

Gender Effect on Selected Haematological and Biochemical Parameters of Ostriches Reared in Captive Condition



Veterinary Science

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ABSTRACT

*This study was designed to assess the effect of sex on haematological and biochemical profile in ostrich (*Struthio camelus*) serum. Ostriches maintained under standard managemental conditions at Post Graduate Research Institute in Animal Sciences, Kattupakkam are used for this study. Ostriches of aged 2, 4, 6, 8, 10, 12 and 24 – 36 months of age were selected. In each age group 3 males and 3 females were selected randomly. 3 ml of blood were collected from each bird during the cooler parts of the day. 3ml of blood were collected from each bird during cooler parts of the day. 1ml of blood was taken in vials containing 0.5 mg of EDTA (Ethylene Diamine Tetra Acetic Acid). The remaining blood was kept undisturbed for two hours for separation of serum. 1ml of blood was later used to estimate Haemoglobin concentration (Hb), Packed Cell Volume (PCV), Total Erythrocytes Count (TEC) and Total Leucocytes Count (TLC) and Differential Count (DC). The biochemical parameters such as Total Protein, Albumin, Calcium, Phosphorus, Cholesterol and Triglyceride were estimated using a Bio system auto analyzer. The biochemical values indicate the overall health status of the bird. The study revealed no significant differences among various blood parameters except monocytes where the female bird showed slightly higher value (3.00 ± 0.13 percent) when compared to that of male (2.57 ± 0.14 percent). The findings are comparable with works done by other scientists from other parts of the world.*

INTRODUCTION

Ostrich is the largest, flightless and heaviest living bird in the world, belonging to the ratite family. It has remarkable tolerance to heat, withstanding temperature of 56°C without undue stress. Ostriches are reared mostly for their large variety of products such as meat, oil, feather, hide, egg and egg shell. The only organised ostrich farm in India is located at Postgraduate Research Institute in Animal Sciences, Kattupakkam. There is considerable scope for improvement in the areas of artificial incubation, chick nutrition, environmental requirements and breeding. Generally growth and production depends on metabolism. Blood metabolism plays a major role in the health profile of any species. Metabolism in biological system is best assessed by the bio chemical profile. The haematological and blood biochemical values are known to be influenced by various factors such as age, sex, diet, body condition, diseases, management systems and nutritional status. The values are useful for diagnosis of disease and illness in birds. The parameters also provide highly valuable information on physiological status and allow the detection of possible diseases. General health can be monitored by assessing their vital biochemical parameters. There is very little understanding on the blood serum profile of ostriches. It is necessary to have standard values and knowledge of their variation in relation to age, sex, season, physiological status, blood collection methods and other factors for proper evaluation of metabolic profiles. However, very little research work had been done on haematology and biochemical parameters of ostrich influenced by age and sex. Hence to arrive at the base line values, present work has been. Ostriches reared under standard managemental conditions at Post Graduate Research Institute in Animal Sciences, Kattupakkam were used for our study.

MATERIALS AND METHODS

Age and sex of birds

Blood was collected from ostriches of age one to twelve months with two month's interval (2, 4, 6, 8, 10 and 12 months) and thereafter in adult birds in the age group of (24-36 months). In each age group 3 male and 3 female were selected randomly. All the birds were maintained in standard management condition and raised in fenced paddocks.

Collection of Blood

Morning time (7.30 9.00-A.M) was utilized for blood collection. Birds were restrained with their wings and face was covered with a black colored hood. Blood was collected by venipuncture from the brachial vein (wing) because of its larger size. Pressure was applied to raise the vein. Three milliliters of blood was collected from all 42 birds using a 5ml syringe. 1ml was taken in vials containing EDTA (Ethylene Diamine Tetra Acetic Acid). Remaining blood was undisturbed for two hours for separation of serum. A drop of blood placed on a clean grease free glass slide was gently slid over using another glass slide to prepare the smears and were allowed to air shade dry and fixed in methanol for two minutes to be used late for staining.

Lab Analysis

Blood analysis was carried out within four hours of collection. Haemoglobin (Hb) concentration was estimated as per the Sahli's Acid hematin method (Sahli, 1909), Packed cell volume (PCV) by microhaematocrit method (McInroy, 1953), Total erythrocyte count (TEC) and Total leucocyte count (TLC) by using Nambiar's diluting fluid (Bancroft and Marilyn, 2008) and Differential count (DC) by using modified Leishman-Giemsa stain as per the method described by Bancroft and Marilyn (2008).

Blood analysis was carried out within four hours of collection. The biochemical parameters such as Total Protein, Albumin, Calcium, Phosphorus, Cholesterol and Triglyceride were estimated using A 15 Biosystem auto analyser with commercially available kits from AGAPPE.

RESULTS AND DISCUSSION

Gender effect on selected haematological and biochemical parameters of ostriches reared in captive condition in India is represented in table. 1 and 2 and discussed below.

HAEMATOLOGICAL PARAMETERS

Effect of sex on Haemoglobin.

The effect of sex on haemoglobin in our study was not affected significantly. The female bird had significantly lower value (10.78 ± 0.12 g/dl) when compared to male (11.02 ± 0.17 g/dl) which is similar to that of the findings of Levi *et al.* 1989 and Bonadiman *et al.* 2009.

Effect of sex on Packed Cell Volume (PCV)

PCV didn't show any significant effect among sexes where the values were 37.33 ± 0.97 in male and 38.86 ± 0.98 in female respectively in which females had higher value than male which is a contrary to the findings of Levi *et al.* 1989, Bonadiman *et al.* 2009. Researchers who had studied the effect of sex on PCV on other species such as Emu (Patodkar *et al.* 2008), Lesser Rhea (Reissig *et al.*, 2002) and Turkey (Schmidt *et al.* 2009) were in agreement and the values in Emu recorded by Menon *et al.* 2013 was contrary to the present findings.

Effect of sex on Total Erythrocyte Count

TEC showed no significant differences between sexes where lower value of $1.72 \pm 0.02 \times 10^6/\text{mm}^3$ in male and $1.74 \pm 0.01 \times 10^6/\text{mm}^3$ in female were reported which is a contrary to findings of Levi *et al.* 1989 and Ahmed *et al.* 2012.

Effect of sex Total Leucocyte Count.

TLC showed no significant differences between sexes. Higher value of $6.82 \pm 0.10 \times 10^3/\text{mm}^3$ in male and comparatively lower value of $6.65 \pm 0.07 \times 10^3/\text{mm}^3$ in female birds were noticed which is similar to finding of Levi *et al.* 1989 and Ahmed *et al.* 2012.

Effect of Sex on Mean Corpuscular volume (MCV) on Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin concentration (MCHC).

Sex didn't show any significant effect on MCV, MCH, MCHC. The values (218.35 ± 6.52 and 224.74 ± 6.69 fl), (64.37 ± 1.35 and 61.85 ± 0.78 pg) and (29.81 ± 0.68 and 28.13 ± 0.70 g/dl) between males and females had been observed, which is similar to finding of Levi *et al.* 1989, Bonadiman *et al.* 2009 and Ahmed *et al.* 2012.

Effect of sex on the Differential Count

Sex didn't show any significant effect on Heterophil (63.67 ± 0.39 and 62.52 ± 0.51 percent), lymphocytes (32.71 ± 0.32 and 33.43 ± 0.46 percent), Eosinophil counts (1.10 ± 0.16 and 1.05 ± 0.16 percent) respectively which is similar to finding of Bonadiman *et al.* 2009.

Monocyte showed Significant variation ($P < 0.05$) between the sexes. The male birds had significantly lower value (2.57 ± 0.14 percent) when compared to the female (3.00 ± 0.13 per cent) which might be due to hormonal influence between sexes and sometimes might be due to environmental variations which is contrary to finding of Bonadiman *et al.* 2009.

BIOCHEMICAL PARAMETERS

Effect of sex on the Serum Total Protein in ostrich

Sex didn't had any significant effect on Serum Total Protein. The value ranged from 3.82 ± 0.23 g/dl to 3.62 ± 0.18 g/dl in sexes which is similar to the findings of Levi *et al.* 1989, Okotie *et al.* 1992, Moniello *et al.* 2006, Chen *et al.* 2011 and Bonadiman *et al.* 2009. Contrary findings were observed by Miranda *et al.* 2008. Researcher who had studied the effect of sex on Serum Total Protein in other species such as Emu (Menon *et al.* 2013) Turkey (Szabo *et al.* 2005, Schmidt *et al.* 2010) and Pheasant (Kececi *et al.* 2009) was in contrary to the present findings, whereas similar observations were made in Chicken by Simaraks *et al.* 2004.

Effect of sex on the Serum Albumin

The value range of Serum Albumin was 2.03 ± 0.06 g/dl to 2.19 ± 0.09 g/dl in female and male ostriches respectively. The effect of sex on Serum Albumin in our study does not show any significance, which is similar to that of the findings of Okotie *et al.* 1992, Moniello *et al.* 2006 and Bonadiman *et al.* 2009. Miranda *et al.* 2008 observations were contrary to our findings. Researcher who had studied the effect of sex on Serum Albumin in other species such as Emu (Menon *et al.* 2013), Pheasant (Kececi *et al.*, 2009) Turkey (Szabo *et al.* 2005) were in contrary to the present findings.

Effect of sex on the Serum Globulin

The range of values of Serum Globulin was 1.59 ± 0.15 g/dl to 1.63 ± 0.20 g/dl in female and male birds respectively. The effect of sex on Serum Globulin in our study does not reveal any significant difference, which is in accordance to the findings of Okotie *et al.* 1992, Moniello *et al.* 2006 and Bonadiman *et al.* 2009. Contrary findings was observed by Miranda *et al.* 2008. Researcher who had studied the effect of sex on Serum Globulin in other species such as Emu (Menon *et al.* 2013), Turkey (Szabo *et al.* 2005) was in contrary to the present findings.

Effect of sex on Serum Calcium

Observed calcium values of male and female were (7.25 ± 0.30 mg/dl) and (7.66 ± 0.44 mg/dl) respectively. The role of sex in determining the level of calcium was not significantly different. However numerically, the level of calcium was higher in female than in male. Miranda *et al.* 2008 reported similar observations that the sex did not reveal any significant variations. Contrary to our findings, Quintavalla *et al.* 2001 in another experiment observed that sex had a role to play and significantly higher levels of calcium were noticed in female than the male ostriches. Similar observations were made by Moniello *et al.* 2005. Researchers observed that the effect of sex on species other than ostrich, observed that serum calcium were higher in males than female ducks (Okeudo *et al.* 2003) and Menon *et al.* 2013 also made similar observation in emu male and females.

Effect of sex on Serum Phosphorus

No significant difference was observed between phosphorus values of male and female respectively 7.13 ± 0.39 mg/dl and 6.06 ± 0.31 mg/dl respectively. Okotie - eboh *et al.* 1992 and Miranda *et al.* 2008 observed that the phosphorus level was not significantly affected by the sex which is in accordance with our results. The observation of workers of Lesser Rhea (Reissig *et al.* 2002) was that the phosphorus level was not influenced by sex, in accordance to our findings. However, Okeudo *et al.* 2003 observed that the phosphorus level was higher in drakes than the ducks. Similar findings were recorded by Menon *et al.* 2013 in emu, where the female had higher levels than the male.

Effect of sex on Serum Cholesterol

The male birds had higher cholesterol (126.52 ± 8.59 mg/dl) than the female birds (123.76 ± 7.90 mg/dl). Significant difference on Serum Cholesterol in sex in our study was not observed, which is similar to that of the findings of Levi *et al.* 1989, Moniello *et al.* 2006 and Bonadiman *et al.* 2009, whereas contrary findings was observed by Okotie *et al.* 1992 and Miranda *et al.* 2008. Researcher who had studied the effect of sex on Serum Cholesterol in other species such as Emu (Menon *et al.* 2013), Pheasant (Kececi *et al.* 2009) was in contrary to the present findings.

Effect of sex on Serum Triglyceride

Among the sex, female ostriches had higher Serum Triglyceride than the male ostriches (216.71 ± 15.35 mg/dl vs 191.00 ± 18.94 mg/dl). The effect of sex on Serum triglyceride in our study is not significant which is similar to that of the findings of Okotie - ebo *et al.* 1992, Moniello *et al.* 2006 and Levi *et al.* 1989 whereas contrary findings were observed by Durgun *et al.* 2005 and Miranda *et al.* 2008. Researcher who had studied the effect of sex on Serum Triglyceride in other species such as Emu (Menon *et al.* 2013), Pheasant (Kececi *et al.* 2009) were in contrary to the present findings.

Effect of sex on Low Density Lipoprotein

LDL value of male and female birds were 22.40 ± 2.61 mg/dl and 20.67 ± 2.22 mg/dl respectively. The effect of sex on Low Density Lipoprotein in our study was not significant which is contrary to that of the findings of Miranda *et al.* 2008. The overall average value of Low Density Lipoprotein observed in our study was 52.43 mg/dl. Lower value of 26.13 mg/dl was observed by Omid

et al.2012, whereas higher value of 134 md/dl was observed by Miranda et al. 2008.

Effect of sex on High density Lipoprotein

The female bird had higher value than the male bird (54.89 ± 5.21 mg/dl vs 50.03 ± 4.59 mg/dl). The effect of sex on High Density Lipoprotein in our study was not significant, which is contrary to that of the findings of Miranda et al. 2008.

CONCLUSION

It is hoped that the data presented in this could be useful to establish some baseline values for haematological and biochemical parameters in relation to sex in ostriches reared in captive condition in India. This could serve as an initiation for the fellow researchers also.

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Table-1. GENDER EFFECT ON SELECTED HAEMATOLOGICAL PARAMETERS OF OSTRICHES

Parameters	Mean for sex ^{NS}	
	Male (n=21)	Female (n=21)
Hb ^{NS} (g/dl)	11.02±0.17	10.78±0.12
PCV ^{NS} (per cent)	37.33±0.97	38.86±0.98
TEC ^{NS} (×10 ⁶ /mm ³)	1.72±0.02	1.74±0.01
TLC ^{NS} (×10 ³ /mm ³)	6.82±0.10	6.65±0.07
MCV ^{NS} (fl)	218.35±6.52	224.74±6.69
MCH ^{NS} (pg)	64.37±1.35	61.85±0.78
MCHC ^{NS} (g/dl)	29.81±0.68	28.13±0.70
Heterophil ^{NS} (per cent)	63.67±0.39	62.52±0.51
Lymphocyte ^{NS} (per cent)	32.71±0.32	33.43±0.46
Eosinophil ^{NS} (per cent)	1.10±0.16	1.05±0.16
Monocyte ^{NS} (per cent)	2.57 [*] ±0.14	3.00 [*] ±0.13

**- Highly significant (P<0.01), *- Significant (P<0.05) and NS- Not significant

Table-2. Gender effect on selected biochemical parameters of ostriches

Parameters	Mean for sex ^{NS}	
	Male (n=21)	Female (n=21)
Serum Total Protein ^{NS} (g/dl)	3.82±0.23	3.62±0.18
Serum Albumin ^{NS} (g/dl)	2.19±0.09	2.03±0.06
Serum Globulin ^{NS} (g/dl)	1.63±0.20	1.59±0.15
Serum Calcium ^{NS} (mg/dl)	7.25±0.30	7.66±0.44
Serum Phosphorus ^{NS} (mg/dl)	7.13±0.39	6.06±0.31
Serum Cholesterol ^{NS} (mg/dl)	126.52±8.59	123.76±7.90
Serum Triglyceride ^{NS} (mg/dl)	191.00±18.94	216.71±15.35
LDL ^{NS} (mg/dl)	22.40±2.61	20.67±2.22
HDL ^{NS} (mg/dl)	50.03±4.59	54.89±5.21

**-Highly significant (P<0.01), *- Significant (P<0.05) and NS- Not significant

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