Original Research

Effect of Age and Sex on Haematological Profile of Kadaknath Fowl Reared Under Intensive System

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Abstract

The study was designed to investigate the haematological parameters at different age groups of male and female Kadaknath fowl, maintained in the poultry unit of College of Veterinary Science & Animal Husbandry, Anjora, Durg Chhattisgarh, reared under intensive farming system using standard feeding and management practices. For this study the blood samples were taken from 15 male and 15 female birds at 8, 12, 24, 40 and 48 weeks of age. The values for packed cell volume (PCV), erythrocyte sedimentation rate (ESR), total erythrocyte count (TEC), total leucocytes count (TLC), haemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and differential leukocyte count (DLC) were assessed. Effect of age in PCV, TEC, TLC, lymphocyte, heterophill, monocyte, eosinophill, Hb, MCV, MCH and MCHC were significant ($p<0.05$). However, no significant ($p>0.05$) age difference was observed in basophill. In general all the haematological parameters showed increasing trend with advancement of age. Effect of sex was found significant for eosinophill, lymphocyte, Hb, MCHC, PCV and heterophill; and these values were higher in males than in females.

Key words: Age, Female, Haematological, Male

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Introduction

Poultry production in India has taken a quantum leap in the last four decades, emerging from an unscientific farming practice to commercial production system with state-of-the-art technological interventions. India has emerged as the third largest egg producer and fifth largest poultry meat producer

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in the world (Watt Executive Guide, 2015). This achievement has been possible due to development of high producing breeds and also due to research in feeding and management practices. In addition to the high producing commercial breeds, now a days, the focus is also on conservation, characterization and improvement of the productivity of native breeds like Kadaknath, Aseel etc. The Kadaknath breed of chicken is gaining tremendous popularity owing to its tasty meat which is believed to be associated with many medicinal qualities. This breed is native to tribal belt of Jhabua and Dhar districts of Madhya Pradesh. The breed is also called as Kalamasi, meaning a fowl with black flesh and also entire body of the Kadaknath bird is black in colour, right from comb to the claws. The breed is resistant to many diseases as compared to the commercial breeds. Kadaknath birds have higher percentage of protein, iron and haemoglobin.

Although haematological test hasn't widely been applied for diagnosis of avian diseases but these tests could be suitable diagnostic tools for monitoring healthy or sick birds in response to therapeutic regimens, and giving a prognosis to some of poultry diseases. Normal values for haematological and biochemical factors of domestic chicken have been studied earlier by different workers (Simaraks *et al.*, 2004; Pampori and Iqbal, 2007; Ladokan *et al.*, 2008; Albokhadaim *et al.*, 2012a; Elagib *et al.*, 2012), however these parameters are greatly affected by breed, sex , age, season and other environmental factors (Fudge, 2000; Kececi and Col, 2011). Indian chicken breeds have better immunocompetence, disease resistance and tropical adaptability as compared to the exotic germplasm (Kundu *et al.*, 1999). The studies on haematological parameters on indian chicken breeds, particularly on Kadaknath are very scanty. Hence the present study was aimed at bridging up this information gap.

Materials and Methods

Experiment Stock

The Kadaknath birds used for the present study were taken from the Kadaknath research unit of the poultry farm of the College of Veterinary Sci. & A.H., Anjora, Durg in Chhattisgarh state. The birds right from their hatching till the completion of the study were raised under deep litter system. The chicks were provided with starter ration (2800Kcal/kg ME and 20% CP) up to 8 weeks of age, grower ration (2700kcal/kg ME and 18% CP on calculated basis) from 9 to 20 weeks of age and layer ration (2,700 Kcal/Kg ME and 16% CP), after 20 weeks of age along with 1.1% calcium and 0.45% available phosphorus. Water was given *ad libitum.* Standard health care and management practices were followed.

Haematology

Blood samples were collected from 15 male and 15 female birds at 8, 12, 24, 40 and 48 weeks of age. Approximately 3ml blood samples were taken from jugular vein in EDTA vials for haematological study.

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Haemoglobin content of blood was estimated by Sahli's haemoglobin meter (Coles, 1986) and PCV was estimated by micro hematocrit method. erythrocyte sedimentation rate was done by wintrobe's method. Total erythrocyte count (TEC), total leucocytes count (TLC) were estimated as per the method given by Nambiar (1960) using diluting fluid recommended by Natt and Herrick (1954). For Differential leukocyte count thin blood smears were air dried, fixed in methanol for three minutes and stained with Giemsa stain for differential counts. The parameters like, MCV, MCH and MCHC were derived by the standard formulae.

Statistical Methods

ANOVA one way classification was used for testing the significance of difference due to age as per the method outlined by Snedecor & Cochran (1994) while sex effect was studied by the student's t test.

Results and Discussion

The mean haematological values along with standard errors in both the sexes of Kadaknath chicken at 8, 12, 24, 40 and 48 weeks of age for PCV, ESR, TEC, TLC, Hb, MCV, MCH, MCHC and DLC are presented in Table 1.

The values for the above haematological parameters at different age groups, pooled over the two sexes are presented in Table 2. At 24 week of age the pooled mean values (Table 2) of PCV(%), ESR(mm), TEC (million/cu.mm.), TLC (thousand/cu.mm.), lymphocyte (%), heterophill (%), monocyte (%), eosinophill (%), basophill (%), Hb (gm/dl), MCV (fl), MCH (%) and MCHC (%) were 38.15 ± 0.40, 4.04 ± 0.06, 2.97 ± 0.16, 29.8 ± 0.34, 70.70 ± 0.87, 21.95 ± 0.87, 3.60 ± 0.30, 1.75 ± 0.18, 2.00 ± 0.16, 14.29 ± 0.32, 134.98 ± 6.55, 51.33 ± 2.97 and 37.95 ± 1.00, respectively and at the 48 week of age the respective values were 41.70 ± 0.29, 4.42 ± 0.09, 2.66 ± 0.11, 26.60 ± 1.40, 72.55 ± 0.82, 20.80 ± 0.59, 2.75 ± 0.26, 2.90 ± 0.26, 2.10 ± 0.19, 17.24 ± 0.27, 161.52 ± 6.17, 66.85 ± 2.78 and 48.94 ± 3.24, respectively. Similar findings were reported by Panigrahy *et al.* (2017) in Vanraja. Likewise, Pandian *et al.* (2012) and Bora *et al*. (2017) also observed similar haematological values in Kadaknath.

Sex Effect

Significant sex effect was observed for eosinophil at 8, 12 and 48 weeks of age with females showing larger counts than the males. The present finding is in agreement with the results observed by Abdi-Hachesoo *et al.* (2011) in indigenous chicken varieties of Iran however, they differ with the findings of Sharmin and Myenuddin (2004) in indigenous chickens of Bangladesh and Simaraks *et al.* (2004) in thai indigenous chicken. The lymphocyte counts also showed significant sex effect at 12, 40 and 48 weeks of age. Contrary to the trends of eosinophil the lymphocyte counts were higher in males than in females.

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Table 1: Haematological parameters of Kadaknath chickens of different sex

	8 WEEK		12 WEEK		24 WEEK		40WEEK		48 WEEK	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
PCV (%)	24.53 ± 0.63	23.47 ± 0.74	26.53 ± 0.96	25.53 ± 0.68	37.60 ± 0.48	38.70 ± 0.62	40.27 ± 0.43^{a}	38.07 ± 0.53^{b}	42.10 ± 0.41	41.30 ± 0.40
ESR (mm)	3.44 ± 0.05	3.47 ± 0.03	3.34 ± 0.06	3.24 ± 0.04	4.15 ± 0.10	3.92 ± 0.06	4.18 ± 0.06	4.09 ± 0.05	4.45 ± 0.15	4.39 ± 0.10
TEC (million/cu.mm.)	2.50 ± 0.26	2.25 ± 0.16	2.67 ± 0.10	2.64 ± 0.15	2.96 ± 0.27	2.67 ± 0.12	2.97 ± 0.09	2.67 ± 0.09	2.99 ± 0.74	2.79 ± 0.14
TLC (thousand/cu.mm.)	19.87 ± 0.45	19.57 ± 1.47	24.43 ± 0.63	23.03 ± 0.86	26.90 ± 2.29	26.30 ± 1.76	29.13 ± 0.75	29.70 ± 0.50	29.95 ± 0.41	29.65 ± 0.56
DLC										
Lymphocyte (%)	76.53 ± 0.62	75.80 ± 0.70	75.47 ± 1.28^{a}	69.20 ± 0.57^{b}	70.80 ± 1.17	70.60 ± 1.35	71.33 ± 0.55^{a}	64.47 ± 0.84^{b}	75.40 ± 0.72^{a}	69.70 ± 0.73^{b}
Heterophill (%)	17.27 ± 0.75	17.87 ± 0.65	17.73 ± 1.08	22.47 ± 0.50	21.70 ± 1.21	22.20 ± 1.31	19.40 ± 0.68^{a}	26.87 ± 1.06^{b}	19.20 ± 0.70^{a}	22.40 ± 0.64^{b}
Monocyte (%)	2.47 ± 0.13	2.47 ± 0.19	2.73 ± 0.54	3.27 ± 0.28	3.70 ± 0.52	3.50 ± 0.34	3.80 ± 0.39	3.87 ± 0.29	3.20 ± 0.39	2.30 ± 0.30
Eocinophill (%)	1.47 ± 0.17^{a}	2.13 ± 0.24^{b}	1.67 ± 0.19^{a}	2.60 ± 0.21^{b}	3.70 ± 0.52	1.80 ± 0.25	3.33 ± 0.39	2.73 ± 0.33	2.20 ± 0.29^{a}	3.60 ± 0.3^{b}
Basophill (%)	2.27 ± 0.23	1.73 ± 0.21	2.40 ± 0.24	2.47 ± 0.24	2.10 ± 0.23	1.90 ± 0.23	2.13 ± 0.19	2.07 ± 0.25	2.10 ± 0.23	2.00 ± 0.26
Hb (g/dl)	10.95 ± 0.33	10.77 ± 0.40	12.09 ± 0.38^{a}	11.13 ± 0.27^{b}	14.86 ± 0.40	13.72 ± 1.44	16.73 ± 0.38^{a}	15.37 ± 0.32^{b}	17.90 ± 0.33^{a}	16.58 ± 0.32^{b}
MCV (fl)	115.48 ±12.46	112.50 ± 9.39	100.19 ± 3.04	101.51 ± 6.93	136.71 ± 11.74	147.21 ± 5.84	137.89 ± 5.08	144.30 ± 4.49	141.67 ± 4.50	151.30 ± 7.50
MCH (%)	52.43 ± 6.84	51.98 ± 4.11	45.98 ± 1.94	44.40 ± 3.13	54.18 ± 4.97	52.29 ± 2.73	57.37 ± 2.57	58.30 ± 2.12	60.25 ± 2.16	66.45 ± 2.50
MCHC (%)	46.59 ± 2.19	44.39 ± 2.18	46.22 ± 1.95	43.94 ± 1.39	39.60 ± 1.25^{a}	35.59 ± 1.43^{b}	41.57 ± 0.90	40.50 ± 1.02	53.05 ± 3.50^{a}	40.17 ± 0.81^{b}

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

Table 2: Haematological parameters of Kadaknath chickens of different age

S. No.		8 weeks	12 week	24 weeks	40 week	48 week
		Mean & SE	**Mean & SE**	**Mean & SE**	**Mean & SE**	**Mean & SE**
1	PCV (%)	24.00 ± 2.67a	26.03 ± 0.58b	38.15 ± 0.40c	39.17 ± 0. 93c	41.70 ± 0.29d
2	ESR (mm)	3.45 ± 0.15b	3.29 ± 0.04a	4.04 ± 0.06c	4.13 ± 0.04c	4.42 ± 0.09d
3	TEC (million/cu.mm.)	2.38 ± 0.83a	2.65 ± 0.09b	2.81 ± 0.16b	2.82 ± 0.09b	2.89 ± 0.11b
4	TLC (thousand/cu.mm.)	20.32 ± 2.19a	23.73 ± 0.54b	26.60 ± 1.40c	29.42 ± 0.45d	29.8 ± 0.34d
5	**DLC**					
a	Lymphocyte (%)	76.17 ± 2.53c	72.33 ± 0.90b	70.70 ± 0.87b	67.90 ± 0.81a	72.55 ± 0.82b
b	Heterophill (%)	17.57 ± 2.69a	20.10 ± 0.73b	21.95 ± 0.87 bc	23.13 ± 0.93c	20.80 ± 0.59b
c	Monocyte (%)	2.47 ± 0.63a	3.00 ± 0.30b	3.60 ± 0.30 bc	3.83 ± 0.24c	2.75 ± 0.26a
d	Eocinophill (%)	1.80 ± 0.85a	2.13 ± 0.16a	1.75 ± 0.18a	3.03 ± 0.26b	2.90 ± 0.26b
e	Basophill (%)	2.00 ± 0.87	2.43 ± 0.16	2.00 ± 0.16	2.10 ± 0.15	2.10 ± 0.19
6	Hb (g/dl)	10.86 ± 1.39a	11.61 ± 0.24b	14.29 ± 0.32c	16.05 ± 0.28d	17.24 ± 0.27e
7	MCV (fl)	113.99 ± 43.09a	100.87 ± 3.76a	141.96 ± 6.49c	141.10 ± 3.38c	145.39 ± 4.73c
8	MCH (%)	52.20 ± 21.88a	45.19 ± 1.82a	53.23 ± 2.77a	57.83 ± 1.64b	59.84 ± 1.66b
9	MCHC (%)	45.49 ± 8.69c	45.08 ± 1.20bc	37.59 ± 1.31a	41.03 ± 0.67ab	46.12 ± 2.20c

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

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Higher values of lymphocytes in males were also reported by Abdi-Hachesoo *et al.* (2011) and Panigrahy *et al.* (2017). The males and females differed significantly for heterophill counts at 40 and 48 weeks of age, the females being on the higher side. Present findings are in line with those of Abdi-Hachesoo *et al.* (2011) and Panigrahy *et al.* (2017). Total TEC were higher in males than that of females. This is supported by the observation of Kundu *et al.* (2013), Elagib and Ahmed (2011), Albokhadaim (2012b) and Isidahomen *et al.* (2011). Higher TLC count in males than that of females is similar to the report of Abdi-Hachesoo *et al.* (2013), Albokhadaim *et al.* (2012a) and Isidahomen *et al.* (2011). The PCV was found significantly higher in males at 40 week of age. Similar observations were made by Panigrahy *et al*. (2017), Addass *et al.* (2012), Albokhadaim (2012b) and Isidahomen *et al.* (2011). The Hb was recorded significantly higher in males at 12, 40 and 48 weeks of age. Similar results have been noted by Panigrahy *et al*. (2017), Albokhadaim (2012b) and Elagib and Ahmed (2011). The MCHC had significantly higher values in males at 24 and 48 weeks of age. In present study MCV, MCH and MCHC had higher values in males. Contrary to this report Panigrahy *et al*. (2017) and Elagib and Ahmed (2011) found higher values in females. TLC values were higher in males than females which are supported with the findings of Bora *et al.* (2017).

Effect of Age

Significant age effect ($p<0.05$) were observed for all the haematological parameters except for basophil. All the haematological parameters showed an increasing trend with advancement of age. Similarly Islam *et al.* (2004) also reported the increasing trend of Hb, PCV and TEC with age. In an another study Elagib and Ahmed (2011) and Islam *et al.* (2004) also reported increasing trend of Hb concentration with the advancing age.

In present study increasing value of TEC was reported with advancement of age which is similar to the report of Islam *et al.* (2004) and Praveen *et al.* (2017). The PCV found in our study agrees well with the range (42-52%) as reported by Panigrahy (2017) and Bora *et al.* (2017) and with report in indigenous chicken in Iran by Bahman *et al.* (2011), Abdi-Hachesoo *et al.* (2013) and Parveen *et al.* (2107). Lower PCV at young age and increasing trend with the advancement of age in this study corresponds to the findings of Praveen *et al.* (2017). However, contradictory findings of ESR were reported by Islam *et al.* (2004). The higher PCV in present study might be because of hemoconcentration due to dehydration by effect of high temperature (Benjamin, 1985). MCV values were reported in the range from 90 to 140 in chicken by Jain (1993) which corroborates well with the present findings. The present finding of MCV, MCH and MCHC were higher to the findings of Islam *et al.* (2004). Praveen *et al.* (2017) reported decreasing values of haematological parameters with advancement of age. Percentages of basophill were

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lower, than reference range as reported by Jain (1993) and similar finding were also observed by Bora *et al.* (2017). However, lymphocyte, heterophil and eosinophil were similar to the findings of Jain (1993). In contrast to present study Bora *et al.* (2017) reported lower values of lymphocyte and monocyte. Heterophill was lower to the finding of Bora *et al.* (2017) where as similar eosinophil value was recorded. Haematological values were comparatively higher in Kadaknath breeds as compared to other breeds like Fayoumi, Aseel and Local chicken (Islam *et al.*, 2004), RIR, Desi and Fayoumi (Praveen *et al.*, 2017) and Aseel and Rajshri (Bora *et al.*, 2017). These variations might be affected by diurnal fluctuations or changes in daily physical and metabolic activities (Sanni *et al.*, 2000, Piccione *et al.*, 2001, 2005).

Conclusion

This study revealed that Kadaknath breed showed variation of haematological parameters with sex and age of the birds. When compared with the reports of other breeds available in the literature, it is discovered that the Kadaknath breed excels in haemoglobin and TEC which is indicative of better vitality and better resistance of the breed to diseases. In conclusion present study provides baseline data of haematological parameters in Kadaknath chickens which could be suitable diagnostic tool for monitoring health.

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