

SHORT COMMUNICATION

Prevalence and Clinico-Pathology of Ketosis in Dairy Cows in Tigray Region of Ethiopia

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ABSTRACT

An investigation to study the prevalence and clinico-pathology of ketosis in dairy cows was undertaken from November 2007 to May 2008 at Kalamino, Agazi and Mekelle University dairy farms in and around Mekelle town of Tigray region of Ethiopia. Recently-calved cows were screened for ketosis by subjecting urine and milk sample to strip (URS-10) and Rothera's tests. An overall prevalence of 12.29% was recorded with highest prevalence during January and February. Age-wise, the highest prevalence was noticed at 8-9 years of age (73.34%). Cows in their 4th lactation (46.67%) and those in 1-2 months (53.35%) of lactation had significantly higher prevalence ($p < 0.005$). The clinical observations in ketotic cows were anorexia, refusal to take concentrate and decrease in milk yield. There was 30-100% decrease in milk yield in most of the cases. The body temperature, pulse and respiration rates were within normal range with decreased rumen motility. Feces were scanty, mucoid and dry; and urine, breath and fresh milk had characteristic smell of acetone. Ketotic animals were treated with dextrose and insulin.

Key Words: Dairy Cows, Ketosis, Prevalence, Mekelle, Ethiopia.

1. INTRODUCTION

Ketosis, (acetonemia) has been recognized as one of the main important metabolic disorders in dairy cows. It is caused by impaired metabolism of carbohydrate and volatile fatty acids that lead to excessive production of ketone bodies: acetoacetic acid, beta-hydroxybutyric acid and their decarboxylation product such as acetone and isopropanol (Radostits et al., 2000).

A high prevalence of clinical and sub-clinical ketosis has been recorded in recently-calved high-yielding dairy cows in many countries (Mcsherry, 1977). But little work has been done on ketosis in dairy cows in Ethiopia which comprise about 42% of the total cattle herds and any disease related to production causes a heavy loss to the farmers (FAO, 1993). Therefore, the present investigation was undertaken to record the prevalence and clinico-pathology of clinical ketosis in cattle dairy farms in and around Mekelle town of Tigray region of Ethiopia.

1.1. Study Area

The present study was carried out in dairy farms located at Kalamino, Ageazi and Mekelle University. Tigray region is located in Northern extremes of Ethiopia extending from 12° to 13° to

14° 54' north latitude and from 36° 27' to 40° 18' east longitude and of 2070 meters above sea level. The mean annual rainfall ranges from 800 to 910 mm and temperature varies from 12°C (November & December) to 27°C (January-March) (MZUAO, 1999).

2. METHODOLOGY

2.1. Study Design

The study involved a cross-sectional observation in a multi-stage sampling technique to estimate the prevalence of bovine ketosis in recently calved dairy cows. A total of 122 milking cows were screened for clinical ketosis from November 2007 to May 2008.

2.2. Study Animals

In this study, Holstein-Friesian (HF) cross-bred cows were examined. Questionnaire data such as age, lactation number, stage of lactation, milk-yield, nutritional condition (feeding), symptoms observed including by owners and the past and present history of illness. Clinical examination of cows such as body temperature, respiration and pulse rates including ruminal motility were thoroughly carried out. The systems examined and how they performed is indicated in table. 2.

2.3. Assay of Ketone bodies

Fresh urine and milk samples were collected and tested for ketone bodies. The diagnosis of clinical and subclinical ketosis was confirmed with the help of different qualitative and quantitative tests with urine and milk (Kaneko, 1989). The ketone bodies in urine were detected using reagent strips (URS-10) which react with aceto-acetic acid but not with acetone and beta-hydroxybutyric acid. Rothera's test was performed with both urine and milk and their sensitivities were compared. Rothera's test detects acetone and aceto-acetate but not beta-hydroxybutyric acid (Kaneko, 1989).

3. RESULTS

Of the 122 lactating cows examined, an overall prevalence of 12.29% (15) was recorded for clinical/ sub-clinical ketosis by Rothera's test. Month-wise highest prevalence was recorded in the month of February (18.8%) followed by January (14.63%), November and March (11.11% each) and December (6.25%). There was no significant difference ($P > 0.05$, $p = 0.7213$) between the month groups.

Age- wise, highest prevalence was recorded at the age of 8-9 years (73.34%) followed by 5-7 years (20 %), and >9 years (6.67% each). Most of the ketotic animals were in their 4th lactation (46.67%) followed by 3rd (33.33%), 2nd (13.33%) and 1st (6.6%) lactations. Maximum number of cases were recorded during 1-2 month post-partum (53.35%) followed by 0-1 month (20%), 2-3 (13.3%), 3-4 and 4-5 month post-partum. There was significant difference ($P < 0.05$) among the age, lactation number and lactation stage.

The clinical observations in ketotic cows are shown in tables 1 and 2. The first characteristic clinical signs observed were partial or complete anorexia, refusal to concentrate and decrease in milk yield. The decrease in milk yield was 36-100% in 5 cases followed by 30-36% in 5 cases and less than 30% in another 5 cases.

The body temperature, respiration and pulse rates were within normal range with decreased ruminal motility. On rectal examination feces were scanty, mucoid and dry in most cases. The cows appeared dull and depressed with a smell of acetone in breath, urine and fresh milk. The mucous membranes were slightly congested. Nervous signs were seen in one case which showed salivation, licking of body and inanimate objects and grinding of teeth (Table 2). Ketotic animals were treated with 50% dextrose intravenous and insulin and resulted in the disappearance of ketone bodies from the milk and urine post treatment.

Table 1. Clinical observations (lactation) in cows suffering from clinical ketosis.

S. No.	Age (Yrs)	lactation no.	Lactation stage (month)	Milk yield (lit/day)		Decrease in milk yield (%)
				Before illness	During illness	
1	6	2	2	15	10	33.33
2	7	2	2	18	13	27
3	10	3	2	11	9	18.18
4	8	3	1	16	10	37.5
5	8	4	2	12	9	25
6	9	4	2	14	9	35.7
7	9	4	3	13	8	46
8	9	4	2	17	13	23.52
9	9	3	2	12	8	33.33
10	8	3	1	16	10	37.5
11	7	3	2	13	9	30.76
12	8	4	3	15	11	26.67
13	9	3	4	11	7	36.36
14	9	4	1	12	7	41.67
15	8	4	1	16	11	31.25
Mean	8.3	3.3	2	14.07	9	31.80
S.E	+ 1.98	+ 0.68	+0. 82	+ 2.10	+ 1.86	+ 6.29

Table 2. Clinical observations (lactation) in cows suffering from clinical ketosis.

No.	Temp (°F)	Pulse rate	Respiratory rate	Ruminal movement/ 2min	Breath smell	Nervous signs	Rothera's test		Strip test
							Urine	Milk	
1	102	50	18	3	+	-	+++	++	++
2	101.5	60	22	1	-	-	++	+	+++
3	98	62	19	2	-	-	++	+	++
4	100	64	20	1	-	-	++++	++	+
5	100	70	21	1	-	-	++	+	+
6	100	66	24	1	-	-	+++	++	+
7	103	74	18	2	-	-	++	+	+
8	104	62	22	1	-	-	++	+	++
9	102	64	19	2	-	-	++	+	+
10	101	66	21	1	-	+	++	++	++
11	100	62	21	1	-	-	+++	++	+
12	98	60	18	2	-	-	++	+++	+
13	101.5	56	20	1	-	-	++	+++	++
14	103	72	24	1	-	-	+++	++	++
15	103	70	24	2	-	-	++++	++	++
Mean	101.13	63.87	20.47	1.47					
S.E	+1.74	+6.08	+1.86	+0.67					

4. DISCUSSION

Among the production diseases in dairy animals, ketosis occupies an important place as it mostly affects the high- yielding animals causing a heavy loss to the farmers, particularly during recently calving stage. In Ethiopia the study of epidemiology, clinico-pathology, diagnosis and treatment of ketosis in cows has not been well-documented and literature on ketosis is still scanty. Hence the present investigation was undertaken to study the prevalence, clinico-pathology and diagnosis of clinical and sub-clinical ketosis in dairy cows.

In the present study an overall prevalence of 12.29% was recorded for clinical ketosis from November 2007 to March 2008. This might be due to the highest calving rates of the animals during period as reported by the farm management personnel. A prevalence of 10.4% and 13.1 % has been reported for clinical ketosis and 33.8% for sub-clinical ketosis by Flemming (1996). Age- wise, highest prevalence of ketosis was recorded in cows of 8-9 years (73.34%) The present observation is in agreement with the findings of Turner (2008) who reported a high prevalence during advanced age.

Lactation- wise the highest prevalence of ketosis was recorded during 4th lactation with greater frequency in 1-2 month post-partum. The Data showed a significant correlation ($P < 0.05$) and

difference between prevalence of ketosis with age, lactation number and stage of lactation. This is due to maximum productivity of animals during this period (Baird, 1982; Turner, 2008). Analysis of sensitivity indicated that in the first few days of lactation the rate of nonesterified fatty acid utilization had a greater effect on ketone body concentration in periparturient cows than the other parameters tested in a model (Guo and Kohn, 2008). The present investigation showed highest prevalence during 1-2 month (53.3%) post-partum followed by 0-1 month (20%), 2-3 month (13.3%) and 3-4 and 4-5 (6.67% each). This is because in this stage the cows are in negative energy balance from calving until the peak lactation is reached, the demand on endogenous nutrient store for energy which increases the susceptibility to ketosis (Radostits et al., 2000).

Clinical ketotic cows showed anorexia, refused to take concentrate, decrease in milk yield and rapid loss of condition. Baird (1982) reported that the decrease in body weight could be caused by rapid mobilization of adipose tissue and also production stores. Milk production of ketotic cows decreased by 36-100% in five cases and followed by 30-36% in another five cases and less than 30% in five cases. It may be due to heavy drainage of lactose through milk to meet the demand of heavy lactation and depends on endogenous nutrient stores and so milk-yield becomes decreased. Anderson and Lundstrom (1985) suggested that increase in ketone bodies in blood may cause a decrease in milk yield. Clinical cases were treated with dextrose and insulin. As a result, no ketone body was found in milk and urine samples post treatment. This is in line with the results of Otto et al. (2007) who reported a marked improvement in ketotic cows. The body temperature, respiration and pulse rates were within normal range while ruminal motility was decreased. These observations are similar to the studies reported by other workers (Baird, 1982; Turner, 2008). The present communiqué conclude that recently calved cows should be routinely examined for ketosis so as to avoid production losses to dairy owners.

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