

Comparative Analysis of Serum Protein and Serum Iron Levels in Goats under Natural Condition at Thanlyin Township, Yangon Region

Kyi Kyi Shwe¹

Abstract

Goat is a member of the *Bovidae* family and is closely related to sheep as both are in the goat-antelope subfamily *Caprinae*. This study was carried out during November, 2018 to August, 2019 at goat breeding farm, Thanlyin Township. 3 mL of venous blood samples were collected from ear veins of 30 goats (15 females and 15 males) under natural condition. Variations of serum protein and serum iron levels were studied in three different seasons. The weights of the goats ranged between 12-15 Kg. All the clotted blood samples were centrifuged at 1,800rpm for 10 minutes and serum samples were analyzed for protein and iron levels by fully automatic Biochemical Analyzer at Central Laboratory of Thiri Sandar Private Hospital. According to seasonal variation, the serum iron and protein levels, total iron binding capacity, serum albumin, serum globulins of both females and males showed slightly lower mean values in raining season.

Keywords: Serum protein, serum iron, total iron binding capacity, serum albumin, serum globulins

Introduction

Goats are important mammals for meat and milk productions. There are many different ways to upgrade the status of these mammals such as nutrition and prevention of diseases. For the nutritional status, serum protein levels and serum iron levels should be studied in detail.

Serum protein electrophoresis is a valuable tool for evaluating health of body, both in diagnosing and clinical monitoring of several diseases (Abate *et al.*, 2000). Although a specific diagnosis can rarely be made with serum protein electrophoresis, processes of diseases can be recognized by serum protein patterns, and alterations to these patterns are associated with a variety of different conditions and diseases. Blood serum contains two major proteins including albumin and globulin. Serum protein electrophoresis from healthy goats exhibits four fractions: albumin, α , β and γ fractions, which, in β -globulin was divided to β_1 and β_2 (Alberghina *et al.*, 2010).

Iron has important functions in the body as a component of hemoglobin and numerous other iron-containing protein. Proteins are the main and most abundant constituents of the blood serum or plasma, having many essential physiological functions. Most proteins present in the blood are biochemically not pure; usually, they are a mixture of simple proteins combined with other substances: glycoproteins, lipoproteins, and other conjugated proteins. Many disease processes can cause changes in the concentrations of serum proteins. The determination of their concentrations and the evaluation of changes in their concentrations during the disease process may provide important diagnostic information for assessing their health. Domestic left-over, protein composition depends on the family menu may constitute parts of the goats' diet. Nutrition, age, sex, genetics, stress and transportation are all known to affect haematological and biochemical parameters observed between tropical and temperate animals. For the nutritional situations of goats and other domestic animals, serum protein levels and serum iron levels should be studied in detail. Individual protein fractions, or blood serum proteins, have different functions and their identification is used also as a diagnostic tool. Many of these proteins are the so-called acute phase proteins. Differences between male

¹ Lecturer, Department of Zoology, Dagon University

and female concentrations of certain acute phase proteins (AGP, haptoglobin) have been described e.g. by Clapperton *et al.* (2005). Cristofól *et al.* (1998) determined individual fractions of serum proteins in dependence on the sex of sheep with a significant difference in albumin values.

Objectives

- to study serum iron and total iron binding capacity of male and female goats
- to determine the serum protein and serum iron levels of male and female goats
- to observe the serum protein and serum iron levels in different season

Materials and Methods

The study was conducted Thanlyin Township, Yangon Region, November, 2018 to August, 2019. Total samples of 30 goats were selected from goat breeding farms at Thanlyin Township under natural condition. Clotted blood samples (3mL) were collected from each animal.

Measurement of serum iron levels

Total serum protein including albumin and globulin levels were measured according to the standard methods by using fully automated biochemical analyzer at Thiri Sandar Central Laboratory, Insein. Serum iron and iron binding capacity levels were examined with standard methods by using fully automated biochemical analyzer at Thiri Sandar Central Laboratory, Insein Township.



Plate 1. A herd of goats under natural condition at Thanlyin Township



Plate 2. Bench Top Centrifuge for the separation of serum from whole blood



Plate 3. Biochemical Auto-analyzer for the measurement of Serum protein and serum iron Levels (Model: PENTRA® 200. EC)

Results

A total of 30 goats (15 males and 15 females) were studied for blood samples. Serum iron, total iron binding capacity, total protein, albumin and globulin of each animal were studied during different seasons. Serum iron and total iron binding capacity (μdL) levels of each animal. The composed of serum iron and iron binding capacity levels were higher in males than those of females. Total protein, albumin and globulin in male the higher than female.

Comparison between serum iron and total iron binding capacity (μdL) levels of male and female goats were shown in Table.1. Serum iron and total iron binding capacity were found to be higher in males ($174.21 \mu\text{dL}$, $397.76 \mu\text{dL}$) than those of females ($153.32 \mu\text{dL}$, $376.51 \mu\text{dL}$) as shown in Fig.1.

Comparison of serum protein (μdL), albumin (μdL) and globulin (μdL) levels between male and female goats as shown in Table. 2. The value of total protein ($97.2\mu\text{dL}$), albumin ($44.8 \mu\text{dL}$), globulin ($60.3 \mu\text{dL}$) were found to be higher than in males than those of females

($91.8 \mu\text{dL}$; $40.3 \mu\text{dL}$; $57.4 \mu\text{dL}$) as shown in Fig.2.

The higher levels of serum proteins in both male and female goats were recorded during winter whereas lower levels were observed in both male and female during the rainy season.

The mean values of serum iron and iron binding capacity levels were found to be significantly higher in males ($143.9 \mu\text{dL}$) than those of females ($129.3\mu\text{dL}$) (Table. 3, Fig.3).

The values of serum protein ($77.8 \mu\text{dL}$), serum albumin ($45.1\mu\text{dL}$) and serum globulin levels ($37.8 \mu\text{dL}$) were found to be significantly higher in males than those of females($68.6 \mu\text{dL}$; $37.2 \mu\text{dL}$; $32.5\mu\text{dL}$) (Table .4, Fig.4).

Table 1. Comparison between serum iron and total binding capacity of male and female goats

Individual No.	Male		female	
	serum iron	total iron binding capacity	serum iron	total iron binding capacity
1	85.46	320.82	86.44	224.66
2	99.39	355.11	131.52	286.54
3	83.24	360.84	111.54	370.18
4	133.93	359.72	125.85	264.11
5	100.19	278.12	132.38	343.56
6	125.85	287.25	129.84	350.28
7	143.22	280.32	125.17	342.80
8	145.42	230.39	132.23	370.31
9	144.72	235.07	133.75	360.44
10	129.72	314.63	153.32*	373.23
11	174.21*	394.55	142.19	280.34
12	152.73	381.94	127.80	260.03
13	162.52	397.76*	126.13	288.33
14	144.8	319.15	134.73	376.51*
15	155.72	364.5	138.05	352.93

*maximum

Table 2. Comparison between total protein, albumin and globulin of male and female goats

Individual No	male			female		
	total protein	albumin	globulin	total protein	albumin	Globulin
1	95.01	40.9	44.2	80.3	30.5	49.6
2	86.4	34	52.5	83.3	33.1	50.2
3	93	33.2	60.3*	86	38	48.2
4	95.7	44.8*	50.8	80.9	30.6	50.4
5	85.9	28.4	57.5	91.8*	40.3*	52.8
Individual No	male			female		
6	97.2*	37.8	59.5	90.6	33.2	57.4*
7	92.4	36.3	56.1	84.4	31.1	53.4
8	86.4	33.9	52.6	88.1	34.8	53.3
9	90.2	29.7	50.6	84.5	31.3	53.3
10	89.8	31.7	47.9	90.5	40.5	50.1
11	79.6	31.8	48.8	76.3	33.3	43
12	91.4	36.2	45.3	72.9	30.2	42.6
13	75.8	33.4	42.4	74.7	30.5	44.3
14	80.2	32	48.2	70.9	29.9	40.9
15	81.6	31.5	50.2	74.5	30.4	44.2

*maximun

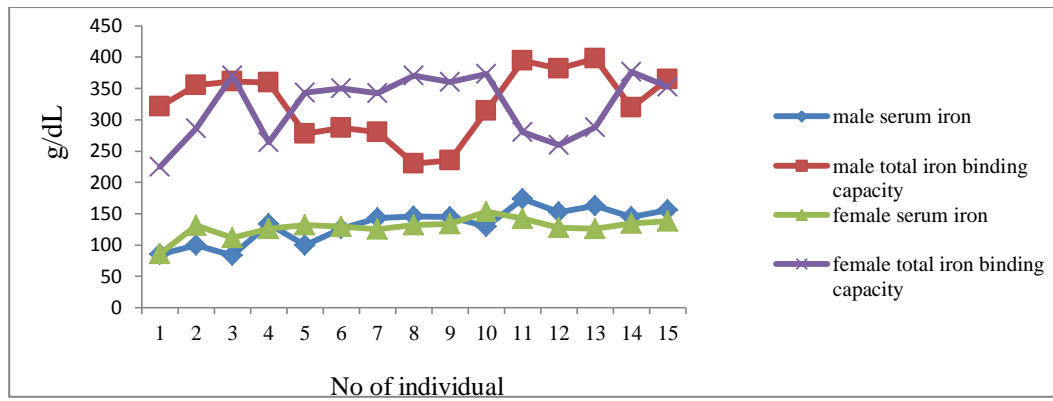


Fig.1 Comparison between serum iron and total binding capacity of male and female goats

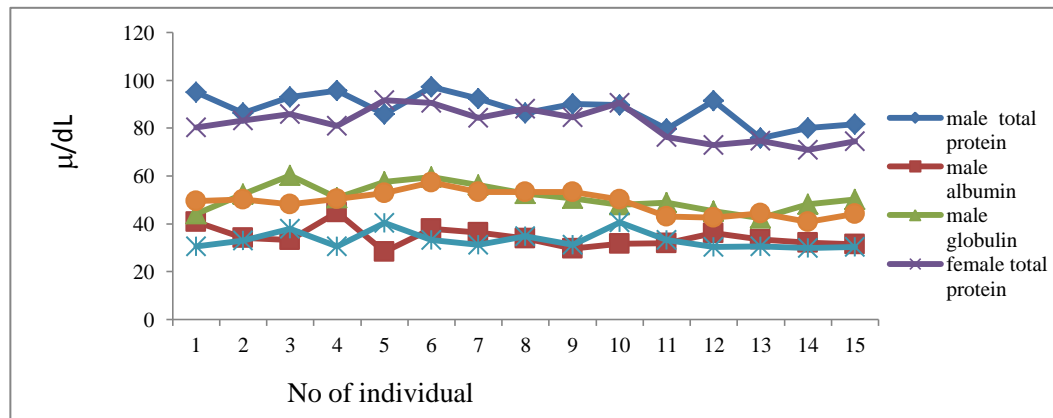


Fig. 2 Comparison between total protein, albumin and globulin of male and female goats

Table 3. Serum iron and TIBC of male and female in different seasons

Sex	Winter		Summer		Rainy season	
	SI	TIBC	SI	TIBC	SI	TIBC
Male	143.9*	360.9*	139.4	341.8	127.5	280.8
Female	129.3*	330.2*	122.3	320.2	115.5	240.4

*maximum

Table 4. Total protein, albumin and globulin of male and female in different seasons

Sex	Winter			Summer			Rainy season		
	TP	albumin	globulin	TP	albumin	globulin	TP	albumin	globulin
Male	77.8*	45.1*	37.8*	75.3	44.9	36.8	68.5	38.2	32.4
Female	68.6*	37.2*	32.5*	62.2	35.2	30.4	57.3	30.1	28.2

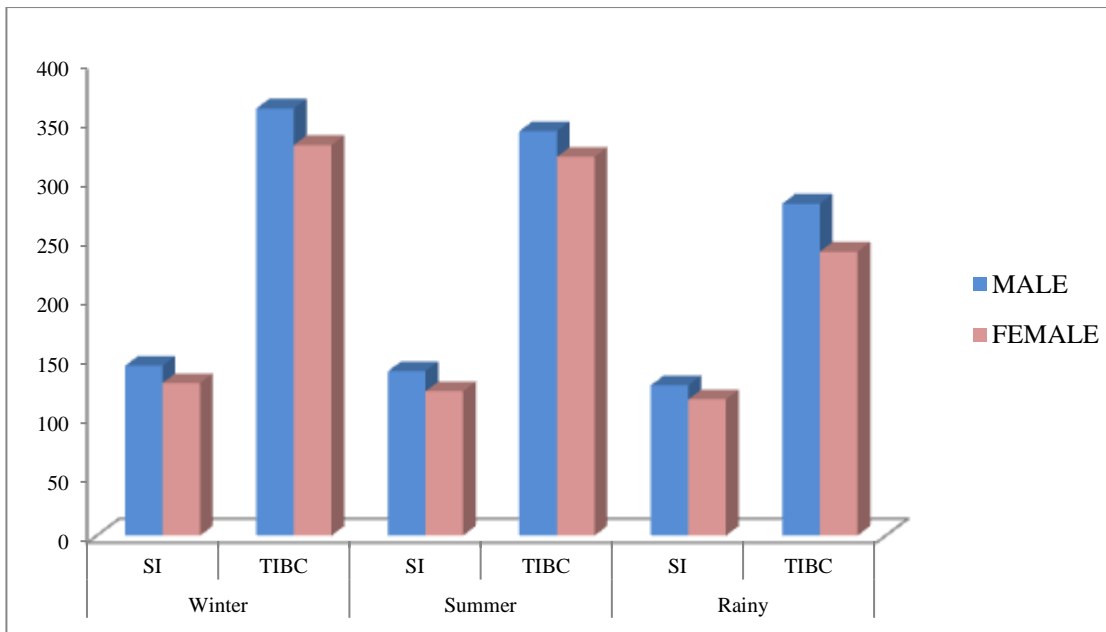


Fig. 3 Serum iron and TIBC of male and female in different seasons

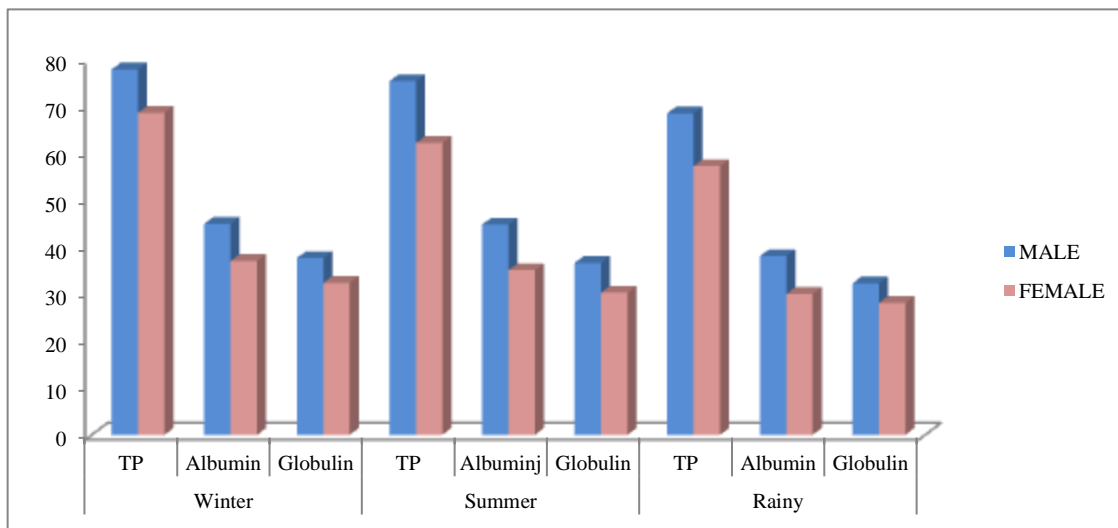


Fig.4 Total protein, albumin and globulin of male and female in different seasons

Discussion

This study served as the prediction of seasonal nutritional parameters like serum iron and serum protein levels in both male and female goats under natural condition. Serum iron and serum protein levels in male goat were found to be consistently higher than those of females throughout the different seasons.

This sort of study had never been done in Myanmar. Regarding seasonal variations, mean serum protein and serum iron levels in both males and females were found to be similar in winter and summer but slightly lower in rainy season. This factor could be due to the effect of heavy rain and higher incidence of parasitic infections during the rainy season.

To meet the high demand for meat as a source of animal protein in the future, much of the increase in meat production would have to come from short-cycle animals which will require a little management practice to rear them.

Examples are the domestic sheep, goat and other mini-livestock such as the grass cutter (lamb).

Blood is the fluid tissue of the body that flows through the vascular channels (arteries, vein and capillaries) and transports the vital nutrients and waste products of the body. Other important functions include defending the body against micro-organisms, homeostasis and maintenance of body temperature.

In this study, blood samples from male and female goats were collected seasonally and analyzed for the contents of serum iron levels, total iron binding capacity, serum protein levels, serum albumin levels, and serum globulin levels which would indirectly give nutritional information to consumers as well as goat breeders from the point of feeding and farming localities.

Blood samples of goats (both male and female) revealed higher and sufficient amounts of serum iron and serum protein in their blood. The results are very good indicators for the consumption of goat meat by humans. Blood samples of male goats showed a significance higher level of serum iron and serum protein than those of females.

Harvey and Ferrier (2011) reported that the incidence of a number of chronic diseases is significantly influenced by the kinds and amount of nutrients consumed. There are many different ways to upgrade the status of goats such as nutrition and prevention of diseases. For the prediction of the nutritional status of farm breeding animals, serum iron and serum protein levels should be studied.

Conclusion

After carrying out this study, the seasonal variation of serum protein levels and serum iron levels in blood samples of goats (both males and females) in natural condition were found to be the highest in winter and lowest in the raining season.

Acknowledgements

I would like to thanks Head and Professor Dr Lu Lu Aung, Department of Zoology, Dagon University for her kind permission to carry out this study.

I also thank professor Dr Moe Moe Dwe, Department of Zoology, Dagon University for his kind permission to carry out this paper.

I also thank to Dr. Myint Sann Oo, Branch Head, Meat Production Branch (Cattle, Sheep and Goat), Veterinary and Slaughter Houses Department, Yangon City Development Committee for his kind collaboration to collect blood samples from goats during the study period.

I am grateful to Dr. Myint Oo, Professor/Director (Retd.), Medical Research, Ministry of Health for his valuable co-supervision and advice in the determination of serum iron and serum protein at Thiri Sandar Private Hospital, Insein.

References

- Abate, O; Zanatta, R; Malisano, T and Dotta, U., 2000. *Canine serum protein patterns using high resolution electrophoresis (HRE)*. Vet. J., 159: 154-160.
- Alberghina, D; Casella, S; Ferrantelli, V; Giannetto, C and Piccione, G., 2010. *Analysis of serum proteins in Clinically healthy goats (Capra hircus) using agarose gel electrophoresis*. Vet. Clin. Pathol.,39: 317-320.
- Clapperton M, Bishop SC, Cameron ND, Glass EJ., 2005: *Innate immune traits differ between Meishan and Large White pigs*. Vet Immunol Immunop 104: 131-144.
- Cristofol C, Navarro M, Franquelo C, Valladares JE, Arboix M 1998: *Sex differences in the disposition of albendazole metabolites in sheep*. Vet Parasitol 78: 223-231.
- Harvey, R., Ferrier, D., 2011. *Lippincott's Illustrated Reviews: Biochemistry*. 5th Edition. New York and London: Lippincott Williams & Wilkins.