Comparison of Albumin/Globulin (A/G) Ratio Between Pregnant and Lactation of Thin-Tail Sheep

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Abstract. The albumin/globulin (A/G) ratio can be an immunological indicator of sheep which can be influenced by reproductive status such as pregnant and lactation conditions. However, a study of A/G ratio during pregnant and lactation in thin-tailed sheep is still lack. This study aimed to determine the levels of A/G ratio in thin-tailed sheep during pregnancy and lactation. This study used twelve of ewes thin-tailed sheeps (seven pregnant sheeps, and five lactating sheeps) rearing in Berbah, Sleman, Yogyakarta. Blood samples were collected through the jugular vein and filled into the EDTA tube and then albumin and total protein were measured. The levels of globulin were calculated by subtracting the total protein with albumin. The mean of A/G ratio in pregnant and lactation thin-tailed sheep was 0.72±0.18, and 0.57±0.15, respectively. Statistical analysis showed that there was no significantly difference in A/G ratio between pregnant and lactation (P>0.05). In conclusion, the difference in physiological status (pregnancy versus lactation) had no significant effect on the A/G ratio in thin-tailed sheep.

1 Introduction

Sheep is one of the small ruminants that have great potential in meeting the needs of animal protein for humans, and is very commonly cultivated in the community and its maintenance is relatively easy and quite profitable [1]. Thin-tailed sheep are often bred because they have many advantages such as being prophylactic or can give birth to twins of 2 to 5 tails in each birth. Then easy to breed, growth is not affected by seasons, can adapt to the tropics and poor diet [2].

The concentration of albumin and/or affects increasing or decreasing the total protein concentration. The liver synthesizes and releases more than 90% of plasma proteins. Physiologically, serum protein concentration is influenced by several factors such as pregnancy and lactation [3]. One of the parameters to determine the health condition of sheep during pregnancy and lactation is by looking at the albumin/globulin (A/G) ratio. The A/G ratio is used to determine changes in protein levels in the blood. In addition, the A/G ratio can also be used to indicate a sheep's immunity and nutrition during pregnancy and lactation [4]. The A/G ratio needs to be studied in sheep because it will know animal health information such as dehydration, liver function and changes in blood plasma. A decrease in the ratio of albumin to globulin can result in autoimmune diseases and nephrotic syndrome [5]. Blood protein examination determines the albumin/globulin ratio is important because it is to determine the health condition of the sheep, especially those related to immunology in pregnant and lactating ewe thin-tailed sheep. This study aims to determine the ratio of albumin/globulin (A/G) in thin-tailed sheep during pregnancy and lactation.

2 Material and Methods

2.1 Experimental animal

This study used twelve thin-tailed sheep consisting of seven pregnant sheep and five lactating sheep to determine the difference in the A/G ratio in pregnant and lactating thin-tailed sheep. The body weight of pregnant and lactating sheep ranges from 35-50 kg. The age of pregnant sheep ranges from 2 years to 3 years and the age of lactating sheep ranges from 18 months to 3 years with the end lactation period. Pregnant and lactating sheep were kept in individual cages. Feed was given twice a day in the morning and evening in the form of forage and concentrate of Nutrifeed BC 133 (Kjub. Puspetasari, Klaten) with the same amount and composition between pregnant and lactating sheep. Drinking water for sheep is provided ad libitum. Based on clinical examination, the whole sheep used in this study showed a healthy condition.

2.2 Tools and materials

Blood samples were taken using a 5 ml syringe (One med, PT One Med Health Care, Surabaya) with a 22 gauge needle. Cotton and 70% alcohol are used at the site of

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blood collection which is useful as an antiseptic. The blood sample was placed in a non-EDTA (Ethylene Diamine Tetra-acetic Acid) Vacutainer tube (Becton Dickinson and Company, USA). The blood sample is centrifuged to separate the serum and blood. Serum was placed in a Microtube (OneMed, Malang) for further analysis. Serum protein analysis was performed using a Cobas 6000 series analyzer machine (Roche, Japan) with the colorimetric method.

2.3 Research location and time

This research conducted from August to October 2021. Sampling time was carried out starting on August 9, 2021, at 07.00-12.00 WIB. Blood sampling was carried out in the morning before feeding. The locations for taking sheep blood samples were El Farm for Sheep and Goats and Pendopo Sawah Kunden which is located at Jalan Kunden, Jragung, Jogotirto, Berbah District, Sleman Regency, Special Region of Yogyakarta with an environmental temperature of 32° C, 56% humidity, 11 km/h wind speed and 10% rainfall.

2.4 Blood sampling and analysis

Sheep are separated from the herd and manually restrained to make it easier for operator to collect blood. The blood collection area was cleaned using a 70% alcohol swab. Blood samples were taken through the jugular vein of sheep using a 5 ml syringe with a needle size of 22 gauge. Blood sampling was carried out in the morning before feeding. The collected blood was collected into a Vacutainer tube (Becton Dickinson and Company, USA) before centrifuging. Blood serum obtained from the centrifugation process was then analyzed using a Cobas Analyzer machine (Roche, Switzerland) with the colorimetric method. The total protein concentration is subtracted by the albumin concentration to obtain the globulin concentration value. The A/G ratio was obtained by dividing albumin and globulin.

2.5 Statistical analysis

Data from the albumin/globulin (A/G) ratio examination was entered into the Microsoft Office Excel application, and analyzed using the Statistical Product and Service Solution (SPSS) version 16.0 application with the Normality Test and Independent T-Test method. The significance used in the analysis was $P < 0.05$ to distinguish the albumin/globulin (A/G) ratio in pregnant ewes and lactating ewes. The results of the statistical analysis carried out will be converted into a file in the form of Microsoft Office Word.

3 Results and Discussion

The results of the study on albumin in thin-tailed sheep with pregnant and lactating status are presented in Table 1.

Table 1. Mean albumin in thin-tailed sheep pregnant and lactation

Physiological status	N	Albumin (g/dl)	Albumin reference (g/dl)
Pregnant sheep	7	2.56±0.36	3.61±0.22
Lactation sheep	5	2.43±0.22	3.44±0.37

Based on Table 1. can is known that the mean albumin in thin-tailed sheep pregnant more tall of the mean albumin in thin-tailed sheep lactation. Analysis statistics on research this show no there is significant difference to mean albumin in thin-tailed sheep pregnant and lactation. Research results this compared with results research conducted [6] with the same physiological phase, but different races showed that the mean albumin of pregnant and lactating sheep was still within normal limits. The same thing also happened in the study of [7] with analysis statistics use *Duncan Multiple Range Test*. ANOVA method show mean albumin value no significant among pregnant sheep of 30.00±4.67 g/dL and lactation sheep of 26.00±3.74 g/dL, but mean albumin on pregnant sheep tends to be more tall from the lactation sheep ($P>0.05$). Trend this in accordance with explanation [8], pregnant sheep have total protein and albumin concentrations in blood that is statistics more tall compared with lactation sheep because decrease in total protein and albumin during lactation. [4] explained, that during lactation, the mother's mammary gland requires blood protein to synthesis milk and colostrum.

The result of the study on globulin in thin-tailed sheep with pregnant and lactating status are presented in Table 2.

Table 2. Mean globulin in thin-tailed sheep pregnant and lactation

Physiological status	N	Globulin (g/dl)	Globulin reference [6] (g/dl)
Pregnant sheep	7	3.66±0.50	3.32±0.90
Lactation sheep	5	4.43±0.80	4.01±0.82

Based on Table 2 can is known mean globulin in thin tail sheep pregnant more low of the mean globulin in thin-tail sheep lactation. Analysis statistics on research this show no there is significant difference to mean globulin in thin-tailed sheep pregnant and lactation. Research results this compared with results research conducted [6] with the same physiological phase, but different races showed that the mean globulin in pregnant and lactating was still within normal limits. Research conducted by [7] with analysis statistics also show the mean globulin no have significant difference among pregnant sheep of 19.80±3.77 g/dL and lactation sheep of 20.90±3.07 g/dL, but tend to be the mean globulin lactation more tall than pregnant sheep ($P>0.05$). Tendency this in accordance with explanation [6] that is highest globulin levels shown to sheep with lactation status. The highest globulin levels were shown in sheep with lactation status. The high

globulin level in lactating sheep is due to an increase in α-globulin. One of the function The main α-globulins are for maintain host to disturbance pathological [9].

The result of the study on A/G ratio in thin-tailed sheep with pregnant and lactating status are presented in Table 3.

Table 3. A/G ratio in thin-tailed sheep pregnant and lactation

Physiological status	N	A/G ratio	A/G reference
Pregnant sheep	7	0.72±0.18	0.93±0.31
Lactation sheep	5	0.57±0.15	1.19±0.33

Based on Table 3. Analysis results statistics on research this show A/G ratio between pregnant and lactation thin-tailed sheep no have significant difference, but tend to be the A/G ratio thin-tailed sheep of lactation more low compared to A/G ratio thin tail of pregnant (P>0.05). Trend this could occur consequence existence drop A/G ratio on physiological status sheep period lactation end as in research done [4]. Research results this is also compared with results research conducted [6] showed that the A/G ratio of pregnant and lactating was still within normal limits.

Research conducted by [4] with calculation statistics use One-way ANOVA method shows existence significant difference (P<0.05) between phase physiological sheep used. Study it uses race on Comisana sheep from a farms in Italy in general have 2 monsoon that is autumn (33◦C) and winter (10◦C) with relative humidity between 69%-73%, sheep 3 years old and an average weight of 52.1 kg, the feed given in the form of straw, hay, and mix wheat. The results of the A/G ratio in the study [4] with phase parameters different physiological that is the late pregnancy of 0.38±0.03, post-partus to of 0.46±0.03, early lactation of 0.88±0.08, mid lactation of 0.81±0.01, end lactation of 0.54±0.60 and the dry period of 0.59±0.04. The study show A/G ratio late pregnancy more low from end lactation phase, although during the lactation period (early, mid, late) decreased. Decrease A/G ratio in period lactation could caused because enhancement of globulin fraction and decrease albumin concentration. Difference A/G ratio in research this with A/G ratio lactation sheep more low from pregnant sheep can occur because existence enhancement. Serum protein requirement in blood during lactation with globulins are needed for given to the mammary gland as shaper colostrum, synthesis of milk and antibodies [4, 10].

Research results this have difference with results research conducted by [6]. The research was conducted on a farm located in Magelang, Central Java. The sheep breed used is sheep fat-tailed with the physiological status of pregnancy and lactation aged different. Data analysis performed in study [6] use Tukey's HSD ANOVA method shows existence difference significant A/G ratio (P<0.05) between lactation and pregnant sheep. Height A/G ratio during lactation because existence translocation immunoglobulin to in mammary glands for help protect sheep from environment with humoral immunity.

Based on study [6] and [4] difference significant score ratio A/G on study this among pregnant and lactation sheep of them could influenced by difference needs protein blood, age, nutrition and energy, race, location taking related samples with condition environment.

4 Conclusion

The results of the study concluded that the average A/G value of pregnant female thin-tailed sheep was higher at 0.72±0.18 compared to the average A/G value of lactating female thin-tailed sheep, which was 0.57±0.15, although this value does not show a significant difference.

References

1. A. Zulfahmi, D. Ramdani, A.A. Nurmeidiansyah, *Performa Induk Domba Lokal yang Dipelihara Secara Semi Intensif di Kecamatan Pamanukan Kabupaten Subang*, J. Univ. Padjadjaran **5**, 1–15 (2016).
2. H.R. Rukmana, H.H. Yudirachma, *Wirausaha Penggemukan Domba dan Perawatan Domba Ketangkasan*, (Lily Publisher, 2015).
3. A. Sudarman, N. Hidayati, S. Suharti, Status *Nutrisi Kerbau Betina di Peternakan Rakyat Cibungbulang: Pengaruh Suplementasi Indigofera sp dan Gaplek terhadap Perubahan Profil Darah*, J. Ilmu Nutr. dan Teknol. Pakan, **17**, 32–37 (2019).
4. G. Piccione, *et al., Electrophoretic Serum Protein Fraction Profile During the Different Physiological Phases in Comisana Ewes*, Reprod. Domest. Anim. **47**, 591–595 (2012).
5. A.B. Iskandar, R.I. Pujianingsih, Widiyanto, *The Effect of Multi Nutrient Block (MNB) as Supplementary Feed on Albumin, Globulin Levels and the Ratio of A/G in Local Goats A.B*, J. Sain Peternak. Indones., **15**, 132–137 (2020).
6. S. Sarmin, S. Winarsih, A. Hana, P. Astuti, & C.M. Airin, *Parameters of blood biochemistry in different physiological status of fat-tailed sheep*, AIP Conf. Proc. **2353**, (2021).
7. A.E. Faith, A.O. Owoeye, A.A. Anzaku, M.M. Jibril, & T.M. Usman, *Serum Electrolyte Concentration of Pregnant and Lactating Ewes*, Int. J. Agric. Earth Sci. **3**, 49–55 (2017).
8. Z. Antunovic, *et al., Blood metabolic profile and some of hormones concentration in ewes during different physiological status*, Bulg. J. Agric. Sci. **17**, 687–695 (2011).
9. C. Tothova, O. Nagy, & G. Kovac, *Serum proteins and their diagnostic utility in veterinary medicine: A review,* Vet. Med. (Praha), **61**, 475–496 (2016).
10. M.M.A. El-Sherif, & F. Assad, *Changes in some blood constituents of Barki ewes during pregnancy and lactation under semi arid conditions,* Small Rumin. Res. **40**, 269–277 (2001).
11. T.O. Ososanya, U.A. Inyang, S.A. Sheha, *Growth performance and blood profile of gestating wad*

ewes fed dietary supplementation of ammonium sulphate, Niger. J. Anim. Prod. **43**, 107–115 (2016).

12. M. Karapehlivan, E. Atakisi, O. Atakisi, R. Yucayurt, & S.M. Pancarci, *Blood biochemical parameters during the lactation and dry period in Tuj ewes*, Small Rumin. Res. **73**, 267–271 (2007).
13. R.E.S. da Cruz, R. E. S. *et al., Effects of age and sex on blood biochemistry of Dorper lambs*, Semin. Agrar. **38**, 3085–3093 (2017).