The Pharma Innovation Journal 2021; SP-10(8): 930-933

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(8): 930-933

www.thepharmajournal.com
Received: 01-06-2021
Accepted: 03-07-2021

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Prevalence of subclinical ketosis in sheep in and around Ballari

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Abstract
Limited information is available regarding the prevalence of SCK in sheep in our country and in particular Karnataka state is very sparce. Blood BHBA is considered as a diagnostic tool for subclinical ketosis. A total of 228 clinically healthy pregnant ewes were randomly selected from sheep flock in and around Kampli, Ballari District. The optimal cut-off point was set based on previous studies of various researcher. Sheep with BHBA concentrations between 0.8-1.6mmol/L were classified as having SCK.
Among Sheep breeds, Ballari, Kenguri, Deccani and Non-descript breeds showed prevalence of 13.63, 12.79, 10.34 and 14.89% respectively. Overall, 13.16% of tested sheep were considered subclinically ketotic in at least one sample period. The results suggest that, BHBA concentration in between 0.8-1.6 mmol/L in the pregnant ewes can be used for diagnosis of subclinical ketosis and making management decisions for prevention and treatment.

Keywords: hernia, buffalo bull, umbilical, herniorrhaphy

Introduction
Subclinical ketosis can cause severe economic losses through higher incidence of peri-parturient problems like dystocia, perinatal mortality of offspring and post-partum genital disorders. Pregnancy toxaemia (ketosis) usually occurs sporadically and unpredictably, even when adequate management and feeding practices are in place. Prevalence ranges from 6.5% to 41% per cent in the pregnant ewes which results from a failure of dietary energy and gluconeogenesis to provide enough glucose to meet the increasing foetal demands in the last 4-6 weeks of gestation (Al-Mujalli, 2008) [1]. Prevalence in breed differences among the sheep and goats with respect to ketosis vary with differences in fecundity, management system and rate of hepatic gluconeogenesis (Kelay and Assefa, 2018) [4].

Materials and Methods
The study was carried out in an apparently healthy, routinely dewormed and vaccinated pregnant ewes that were in the last 4-6 weeks of gestation, maintained under free range system of rearing and not provided with concentrate feed. Diagnosis of subclinical ketosis in the pregnant ewes using hand held device in and around Kampli, Ballari District as normal part of the diagnostic work up and therapeutic protocol adapted in the present study. In the present study, blood BHBA level of 0.8-1.6 mmol/L was set as threshold for subclinical ketosis.
Ewes were examined for pregnancy based on history by thorough interviewing of shepherds, abdominal palpation of ewes in flocks. Abdominal palpation in sheep is relatively inexpensive and easy to perform in the field with an accuracy of >90% (Ishwar, 1995) [3]. The BHBA was determined with the handheld device Freestyle Optium-H Blood glucose and ketone monitoring system using Freestyle Optium H β-ketone test strips. Animal's head was fixed by attendant and simultaneously performed the venipuncture of an ear vein after taking aseptic measure. For this, a well-visible vein was chosen and punctured with a needle, as described by Pichler *et al.* (2014) [5]. A drop of whole blood was obtained and immediately instilled on a disposable ketone test strip which was inserted into the ketometer, after few seconds results were recorded and expressed in mmol/L.

Statistical Analysis
The data were analysed by using 'student t test'. All the data were analysed by using Graph pad prism 9 statistical software for data analysis. Values were represented by means ± standard error (SE). All differences were considered statistically significant at $P \leq 0.05$.

Results

Prevalence

A total of 228 pregnant ewes were subjected for the diagnosis of subclinical ketosis, among those 30 animals were found positive based on screening of BHBA using Freestyle Optium Neo H Blood glucose and ketone monitoring system, indicating 13.16% prevalence of SCK in present study (Table 1, Fig. 1)

Breed wise prevalence

Among breeds, 9 out of 66 Ballari breed, 11 out of 86 Kenguri breed, 3 out of 29 Deccani breed and 7 out of 47 Non-descript breed were found positive for subclinical ketosis indicating the prevalence of 13.63, 12.79, 10.34 and 14.89% respectively. The analysis of data revealed that the prevalence of SCK was higher among non-descript breed followed by Ballari, Kenguri and Deccani breeds (Table 2, Fig. 2)

Age wise prevalence

With respect to age wise distribution of subclinical ketosis among the pregnant ewes, 2 out of 30 animals belonging to 1-2 years age group, 19 out of 104 animals belonging to 2-4 years age group and 9 out of 94 animals belonging to 4-6 years of age group were found positive for subclinical ketosis indicating the prevalence rate was recorded as 6.67, 18.27 and 9.57% respectively. The prevalence rate was increased with advancement of age up to 4 years and lowest was observed in 1-2 years age group during pregnancy. These observations suggested that highest susceptibility was recorded in 2-4yrs age group in pregnant ewes (Table 3, Fig. 3)

Table 1: Prevalence of sub-clinical ketosis in pregnant ewes

Animals	No. screened	No. positive	percentage
Pregnant ewes	228	30	13.16

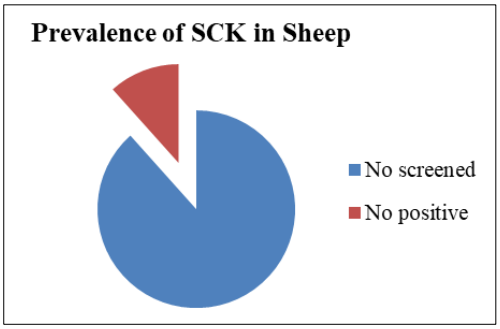

Fig 1: Prevalence of sub-clinical ketosis in sheep

Table 2: Breed wise prevalence of Sub clinical ketosis in pregnant ewes

Breed	No. of Pregnant ewes screened	No. of Pregnant ewes found positive	Percentage
Ballari	66	9	13.63
Kenguri	86	11	12.79
Deccani	29	3	10.34
Non-descript	47	7	14.89
Total	228	30	13.16

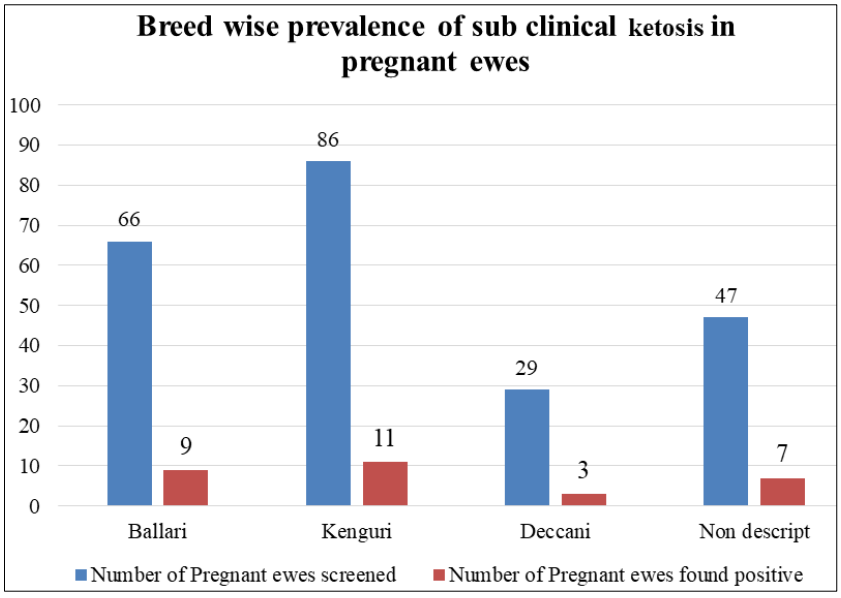

Fig 2: Breed prevalence of sub-clinical ketosis in pregnant ewes

Table 3: Age wise prevalence of Sub clinical ketosis in pregnant ewes

Age in yrs	No. of Pregnant ewes screened	No. of Pregnant ewes found positive	percentage
1-2	30	2	6.67
2-4	104	19	18.27
4-6	94	9	9.57
Total	228	30	13.16

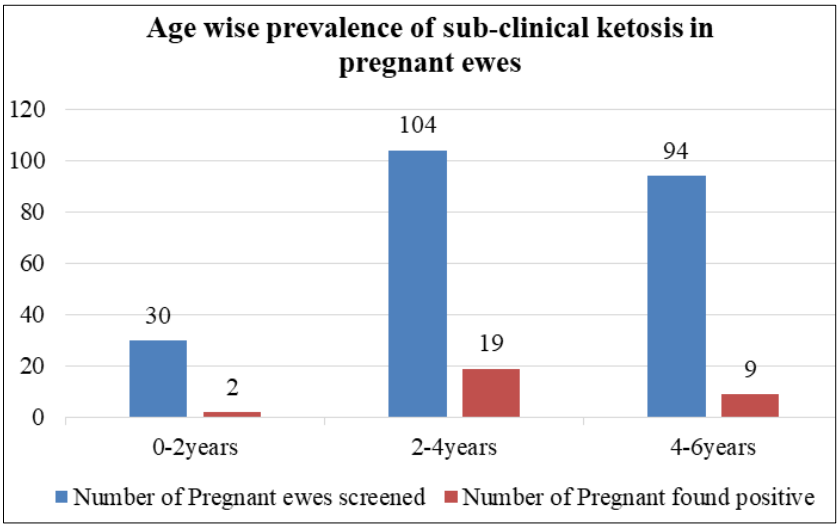

Fig 3: Age wise prevalence of sub-clinical ketosis in pregnant ewes

Discussion

Epidemiological studies

Pregnancy toxaemia occurs in all parts of the world. With the drive to increase lambing percentages dependent on feed costs, particularly in intensively fed flocks, the problem has become widespread. The incidence in a flock varies with the nature and severity of the nutritional deprivation and the proportion of the flock at risk. The case fatality is high unless treatment is initiated early in the clinical course. It causes 100 per cent ewe mortality and high neonatal mortality in untreated case (Radostits *et al*., 2007) [7].

Prevalence: In the present study, though no clinical ketosis was recorded in sheep based on overt signs of the disease, subclinical ketosis was diagnosed on the basis of estimation of BHBA using handheld device Freestyle Optium-H Blood glucose and ketone monitoring system.

The overall prevalence of subclinical ketosis in present study was 13.16%. This finding was in proximity with the observation of Venkateshalu *et al.* (1994) [9] and Gupta *et al.* (2008) who reported 14.86% and 14.69% prevalence of subclinical ketosis in pregnant sheep respectively. As the pregnancy advances, the energy demand also increases and at the same time, the capacity of rumen shrinks due to growing foetus in uterus taking up more and more space inside, leaving less space for the rumen. This combination results in low feed intake leading to negative energy balance. To meet out growing energy demand, body tissues especially adipose tissue breaks down to provide energy for growing foetus and in these process ketone bodies are released into bloodstream. When this process occurs too rapidly, the ewe's body cannot detoxify the ketone bodies fast enough and ketosis or pregnancy toxaemia results (Radostits *et al*., 2007) [7].

Breed wise prevalence: In the present study, breed wise distribution of data indicated that the prevalence of SCK was higher in non-descript breed (14.89 per cent) followed by Ballari (13.63 per cent), Kenguri (12.63 per cent) and Deccani (10.34 per cent) breeds. However, the breed-wise prevalence of SCK among sheep in India is not documented however, among goats, the prevalence of SCK in Barbari and Jamunapari breed was recorded to be 9.32 and 20.37 per cent respectively (Gupta, 2004) [2]. The difference may be due to variation in dietary assimilation and absorption of food from intestine, browsing behaviour, body weight, size, additional stress of the wool production and differences in flock management (Radostits *et al*., 1994) [6].

Age wise prevalence: In the present study, age group of 2-4 years (18.27%) was found to be most affected by subclinical ketosis. Although, the disease was prevalent in all age groups above one year of age. Similar observations were recorded by Gupta (2004) [2], who reported higher prevalence rate in the pregnant ewes of 3-4 years age. The variation in prevalence rate between different age groups was highly significant, this could be explained on very fact that animals during 2-4 years age group are more producing, which makes them more susceptible (Smith and Sherman, 1994) [8]. Variation in the of feed intake, feeding schedule, browsing availability, provision of additional concentrate feed, season and stress of severe cold also play a role in causation of subclinical ketosis (Radostits *et al.*, 2007) [7].

Conclusion

Prevalence of subclinical ketosis (Blood BHBA level ≥0.8mmol/L) is high during late gestation. The economic losses from pregnancy toxaemia might be significant. The mortality rate in affected animals could attain up to 100%, and even if treatment is initiated, the outcome could be fatal due to severe irreversible organ damage. A primary and reliable parameter for monitoring negative energy balance and ketosis is estimation of blood BHBA concentrations and is important tool for herd health management in sheep. The blood BHBA with a cut-off value between 0.8-1.6 mmol/L can be potentially useful tool for the routine monitoring and screening of subclinical ketosis in pregnant ewes. The blood BHBA estimation at field level can be done using hand held meter used as the primary monitoring tool and it can replace the need for submitting blood samples to laboratories for BHBA testing.

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