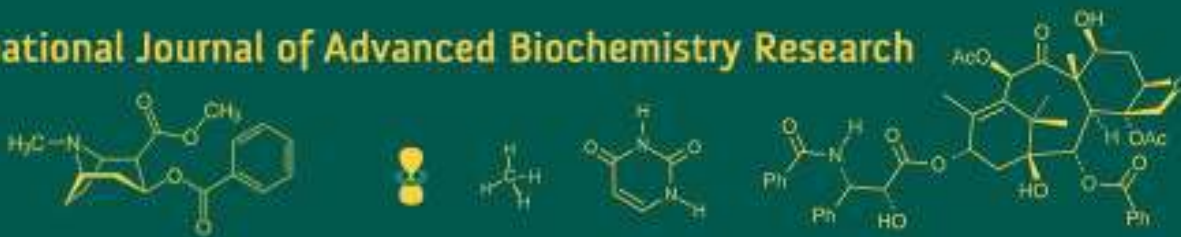


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Prevalence of lameness in crossbred cattle in the Pantnagar region of Uttarakhand

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Abstract

This cross-sectional investigation evaluated lameness in 228 crossbred dairy cattle from Jan 2024 to Jan 2025, over three years of age from the Instructional Dairy Farm (IDF) and Veterinary Clinical Complex (VCC), G.B. Pant University of Agriculture and Technology, Pantnagar, employing the validated Sprecher et al. (1997) ^[19] locomotion scoring (scale 1-5) alongside comprehensive hoof paring for lesion identification. Results revealed a substantial overall prevalence of 45.18% (103/228 cases), spanning mild (11.84%), moderate (14.04%), lame (12.72%), and severe (6.58%) categories—elevated beyond typical Indian field incidences (9-57%) yet comparable to high-production global herds. Age distribution showed peaks in prime productive phases (5-7 years: 30.46%; 9-11 years: 26.4%), linked to cumulative physiological demands, while hindlimbs were overwhelmingly affected (80.58% vs. 19.42% forelimbs) owing to biomechanical stress on concrete surfaces. Prevalent pathologies encompassed wall cracks (22.33%), overgrown claws (20.38%), interdigital skin hyperplasia (15.96%), foreign body penetrations (11.65%), and heel erosions (6.79%), highlighting environmental and managerial contributors. These insights affirm lameness as a multifactorial welfare-economic challenge, advocating proactive measures like systematic scoring, regular trimming, and housing optimizations to safeguard productivity and animal well-being in semi-intensive Indian dairy systems.

Keywords: Lameness, prevalence, crossbred dairy cattle, hoof lesions, hindlimb disorders

Introduction

Dairying is a crucial aspect of the livelihood systems for the rural poor in India, closely linked to agriculture and significantly contributing to the rural economy (Singh, 2017) ^[15]. Livestock plays an essential role in the Indian economy, with animal husbandry being a key economic activity in rural areas (World Bank, 2019) ^[23]. Lameness is the third most economically important health issue in dairy herds after fertility problems and mastitis, and it substantially affects milk production, health, and welfare. (Westin *et al.*, 2016) ^[22]. Lame cows exhibit behaviour alterations, leading to lot of stress and restlessness during milking and more time lying down (O'Callaghan *et al.*, 2003) ^[14]. Hoof problems are particularly prevalent in crossbred cattle, leading to reduced milk yield, lower reproductive performance, and shorter lifespans. Timely identification and treatment of hoof issues are critical to minimizing losses, especially during peak lactation periods (Kumar *et al.*, 2018) ^[11]. Lameness severity in cows ranges from mild to severe, manifesting as reduction in gait symmetry, reluctance or inability to bear weight on an affected limb, or the animal cannot stand leading to complete recumbency. Bran et al. (2018) ^[2] found that factors like age, parity, lactation stage, and breed significantly influence lameness prevalence in dairy cows. Globally, around 20% of cows in intensively managed dairy herds experience lameness (Espejo *et al.*, 2006) ^[6]. In India, the prevalence of lameness in cows is around 8 to 30.5% (Sood and Nanda, 2013) ^[18]. Bran et al. (2018) ^[2] found that factors like age, parity, lactation stage, and breed significantly influence lameness prevalence in dairy cows. Lameness undermines dairy cows' overall health, reducing milk yield, altering behavior, decreasing productivity, and harming animal welfare. This study therefore assesses the prevalence of lameness in dairy cows in and around Pantnagar.

Materials and Methods

The present investigation was undertaken to determine the prevalence of lameness. In present investigation, a total number of 228 cross bred animals were evaluated for lameness. The study was conducted at the Instructional Dairy Farm (IDF), Nagla, G.B. Pant University of Agriculture and Technology, Pantnagar where the animals are housed on concrete floor under a loose housing system. Cases from the Department of Veterinary Clinical Complex

(VCC), College of Veterinary and Animal Sciences (CVASc), Pantnagar were also included. All the lactating cattle aged more than three years were first examined at their yard and subsequently during their walk to the milking parlor. Lameness scoring system by Sprecher et al. (1997)^[19] was used specifically to evaluate lameness in dairy cattle and were categorized on the basis of severity as mild, moderate, lame or severely lame.

Table 1: Category wise lameness scoring system Description

Category	Lameness Score	Category wise Description
Normal	1	Walks with a steady, regular gait and does not exhibit any signs of pain
Mild	2	May have a slightly arched back but moves well
Moderate	3	Stride is shortened, and a noticeable limp is present
Lame	4	Has a pronounced arch in its back and avoids bearing weight on the affected limb(s)
Severely Lame	5	lameness is highly noticeable and may indicate severe pain or a significant injury

Animals showing abnormalities in locomotor behaviour, posture or any gross lesion on the foot were identified and subjected to further detailed hoof examination either in standing position within a handling crate or by casting them to identify foot affections.

After restraining, the animals' feet were pared as superficially as possible to expose any lesion on the ground surface of the claw, to identify lesions of foot like sole ulcer, foreign body, white line disease, heel horn erosion, under run sole, cork screw claw etc. All observations were systematically recorded on animal individual record sheets. The total number of cases of lameness in cross bred cattle was screened out to determine overall prevalence of lameness in cattle. The age wise was estimated on the basis of different age groups viz; 3-5 years, 5-7 years, 7-9 years, 9-11 years and greater than 11 years. The limb wise prevalence was estimated on the basis of limb to be most affected i.e.; hind limb or fore limb and Prevalence of lesions was also evaluated.

Results and Discussion

After hoof trimming, various claw disorders were detected in the animals, such as sole haemorrhage, white line disease, sole ulcers, digital dermatitis, double hooves, and overgrown hooves etc.

Overall prevalence (%) of lameness

In present study, a total of 228 animals were evaluated for lameness. Of these, 125 animals (54.82%) were assigned a lameness score of 1, indicating no observable signs of lameness. Mild lameness, corresponding to a score of 2, was observed in 27 animals (11.84%). Moderate lameness, classified as a score of 3, was seen in 32 animals (14.04%). Animals with scores falling into the lame category, scores 4 made up 29 animals (12.72%). Among these, 15 animals (6.58%) were identified as severely lame, with a score of 5. Overall prevalence of lameness was found to be 103/228 (45.17%) which is given below.

Table 2: Overall prevalence of lameness in cross bred cattle

Category	Lameness Score	Animals affected	Prevalence (%)
Normal	1	125	54.82%
Mild	2	27	11.84%
Moderate	3	32	14.04%
Lame	4	29	12.72%
Severely Lame	5	15	6.58%

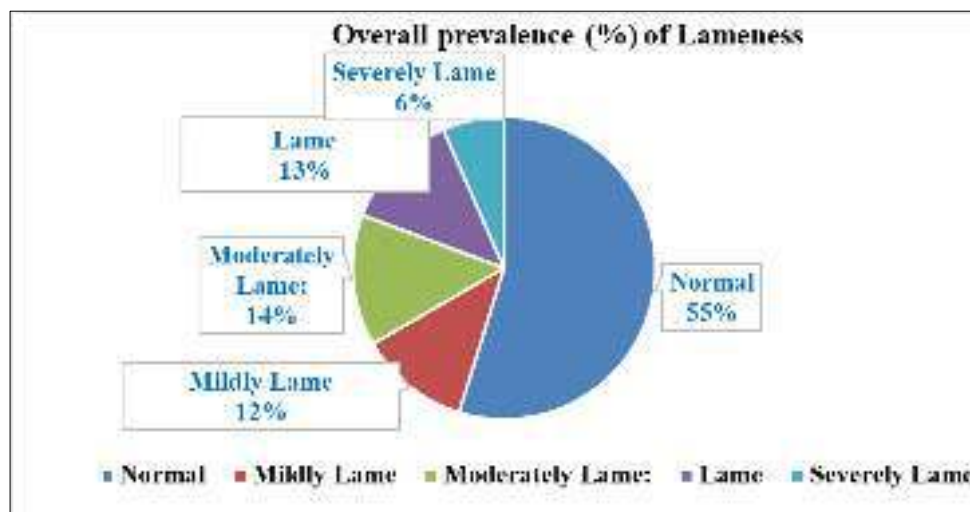


Fig 1: Overall prevalence (%) of lameness in cross bred cattle

Previous studies have documented the incidence of clinical lameness in cattle under various conditions. Nandi *et al.* (2008) ^[13] reported an annual clinical lameness rate of 9.42% in crossbred cattle in West Bengal, with seasonal variations of 7.25% in summer and 11.6% in winter. More recently, Bran *et al.* (2019) ^[3] observed a higher prevalence of 42.1% clinical lameness in exotic cattle breeds, with 20.9% of these cases categorized as severe. Additionally, Kalsi *et al.* (2002) ^[10] and Jain *et al.* (2006) ^[8] estimated the overall incidence of lameness in crossbred cattle in India to range between 35% and 57%.

Age wise prevalence of lameness

The prevalence of lameness in cattle varied across different age groups, with the highest incidence recorded in the 5-7

years age group (39 cases, 30.46%), followed by the 9-11 years group (33 cases, 26.4%). The 7-9 years group accounted for 23 cases (18.4%), while 11 years had 17 cases (13.6%), and the lowest prevalence was observed in the 3-5 years group with 13 cases (10.04%) which is given below.

Table 3: Age wise prevalence (%) of lameness in cross bred cattle

Age of animals	No. of animals affected	Prevalence (%)
3-5 years	13	10.04%
5-7 years	39	30.46%
7-9 years	23	18.4%
9-11 years	33	26.4%
11 years onwards	17	13.6%

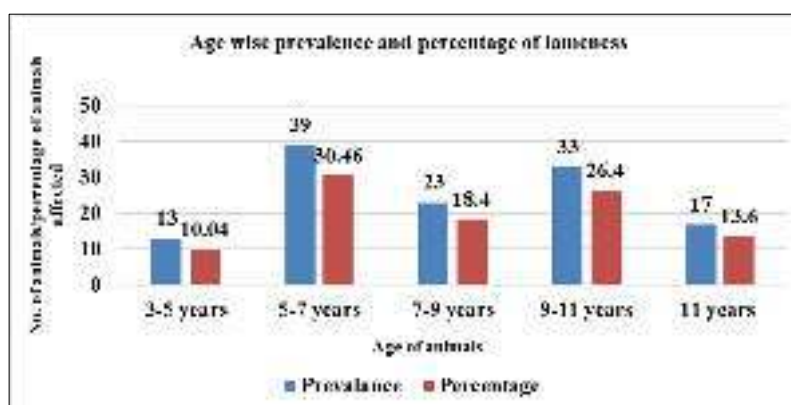


Fig 2: Age wise prevalence and percentage (%) of lameness in cross bred cattle

The increased prevalence of lameness in the age groups (5-7 years) and (9-11 years) may be due to the greater physical strain and workload experienced by cattle during their peak productive years. In contrast, younger cattle (3-5 years) likely have a lower prevalence because of reduced physical demands and their still-developing musculoskeletal systems. Similarly, the reduced prevalence in the 11 years age group could be linked to decreased activity levels or the removal of older, less healthy animals from the herd through selective culling.

Age plays a significant role in the prevalence of lameness among crossbred cattle, with several studies highlighting its impact alongside other contributing factors. Younger cattle, such as heifers, generally exhibit a lower prevalence of lameness compared to older cows. This difference may be attributed to their limited exposure to environmental and management-related stressors, as noted by Hernandez *et al.* (2019) ^[7]. Supporting this, Thomsen *et al.* (2018) ^[21] identified age as a critical risk factor, observing that cows in advanced lactations are more susceptible to lameness due to declining body condition and increased parity.

Environmental factors also interact with age in influencing lameness. Chapinal and Goldhawk (2017) ^[4] emphasized that although lameness becomes more common as cattle age, its prevalence can be mitigated by better housing and management practices. Cook and Nordlund (2020) ^[5] reinforced this idea, pointing out that poorly managed systems disproportionately affect older cattle, suggesting that age alone does not account for all cases of lameness.

In addition to prevalence, the type of lameness varies with age. Ahrens and Döpfer (2021) ^[1] observed that younger cattle are more likely to suffer from injuries, whereas older

cows tend to experience chronic conditions such as sole ulcers and digital dermatitis.

Limb wise prevalence

Out of 103 crossbred cattle examined, lameness was observed in 20 (19.41%) animals affecting the forelimbs, whereas 83 (80.58%) animals showed lameness in the hindlimbs, indicating a higher prevalence in the hind limbs which is given below.

Table 4: Limb wise prevalence (%) of lameness in cross bred cattle

Limb Affected	No. of animals affected	Prevalence (%)
Fore Limb	20	19.41%
Hind Limb	83	80.58%

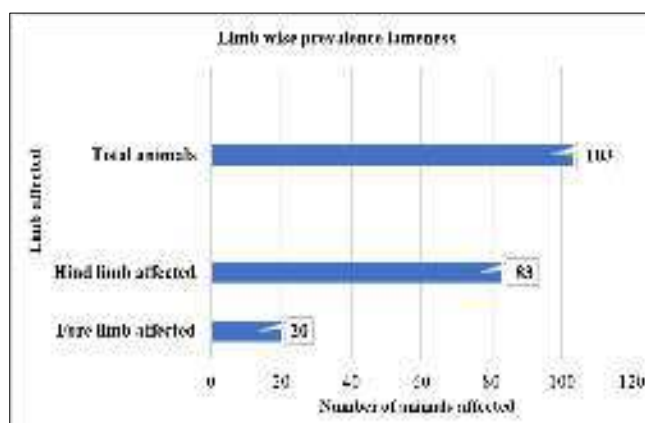


Fig 3: Limb wise prevalence lameness in cross bred cattle

Lameness in crossbred cattle is generally more prevalent in the hind limbs than the fore limbs, primarily because the hind limbs carry a larger portion of the animal's weight, leading to increased stress. This higher weight-bearing load makes the hind limbs more susceptible to issues that can result in lameness. Contributing factors to this condition include uneven flooring, improper hoof trimming, and metabolic disorders, all of which can exacerbate the strain on the hind limbs.

Previous studies have consistently highlighted that hind limb lameness is more common than fore limb lameness, underlining the significant role of weight distribution. Additionally, poor hoof care and inadequate management practices further increase the likelihood of lameness in the hind limbs. As a result, addressing these factors is crucial in preventing and managing lameness in crossbred cattle, particularly in the hind limbs (Smith, 2015; Jones and Brown, 2018; Taylor *et al.*, 2020) [16, 9, 20].

Types of foot lesions

After hoof trimming, among the 103 animals which were positive for lameness. The most common foot lesion observed was wall cracks, which were present in 22.33% of animals, followed by overgrown claws i.e., 20.38%.

Interdigital skin hyperplasia was found in 15.5% of the animals, while foreign body penetration and heel erosion were seen in 11.65% and 6.79% of the animals, respectively. Other hoof conditions such as digital dermatitis (4.85%), interdigital dermatitis (5.82%), corkscrew claw (5.82%), white line disease (2.91%), and sole ulcers (3.88%) were also noted, reflecting the diversity of hoof issues affecting the population under study.

Table 5: Lesion wise prevalence (%) of lameness in cross bred cattle

Type of Lesion	No. of animals affected	Prevalence (%)
Wall Cracks	23	22.33
Overgrown Claw	21	20.38
Interdigital Skin hyperplasia	16	15.96
Foreign Body Penetration	12	11.65
Heel Erosion	7	6.79
Digital Dermatitis	5	4.85
Interdigital Dermatitis	6	5.82
Corkscrew Claw	6	5.82
White line Disease	3	2.91
Sole Ulcer	4	3.88

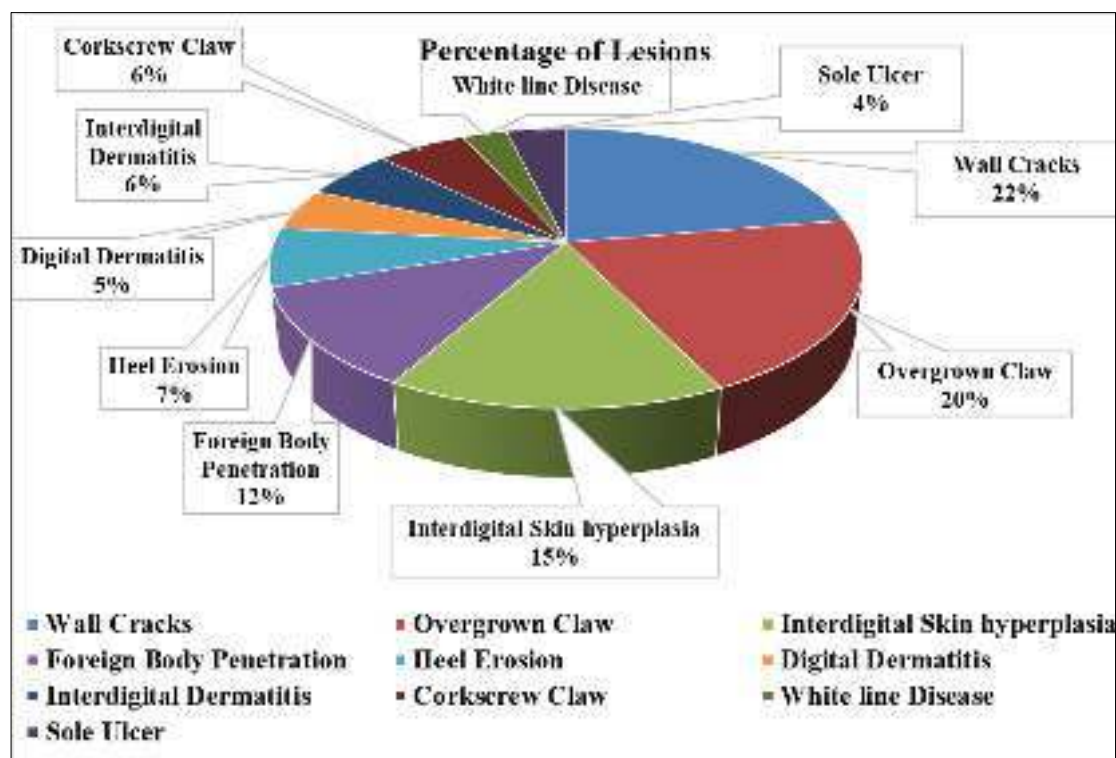


Fig 4: Lesion Wise Prevalence and percentage (%) of Lameness in cross bred cattle

Conclusion

The present study revealed a high prevalence of lameness (45.18%) among crossbred dairy cattle maintained under semi-intensive systems in and around Pantnagar. The observed prevalence is higher than several earlier field reports from India, which may be attributed to the inclusion of mild and subclinical cases through systematic locomotion scoring. The findings indicate that lameness remains an under-recognized problem in crossbred dairy cattle, particularly in herds managed on concrete flooring. Approximately 85%- 90% of the causes of lameness involve lesions of hoof (Manske *et al.*, 2002) [12]. Hoof lesions are

considered significant indicators and risk factors for lameness in dairy cows (Solano *et al.*, 2016) [17].

Age-wise analysis showed that cows in the 5-7 year and 9-11 year age groups were most affected, suggesting that cumulative production stress and advancing parity play a significant role in the development of lameness. Lower prevalence in younger and older animals may be associated with reduced physiological stress in early life and culling of severely affected animals at later ages. These results highlight the need for targeted monitoring of cows during peak productive stages.

A significantly higher involvement of hindlimbs (80.58%) compared to forelimbs was recorded, which may be attributed to greater weight bearing, locomotor stress, and unfavourable floor conditions. The predominance of hoof lesions such as wall cracks, overgrown claws, and soft tissue proliferations indicates inadequate hoof management and adverse housing environments as major contributing factors. In conclusion, lameness in crossbred dairy cattle in the Pantnagar region is a multifactorial condition influenced by age, limb biomechanics, housing, and hoof health. Regular locomotion scoring, timely hoof trimming, and improvement in housing and floor management are recommended to reduce the incidence of lameness and enhance productivity and welfare of dairy cattle.

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Authors Declaration

All authors contributed to the study's conception and design, material preparation and data collection, Statistical analysis, draft of the manuscript etc. All authors read and approved the final manuscript draft for submission.

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