

Blood cell morphometry and leukocyte-thrombocyte profile of indigenous chicken Sikhar of Mizoram

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Sikhar bird is one of the desi/local type of chicken whose home tract is in different parts of Mizoram, India. Sikhar chicken is comparatively small in size as compared to other indigenous chicken (Mayengbam *et al.* 2018). Mayengbam *et al.* (2017). indicated resemblance of erythrocyte indices of Sikhar chicken to indigenous chicken and some wild birds. There is, however, no data available on blood cell morphometry, leukocyte and thrombocyte picture of indigenous chicken Sikhar of Mizoram. The present study revealed age wise variation in size of erythrocyte, leukocyte and thrombocyte, and number of leukocyte and thrombocyte of Sikhar chicken.

The study was carried out on Sikhar bird of Mizoram reared in the backward rearing system where the climate is tropical monsoon type. A few drops of blood were collected from wing veins of 5 different groups, viz. Gr 1 (2 months old), Gr 2 (4 months old), Gr 3 (6 months old), Gr 4 (8 months old) and Gr 5 (10 months old). Each group comprised 12 birds of either sexes. The body weight recorded were 217.92 ± 7.11 , 484.67 ± 21.69 , 728.33 ± 27.38 and $1,134.20 \pm 69.58$ g in groups 1, 2, 3, 4 and 5, respectively (Mayengbam *et al.* 2017).

Total leukocyte count (TLC), total thrombocyte count (TTC) and differential leukocyte (DLC) were done by using standard procedures (Wakenell 2010). Morphometry of blood cells, viz. erythrocytes, leukocytes and thrombocytes was done while performing DLC by using Carl Zeiss trinocular microscope. The recorded pictures were used to measure the length and width of erythrocyte, lymphocyte, heterophil, monocyte, eosinophil, basophil and thrombocyte by using ZEN 2012 software. Recorded data were subjected to one-way ANOVA for statistical significance followed by Duncan's post hoc multiple comparisons to evaluate the differences between different age groups on all the parameters under the study and $P < 0.05$ was accepted as statistically significant.

The morphometric records of blood cells, viz.

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erythrocyte, leukocytes – lymphocyte, heterophil, monocyte, eosinophil, basophil and thrombocyte are presented in Table 1. The TLC, TTC and DLC of Sikhar birds are presented in Table 2. Blood smear images stained with Leishman stain and observed under $100\times$ oil immersion microscope are presented in Fig. 1.

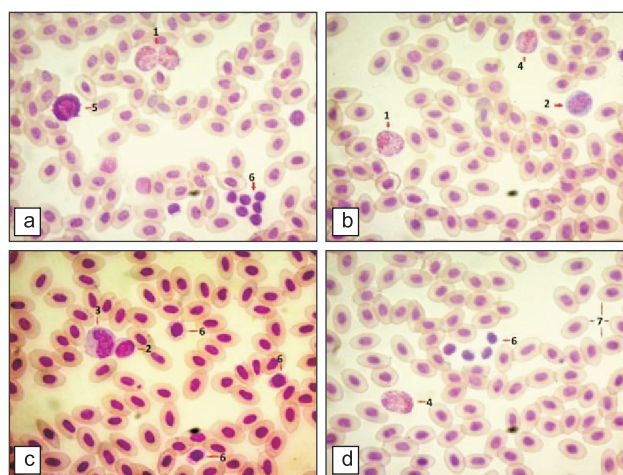


Fig. 1a-d. Peripheral blood smear of Sikhar chicken stained with Leishman's stain (1, heterophil; 2, lymphocyte; 3, monocyte; 4, eosinophil; 5, basophil; 6, thrombocyte; and 7, erythrocyte).

The length and width of erythrocytes of Sikhar chicken was in lower ranges as compared to that of local chicken of Kashmir (Pampori and Iqbal 2007). When the size was compared to that of broilers, Sikhar had similar range in length and higher range in width as compared to other indigenous chicken (Nawaczewsky and Kontecka 2012). The differences could be due to adaptation at different levels of altitude in Kashmir (1850 m above sea level) and Mizoram (1130 m above sea level) as bovine erythrocyte is influenced by altitude (Adili *et al.* 2013). Sikhar chicken have small lymphocytes with a round nucleus, medium lymphocytes with abundant cytoplasm and medium to large lymphocytes similar to the size of monocytes like other chicken (Wakenell 2010). Length and width of lymphocyte, heterophil and basophil of adult Sikhar chicken resembled that of Bronze breed turkey (Bhattacharjee *et al.* 2017). Length and width of eosinophil of Sikhar was in the range

Table 1. Morphometric record of blood cells of Sikhar in different age groups

Parameter (mean±SE, range)		Group 1	Group 2	Group 3	Group 4	Group 5
Erythrocyte (µm)	Length	11.15±0.13 ^a 9.04–12.94	12.42±0.16 ^b 10.71–14.56	11.69±0.14 ^a 9.57–13.54	11.46±0.15 ^a 10.05–13.91	11.50±0.16 ^a 8.84–13.32
	Width	6.89±0.10 5.85–7.93	6.95±0.11 5.37–8.13	7.24±0.10 6.00–7.93	7.20±0.11 5.22–8.05	7.10±0.11 5.96–8.15
Lymphocyte (µm)	Length	11.41±0.48 ^c 9.67–13.92	8.10±0.75 ^a 5.84–13.83	10.72±0.31 ^{bc} 9.16–13.06	10.64±0.54 ^{bc} 8.49–13.05	9.36±0.31 ^{ab} 6.15–13.15
	Width	10.72±0.61 ^c 8.62–14.32	7.62±0.81 ^a 5.16–13.79	9.56±0.31 ^{ab} 8.14–11.20	9.63±0.64 ^{ab} 6.97–12.32	8.47±0.30 ^a 5.54–11.98
Heterophil (µm)	Length	8.81±0.24 ^a 7.70–9.91	10.49±0.43 ^b 8.82–11.76	11.13±0.43 ^b 8.43–12.99	10.48±0.24 ^b 9.05–12.25	10.74±0.20 ^b 9.30–12.97
	Width	7.75±0.29 ^a 6.52–9.11	8.95±0.38 ^{ab} 6.70–10.52	9.86±0.41 ^b 7.76–12.56	9.33±0.25 ^b 7.33–11.00	9.69±0.22 ^b 7.98–11.28
Monocyte (µm)	Length	11.44±0.41 ^{ab} 10.72±0.33	10.87±0.37 ^a 10.29±0.35	11.54±0.41 ^{ab} 10.82±0.44	12.94±0.34 ^b 11.07±0.42	10.39±0.38 ^a 9.89±0.34
	Width	10.05–13.90 9.25–13.03	9.27–12.27 8.71–11.66	10.14–13.81 8.84–13.08	11.66–14.32 10.16–13.25	8.84–12.18 7.78–10.99
Eosinophil (µm)	Length	10.62±0.69 ^a 8.92±0.42 ^a	15.14±0.87 ^b 12.53±0.54 ^b	11.50±0.62 ^a 10.12±0.65 ^a	12.30±0.63 ^a 9.25±0.33 ^a	11.31±0.31 ^a 10.18±0.22 ^a
	Width	8.48–16.30 7.44–11.67	11.65–19.09 10.51–15.19	9.48–14.02 8.79–13.85	10.62–14.08 8.11–9.93	9.64–13.42 8.24–11.12
Basophil (µm)	Length	9.90±0.44 7.05–11.52	11.10±0.51 8.78–13.34	10.42±0.33 9.08–12.56	10.26±0.59 9.28–11.32	10.90±0.91 8.36–13.06
	Width	9.06±0.46 6.70–10.48	9.74±0.46 7.99–11.34	9.60±0.27 8.51–11.36	8.84±0.31 8.23–9.24	10.40±1.22 7.93–13.78
Thrombocyte (µm)	Length	4.81±0.13 ^a 4.31–5.81	5.41±0.20 ^{ab} 4.20–7.37	11.72±0.21 ^c 9.57–13.54	5.73±0.21 ^b 4.99–7.02	5.55±0.16 ^{ab} 4.41–7.61
	Width	4.03±0.15 ^a 3.60–5.34	4.74±0.21 ^b 3.30–6.40	7.13±0.14 ^c 6.00–7.93	4.99±0.29 ^b 3.95–6.54	4.60±0.12 ^{ab} 3.46–5.68

Means in the same row with different superscripts differ significantly ($P < 0.05$).

Table 2. Leukocyte and thrombocyte profile of Sikhar birds (mean±SE)

Parameter	Group 1	Group 2	Group 3	Group 4	Group 5
TLC ($\times 10^3/\mu\text{l}$)	35.58±3.34 ^{bc}	37.58±1.44 ^c	33.41±5.47 ^{ab}	33.33±3.58 ^{ab}	32.00±4.67 ^a
TTC ($\times 10^3/\mu\text{l}$)	42.86±3.40 ^{ab}	48.71±1.75 ^b	46.67±2.21 ^b	43.21±1.88 ^{ab}	38.50±1.29 ^a
Lymphocyte (%)	44.29±0.87 ^b	45.37±1.29 ^b	38.82±1.22 ^a	45.55±2.48 ^b	33.72±2.53 ^a
Heterophil (%)	40.90±0.71 ^a	37.72±2.21 ^a	43.09±1.88 ^a	40.18±2.30 ^a	49.26±1.95 ^b
Monocyte (%)	6.70±0.45 ^{bc}	6.95±0.86 ^c	4.91±0.28 ^a	5.20±0.49 ^{ab}	5.69±0.53 ^{abc}
Eosinophil (%)	3.48±0.37 ^a	4.69±0.36 ^a	6.32±0.38 ^b	4.01±0.61 ^a	4.68±0.70 ^b
Basophil (%)	4.64±0.27	5.27±0.82	6.86±0.93	5.06±0.60	6.66±0.74

Means in the same row with different superscripts differ significantly ($P < 0.05$).

reported in other chicken and turkey (Wakenell 2010).

The TLC of Sikhar birds were in higher range as compared to TLC of other indigenous chicken of India (Pampori *et al.* 2007, Pandian *et al.* 2012, Dutta *et al.* 2013). Presence of higher TLC in indigenous chicken as compared to broilers of same age groups had also been reported earlier (Dutta *et al.* 2013). TLC of Sikhar increased ($P < 0.05$) till the age of 4 months (Table 1) as in Nigerian chicken (Addass *et al.* 2012). The presence of higher TLC in younger birds indicated activation of immune system as these birds were exposed to natural environment after 1 month of natural brooding. The decline of TLC in Gr 3 and its stable count in adults could possibly be due to a stable immune response

at the age of 6 month and thereafter. Maintenance of higher basal TLC could be a characteristic of Sikhar birds which might have adapted to the existing rearing systems and prevailing climatic conditions as reported earlier (Oke *et al.* 2017).

A wide range of TTC, i.e. 13.33 to 46.75 ($10^3/\mu\text{l}$) was also reported in Vanaraja, Nicobari and their F_1 crossbreeds (Kundu *et al.* 2013). The present study in Sikhar chicken recorded higher ranges of TTC as compared to other indigenous chicken and broilers (Dutta *et al.* 2013, Kundu *et al.* 2013). TTC was higher in younger birds than older birds like in other indigenous chicken of Bangladesh, broilers and crossbreds (Dutta *et al.* 2013).

The DLC of Sikhar birds was in the range reported in other indigenous chicken of India (Pandian *et al.* 2012, Kundu *et al.* 2013) except for higher range of basophil. Except for basophil values of differential leukocyte counts were age dependant that disagrees the findings of Albokhadaim (2012).

SUMMARY

The study revealed age-wise variation in size and number of blood cells of indigenous chicken. The size of erythrocyte was recorded highest at 4 months of age, while TLC declined gradually with age. Size and number of lymphocytes decreased in adults while the reverse was true for heterophils. TTC remained stable till 8 months and declined at 10 months while length and width of thrombocytes increased till 6 months and declined gradually till 10 months. Sikhar chicken appeared to possess characteristic blood cell size and number with the stage of life and different physiological state. Blood cells showed adaptive characteristics to altitude and management.

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