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Comparative Evaluation of Hematological, Biochemical and Blood Morphological Variables between Omani Chicken and Cobb 500 Boiler Breeds at Three Different Age Intervals

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ABSTRACT

One-day-old chicks were separately allocated to two groups, indigenous and commercial strains of chickens. Each strain was divided into fifteen replicates of six chicks per replicate: a total of 90 chicks per strain. An experimental medication-free diet, primarily composed of corn-soybean meal, was given to the chicks. Blood samples were collected at 1, 3**,** and 5 weeks of age for hematological, serum biochemistry and morphometry assessment of blood cells of both breeds. Hematological analysis involved some parameters for red blood cells and different white blood cells. For serum chemistry, total protein, certain enzymes, electrolytes, urea, and glucose were assessed. It was noted that age and breed influenced hematological values in the two breeds. In contrast to Cobb 500, local breed had values in an increasing trend with age, specifically for RBCs, Hb, and PCV. As for WBC, both breeds had an increasing trend in heterophils count with age but not for monocytes or lymphocytes which tended to decrease. The two breeds did not differ much in serum biochemistry as they both showed a trend for increase in aspartate aminotransferase and CK level with age. Moreover, both age and breed had a significant effect on the length, width, and area of erythrocyte and thrombocyte**.** This study revealed a significant impact of age on all hematological parameters in both local Omani and Cobb 500 broiler chickens and could furnish markers suggesting the health status of these breeds.

Key words: Chickens, Age, Blood, Cells, Morphology, Oman, Cobb 500.

INTRODUCTION

More than 80% of impoverished households in developing countries of the world rely heavily on local chicken production for their meat and eggs, making it a crucial component of human subsistence (Shaat and Al-Habsi 2016). Local Omani chicken represents a long-established indigenous chicken breed in the Sultanate of Oman, particularly in rural areas. As livestock farming practices continue to evolve in Oman, the production of local "indigenous" chickens is emerging as a major activity that offers food security and income generation opportunities for numerous rural families (Al-Qamashoui et al. 2014). Omani chickens are considered dual-purpose birds, exhibiting significant variations in plumage and shank color, comb types, and other observable traits within and between populations in Oman. Additionally, there is a noticeable disparity in body weight between males and females, with males weighing around 1.3kg and females weighing approximately 1.1kg (MAF 2018). However, The Cobb 500 broiler chickens are a globally recognized breed known for their adaptability to warmer climates, fast growth rate, and ability to thrive on affordable low-density diets (Dessie et al. 2017). As a result, their popularity has soared in Oman, enabling poultry farmers to economize significantly on feed prices. Therefore, it is imperative to establish a baseline for blood profiles under natural conditions at different ages and rearing system for gauging improvement in productivity (Parveen et al. 2017). Approximately 129 thousand tons of broiler chickens are produced annually in the Sultanate, with around 54% of the production being consumed

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domestically. However, to meet the poultry meat demands of the population, the Sultanate heavily relies on imports (MAF 2018).

Hematological and serum biochemical have been reported to provide valuable information in diagnosing the various pathological and metabolic disorders and immune status of birds (Gallo et al. 2015; Rasheed et al. 2017; Duah et al. 2020; Okenyi et al. 2022; Sallam et al. 2023). Ifelayo et al. (2020) and Maoba et al. (2021) conducted multiple studies to assess the hematological parameters in various poultry genotypes. However, these studies have produced inconsistent findings. In our knowledge, this is the first study to assess of blood cells indices of local and commercial breed of chickens at different age period in Oman. The main aim of this study was to compare hematological as well as biochemical indices and cellular morphology of two strains of chickens reared in closed house system at the 1st, 3rd and 5th week of age.

MATERIALS AND METHODS

Birds Housing and Management

A total of 180 a-day old chicks of two different chicken breeds (90 each), namely native and Cobb 500, were procured from a commercial hatchery. Chicks were weighed individually on the day of arrival and those with an extreme body weight difference were excepted. Thirty suspended wire cages with 6 birds each were randomly allotted to ensure to achieve an approximately uniform average initial weight among all cages. The shed temperature was initially maintained at 33°C and gradually reduced by 2°C every week to reach a constant 22ºC, under relative humidity of about 60% maintained throughout the experimental period. The light cycle was 23 hours of light and 1 hour of darkness. Food and water were given freely and without restriction. Chicks were fed a standard starter diet formulated to meet the National Research Council (NRC) requirements during the experimental period of 35 days. Each strain of chicken had 15 replicates, with 6 birds in each replicate cage, resulting in a total of 90 birds per strain. The allocation of birds to replicate cages was randomized. Birds were vaccinated against Newcastle (at Day 5 and Day 22) and Gumboro (at Day 12) diseases. The vaccinations were administered orally in the drinking water of the chickens.

Blood Collection

At 1st, 3rd, and 5th weeks of age, one bird per cage was selected randomly from each strain for blood collection. Blood samples were obtained by puncturing the wing vein using a 23-gauge needle and collecting approximately 4 ml of blood in 5mL disposable syringe. The feathers round the wing vein were plucked and sterile alcohol wipes were used to visualize and dilate the vein before bleeding. Two milliliters of blood were collected and promptly transferred to ethylenediaminetetraacetic acid (EDTA) -treated hematological tubes for analysis of blood cells, while remaining 2 ml were transferred tubes without anticoagulant for serum biochemistry. The serum was separated from the plasma by centrifugation of the clotted blood at 4000 rpm for 15 minutes and stored at -20°C until further analysis.

Hematological Indices

Blood films were prepared so that each type of cell could be separately visualized. Then Wright-Giemsa staining method was used to fix and stain these. A hemocytometer was used to manually count the total erythrocytes and total leukocytes (Campbell 1995). The microhematocrit method was employed to determine packed cell volume (PCV) and the cyanmethemoglobin method was used to determine the hemoglobin concentration (HB) by following the method described by Coles (1986). The cell indices were calculated following the procedures described by Ritchie et al. (1994).

Serum and Biochemistry Studies

Cobas C111 Machin serum chemistry analyzer Roche (Diagnostics, Germany) was used to conduct serum biochemistry. These parameters included creatinine (CRE), total serum protein (TP), albumin, urea, serum electrolytes, glucose (GLU) and the liver enzyme Aspartate aminotransferase (AST).

Cellular Morphological Studies

Blood cells were measured under light microscope at 100X magnification employing a computer microscope image analysis (cellSens Standard program). Erythrocyte, thrombocyte, monocyte, heterophil, lymphocyte and eosinophil were determined, examined in terms of their morphology, and their size. The shape and dimensions were measured in micrometers for length, width, and area. Each blood film was evaluated using four cells in total, with a total of 60 measurements for each cell type per chicken strain.

Statistical Analysis

Analysis of variance (ANOVA) was carried out to test the impact of breed and age on hematology, serum biochemistry and cellular morphology using the SAS statistical program package's General Linear Models (SAS 2001). To determine differences, the least significant difference procedure was utilized, and if the interaction between treatments was not significant ($P>0.05$), it was removed from the model.

RESULTS

All Birds Remained Healthy Under Steady Experimental Conditions throughout Sampling and Analysis

Result of the mean of hematological values of broiler and Omani chickens' breed at different ages was shown in Table 1. Variations in some red blood cell parameters (RBC, HB and PCV) were observed between 1st and 5th week in Omani and Cobb 500 breeds. The RBC counts of Omani chicks remained significantly high ($P <0.05$) in comparison **to** n RBC counts of Cobb 500 chicks at all studied intervals. The hematological parameters except HB differed significantly ($P<0.05$) across age periods. Notably, as the two breeds age their RBC, Hb, and PCV levels increased, with the highest value of PCV at 3rd week for both breeds. The MCV concentration showed a significantly higher value ($P<0.0001$) at 1st week in both breeds than at 3rd and 5th weeks. The lowest MCV values were observed at week 3 for both breeds. MCH

concentration for 1st week was significantly higher (P<0.0001) than values at 5th week for both Omani and Cobb 500 breeds (54.76 and 52.58pg, respectively). MCHC value was significantly higher (P<0.0001) at 1st week for both Omani and broiler breeds. However, there was no significant difference between 3rd and 5th week in the MCHC values for broiler chicken (3.10g/L): whereas there was a significant difference between 3rd and 5th week in the MCHC value of Omani chicken (3.08 and 3.11g/L, respectively), with week 5 showing a higher MCHC value than that at week 3.

The leukocyte component differed significantly with age and breed (P<0.05). As shown in Table-2, WBC count increased with age in both Cobb 500 and Omani breeds. In both breeds, heterophils increased significantly with age, unlike monocytes and lymphocytes, which decreased with age. For eosinophil, the highest value was observed in the 3rd week and the lowest in the 1st week in Cobb 500 breed, whereas for the Omani breed the value decreased with progress in the age.

The Omani breed's blood cellular elements morphology shown in Table 3 were similar to those of the Cobb 500 broiler breed (Fig. 1 and 2)**.** Fig. 1A and 2A shows heterophils with their large size, characteristic segmented nucleus, and pinkish cytoplasmic granules. However, there was no significant difference in the length, width and area of these cells through week 1,3, and 5 of age for both breeds. Nonetheless, there was a

Table 1: Hematological values of Omani and Cobb 500 broiler chickens at different age periods

Parameters	Breed						SEM	Significance	
	Broiler			Omani					
	Age			Age					
	Week 1	Week 3	Week 5	Week 1	Week 3	Week 5		Breed	Age
RBC (×10^{6}rbc/cu mm)	1.62^{c}	2.33^{ab}	2.24^{b}	1.78^{c}	2.50^{a}	2.29^{ab}	0.02	*	***
Hb (g/dL)	8.79^{a}	9.87^{a}	9.91^{a}	9.28^{a}	9.69^{a}	9.77^{a}	2.01	NS	NS
PCV (%)	27.87^{c}	31.87^{ab}	32.00^{ab}	29.67^{bc}	31.20^{ab}	33.71^{a}	2.94	NS	***
MCV (fL)	173.36^{a}	138.31^{c}	145.51^{bc}	168.13^{ab}	126.57^{c}	138.13^{c}	1.00	NS	***
MCH (pg)	54.76^{a}	42.87^{c}	45.06^{bc}	52.58^{ab}	39.29^{c}	42.93^{c}	0.86	NS	***
MCHC (g/L)	3.16^{a}	3.10^{bc}	3.10^{bc}	3.13^{ab}	3.08^{c}	3.11^{bc}	0	NS	***

SEM: Standard error of mean, ***P<0.0001, *P<0.05, NS: Not significant, WBC: White blood cell, RBC: Red blood cell counts, HB: Hemoglobin, PCV: Packed cell volume, MCH: Mean corpuscular hemoglobin, MCV: Mean corpuscular volume, MCHC: Mean corpuscular hemoglobin concentration.

Table 2: White blood cell profile of Omani and Cobb 500 chickens at different age periods

Parameters	Breed						SEM	Significance	
	Broiler			Omani					
	Age			Age					
	Week 1	Week 3	Week 5	Week 1	Week 3	Week 5		Breed	Age
WBC (×10^{3}wbc/cu mm)	23.47^{ab}	24.16^{ab}	29.3^{a}	20.53^{b}	28.95^{ab}	37.28^{a}	0.02	NS	**
Heterophils	6.80^{d}	25.27^{b}	36.53^{a}	6.67^{d}	16.60^{c}	28.00^{b}	2.01	**	***
Lymphocytes	74.67^{a}	62.33^{bc}	55.33^{c}	67.53^{ab}	74.47^{ab}	66.07^{abc}	2.94	*	*
Monocytes	14.93^{a}	6.53^{b}	3.53^{b}	16.14^{a}	5.33^{b}	2.73^{b}	1.00	NS	***
Eosinophils	3.53^{a}	5.87^{a}	4.60^{a}	3.93^{a}	3.53^{a}	3.20^{a}	0.86	NS	NS
Basophils	0	0	0	0	0	0	0		

SEM= standard error of mean. NS= Not significant, ***P<0.0001, **P<0.001, *P<0.05.

Table 3: Cellular measurements of blood cells of Omani and Cobb 500 chickens at different age periods

Parameters		Breed						SEM	Significance	
		Broiler			Omani					
		Age			Age					
		Week 1	Week 3	Week 5	Week 1	Week 3	Week 5		Breed	Age
Heterophils	L.(µm)	13.49^{a}	12.62^{a}	13.09^{a}	13.03^{a}	13.05^{a}	12.36^{a}	0.30	NS	NS
	W.(µm)	11.59^{a}	11.15^{a}	11.23^{a}	11.16^{a}	11.38^{a}	10.69^{a}	0.27	NS	NS
	A.(µm2)	129.34^{a}	120.42^{a}	121.19^{a}	111.40^{a}	122.86^{a}	111.21^{a}	5.17	*	NS
Lymphocytes	L.(µm)	12.07^{a}	11.45^{ab}	10.90^{b}	11.81^{ab}	11.28^{ab}	10.97^{b}	0.26	NS	**
	W.(µm)	12.31^{a}	9.74^{a}	9.66^{a}	10.31^{a}	9.83^{a}	9.44^{a}	0.85	NS	NS
	A.(µm2)	122.45^{a}	93.34^{a}	89.54^{a}	97.24^{a}	92.87^{a}	85.67^{a}	10.74	NS	NS
Monocytes	L.(µm)	15.17^{a}	14.53^{a}	17.82^{a}	14.39^{a}	14.79^{a}	14.07^{a}	1.23	NS	NS
	W.(µm)	13.19^{a}	12.21^{a}	13.14^{a}	12.64^{a}	12.88^{a}	12.08^{a}	0.30	NS	NS
	A.(µm2)	159.87^{a}	145.01^{a}	160.17^{a}	140.80^{a}	159.06^{a}	142.53^{a}	6.18	NS	NS
Eosinophils	L.(µm)	13.33^{a}	12.78^{a}	12.47^{a}	13.09^{a}	12.85^{a}	12.22^{a}	0.31	NS	*
	W.(µm)	11.50^{a}	28.73^{a}	10.94^{a}	36.61^{a}	33.83^{a}	10.32^{a}	15.29	NS	NS
	A.(µm2)	121.85^{a}	115.81^{a}	117.32^{a}	144.73^{a}	120.76^{a}	106.86^{a}	4.62	NS	NS
Erythrocytes	L.(µm)	11.57^{a}	10.94^{ab}	10.63^{bc}	11.05^{ab}	10.68^{b}	10.01^{c}	0.15	**	***
	W.(µm)	6.00^{b}	5.97^{b}	5.93^{b}	6.42^{a}	6.21^{ab}	6.15^{ab}	0.09	**	NS
	A.(µm2)	56.95	53.39	51.90	57.48	54.65	50.08	1.00	NS	***
Thrombocytes	L.(µm)	5.50^{a}	4.61^{b}	4.47^{b}	5.71^{a}	5.31^{a}	4.35^{b}	0.13	*	***
	W.(µm)	4.73^{ab}	3.75^{c}	3.76^{c}	5.06^{a}	4.38^{b}	3.56^{c}	0.13	*	***
	A.(µm2)	22.20^{ab}	14.67^{c}	14.21^{c}	24.06^{a}	19.70^{b}	12.96^{c}	0.88	*	***

L=Length, W= Width, A= Area, SEM= standard error of mean. NS= Not significant, ***P<0.0001, **P<0.001, *P<0.05.

significant difference (P<0.05) between Omani and Cobb500 breeds in area, with that of broiler being higher than that of Omani breed. The lymphocytes with their known morphological characteristics, were similar in both Omani and Cobb 500 breeds (Fig. 1B and 2B). At week 1 in both breeds, the length was more significant (P<0.001) than at 3rd and 5th week of age, with no noteworthy variations observed in the remaining indices. The monocytes as they appear in Fig. 1C and 2C were also similar in both Omani and Cobb 500 breeds**.** The eosinophils with their characteristic features had similar morphological characteristics in both breeds (Fig. 1D and 2D). No remarkable alteration was seen detected in the length, width, or area concerning either breed or age. As for basophils**,** they were rarely seen in the blood of chicken based on their identification with single nucleus, and highly basophilic specific granules occupying the cytoplasm (Fig. 1E and 2E). Thrombocyte (Fig. 1F and 2F) were similar in both breeds but there was significant difference in the length, width, and area values among different age groups. However, these values were higher at 1st week than at the 3rd and 5th week, with tendency of the Omani breed to higher overall values. Nonetheless, both breed and age influenced the previous three measurements. Erythrocyte measurements reflect a change in shape with progress in the age for both breeds apparent from decreasing pattern of values.

The serum biochemistry profile of the two breeds is shown in Table 4. With advancing age, there was a noteworthy increase in albumin (P<0.0001), aspartate aminotransferase (AST) (P<0.0001), and creatine kinase (CK) (P<0.001) levels in both the Cobb 500 and Omani breeds. On the other hand, no significant effect of breed and age was observed on urea or total protein (TP) values. Glucose values for Omani breed were significantly higher across all age period in comparison to Cobb 500.

Table-5 presented serum electrolytes values in Omani and Cobb 500 breeds. In Cobb 500 breed sodium significantly increased with progress in the age whereas potassium significantly decreased (P<0.05). Similarly, calcium significantly increased whereas phosphorous significantly decreased (P<0.0001). However, it was observed that chloride tended to decrease after a higher value at the 3rd week followed by a drop at the 5th week. Magnesium showed significantly highest value at the 1st week followed by a decrease at week 3 then a rise at 5th week (P<0.0001). In Omani breed sodium and potassium significantly increased at week 3 to its highest value then decreased at the 5th week; however, week 1 showed the lowest sodium and potassium values when compared with 5th week values, which was in an opposite in trend to chloride, the latter being significantly lower at week 5 compared with week 1. Calcium value observed at week 3 was the lowest compared with values at the 1st and 5th week.

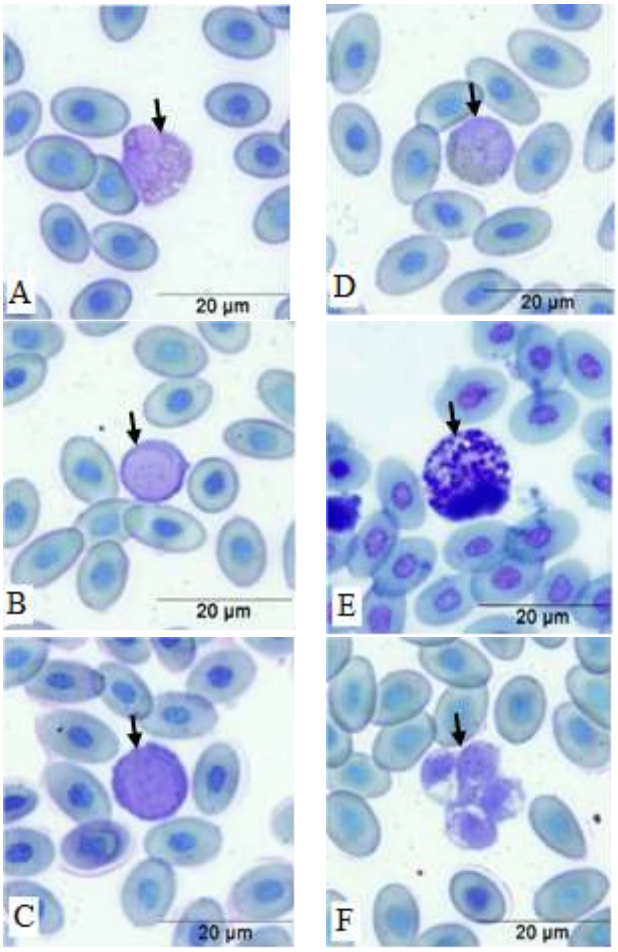

Fig. 1: Microscopic appearances of blood cells of Cobb 500 broiler chickens - arrow indicate blood cell type at 100 X: (A) Heterophil (B) Lymphocyte (C) Monocyte (D) Eosinophil (E) Basophil and (F) thrombocyte.

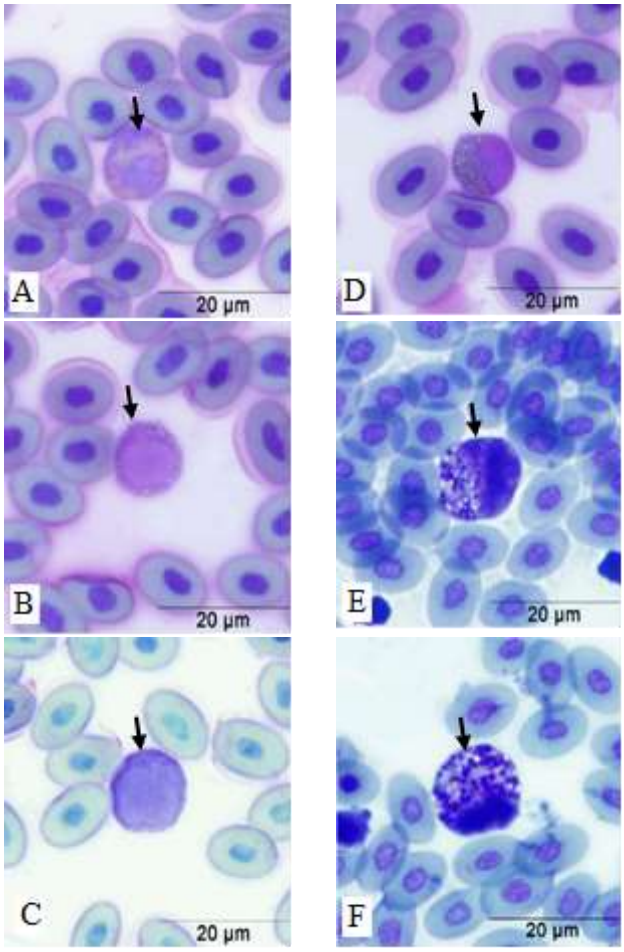

Fig. 2: Microscopic appearances of blood cells of Omani chickens - arrow indicate blood cell type at 100 X: (A) Heterophil (B) Lymphocyte (C) Monocyte (D) Eosinophil (E) Basophil and (F) thrombocyte.

Table 4: Serum chemistry of Omani and Cobb 500 broiler chickens at different age periods

Parameters	Breed						SEM	Significance	
	Broiler			Omani					
	Age			Age					
	Week 1	Week 3	Week 5	Week 1	Week 3	Week 5		Breed	Age
Albumin(g/dL)	1.29^{d}	1.51^{c}	1.77^{a}	1.44^{c}	1.57^{bc}	1.68^{ab}	0.03	NS	***
Urea (g/dL)	3.98^{a}	3.21^{a}	3.77^{a}	3.64^{a}	3.53^{a}	3.31^{a}	0.30	NS	NS
TP(g/dL)	3.39^{a}	3.20^{a}	3.37^{a}	3.28^{a}	3.62^{a}	3.26^{a}	0.19	NS	NS
Glucose(mmol/L)	10.74^{b}	10.99^{b}	10.86^{b}	12.86^{ab}	14.49^{a}	11.94^{b}	0.6831	***	NS
AST (IU/L)	194.59^{bc}	225.80^{abc}	276.47^{a}	184.23^{c}	192.24^{bc}	259.00^{ab}	16.38	NS	***
CK (U/L)	2430.79	3994.29^{ab}	5422.99^{a}	1862.65^{b}	1571.50^{b}	3708.46^{ab}	596.24	*	**

SEM= standard error of mean. NS= Not significant, ***P<0.0001, **P<0.001, *P<0.05. AST: Aspartate amino transaminase, GGT: Gamma-glutamyl transferase, TP: Total protein, CK: Creatine Kinase

Table 5: Serum electrolytes of Omani and Cobb 500 broiler chickens at different age periods

Parameters	Breed						SEM	Significance	
	Broiler			Omani					
	Age			Age					
	Week 1	Week 3	Week 5	Week 1	Week 3	Week 5		Breed	Age
Sodium	126.14^{b}	139.50^{ab}	150.01^{a}	135.61^{ab}	155.49^{a}	138.08^{ab}	5.53	NS	*
Calcium	2.21^{d}	2.53^{bc}	3.32^{a}	2.76^{b}	2.35^{cd}	3.60^{a}	0.07	**	***
Potassium	5.31^{a}	4.92^{a}	3.19^{a}	3.71^{a}	4.96^{a}	3.39^{a}	0.53	NS	*
Chloride	101.59^{a}	127.12^{a}	110.19^{a}	108.21^{a}	127.65^{a}	93.95^{a}	10.59	NS	NS
Magnesium	1.28^{a}	0.79^{c}	0.96^{b}	1.02^{b}	0.98^{b}	0.91^{bc}	0.04	NS	***
Phosphorous	2.57^{ab}	2.25^{b}	1.77^{c}	2.71^{a}	2.41^{ab}	2.20^{bc}	0.11	*	***

SEM= standard error of mean. NS= Not significant, ***P<0.0001, **P<0.001, *P<0.05.

DISCUSSION

This study revealed a relationship between age and hematological profile of broiler Cobb 500 and Omani breed. Our study showed that the RBCs count of both breeds of chickens increased with age which can be attributed to dietary effect as fully grown birds consume more feed than younger ones (Hong et al. 2021). The RBC values reported in the current study were within the physiological limits reported by (Mohanty and Gayatri 2020). Though PCV increased with chicken's age, a decrease or increase in RBC did not affect the PCV which is in concordance with previous records (Talebi et al. 2005; Onyishi et al. 2017). The present results showed no difference between the two breeds in Hb concentration which increased in the same pattern as for PCV with values in agreement with those reported in previous studies (Orawan and Aengwanich 2007; Mohanty and Gayatri 2020) and coinciding with increase in RBCs count. The MCH value in the current study decreased with age which agrees with previous records showing lower values in older than younger chickens (Islam et al. 2004; Trincă et al. 2012). Similar observations were obtained with MCHC values which varied significantly with age and the MCHC values found in this study were lower than those reported in earlier studies (Islam et al. 2004; Talebi et al. 2005). The MCV, MCH, and MCHC values were used to estimate the mean size of red blood cells, quantify the hemoglobin content per blood cell, and determine the hemoglobin amount in relation to the size of erythrocyte cell (Bounous and Stedman, 2000). The findings of this investigation indicated that all the assessed hematological indices fell within the normal range (Baudouin et al. 2021; Lugata et al. 2022)

With increasing age, total WBC counts, heterophils, eosinophils and basophils were significantly increased ($P < 0.05$) whereas lymphocytes and monocytes count decreased with the age of both breeds. The highest significant ($P<0.05$) values of heterophil counts were obtained in Cobb 500 chickens. However, Omani strain had the highest significant ($P<0.05$) values for of the total WBC count and lymphocytes counts at 5 weeks of age. Unlike heterophils and lymphocytes, monocytes count was affected only by age, showing decrease in number with advancing age. Our results are similar to those reports in literature (Simaraks et al. 2004; Orawan and Aengwanich 2007; Tufan and Ramazan 2009). The eosinophils percentage was age- and breed-independent and ranged from 3-5% for both breeds which is in agreement with other studies (Orawan and Aengwanich 2007; Tufan and Ramazan 2009). Since the hematological parameter values obtained in this study fell within the anticipated range for typical chicken growth, the data obtained from both the red and white fractions of birds can serve as reference values for the Cobb 500 broiler and Omani breed.

Heterophils and lymphocyte values were affected by both age and breed. Omani chicken had a higher lymphocytes percentage compared to Cobb 500. Unlike monocytes count which was affected only by age, showing decrease in number with advancing age. The eosinophils percentage was age- and breed-independent and ranged from 3-5% for both breeds. The results obtained agree with different breeds of tested chickens namely: Thai indigenous chickens as reported by Simaraks et al. (2004), broiler strains: Marshall, Rose and Anak breed as reported by Rasheed and Olusegun (2017), indigenous Vanaraja chicken and broiler chicken as reported by Mohanty and GayatriAcharya (2020). The analysis of blood cell features showed that the morphology of erythrocytes and leukocytes, including heterophils, lymphocytes, monocytes, eosinophils, basophils, and thrombocytes, was comparable between the two strains of chickens. No discernible disparities were

detected between the two chicken breeds. The findings pertaining to blood characteristics are consistent with earlier investigations conducted (Tadjalli *et al.* 2003; Orawan and Aengwanich 2007).

There were significant breed and age differences during the serum biochemical indices measured, with age advancing, serum total protein, serum albumin, glucose, AST and CK significantly increased. As the age increases, the Omani chickens showed highest values for serum albumin and glucose whereas AST and CK values were higher in Cobb 500. Similarly, electrolytes were not significantly affected by breed of chicken such as Sodium, Potassium, Chloride and Magnesium though these were significantly affected by age, excluding Chloride. Other electrolytes such as Calcium and Phosphorous were significantly affected by both age and breed. Notably In both breeds Magnesium and Phosphorous decreased with age. Previous research has documented alterations in blood chemistry in relation to age and breed of chickens. Specifically, a number of investigations (Tufan and Ramazan 2009; Kawasaki et al. 2018; Livingston et al. 2020) have highlighted a rise in broiler plasma levels of phosphorus, aspartate aminotransferase, Creatine Kinase, and total protein with increasing age.

Conclusion

This study is the first to examine the influence of breed and age across three time points on multiple blood parameters in both indigenous Omani and commercially bred broiler chickens fed an identical diet. Although many blood indices depended on age and breed, caution must be exercised when interpreting our findings. Therefore, the data from the haematological and serum biochemical indices obtained can be considered reference values for indigenous Omani and broiler Cobb 500 chickens under local conditions.

Author contributions

WAM conceived, designed the experiments, project administration, funding acquisition, analyzed the data and wrote the original draft; SKA performed the experiment, sample collections, prepared Figures/Tables, and draft preparation; HME, HA, YE and EHJ supervision, designed the experiments, reviewed and edited the draft, KA and AA methodology. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest Statement:

The authors declare that they have no conflict of interest.

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