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Research Article

EPIDEMIOLOGICAL FACTORS RELATED TO THE LAMENESS IN DAIRY CATTLE

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ABSTRACT

The aim of the study was to relate the various factors involved in cause of lameness in lactating dairy cattle and correct the predisposing factors in such conditions. The population size was 1142 reared under organised (950 animals) and unorganised management system (192 animals) illuminating the overall incidence of lameness as 10.15 % with 17.18 % and 8.73 % in unorganised and organised management system, respectively and lameness was evaluated on the basis of numerical scoring scale for locomotion. The incidence of lameness was evaluated in different seasons with highest incidence in winters as 62.06%. Age wise incidence of lameness was seen as higher in old aged group as compared to younger ones in both the management system. The stage of milk production was seen having positive relation with the incidence of lameness with highest in 5th and above lactation and lower in 1st four months of lactation in both the rearing methods. Similarly, the milk yield too has positive relation with the incidence of lameness being high in high yielding cows as compared to the low yielding cows. Therefore, interventions to be needed to correct the voids wherein to prevent the incidence of lameness.

Keywords: Cross-sectional, lameness, lactation, milk yield, organised, rearing

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Lameness is the inability to walk normally because of an imperfection of, or injury to a foot or leg and may be defined as an atypical gait or locomotion characterized by limping (claudication) or not bearing full weight on a leg, usually allied with pain in the musculoskeletal system. After metabolic & production disorders lameness leads to a huge monetary damage to animal breeders primarily due to increased culling rate and wilted reproductive performance. Along with fiscal impacts, lameness raises animal welfare issues in today's dairy cattle production. Structural abnormality in claw horn and infectious disease such as digital dermatitis and leg injuries causes lameness in dairy cows. Factors which contribute to the development of lameness includes the milking status, pregnancy, feeding, floor type, length of rough track, frequency of floor cleaning, age, sex, and herd size. Claw lesions are discernible both at clinical (i.e., being lame) or at subclinical level (i.e., digital disorders noticeable at hoof trimming). Apart from common cause of laminitis; direct injury to the hoof, lesions conducive to laminitis are sole ulcer, white line abscess, digital dermatitis and interdigital phlegmon.

In India, an overall incidence of lameness of 10.9% has been reported in dairy animals including 11.8% in cattle and 9.9% in buffaloes with incidence of lesions varying from 30.55 to 35.5%, 13.2% and in some reports even up to 56.57%.

India being the largest producer of milk in the world and lameness with a multifactorial aetiology like feeding larger amounts of concentrates in the parlor or in out of parlor feeders, grooved concrete, accumulation of slurry, farms that undertake footbathing, but not very frequently have a digital dermatitis problem associated with a tendency for greater prevalence of lameness; is a major concern in dairies where the animals are reared for their maximum economic benefits. In view of above defined lines, the epidemiological investigation was undertaken to study the incidence of various hoof disorders and associated risk factors in dairy cattle in Shivalik belt of Jammu & Kashmir region.

MATERIALS AND METHODS

The study was conducted on various organized and unorganized dairy farms (dairy owners rearing 2-19 number of animals) in and around Shivalik (Jammu) belt of Jammu & Kashmir region.

Monitoring of affected dairy cattle

Farms (organized and unorganized) of the identified management systems were visited periodically to identify the hoof lesions in the dairy herds. Epidemiological information (pertaining to age, sex, parity, housing type, herd size, lactation status, type of lesion, milk yield etc.) was collected and noted down in the preforms as shown below and the data was used to find the link between the risk factors and various disorders.

Three organized dairy farms consisting a total of 950 lactating animals and eight unorganized dairy farms consisting a subtotal of 192 lactating animals, comprising a total of 1142 dairy animals which formed the pedestal for

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Lameness evaluation proforma

Age	Lactation	Stage of lactation	Milk yield/Day
<3 years	1st	<4 months	<5 lts
3-6 years	2nd	4-8 months	5-10 lts
6-9 years	3rd/4th	8-12 months	10-15 lts
>9 years	5th and above	>12 months	15-20 lts
		Management	
Floor type	Kaccha	Pacca	Concrete/Brick/Mixed
Plane of Nutrition	Poor	Medium	High
	Roughage based diet	Roughage+green fodder + occasionally concentrate	Roughage + ad lib green fodder + ad lib concentrate
		Locomotion Score	
0 1	2	3	4

the conduction of the study to find out the association of possible risk factors with various hoof disorders.

Examination of Lame animals:

Locomotion score

All the animals were made to walk for about 30 meters. Gait of individual animal was inspected and appraised on the numerical scoring scale from 0 to 4 as per the method adopted by Wells *et al.* (1993) as given in the Table 1.

Table 1. Numerical scoring scale for lameness

Lameness score	Gait
0	No gait abnormality visible at walk
1	Mild lameness with variation from normal gait symmetry at walk
2	Moderate lameness with moderate and consistent gait asymmetry
3	Severe lameness with marked gait asymmetry or severe systemic abnormality
4	Non ambulatory or recumbent animals

Hoof examination

After using proper restraining techniques followed by hoof trimming several foot lesions were identified as per Toussaint (1989). Each foot was inspected for any lesion ensuing paring a layer of approximately 1 mm of horn from the weight bearing surface.

RESULTSAND DISCUSSION

The results on the epidemiological investigation/ data pertaining to age, sex, parity, housing type, herd size, lactation status, type of lesion, milk yield etc. inferring the close linkage with the hoof disorders in dairy animals carried out from August 2015-June 2016 in and around Jammu are obtainable as under:

Overall per cent incidence of lameness

In unorganised and organised dairy farms the incidence of lameness was recorded as 17.18% and 8.73%, respectively with an inclusive incidence of 10.15% from both unorganised and organised dairy management system in and around Jammu belt. Our results are in cognisance with previous studies also indicating incidence of clinical lameness at about 9 percent in lactating cattle (Randhawa, 2006). As investigated by other workers there is wide range variation in the incidence of lameness ranging between 2 and 69% thereby supporting over investigation (Ranjbar *et al.*, 2016; Kumar *et al.*, 2021).

The greater incidence of lameness in cattle from unorganised farms might be due to intensive feeding and management practices followed there moreover animals in unorganised farms were given more concentrate diet and less forage for maximum milk production during lactation period and animals were stall fed, the animals were kept on concrete floor/bricks and snarled at one place for 24 hours (zero grazing system). The concurrent intensive feeding with more concentrate feeding and the management practise in organised farms was followed to achieve the production potential up to maximum but the animals were kept on concrete floor and kaccha floor for 12 hours each as routine practice, resulting in lesser hoof disorders in organised farms.

Season wise percent incidence of lameness

Overall incidence pattern in organised and unorganised farms during winter, summer and monsoon season is 62.06%, 15.51%, 22.41%, respectively. Our results are in cognisance with the prior findings of many workers who investigated the lameness being more prevailing in winter followed by monsoon and then summer season (Espejo *et al.*, 2006; Nandi *et al.*, 2008). The studies conducted by Nandi *et al.* (2008) revealed the annual incidence of lameness was 9.42 with 7.25% in summer season, respectively which is in close affirmation with our report for incidence of lameness in summer season. As there is difference in the housing system employed in summer

season thus the incidence pattern will vary according to the management pattern.

Age wise percent incidence of lameness

The per cent incidence of lameness was highest among the older cows in appraisal to younger ones with higher in 6-9 year age group than 3-6 year age group followed by >9 years age group and with least in young age group (<3 years) as 17.64%, 17.24%, 12.5% and 2.38%, respectively in organised dairy farms as represented in Table 4 and in unorganised farms with figures as 23.68% in 6-9 years old cows tailed by 20.63% in 3-6 years old cows followed by 14.8% in >9 years old cows and least in 3 years age group as 12.5% as depicted in Table 4. The preceding findings may be due to the fact that there might be increased softening/weakening of sole with the age making animals more inclined to lameness with the increase in age or weakening of suspensory apparatus with the increase in the age of animal (Mulling and Lischer, 2002; Randhawa, 2006).

Lactation (parity) wise per cent incidence of lameness among dairy cattle in different management system

The percent incidence of lameness in organised management system ranged 5.68% and 19.04% in first to fifth lactations, respectively, the incidence being highest in fifth and above lactations followed by fourth lactation, third, second and lowest in first lactation and overall incidence being 12.73% while as the percent incidence of lameness in un-organised management system ranged 12%. The incidence being highest in fifth and above lactations followed by fourth lactation, third, second and lowest in first lactation with figures as 30.76%, 30.30%, 15.78%, 15% and 12%, respectively and overall incidence being 20.37% as depicted in Table 5.

Previous reports also share the occurrence pattern and the reason for such findings are commonly attributed to the increased milk production leading drainage of minerals and nutrients from the body store thus lesser availability to the body organs for the maintenance of normal integrity leading to softening of hoof tissue and therefore render prone to lameness (Randhawa, 2006). Similar findings have been reported by other distinguished workers which ascribed lactation stage as one among the predisposing factor for the occurrence of lameness in a herd (Espejo *et al.*, 2006; Sogstad *et al.*, 2005; Wells *et al.*, 1993). Also, previous reports suggest that that as the parity increases the chances of a cow becoming lame also increase (Solano *et al.*, 2016).

Percent incidence of lameness in cross bed dairy cows in relation to the stage of lactation

The chronology of incidence of lameness in dairy cows seen in the unorganised management system is as, highest in first 120 days or less than four months of lactation followed by 4 to 12 months of lactation, then 4 to 8 months of lactation and least in animals with more than 12 months of lactation with the figures as 28.57%, 25.71%, 18.6%, and 8.33%, respectively, as shown in the Table 6. Similar results were comprehended in the organised management system with the figures as 44.4% in less than 4 months of lactation, followed by 22.22% in 8 to 12 months of lactation, then 9.28% in 4 to 8 months of lactation and nethermost in those animals with more than 12 months of lactation as 5.55% as shown in Table 6. As the early lactation is associated with the dynamic physiological changes or adaptive response to the calving and more milk

Table 4. Age wise per cent incidence of Lameness among dairy cattle reared under different management systems

Age (years)	No. of lame animals	Total number of animals	Incidence%
Organized Farms			
<3	12	504	2.38
3-6	30	174	17.24
6-9	24	136	17.64
>9	17	136	12.5
Total	83	950	8.73
Unorganized Farms			
<3	8	64	12.5
3-6	13	63	20.63
6-9	8	38	23.68
>9	4	27	14.81
Total	33	192	17.18

Table 5. Parity/lactation wise percent incidence of lameness among dairy cattle under different management system

Age (years)	No. of lame animals	Total number of animals	Incidence%
Organized Farms			
1st	10	176	5.68
2nd	18	153	11.76
3rd	16	98	16.32
4th	12	65	18.46
5th	20	105	19.04
Total	76	597	12.73
Unorganized Farms			
1st	3	25	12
2nd	6	38	15.78
3rd	6	40	15
4th	10	33	30.30
5th	8	26	30.76
Total	33	162	20.37

Table 6. Percent incidence of lameness among cross bred cows in relation to stage of lactation

Stage of lactation	No. of lame animals	Total number of animals	Per cent incidence (%)
Unorganised management system			
<4	8	28	28.57
4-8	14	75	18.66
8-12	9	35	25.71
>12	2	24	8.33
Total	33	162	
Organised management system			
<4	20	45	44.4
4-8	13	140	9.28
8-12	18	81	22.22
>12	5	90	5.55
Total	56	356	

production during early lactation which puts a negative effect on the body mineral and energy reserves and thus making milking animals prone to lameness (Mulling and Lischer, 2002).

Incidence of lameness among cross bred cows with respect to the milk yield in different management system

In unorganised dairy farms the higher percent of lameness was seen in the lactating cows having 10-15 litres of milk yield per day with the overall incidence as 26% followed by 22.58% in lactating cows with daily yield as 15-20 litres, then in cows with daily yield as 5 litres (18.18%) and least incidence, of 15% in those cows with daily yield as 5-10 litres, depicted in Table 7. Similar heave was seen in the organised dairy farms with highest incidence of 26% in cows daily having daily yield as 10-15 litres of milk, then in cows with daily yield as 5-10% with an overall incidence of 12.85% followed by 12.5% incidence in those animals having daily yield as 15-20 litres and least incidence of 6.66% in those having less than 5 litres of milk yield per day as depicted in Table 7. Incidence pattern in unorganised farms could be due to the plane of nutrition as with the increase in the daily milk output which causes drainage of minerals and nutrients from the body stores leads to the incidence of the lameness by causing the softening of the hoof tissue and making them more prone to claw disorders along with the bad sanitary practise as this dirtiness of the cows could be associated with the dirty flooring conditions in the farms which has significant influence on lameness (Randhawa, 2006).

CONCLUSION

The managemental practises during seasonal variation, plan of nutrition have to be checked to prevent the incidence in any farm setup for the economic uplifment of dairy sector which is the largest backbone of national economy. Also, the incidence and factors causing lameness need to be checked in food animals as a matter of animal welfare.

Table 7. Percent incidence of lameness among cross bred cows in relation to milk yield in different management system

Milk yield (L) lactation	No. of lame animals	Total number of animals	Per cent incidence (%)
Unorganised management system			
<5	4	22	18.18
5-10	9	60	15.00
10-15	13	50	26.00
15-20	7	31	22.58
Total	33	162	
Organised management system			
<5	3	45	6.66
5-10	22	171	12.85
10-15	26	100	26.00
15-20	5	40	12.5
Total	56	356	

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