



*Original Research*

## Effect of Age on Plasma Enzymes and Electrolytes of Indigenous Chicken 'Sikhar' of Mizoram

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### Abstract

The present study revealed the plasma enzyme activities viz. serum glutamic pyruvic transaminase (SGPT), serum glutamic oxaloacetic transaminase (SGOT) and alkaline phosphatase (ALP) and electrolytes viz. sodium (Na), potassium (K), chloride (Cl), calcium (Ca), phosphorus (Pi) and magnesium (Mg) of indigenous chicken, Sikhar of Mizoram in six different age groups viz. group I (1 month old), II (2 months old), III (4 months old), IV (6 months old), V (8 months old) and VI (10 months old). Each group comprised of 12 birds and blood was collected from each birds. Activities of SGPT and ALP increased and decreased respectively with age while SGOT was not affected by age. Na and Cl were highest in group II and K fluctuated in different groups. Ca had no significant change in different groups while Pi decreased with age. Birds of group IV and VI had higher Mg than other groups.

**Key words:** ALP, Electrolytes, Indigenous Chicken, SGOT, SGPT

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### Introduction

Sikhar bird is one of the deshi/local type of chicken whose home tract is in different parts of Mizoram state in India. They are comparatively small in size as compared to other indigenous chicken (Padhi *et al.*, 2004; Mayengbam *et al.*, 2017). Being an indigenous bird they can thrive and produce with irregular supply of feed and water and with minimum healthcare (Padhi, 2016). Recent findings indicated close resemblance of some hematological and biochemical parameters of Sikhar chicken to that of other indigenous chicken and wild birds of India and other countries (Mayengbam *et al.*, 2017). There is however no report on plasma enzyme activities and electrolyte profile of Sikhar chicken. The present study reveals the activities of serum





glutamic pyruvic transaminase (SGPT), serum glutamic oxaloacetic transaminase (SGOT) and alkaline phosphatase (ALP) and electrolytes viz. sodium (Na), potassium (K), chloride (Cl), calcium (Ca), phosphorus (Pi) and magnesium (Mg) in plasma of Sikhar chicken with respect to age and physiological state.

## Materials and Methods

### Birds and Blood Sampling

The study was carried out in Sikhar bird of Mizoram reared around the campus of College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India. The study comprised of six different groups viz. group I (1 month old), II (2 months old), III (4 months old), IV (6 months old), V (8 months old) and VI (10 months old) and each groups comprised of 12 birds of either sexes. All the birds were reared from hatching to 10 months of age and same birds were being used for blood sampling. After hatching from natural incubation, the chicks were kept with the mother till they attained 1 month of age and thereafter they were let loose. The birds were reared in the backyard with infrequent supplementation with commercially available pelleted layer feeds. Group IV consisted of birds in the pre-pubertal stage when cocks had started vocalization. Group V consisted of cocks that could make calls and hens that had just started laying eggs. Group VI consisted of adult cocks and hens that were at peak stage of laying eggs. Blood samples were collected on 31<sup>st</sup>, 61<sup>st</sup>, 122<sup>nd</sup>, 183<sup>rd</sup>, 244<sup>th</sup> and 305<sup>th</sup> day of age of each bird. Blood sampling was done by puncturing jugular vein of young birds and wing vein of older birds and samples were collected in lithium-heparin coated tubes for plasma separation.

### Analysis of Samples

Cold chain was maintained during the transit of the samples from farm to laboratory and plasma was separated immediately by centrifugation at 1500 rpm for 1 h. SGPT, SGOT, ALP, Na, K, Cl, Ca, Pi and Mg were estimated in plasma immediately after separation by using diagnostic test strips for automatic blood analyzer, Fuzifilm DRI-CHEM 4000i.

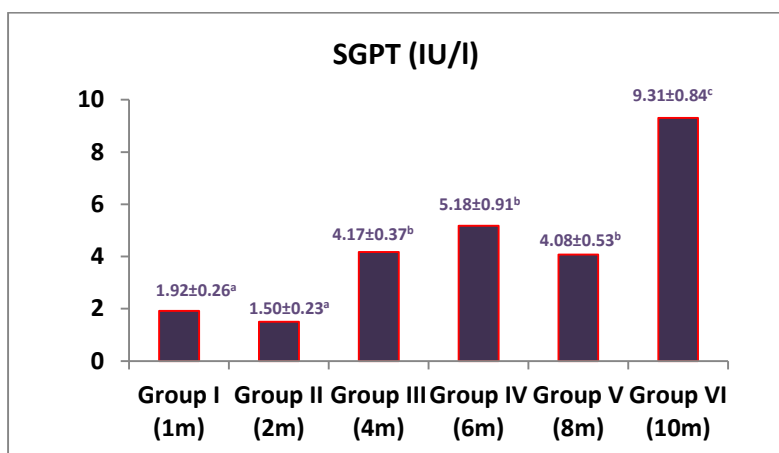
### Statistical Analysis

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.

### Result and Discussion

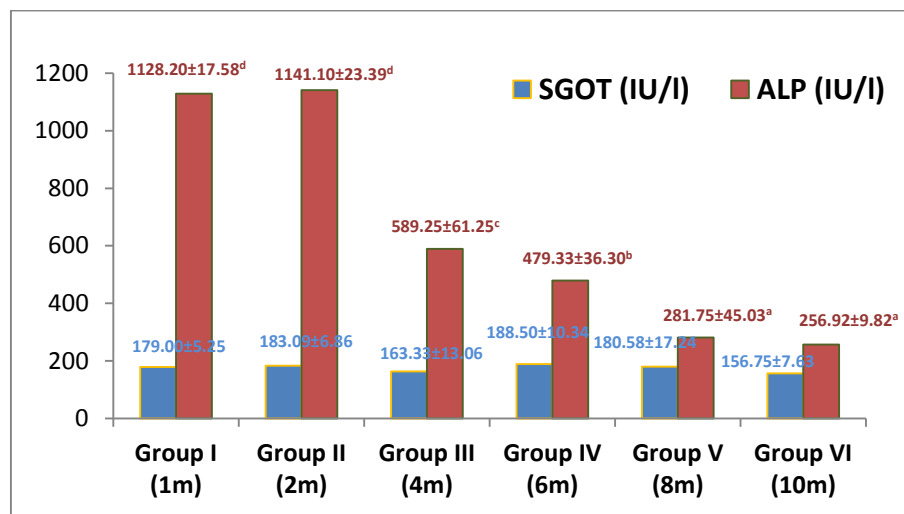
The study revealed the baseline data on activities of SGPT, SGOT and ALP and plasma concentration of Na, K, Cl, Ca, Pi and Mg of indigenous chicken, Sikhar of Mizoram. The variation in various parameters

due to age of Sikhar birds during the present investigation were presented in Fig. 1, Fig. 2, Fig. 3 and Fig. 4. Activity of plasma SGPT of Sikhar birds had no significant change from 1 month to 2 months of age. There was a significant increase at 4 months of age ( $P<0.05$ ) and thereafter the change was not significant till 8 months of age. At 10 months of age a significant increase of SGPT was recorded. Increase in SGPT was attributable to increase in activity of liver function as these birds were actively growing and gaining their body weight with age (Vidyarthi, 2008; Mayengbam *et al.*, 2017). Sikhar birds of 1 month old and 2 months old were found to have SGPT in close resemblance with that of Kadaknath and Aseel Peela (Biswas *et al.*, 2010) while higher ranges of SGPT were reported in broiler chicken (Abdi-Hachesoo *et al.*, 2011). SGPT activity of 4 months old and other older Sikhar birds closely resembled SGPT activity reported in Kadaknath and Aseel Peela (Biswas *et al.*, 2010) and were in the ranges reported in other indigenous chicken of Iran (Abdi-Hachesoo *et al.*, 2013). Further increase ( $P<0.05$ ) of SGPT was recorded in adults at 10 months of age (Fig. 1) which was in accordance with the active stage of laying by hens and maximum body weight gained by the cocks as reported in previous studies (Vidyarthi, 2008).



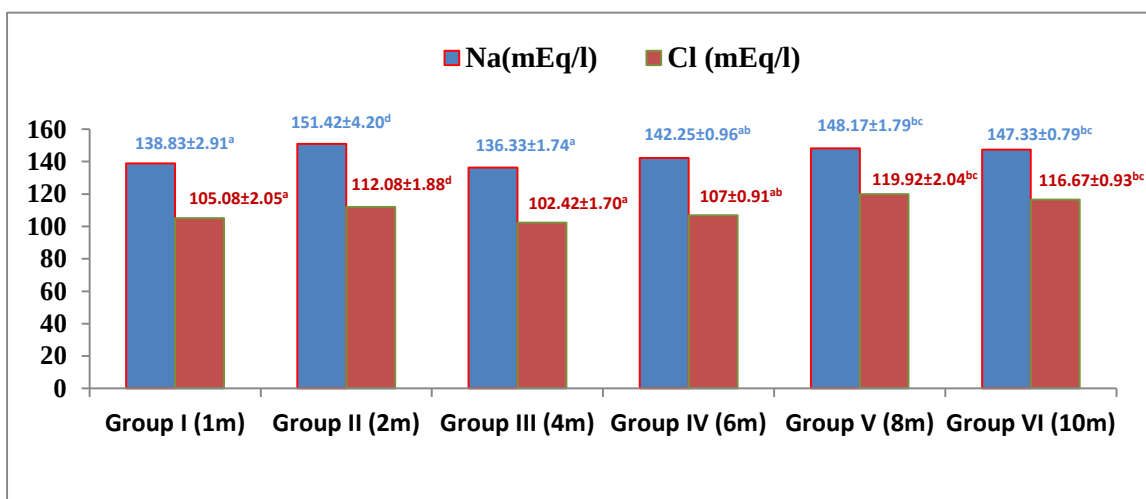
**Fig. 1:** Activity of plasma SGPT of Sikhar chicken in different age groups. Means with different superscripts differ significantly at  $P<0.05$ .

Plasma activity of SGOT of Sikhar birds was not influenced by age (Fig. 2) similar to the reports of Albokhadaim *et al.* (2012) in local chicken of Saudi-Arabia. In broilers, however, SGOT activity was found to increase with age and the increase had been attributed to increase of body mass (Silva *et al.*, 2007). It was apparent that, as these birds were small in size as compared to other indigenous chicken (Mayengbam *et al.*, 2017) and much smaller than broilers and layers (Padhi *et al.*, 2004), the SGOT activity did not show any significant change with age. SGOT activity of Sikhar birds were in the ranges reported in Kadaknath and Aseel Peela (Biswas *et al.*, 2010) and lower than that of broiler adult birds (Silva *et al.*, 2007).



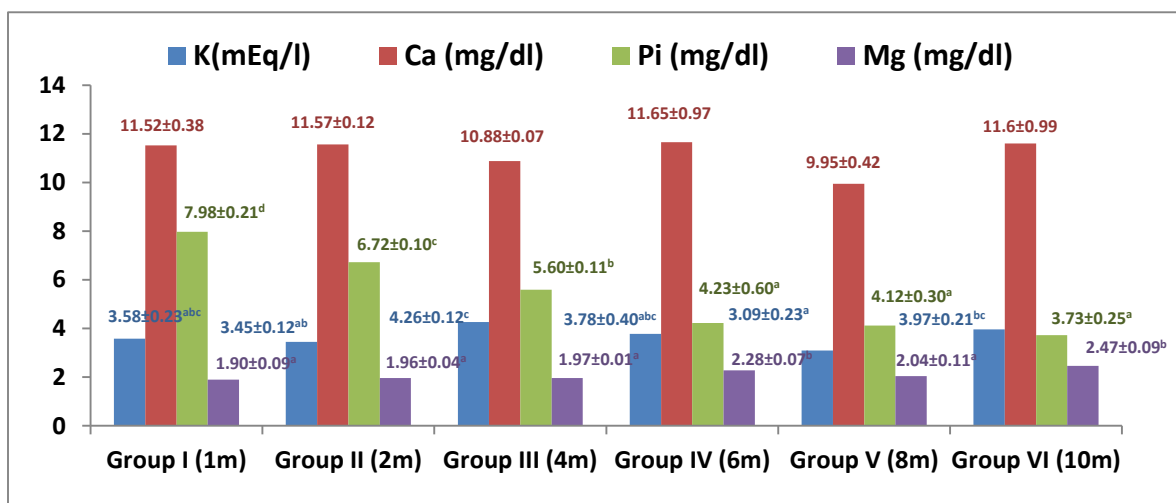
**Fig. 2:** Activity of plasma SGOT and ALP of Sikhar chicken in different age groups. Means with different superscripts differ significantly at  $P<0.05$ .

Change in activity of ALP from 1 month till the age of 2 months was not significant and thereafter there was gradual and significant decline ( $P<0.05$ ) in different groups till the birds were 8 months (Fig. 2). ALP activity of 8 months old and 10 months of old was statistically similar (Fig. 2). Higher activity of ALP in young birds was indicative of rapid turnover of the bones during growth in young animals as ALP is a bone turnover marker present in plasma (Rosol and Capen, 1999). ALP of Sikhar birds were in the ranges reported in young indigenous and exotic chicken and adult indigenous chicken of Iran (Abdi-Hachesoo *et al.*, 2011; 2013). The plasma concentrations of Na and Cl were found to increase significantly ( $P<0.05$ ) from group I to II (Fig. 3).



**Fig. 3:** Plasma concentration of Na and Cl of Sikhar chicken in different age groups. Means with different superscripts differ significantly at  $P<0.05$ .

This was the period when the chicks were let loose in the open field after natural brooding with the mother, which enabled them to free access to soil and vegetations. Increase in plasma Na and Cl could be due to body's demands for growth and development which the birds had adapted to the prevailing surroundings. Plasma K was found to fluctuate in different age groups (Fig. 4). The Na, K and Cl of Sikhar birds were in the ranges reported in indigenous chicken of Thailand (Simaraks *et al.*, 2004; Elagib *et al.*, 2012).



**Fig. 4:** Plasma concentration of K, Ca, Pi and Mg of Sikhar chicken in different age groups. Means with different superscripts differ significantly at  $P < 0.05$ .

The plasma concentration of Ca was not influenced by age (Fig. 4). Ca concentration of White Leghorn chicken did not change till the initiation of laying (Sedrani, 1984). It had also been reported that plasma Ca varied depending on the egg production potential in laying hens with higher Ca in high egg producing layers as high as 30.5 mg/dl in 30 weeks old White Leghorn while Cornish had 14.4 mg/dl (Preda *et al.*, 2013). Low level of plasma Ca of adult birds in the present study could be one characteristic of Sikhar being an indigenous chicken as their concentration also resembled that of other indigenous hens and cocks (Simaraks *et al.*, 2004; Abdi-Hachesoo *et al.*, 2013) and there was no record of deformed egg shells.

Plasma Pi was highest in 1 month old chicks which declined gradually with age ( $P < 0.05$ ) till the birds were 6 months and thereafter Pi had no significant change (Fig. 4). Presence of higher Pi in young birds was indicative of higher demand of the mineral for actively developing musculo-skeletal system which could be influenced by growth hormone that increased renal phosphate absorption (Rosol and Capen, 1999). Higher level of Pi also associated with higher ALP activity; a marker for bone turn over in young birds (Rosol and Capen, 1999). In White Leghorn chicken, plasma Pi was found to decline gradually with age and increase after initiation of laying (Sedrani, 1984). Present finding of insignificant change in Pi with initiation of laying in hens could be a characteristic of Sikhar being an indigenous chicken as the



concentration resembled that of other indigenous cocks and hens (Abdi-Hachesoo *et al.*, 2013) and lower than of White Leghorn (Sedrani, 1984).

Plasma Mg of Sikhar birds did not change with age till the birds were 4 month of age (Fig. 4). Indigenous chicken of Saudi Arabia were also found to have insignificant change in Mg till the age of 3 months (Albokhadaim *et al.*, 2012) and the concentration resembled other indigenous chicken (Albokhadaim *et al.*, 2012; Lin *et al.*, 2012). At the age of 6 months and 10 months there was a significant rise of Mg with a decline at 8 months ( $P < 0.05$ ) with the values in higher ranges as compared to other indigenous chicken (Albokhadaim *et al.*, 2012) and broilers of similar age groups (Arzour-Lakehal *et al.*, 2015). An antagonistic relationship was reported between calcium and magnesium that reflected in terms of egg shell quality and egg shell mineral distribution (Atteh and Leeson, 1983) and plasma concentration of Ca and Mg was also found to decrease during shell formation in domestic hen (Waddell *et al.*, 1991). Maintenance of higher plasma Mg in older birds could be the reason for insignificant increase of Ca of Sikhar before initiation and during laying period unlike other chickens (Sedrani, 1984; Preda *et al.*, 2013). The present study however could not clearly conclude how Ca and Mg were related in egg shell formation and hatchability of eggs and how Ca, Mg and Pi homeostasis was maintained in Sikhar.

## Conclusion

The actively growing skeletal development was evident at 2 to 4 months of age when ALP activity and plasma Pi were the highest. Higher liver activity during the attainment of puberty and peak egg laying stage reflected a significant increase in SGPT while SGOT did not change with age. The present findings generated a baseline data for plasma enzymes and electrolytes of Sikhar birds and the generated data could be utilized for further detailed studies and also in diagnostic practices.

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## References

1. Abdi-Hachesoo B, Talebi A and Asri-Rezaei S. 2011. Comparative study on blood profiles of indigenous and Ross-308. *Global Vet.* 7(3): 238-241.
2. Abdi-Hachesoo B, Talebi A, Asri-Rezaei S and Basaki M. 2013. Sex related differences in biochemical and hematological parameters of adult indigenous chicken in northwest of Iran. *J Anim Sci Adv.* 3(10): 512-516.
3. Albokhadaim I, Althnaian T and El-Bahr SM. 2012. Investigation of selected biochemical parameters of local chickens with different age and sex in Al-ahsa, Saudi Arabia. *Pak J Biol Sci.* 15(17): 827-832.
4. Albokhadaim I. 2012. Hematological and some biochemical values of indigenous chickens in Al-Ahsa, Saudi Arabia during summer season. *Asian J Poultry Sci.* 6(4): 138-145.



5. Arzour-Lakehal N, Benlatreche C, Boukerrou A and Siliart B. 2015. Effect of age on selected plasma indices of biochemical and mineral metabolism in two strains of broiler chickens. *Int J Poult Sci.* 14(7): 411-419.
6. Atteh JO and Leeson S. 1983. Influence of increasing dietary calcium and magnesium levels on performance, mineral metabolism, and egg mineral content of laying hens. *Poult Sci.* 62(7): 1621-1628.
7. Biswas A, Mohan J and Sastry VH. 2010. Age-dependent variation in hormonal concentration and biochemical constituents in blood plasma of Indian native fowl. *Vet Med Intl.* (2010): 1-5.
8. Elagib HAA, Elamin KM, Ahmed ADA and Malik HEE. 2012. Blood biochemical profile of males and females of three indigenous chicken ecotypes in Sudan. *J Vet Adv.* 2(12): 568-572.
9. Lin CY, Hsu1 JC and Wan TC. 2012. Effect of age and caponization on blood parameters and bone development of male native chickens in Taiwan. *Asian-Aust J Anim Sci.* 25(7): 994 – 1002.
10. Mayengbam P, Tolengkomba TC and Ali MA. 2017. A brief biological note on semi-wild indigenous chicken 'Shikhar' of Mizoram, India. *Int J Liv Res.* 7(8): 146-152.
11. Mishra SK, Swain RK, Behura NC, Das A, Mishra A, Sahoo and Dash AK. 2013. Effect of supplementation of organic minerals on the performance of broilers. *Indian J Anim Sci.* 83 (12): 1335–1339.
12. Padhi MK, Ahlawat SPS, Senani S, Saha SK and Kundu A. 2004. Comparative evaluation of White Leghorn, Brown Nicobari and their crossbred in A&N Islands *Indian J Anim Sci.* 74(5): 557-558.
13. Padhi MK. 2016. Importance of indigenous breeds of chicken for rural economy and their improvements for higher production performance *Scientifica.* 1-9.
14. Preda C, Bălăceanu R and Dojană N. 2013. Evolution of hormonal control of calcium and phosphorus metabolism in different hen breeds during the laying cycle. *Bull UASVM Vet Med.* 70(2): 286-292.
15. Rosol TJ and Capen CC. 1999. Calcium-regulating hormones and diseases of abnormal mineral (calcium, phosphorus and magnesium) metabolism. In: J.J. Kaneko, J.W. Harvey and M.L. Bruss (Eds.), *Clinical Biochemistry of Domestic Animals*, Harcourt Brace & Company Asia PTE LTD. pp. 619-702.
16. Sedrani SH. 1984. Changes in serum levels of 1, 25-&hydroxyvitamin D, calcium and phosphorus with age and vitamin D status in chickens. *Br J Nutr.* 52: 329-334.
17. Silva PRL, Freitas NOC, Laurentiz AC, Junqueira OM and Fagliari JJ. 2007. Blood serum components and serum protein test of Hybro-PG broilers of different ages. *Braz J Poult Sci.* 9(4): 229-232.
18. Simaraks S, Chinrasri O and Aengwanich W. 2004. Hematological, electrolyte and serum biochemical values of Thai indigenous chickens (*Gallus domesticus*) in north eastern, Thailand. *Songklanakarin J Sci Technol.* 26(3): 425-430.
19. Vidyarthi VK. 2008. Influence of herbal growth promoters on the performance and economy of rearing of broiler chicken. *Indian J Poultry Sci.* 43(03): 297- 300.
20. Waddell AL, Board RG, Scott VD and Tullett SG. 1991. Role of magnesium in egg shell formation in domestic hen. *Br Poult Sci.* 32(4): 853-864.

