

PREVALENCE OF PREGNANCY TOXEMIA DUE TO INADEQUATE FEEDING OF GOATS IN KANCHEEPURAM, TAMIL NADU, INDIA

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ABSTRACT

A study was carried out to examine the prevalence of pregnancy toxemia due to inadequate feeding of local breeds of goats in India. Three hundred goats of local breeds in pregnancy were selected. They were assessed for feeding management through questionnaire, body condition score and pregnancy for number of fetuses with ultrasonography. The blood samples were collected and assayed for blood glucose level and β -hydroxy butyric acid (BHBA). The Body condition score (BCS) less than 2, blood glucose < 40 mg/dl and BHBA > 0.8 mg/dl were considered positive indicator for pregnancy toxemia. The feeding regime was documented in sub clinical pregnancy toxemia goats and the feed and fodder samples were collected from 10% of these animals. The predominant feeding regime for pregnancy toxemia in the survey was identified and further studied for Dry matter intake (DMI) and nutrient intake. The overall prevalence of pregnancy toxemia was 36.7 %. The incidence of subclinical pregnancy toxemia increased significantly ($P < 0.01$) in late stage (34.3 %) than in early stage of pregnancy (2.7 %) and was found to be significantly ($P < 0.01$) higher in animals bearing twins. The average DMI of pregnancy toxemia does (2.79 %) was significantly ($P < 0.01$) lower than the actual requirement of DMI 3.82 % during pregnancy. The average Metabolizable Energy (ME) and protein intake were 1940 kcal and 45.2 gms which was significantly ($P < 0.01$) lower than the actual requirement of ME and protein intake of 2400 kcal and 58.6 g respectively, during late stage of pregnancy. Hence, the pregnant goats should be fed with adequate nutrients and twins carrying animals should be assessed for their BCS, blood glucose and BHBA to prevent the incidence of pregnancy toxemia disorder.

Key words: Pregnancy toxemia, goats, does, BHBA, BCS, poor nutrition

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INTRODUCTION

Pregnancy toxemia is a disorder of periparturient ewes and does, characterized clinically by impaired nervous functions (Abreu-Palermo *et al.*, 2021). The disorder

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occurs frequently in malnourished ewes and does in their last 2-3 weeks of gestation. Goat feeding depends on hand-fed concentrates, agro-industrial by-products, cereals and straws which are often imbalanced and do not meet out the nutrient requirements. Late-gestation and lactation are the most critical periods for doe feeding that require proper nutrition to maintain the energy balance as well as the growth of fetuses. Reduction in the energy level of animal feed during late pregnancy led to pregnancy toxemia. Lima *et al.* (2016) observed that β -hydroxy butyric acid (BHBA) level is increased while a significant drop in glucose, as indicators for pregnancy toxemia. Body condition score (BCS) is another indicator of nutrient requirements of animal. Poor nutritional management is the main cause for the prevalence of pregnancy toxemia and it is commonly observed in the unorganized goat farms. Hence, a study was conducted on prevalence of pregnancy toxemia among local breeds of goats due to inadequate feeding in Kancheepuram, Tamil Nadu.

MATERIALS AND METHODS

Study area and sampling procedure

Kanchipuram is located at 12.8387°N 79.7016°E, 72 km (45 mi) south-west of Chennai. A survey was conducted and randomly six blocks were selected and from each block five villages were selected. Ten farmers from each village were randomly surveyed through questionnaire for feeding regimen adopted by them to record the nutrient availability. Totally, 300 farmers holding 2,321 goats which some of them were pregnant were selected. From 300 farmers, 300 pregnant local breeds of goats were randomly selected,

so that a sample size of 10 animals per village and 50 animals per block were maintained. This study was conducted from 2017 to 2018.

Data collection

The data was recorded by the veterinarian on the feeding regimen, twins birth and the occurrence of pregnancy toxemia through a pre-tested structured questionnaire. Does were examined for their pregnancy by using ultrasonography, body condition score and collection of blood samples at local veterinary dispensary for further analysis of blood glucose and BHBA. The animals were assessed for the scoring of body condition of does using a five-point scale (1.0 – 5.0, 0.5 increments) as per Villaquiran *et al.* (2012). These animals were also measured for its body weight. Blood samples for determination of blood glucose and BHBA were obtained in the morning, before feeding, through puncture of the jugular vein into 10 ml vacutainers for serum harvesting. Blood glucose was estimated by one touch glucometer. BHBA as per Stefanska *et al.* (2017) was analysed. The feeding regimen was documented in the identified subclinical pregnancy toxemia goats and the feed and fodder samples were collected from 10 % of these animals for proximate analysis (AOAC, 2012). The predominant feeding regime which causes the pregnancy toxemia in the survey was identified and further studied for dry matter intake and nutrient intake in affected goats.

Experimental animals and design

Farmers who adopted the feeding regimen of grazing and rice gruel with cooked rice (T1) and feeding regimen of grazing, tree

fodder and rice gruel with cooked rice (T2). Both feeding regimen contained small quantity of concentrate feed or rice bran. Twelve goats were selected from each feeding regimen of T1 and T2 for dry matter intake (DMI) and nutrient intake through feeding trial for one month. Goats were randomly distributed into two groups of six animals in each treatment. The animals were maintained at farmers' premises. Goats were allowed for grazing for 8 hours during daytime. The total DMI was measured in T1 and T2 group (Sultana *et al.*, 2012). The metabolizable energy intake and protein intake was calculated by prediction equation method (Luo *et al.*, 2004). The body weight of the animal was measured at the end of trial. The data were subjected to one-way analysis of variance (ANOVA) (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

The age, body condition scores, body weight, stage of gestation, number of parity and number of fetuses in does are presented in table 1. The results indicated that the does in highest age group 4 to 6 years (34.7%) and BCS less than 2 (39.3%) were under poor nutritional management and the risk for occurrence of pregnancy toxemia (Marutsova and Binev, 2017). The body weight less than 25 kg in 36.7% does were under poor nutrition during pregnancy (Perez *et al.*, 2013). Does were in late gestation (41.7%) and carrying twin and triplet fetuses (39%) were under risk of pregnancy toxemia due to negative energy balance and impaired gluconeogenesis (Vázquez-García *et al.*, 2021).

The blood glucose and BHBA level of does are presented in table 2. It indicated that

the 42.6% does were under risk of pregnancy toxemia due to negative energy balance (NEB) and impaired gluconeogenesis (Ismail *et al.*, 2015). The prevalence of subclinical pregnancy toxemia in does was significantly ($p < 0.01$) higher in late stages (34.3%) than in early stages (2.4 %) due to the accelerated growth of fetuses increased nutritional requirement. It was significantly higher ($p < 0.01$) in third and fourth parity does and does which carried twins and triplets (36.7%). Lima *et al.* (2016) reported that the body of the animals become weaker in poor nutritional management in increased parity resulting higher risk of disorder. In this study, the overall prevalence of sub clinical pregnancy toxemia was found in 36.7 % of does in which most were in late gestation, third and fourth parity and carrying twins (Osman *et al.*, 2019).

The survey report based on 300 farmers, holding 2,321 local breed goat is presented in table 3. Farmers adopted the four types of feeding regimen. The prevalence of subclinical pregnancy toxemia was found higher in feeding regimen containing grazing and feeding rice gruel with cooked rice (28.1%) than grazing and feeding tree fodders and rice gruel with cooked rice (8.6 %) due to imbalanced nutrition. The feed and fodder samples were analysed for its chemical composition, and it is presented in table 4. The crude protein content varied from 7.8% to 12% in roadside grass (Sultana *et al.*, 2012) and in mixed tree fodders varied from 8.51 to 14.96% as per Perez *et al.* (2013). The rice gruel with cooked rice had the crude protein of 12.27% (Murugeswari *et al.*, (2020).

Table 1. Body condition scores, Body weight, Stage of gestation, No. of parity and No. of fetuses in does

Parameters	Number of does	Percent of does
Body Condition Score		
Less than 2	118	39.3
2 to 3	133	44.3
3 to 4	49	16.4
Body weight		
Less than 25 kg	110	36.7
25 to 30 kg	141	47.0
More than 30 kg	49	16.3
Stage of gestation		
Early	175	58.3
Late	125	41.7
No. of parity		
3	65	21.7
4	49	16.3
More than 4	37	12.3
No. of fetuses		
Single	183	61.0
Twin	110	36.7
Triplet	7	2.3

Table 2. Blood glucose and BHBA level of does

Blood glucose (mg/dl) < 40 and Blood BHBA (mmol/lit) > 0.8	Number of does	Percent of does
BCS - Less than 2	126	42.0
BW – Less than 25 kg	118	39.3
Early gestation	7	2.4
Late gestation	103	34.3
3 rd and 4 th parity	126	40.7
Twins carrying	105	35.0
Triplet carrying	5	1.7

Table 3. Feeding regimen and no. of goats maintained by farmers of Kancheepuram, Tamil Nadu, INDIA

Sl.No	Feeding regimen	Number of farmers assessed	Percentage of farmers adopting feeding regimen	Average no. of goats with kids per farmer	Pregnancy toxemia identified (%)
1	Grazing and rice gruel with cooked rice	114	38.0	8	28.1
2	Grazing, green fodder and rice gruel with cooked rice	47	15.7	9	-
3	Grazing, tree fodder and rice gruel with cooked rice	101	33.7	6	8.6
4	Green fodder, tree fodder and concentrate feed	38	12.7	10	-

Table 4. Chemical composition of road side grass, mixed tree fodder and rice gruel with cooked rice of sub chemical pregnancy toxemia identified does

Parameters	Roadside grass	Mixed tree fodder	Cooked rice
Dry matter (%)	20.53 ± 2.78	42.67 ± 5.13	23.45± 4.07
Crude protein (%)	10.72 ± 1.74	11.85 ± 6.93	10.27± 2.01
Crude fiber (%)	23.45 ± 3.83	17.09 ± 5.49	0.55± 0.18
Ether extract (%)	2.32 ± 0.07	2.68 ± 1.15	1.29± 0.67
Total Ash (%)	10.52 ± 2.36	9.65 ± 3.78	0.86± 0.01
Nitrogen free extract (%)	52.49 ± 2.86	40.86 ± 5.91	87.03± 4.98
Energy (kcal)	272.46 ± 11.95	234.23 ± 9.56	403.92± 19.12

Table 5. Dry matter and nutrient intakes of sub clinical pregnancy toxemia does (Mean $\pm$ SE)*

Parameters	Grazing and rice gruel with cooked rice – T1	Grazing, tree fodder and rice gruel with cooked rice – T2
Number of animals	6	6
Average live weight (kg)	20.63 $\pm$ 3.17	21.44 $\pm$ 4.29
Dry matter intake from concentrate / feed ingredients (kg/day)	0.124 $\pm$ 0.01 ^b	0.092 $\pm$ 0.01 ^a
Dry matter intake from grazing (kg/day)	0.451 $\pm$ 0.03 ^b	0.403 $\pm$ 0.03 ^a
Dry matter intake from tree fodders (kg/day)	-	0.098 $\pm$ 0.03
Total dry matter intake (kg/day)	0.577 $\pm$ 0.04 ^a	0.604 $\pm$ 0.04 ^b
Dry matter intake (% of BW)	2.79 $\pm$ 0.11	2.80 $\pm$ 0.16
Energy Intake (kcal/day)	1921.60 $\pm$ 11.95 ^a	1973.67 $\pm$ 12.54 ^b
Crude protein intake (g)	44.41 $\pm$ 3.06 ^a	50.94 $\pm$ 4.52 ^b

*Mean of six samples; Means bearing different superscripts differ high significantly (P<0.01) among treatments.

The dry matter and nutrient intake of subclinical pregnancy toxemia does are presented in table 5. The study was conducted in pregnancy toxemia animals following the feeding regimen of T1 (Grazing and rice gruel with cooked rice) and T2 (Grazing, tree fodder and rice gruel with cooked rice). There was no significant difference observed in dry matter intake. The crude protein intake was highly significant (P<0.01) in T2 (50.94 g) than T1 (44.41 g) due to feeding tree fodder feeding (Perez *et al.*, 2013). The energy intake also was significantly higher (P<0.01) in T2. The required intake of DM, energy, and protein

during late stage of pregnancy should be 3.82 %, 2400 kcal and 58.6 gms respectively in does. An average DMI, energy intake and protein intake were 2.79 %, 8.12MJ and 47.67 g respectively were recorded in subclinical pregnancy toxemia does (Dore *et al.*, 2015). In Tamil Nadu, most goat farms belong to the unorganized sector (Livestock census, 2017) and they feed their goats with locally available feed resources. The feeding regime adopted by the farmer in this study could not support the nutrient requirements of pregnant does which requires additionally 10.04 MJ of energy, 58.6 gms of protein and 3.82% DMI (ICAR, 2013).

CONCLUSION

The prevalence of pregnancy toxemia disorder was 36.7 % in Kancheepuram district. The subclinical pregnancy toxemia was higher in late stage of pregnancy animals bearing twins which was diagnosed by their BCS, blood glucose concentration and BHBA level. The metabolizable energy and crude protein requirements were not sufficient due to poor nutritional management. Hence, it is recommended that the pregnant goats should be fed according to their nutrients requirements and twin carrying animals should be assessed for their BCS, blood glucose concentration and BHBA level to prevent the occurrence of pregnancy toxemia.

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