23	89.47±35.85	946.87±43.29	168.64±60.13	1.46±.24	29.50±6.27
Female (n=15)	6.93±.73	3.66±.30**	3.26±.54	52.38±16.60**	27.46±9.30**	12.49±2.93	61.99±22.04*	739.52±42.26**	198.45±54.14	1.22±.30*	38.66±9.81**

Data expressed as mean ± SD, *: P<0.05, **: P<0.01

Table 3. Hematological constituents in male and female buffaloes.

	RBCs count	Hb (g/dl)	HCT (%)	MCV (fl)	MCH (pg)	MCHC (g/dl)	RDW (%)	PLT (x10 ⁹ /mm ³)	MPV (fl)	PCT (%)	PDW (%)	WBCs count (GL)	Lymphocytes (GL)	Neutrophils (GL)	Band (GL)	Monocytes (GL)	Eosinophils (GL)	Basophils (GL)
Male (n=15)	8.2±1.1	12.2±1.0	35.52±3.50	43.5±2.8	15.0±1.6	34.5±1.8	23.03±1.3	170.3±80.5	6.6±0.3	0.1±0.1	10.2±.4	10.4±2.4	6.1±1.9	3.5±0.9	0.1±.08	0.5±0.2	0.3±0.1	0.0±0.0
Female (n=15)	8.8±.7	13.1±1.7	41.5±5.7**	46.9±4.4*	14.8±1.2	31.6±.7**	22.8±1.3	206.5±68.5	6.4±0.3	0.1±0.0	9.9±0.5	12.1±2.5	7.6±1.3*	3.8±1.6	0.12±.1	0.4±0.2	0.3±0.2	0.0±0.0

Data expressed as mean ± SD, *: P<0.05, **: P<0.01

Results obtained in the present study indicated higher MCV in female than male buffaloes (Table 3), the significant increase in HCT% in female buffaloes may be attributed to the significant increase in MCV, similar findings were reported by Beechler et al. (2009).

Conclusion

Hematological and serum biochemical constituents are varied between male and female buffaloes, which necessities the importance of using separate groups from male and female buffaloes in research studies.

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