



# Clinical lameness in postpartum lactating dairy cattle: a prevalence study<sup>#</sup>

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## Abstract

A study was carried out to identify the prevalence of clinical lameness and associated claw affections in dairy cows using claw health indicators, claw dimensions and locomotion scoring. Hundred postpartum lactating dairy cattle reared under similar managerial conditions were subjected to body weight estimation, body condition scoring (BCS), evaluation of claw health indicators, claw dimension measurement and lameness scoring. Animals with higher score on claw health indicators and locomotion score were subjected to functional hoof trimming. A prevalence of 20 per cent clinical lameness was observed in the present study. Significantly increased claw length and reduced heel height were observed in dairy cows with higher locomotion score while body weight, body condition score and claw health indicators had no significant relationship with locomotion score on statistical analysis. Sole ulcers and white line lesion were identified as the major sole lesions causing clinical lameness in postpartum lactating dairy cattle.

**Keywords:** Lameness, postpartum lactating dairy cattle, claw health indicators

Lameness is one of the most devastating disorders causing huge economic loss to dairy farmers in addition to raising serious animal welfare concerns (Solano *et al.*, 2016). The reduction in milk yield resulting from clinical lameness was due to tissue damage and severe pain caused by claw affections. So, an early diagnosis and treatment of clinical lameness is important

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in the management dairy cows. Claw health indicators like claw length, toe height, toe angle and heel height along with claw dimensions and locomotion scoring were considered as an effective assessment aid in diagnosis of lameness (Philip, 2022). Anees *et al.* (2022) conducted a study in northern districts of Kerala and stated that cows with abnormal claw dimensions were more prone to sole lesions. So, abnormal claw dimensions, higher scores on claw health indicators and prevalence of clinical lameness were used for evaluating and optimising the management practices in postpartum dairy cattle in profitable dairy farms. So, a study was carried out with the objective to identify the prevalence of clinical lameness and associated claw affections in postpartum crossbred dairy cows using claw health indicators, claw dimensions and locomotion scoring.

### Materials and methods

The study was conducted in University Livestock Farm and Fodder Research and Development Scheme, Mannuthy, Thrissur, Kerala and mini dairy units in and around Thrissur district. The body weight of hundred postpartum lactating dairy cows was estimated by Schaeffer's formula (Siddiqui *et al.*, 2015). Body condition score was recorded in a 5-point scoring system based on the evaluation of different body portions and surrounding fat (Philip, 2018).

The claw health indicators were evaluated and scored. Hoof angle between the dorsal hoof wall with the ground surface was measured by a protractor and scored on a 3-point scale (Philip, 2018). The degree of curvature of the hock was viewed from the

lateral side and measured using a goniometer and scored in a 3-point score (Philip, 2022). Hair loss, swelling, wound and ulceration on the hock in each cow when viewed from lateral side were observed and assessed on 3-point scores (Gibbons *et al.*, 2012). The rear leg set of each cow was assessed from behind the animals. The position of hock and placement of hoof compared to the midline or spine of the body were evaluated in a 3-point score (Greenough, 2007). A 3-point scoring system described by Philip (2022) was used to assess claw hygiene scoring and it was scored by assessing the cleanliness of the three main zones *viz.* udder, hind leg and flank.

Animals were evaluated in an open concrete paddock and were scored using a 5-point scale visual locomotion scoring method described by Sprecher *et al.* (1997). A cow was considered clinically lame if it received a locomotion score of  $\geq 3$  on the 5-point scale.

Claw dimensions were measured on the rear lateral claws of each animal. Claw length was measured along the dorsal border from the tip of the claw to the proximal end of the claw capsule at the coronary band, using a measuring scale (Fig.1). Toe height was measured by a measuring scale at the abaxial wall as the distance between the periople and the abaxial wall border (Fig. 2). The claw angle (degree) was measured at the proximal part of the dorsal border, near the tip of the claw to the sole surface with a protractor (Fig. 4) and height of the heel was measured along a line perpendicular to bulb and the highest point of heel using a measuring scale (Fig. 3). From the data collected the prevalence of lameness was estimated in the study population. The data was statistically analysed to evaluate the



**Fig.1.** Claw length



**Fig.2.** Toe height



**Fig.3.** Heel height



**Fig.4.** Claw angle

effect of body weight, body condition score, claw health indicators and claw dimensions on locomotion score. The animals with variation from normal claw dimensions and higher score on claw health indicators and locomotion score were selected for functional hoof trimming for identification of claw lesions.

## Results and discussion

Peake *et al.* (2011) reported that low body condition score was recognised as one of the triggering factors for lameness. On screening 100 postpartum dairy cattle, 48 per cent of the animal had BCS less than 2.5 (Table 1) and Espejo and Endres (2007) stated that animals with BCS  $\leq 2.5$  had higher prevalence of lameness. Goonewardene and Hand (1995) opined that animals with higher body weight were prone to hoof disorders. Mean  $\pm$  SE values body weight in the present study was  $337 \pm 5.58$  Kg. On statistical evaluation of the data obtained in the present study could not establish significant relation between body condition score and body weight, with locomotion score.

Somers *et al.* (2005) stated that steeper hoof angles were indicative of increased lameness in dairy herds. On screening of 100 animals, 85 per cent of the animals had a higher hoof angle score and the observation was comparable with that of Philip (2022). The author reported an incidence of 64 per cent higher hoof angle score in dairy cattle with sole lesions. Anees (2019) observed increased hock angle in animals affected with sole lesions. Twenty three per cent animals had a higher hock angle score and rest had normal hock angle score (Table1). This was lower compared to the observation of Philip (2022) and who reported a higher hock angle in 59 per cent, in a study on postpartum dairy cattle with laminitis related sole lesions. Rutherford *et al.* (2008) reported that animals that had higher incidence of hock injury also had higher prevalence of lameness. Sixty one per cent of the cows had higher hock wound score. This observation was higher compared to Potterton *et al.* (2011) and the author reported 44.7 per cent of dairy cows with higher hock wound score in a study to evaluate the effect of poor hock condition in lameness in dairy cattle. Philip (2022) observed 51 per cent cows with

**Table 1.** Body condition score, claw health indicators and lameness score in the study population (n =100)

| Character              |                  | Score | Per cent | Median |
|------------------------|------------------|-------|----------|--------|
| Body condition scoring |                  | 1     | 3        | 3      |
|                        |                  | 2     | 35       |        |
|                        |                  | 3     | 49       |        |
|                        |                  | 4     | 13       |        |
|                        |                  | 5     | 0        |        |
| Claw health indicators | Hoof angle score | 1     | 15       | 2      |
|                        |                  | 2     | 67       |        |
|                        |                  | 3     | 18       |        |
|                        | Hock angle score | 1     | 77       | 1      |
|                        |                  | 2     | 19       |        |
|                        |                  | 3     | 4        |        |
|                        | Hock wound score | 1     | 39       | 2      |
|                        |                  | 2     | 52       |        |
|                        |                  | 3     | 9        |        |
|                        | Rear leg set     | 1     | 28       | 2      |
|                        |                  | 2     | 54       |        |
|                        |                  | 3     | 18       |        |
| Claw hygiene score     | 1                | 56    | 1        |        |
|                        | 2                | 41    |          |        |
|                        | 3                | 3     |          |        |
| Lameness score         |                  | 1     | 48       | 1      |
|                        |                  | 2     | 32       |        |
|                        |                  | 3     | 17       |        |
|                        |                  | 4     | 2        |        |
|                        |                  | 5     | 1        |        |

higher hock wound score in a study on dairy cattle with lameness and this was lower when compared with the present study. Seventy two per cent had a higher rear leg set score and higher rear leg set score was indicative of lameness (Leach *et al.*, 2009). Philip (2022) also reported 72 per cent dairy cattle with higher rear leg set score in a study conducted in postpartum lactating dairy cattle with clinical lameness. Popescu *et al.* (2010) in their study on dairy herds also reported that lameness problems were related to poor leg hygiene. In the current study 44 percent had a higher claw hygiene score. Philip (2022) reported 95 per cent dairy cows with higher claw hygiene score in a study conducted on postpartum lactating dairy cattle with clinical lameness. On statistical evaluation using Kruskal Walli's ANOVA followed pairwise comparison, claw health indicators had no significant relationship with locomotion score. Toe length, toe angle, claw diagonal length, toe height and toe width of sole were used for evaluating the claw health in bovine (Vermunt and Greenough, 1995).

On screening of 100 dairy cows, the mean  $\pm$  SE values of claw length, toe height, claw angle and heel height were  $91 \pm 1.4$  mm,  $60 \pm 0.8$  mm,  $33 \pm 0.52$  degree and  $32.5 \pm 0.5$  mm respectively. These dimensions were comparable to the reports of Mohamadnia and Khaghani (2013) and the authors reported an average toe length of 8.58 cm, toe height 6.65 cm and heel height of 3.84 cm in their morphometric study of hoof in dairy cattle.

**Table 2.** Optimum values for claw dimensions

| Claw dimension      | Optimum values |
|---------------------|----------------|
| Claw length (mm)    | 75.0           |
| Toe height (mm)     | 60.0           |
| Heel height (mm)    | 30.0           |
| Claw angle (degree) | 45.0           |

In the present study claw length was significantly higher in dairy cattle with clinical lameness and similar observations were reported by Raulkar *et al.* (2016) and the author reported an average toe length of 9.05 cm in lateral claws on the hind limb of cattle affected with claw affections. Philip *et al.* (2022) also reported a similar significant increase in toe length, in animals affected with sole lesions.

The values of claw angle observed in the study were in accordance with Kibar and Caglyan (2016) and the author reported a claw angle of 33.2 degrees in the study on dairy cattle affected with clinical lameness. Philip (2022) also observed a similar significant reduction in claw angle and the author reported a toe angle less than 43 degree in animals affected with sole ulcers. A significant reduction in heel height was observed in the present study and this was in accordance with Benz *et al.* (2014) and the author reported a heel height of 3.5 cm in dairy cattle housed in rubber matted floors. Philip (2022) reported a lower heel height of 1.97 cm in dairy cattle with sole lesions.

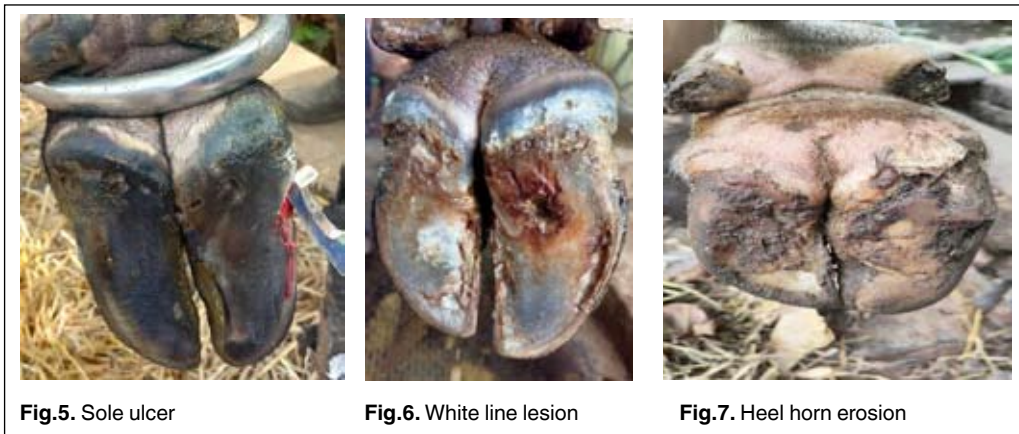
Fifty two percent animals had a higher locomotion score. This observation was similar to the study conducted by Clarkson *et al.* (1996) and the author reported 54 percent dairy cattle had a higher locomotion score in their study for the evaluation of lameness in dairy cattle. Animals with a score above 3 was considered clinically lame. In the present study, 20 animals were identified with clinical lameness. Thus, the prevalence of clinical lameness was estimated as 20 per cent and this was in accordance with Solano *et al.* (2016), who using locomotion scores, reported 21 per cent clinically lame animals in dairy herds. Anees *et al.* (2022) reported a prevalence of 27 per cent lameness and Philip (2022) reported a prevalence of 26 per cent lameness in different studies conducted in cross bred postpartum dairy cattle in Kerala.

Animals diagnosed with clinical lameness were subjected to functional hoof trimming by 'Dutch five step method'. Sole ulcers (Fig.5.) (50 per cent), white line disease (Fig.6.) (20 per cent), heel horn erosion (Fig. 7.) (10 per cent), thin sole (10 per cent), foot rot (5 per cent) and upper limb lameness (5 per cent) were observed on clinical assessment of claw. Similar observations were reported by Green *et al.* (2002) and Zahid *et al.* (2014) and the authors reported sole ulcers and white line lesions as the major claw affections causing clinical lameness in their study on lactating Holstein Friesian cattle. All the dairy cattle affected with sole lesions were treated by therapeutic hoof trimming, hoof blocking and hoof bandaging and rest of the animals were given medical management.

**Table 3.** Comparison of claw dimensions among different groups based on lameness score

| Variables          | Lameness score             |                            |                           | F-value (p-value)           |
|--------------------|----------------------------|----------------------------|---------------------------|-----------------------------|
|                    | 1                          | 2                          | 3 or 4                    |                             |
| Claw length (mm)   | 88.80 ± 1.70 <sup>b</sup>  | 89.70 ± 2.30 <sup>b</sup>  | 99.90 ± 4.50 <sup>a</sup> | 4.563* (0.013)              |
| Toe height (mm)    | 62.40 ± 1.10               | 59.6 ± 1.30                | 60.80 ± 2.60              | 1.123 <sup>ns</sup> (0.33)  |
| Toe angle (degree) | 34.18 ± 0.66               | 34.25 ± 0.83               | 31.50 ± 1.68              | 2.015 <sup>ns</sup> (0.139) |
| Heel height (mm)   | 32.80 ± 0.60 <sup>ab</sup> | 30.90 ± 1.00 <sup>ab</sup> | 34.4 ± 1.40 <sup>a</sup>  | 3.196* (0.045)              |

\*\* Significant at 0.01 level; ns non-significant, means having different letters as superscript differ significantly within a row



## Conclusion

On screening 100 postpartum lactating dairy cattle a prevalence of 20 per cent clinical lameness was observed. Significantly increased claw length and reduced heel height were observed in dairy cows with higher locomotion score while body weight, body condition score and claw health indicators had no significant relationship with locomotion score on statistical analysis. Sole ulcers and white line lesion were identified as the major sole lesions causing clinical lameness in postpartum lactating dairy cattle, in the present study.

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