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Retrospective and prospective studies on prevalence of Bovine ketosis in Kashmir Valley

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Abstract

The present study was undertaken to ascertain the prevalence of bovine ketosis in dairy cattle's. In a retrospective study from 2007-2014 overall prevalence of ketosis was 3.36% with highest prevalence (3.71%) for year 2014. The highest prevalence was observed in spring (4.70%), 4th parity animals (38.04%) and in animals above 7 year of age. The overall incidence of ketosis from September 2014 to august 2015 was 35.27%, with 26.21% subclinical ketosis and 9.06% clinical ketosis. Prevalence of subclinical ketosis was highest in 5-9 year old (71.59%), animals in 4th parity (29.62%) and in first of lactation (18.51%). Prevalence of clinical ketosis was highest in 5-8 year old (82.13%), animals in 3rd parity (46.42%) and in third week (21.42%) of lactation.

Keywords: Bovine, ketosis, ketone bodies, oral glucose and prevalence

1. Introduction

Ketosis is a production disease with high intensity of prolonged morbidity causing substantial loss in dairy industry [1]. Ketosis has become a very common metabolic disorder in modern dairy production by causing decrease in milk production and increase in prevalence and duration of fresh cow diseases, enhancing time to conception, and augmenting risk of culling [2, 3]. High incidence ranging from 4.4 to 15% and 34 to 62.5% of clinical and subclinical ketosis, respectively in dairy cattle has been reported from India and abroad [4, 5]. It is commonly recorded in high producing dairy Cattle in early and at peak lactation. In the recent past, the frequency of clinical cases has increased sharply because of increased milk production and rearing of cross bred dairy cows [3]. There are two sources of ketones that are important in pathogenesis of ketosis in cattle. The first is exogenous ketogenic precursors which is metabolised to long chain fatty acids before acting as a precursor for ketone production [6] or possibly from the feeding of fats containing medium chain fatty acids [7]. In this study, attempts have been made to ascertain the frequency of different forms of ketosis in respect of prevalence, age, season, stage of calving and stage of location among the dairy cows in Kashmir division of Jammu and Kashmir.

2. Materials and Methods

The present study involved retrospective and prospective studies.

2.1 Retrospective study

Retrospective study was conducted in district Budgham. The district consist of 8 blocks and data of past 7 years (2007-2014) from block hospitals were records according to the parity, age, season and year of occurrence.

2.2 prospective study

The prospective prevalence study was conducted on recently calved crossbred cows at Veterinary Clinical Service Complex, FVSc and AH, Shuhama; District Budgam and Mountain Livestock Research Institute, Mansbal. Fresh Milk and urine samples were collected from all animals and subjected to Rotheras test. The cases positive for Rotheras test were categorized as ketotic animals. If clinical signs were evident the cases were categorized as clinical ketotic animals and if the clinical signs were not so evident the animals were categorized as subclinical ketotic. During the study, 309 milk-cows of mixed population were screened for suspected ketosis.

2.3 Clinical and laboratory Evaluation

The clinical signs, selective feeding, inappetence, reduced milk yield, excess salivation, stomach pain, and acetone (pear drop) smell of milk with rapid breathing were observed. After obtaining complete history of milk yield, stage of lactation, age from the dairy owners, the analysis of urine and milk of 309-test-cows were qualitatively assessed by Rothera's test and Ross test.

2.4 Statistical analysis

Data was analyzed statistically applying chi square test. Difference were considered significant when $P \geq 0.5$.

3. Results

3.1 Retrospective study

The overall prevalence of ketosis for the period 2007-2014 was 3.36% (267332/8998). The prevalence revealed an increasing trend from 2007 to 2014 with highest prevalence (3.71%) for year 2014 and lowest (3.16%) for year 2007 (Fig 1). Prevalence revealed a different trend according to seasons with highest prevalence in spring (4.70%) followed by winter (3.92%), autumn (3.03%) and summer (2.16%) (Table 1). Majority of affected animals were in 4th parity (38.04%) followed by 3rd (23.46%) and 5th parity (16.79%). First parity animals were the least affected (4.67%). Age wise analysis revealed that majority affected cattle was above 7 year of age (Table 2).

3.2 Prospective study

The overall incidence of ketosis from September 2014 to August 2015 was 35.27% with 26.21% subclinical ketosis and 9.06% clinical ketosis. The highest prevalence of subclinical ketosis was reported in MLRI Mansbal (42.62%), followed by VCSC (27.92%) and Budgam (17.51%) and highest prevalence of clinical ketosis was reported at VCSC Shuhama (11.17%), followed by Budgam (9.48%) and MLRI Mansbal (3.27%) (Table 3). Out of 109 cases of ketosis, majority of animals (61.47%) were 5-8 year old (table 4). Parity wise the highest prevalence was recorded in 3rd parity (29.35%) and 4th (29.35%) followed by 2nd (22.9%)

Out of 81 cases of subclinical ketosis, majority of animals (71.59%) were 5-9 year old. The young (<4 year) and too old (>9 year) animals were less affected. Majority of animals were in 4th parity (29.62%) followed by 3rd (23.45%) (Table 4)

Out of 28 cases of clinical ketosis, majority of animals were 5-8 year old. Only one case was observed in <4 year age group. Majority of animals, thirteen cases were in 3rd parity, eight were in 4th and five animals were in 2nd parity while two animals were in first parity (Table 4)

Lactation-wise the prevalence of subclinical ketosis was highest in first week (18.51%) followed by 4th (14.81%) while as in clinical ketosis the highest prevalence was observed in third week (21.42%) followed by 4th week (17.85%) (Fig 2)

4. Discussion

4.1 Retrospective study

The present study indicates an overall prevalence rate of 3.36% in Budgam district from 2007-2014. There was a gradual increase in prevalence rate from 2007 to 2014 from 2.86 to 3.71%. Our observations are in agreement with [8] who reported 3.4% prevalence of clinical ketosis. The prevalence of clinical ketosis ranging from 1.4 to 20 per cent has been reported in dairy cattle [4, 5, 9]. The gradual increase in prevalence of the disease from 2007 to 2014 may be attributed to the rearing of animals of high genetic potential with the

passage of time and consequential increase in milk yield. A higher prevalence rate 4.70% in spring was observed followed by 3.92% in winter, 3.03% in autumn and 2.16% in summer. [10] Also documented higher prevalence of ketosis in spring and winter months of the year. The observed higher prevalence in spring months may be attributed to the fact that in Kashmir valley, most of the cattle calve during this season and ketosis is generally observed in post parturient period. The higher prevalence in winter as compared to summer and autumn could be due to low availability of quality fodder or scarcity of fodder during winter months. The high prevalence of bovine ketosis in winter season in Northern climatic conditions were recorded which exerted the adverse health impacts on dairy cattle [11, 12]. In such areas, in winter season, grazing pasture was not suitable for lactating cows. The present finding is in consonance with other workers who observed the highest prevalence during the winter season than summer [13, 12].

Parity wise comparison revealed highest prevalence in fourth parity (38.04%) and lowest prevalence in first parity (4.67%) animals. Generally cattle achieve their higher milk production status in 3rd to 5th lactation. [14] Observed prevalence of bovine ketosis as 3, 7, 20, 22 and 13 per cent at first, second, third and fifth or later calving, respectively. [15] Recorded highest incidence of clinical ketosis in cows in the order 3rd > 4th > 2nd > 1st parity. Higher the milk production, higher could be the nutritional demands and higher negative energy balance. This negative energy balance coupled with scarcity of quality fodder could be the possible reason for higher prevalence in 3rd to 5th parity animals observed in our study.

4.2 Prospective prevalence

In the present study, Out of the total 309 cross bred cows sampled during the study period 109 (35.27%) animals were found positive for ketosis, out of which 81 (26.21%) were sub-clinical and 28 (9.06%) were clinical ketosis. In VCSC, FVSc & AH, 27.92 per cent cows were positive for subclinical and 11.17 per cent for clinical ketosis, while as in MLRI, Mansbal 42.62% animals were positive for subclinical and 3.27 for clinical ketosis. In District Budgam 17.51% animals were positive for subclinical and 9.48 per cent were positive for clinical ketosis. Our results are in agreement with [16] who recorded 12.29 per cent prevalence of clinical ketosis. Similar to our results, prevalence rate of 10.3% [17] and 21.8 per cent [18] of subclinical ketosis has been reported in dairy cows. [12] Reported 36.7% prevalence of ketosis in Odisha.

A varied range of prevalence (0-40%) was documented as per the present finding of 35.27%. On the contrary, a wide range of prevalence varying from 2.9% to 59.7% was also recorded [2, 19]. Such type of wide variation in prevalence might be attributed to agroclimatic condition, climate change, and breed susceptibility, stage of calving, feeding habit, production potential and managemental practices followed by the dairy owners

Though cows of any age may be affected with ketosis, the disease appeared mostly in animals with higher age. Age wise prevalence of ketosis revealed the highest prevalence of clinical ketosis in 5-8 year age group while as in subclinical ketosis highest prevalence was observed in 5-9 year age group. [20] Reported highest prevalence of clinical ketosis in the age group of 8-9 years (73.34%) followed by 5-7 (20%) and > 9 years (6.67%). [15] Reported highest prevalence age wise prevalence (40.8%) in the age group of 5.5- 6.5 years. Parity-wise, highest prevalence was found in 3rd parity followed by 4th and 2nd in case of subclinical ketosis while as in clinical ketosis highest prevalence was observed in 3rd

parity followed by 2nd and 4th. This could be attributed to the peak milk yield during this period which puts the animal in more negative energy balance, resulting in the shift of metabolism towards ketone production and thus leading to ketosis. The disease increases from low prevalence at the first calving and peaks at the fourth [10] observed in the present study. Similarly to the present findings, number of research workers recorded that the prevalence of ketosis increases with the age, with peak prevalence in 3rd-6th lactation [20, 12]. It might be elucidated that the cows in very first state of calving were not accomplished with the highest lactation potential as the udder development was still to attain its fulfilment with required amount of secretory tissues for synthesis of milk. The present findings corroborate with earlier findings which reported that ketosis was more prevalent among the multipara milk cows [21]

The prevalence scenario of ketosis at different monthly stages of lactation demonstrated that the intensity and dimension of the disease was more at the peak stage of lactation with gradual decrease of frequency at later stage [2]. In the present study highest prevalence of clinical ketosis was observed 3-4 weeks after parturition while as highest prevalence of subclinical ketosis was observed First week after parturition. The highest prevalence during the first few weeks after parturition could be attributed to the low dry matter intake and high demand for milk production resulting in more negative energy balance [22]. Many researchers have noted that immediate post parturient period was a greater risk and most cases occur in the first 6 weeks following calving [21, 23]. Observed a prevalence of 63.00, 68.00 and 59.00 per cent during the week 2nd, 4th and 6th postpartum.

Table 1: Seasonal prevalence of bovine clinical ketosis in district Budgam.

Season	Spring	Summer	Autumn	Winter	Average
Percentage	2983/63494 (4.70%)	1623/75964 (2.16%)	2036/67740 (3.00%)	2356/60134 (3.92%)	8998/267332 (3.36%)

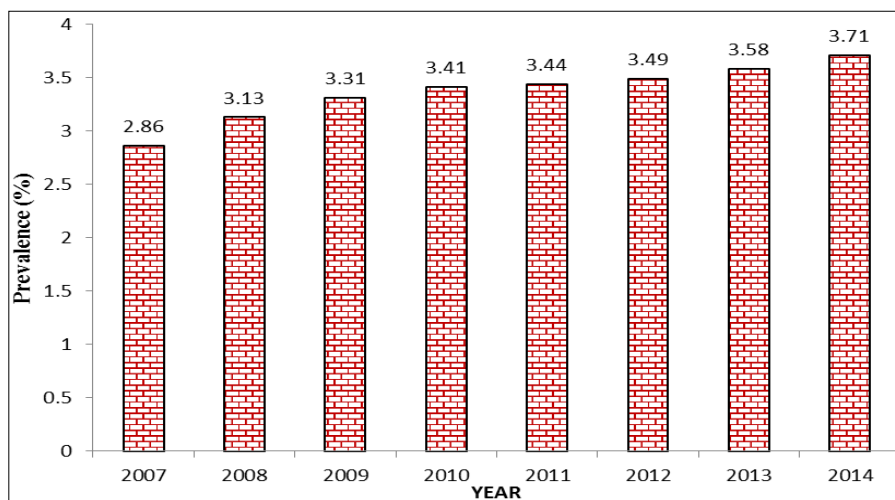


Fig 1: Prevalence of bovine clinical ketosis in district Budgam from 2007-2014.

Table 2: Parity-wise and age wise prevalence of clinical ketosis in district Budgam.

Parity (Lactation Number)	1	2	3	4	5	6
Percentage	4.67 ^d	9.57 ^c	23.46 ^b	38.04 ^a	16.79 ^b	7.44 ^c
Age wise	3 - 4	5 - 6	7 - 8	9 - 10	>10	
Percentage	10.28 ^d	13.84 ^{cd}	25.20 ^b	32.51 ^a	18.17 ^c	

The values bearing different superscript (small letters) in a column differs significantly ($p \leq 0.05$)

Table 3: Prevalence of bovine ketosis in different study areas during study period (N=309).

Area of study	No. of susceptible animals examined	Ketosis (as per laboratory diagnosis)		Clinical ketosis		Subclinical ketosis	
		Affected	%ge	Affected	%ge	Affected	%ge
Budgam	137	37	27.00 ^b	13	9.48 ^a	24	17.51 ^c
MLRI, Mansbal	61	28	45.90 ^a	2	3.27 ^b	26	42.62 ^a
Tvcsc Shuhama	111	44	39.64 ^a	13	11.17 ^a	31	27.92 ^b
Mean	309	109	35.27	28	9.06	81	26.21

The values bearing different superscript (small letters) in a column differs significantly ($p \leq 0.05$)

Table 4: Age-wise and Parity wise prevalence of ketosis during study period.

Age wise	<4	4-5	5 - 6	6 - 7	7-8	8-9	>9
Clinical	1/28 (3.57 ^c)	4/28 (14.28 ^b)	6/28 (21.42 ^b)	8/28 (28.57 ^{ab})	9/28 (32.14 ^a)		
Subclinical	8/81 (9.87 ^{ab})	10/81 (12.34 ^b)	16/81 (19.75 ^a)	11/81 (13.58 ^b)	17/81 (20.98 ^a)	14/81 (17.28 ^a)	5/81 (6.17 ^c)
Mean	8.2 (9/109)	12.8 (14/109)	20.1 (22/109)	17.43 (19/109)	23.85 (26/109)	12.8 (14/109)	4.58 (5/109)
Parity (Lactation Number)	1	2	3	4	5	6	
Clinical	3/28 (7.14 ^d)	5/21 (17.85 ^c)	13/28 (46.42 ^a)	8/28 (28.57 ^b)	-	-	-
Subclinical	14.81 ^c (12/81)	20.98 ^b (17/81)	23.45 ^b (19/81)	29.62 ^a (24/81)	8.64 ^d (07/81)	2.46 ^d (02/81)	
Mean	15.59 (17/109)	22.9 (25/109)	29.35 (32/109)	29.35 (32/109)	6.4 (07/109)	1.83 (02/109)	

The values bearing different superscript (small letters) in a column differs significantly ($p \leq 0.05$)

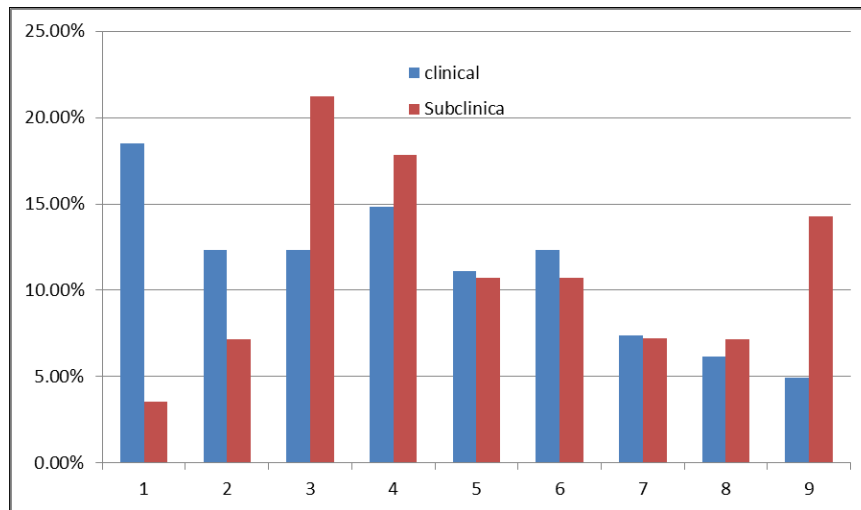


Fig 2: Prevalence of bovine subclinical ketosis in relation to lactation age.

5. Conclusion

In a retrospective study from 2007-2014 overall prevalence of ketosis was 3.36% with highest prevalence (3.71%) for year 2014. The overall incidence of ketosis from September 2014 to august 2015 was 35.27%, with 26.21% subclinical ketosis and 9.06% clinical ketosis. Prevalence of clinical ketosis was highest in 5-8 year old (82.13%), animals in 3rd parity (46.42%) and in third week (21.42%) of lactation.

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