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Analysis of Lameness in Friesian Holstein Dairy Cattle on a Farm in Indonesia

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Abstract— *The study was conducted from January 2024 to December 2024 in a modern dairy farm in Blitar, Indonesia, to evaluate the lameness cases from 4,100 Friesian Holstein cows in different lactation periods. The variables observed in this study were: the prevalence rate of lameness cases, the percentage of lameness in each lactation period and Days in Milk (DIM), and the type of lameness. The Lameness case was observed through direct behavioral observations, then followed by hoof examination. There were 300 dairy cows detected as lame. The incidence of lameness from each period of lactation were 25.67% (lactation III); 20.67% (lactation II); 20.33% (lactation I), and 19.00% (lactation IV) respectively. Meanwhile, the specific conditions that contribute to lameness were White Line (29.33%), Sole Thin (18.67%), Sole Ulcer (17.33%), Dermatitis (14.67%), and Dislocation (13.33%). The study identified a lameness prevalence rate of 7.32% for the year 2024. Lameness occurred most frequently in cows during their third lactation, with white line disease identified as the primary cause. This phenomenon emphasizes that even though the research was conducted within a limited scope, there is an urgent need for proactive hoof management to reduce economic losses and improve animal welfare within Indonesia's dairy industry.*

Keywords— *Lameness; Dairy Farm; White Line; Sole Ulcer; Dermatitis; Dislocation.*

I. Introduction

Lameness is a significant welfare and economic concern in dairy cattle worldwide, significantly affecting productivity, reproductive performance, and animal well-being [1,2]. The multifactorial nature of lameness, involving both infectious and non-infectious causes, necessitates integrated monitoring and management approaches [3]. Along with locomotor disorder, lameness is believed one of the most significant factors that lead to the risk of early culling [4,5]. Lameness is also associated with economic loss due to decreased milk production, increased medical costs, decreased reproductive performance, and increased risk of death and culling [6,7].

Previous studies have shown that the prevalence of lameness is associated with a variety of risk factors, including milking status, exercise, age, milk production, and stage of lactation [8], body condition score (BCS), presence of excessive hoof growth, length of time in milk production, herd size, and parity [9]. In addition, floor type, joint and knee injuries, animal hygiene, provision of hoof care, and presence of hoof lesions were found to be significantly associated with lameness [10].

Recent studies emphasize the importance of region-specific data in improving herd health management strategies [2]. Furthermore, understanding lameness prevalence is essential for assessing its impact on the dairy industry and evaluating the effectiveness of preventive strategies to reduce lameness incidence. Recognizing, and delineating the risk factors related to preventing lameness is essential. In Indonesia, Friesian Holstein cattle is the predominant dairy breed, and because of their high milk yield, they become the most susceptible breed to lameness [5].

However, data on the prevalence and characteristics of lameness in Friesian Holstein cattle in Indonesia are still limited. This study's primary objectives were to determine the prevalence of lameness and explore the relationship between various risk factors.

II. Materials and Methods

A. Animal care

The study was conducted on a dairy farm in Blitar with 4,100 Friesian Holstein cows managed under a loose housing and an intensive feeding system. Lameness was assessed through direct visual observation during routine activities without handling or invasive procedures. Evaluations were assessed by veterinarians and trainee staff, following the Five Freedoms to ensure animal welfare throughout the study. The present experiment was declared ethically appropriate fulfilling 7 (seven) WHO 2011 Standards according to the 2016 CIOMS Guidelines.

B. Animals, diets, and experimental design

The study used an observational field design focusing on lactating cows in lactation periods 1 to 7. Cows were selected purposively from different production groups based on accessibility and activity level. No treatment or experimental manipulation was applied. This study used direct behavior observation and the analysis of lameness type was obtained from the results of hoof examination. The objective was to assess the prevalence and characteristics of lameness under existing management conditions.

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C. Data and sample collection

Lameness was identified through direct behavioral observation of cow locomotion, particularly when walking to and from the milking parlor. Indicators such as gait asymmetry and posture changes were noted. Cows suspected of lameness was further examined through hoof inspection to determine the type of lameness, such as claw disorders of infectious foot lesions. All assessments were performed by veterinarians and hoof care professionals. Variable observed: i) Prevalence rate of lameness; ii) Percentage of lameness cases by lactation period (1-7) and Days in Milk; iii) Type of lameness based on clinical hoof findings.

D. Statistical analysis

Descriptive statistics were used to present the data. The prevalence and distribution of lameness were expressed in percentage and summarized using tables and figures. Data were processed using Microsoft Excel, with no inferential tests applied due to the descriptive nature of the study.

III. Results and Discussion

Lameness Prevalence

The incidence of lameness during the study was 300 out of 4,100 lactating cows, or 7.32% (figure 1). This number was lower than the global average. A comprehensive literature review from 53 studies worldwide reported a mean lameness prevalence of 22.8%, with individual studies ranging from 5.1% to 45% [11]. In comparison, the result from a study conducted in Hawassa, Ethiopia, showed a lameness prevalence of 10.2% [8], which is higher than that observed in Blitar. In New Zealand, an observational study across 120 pasture-based dairy farms found a median lameness prevalence of 2.8%, with individual farm rates ranging from 0.0% to 17.0% [12].

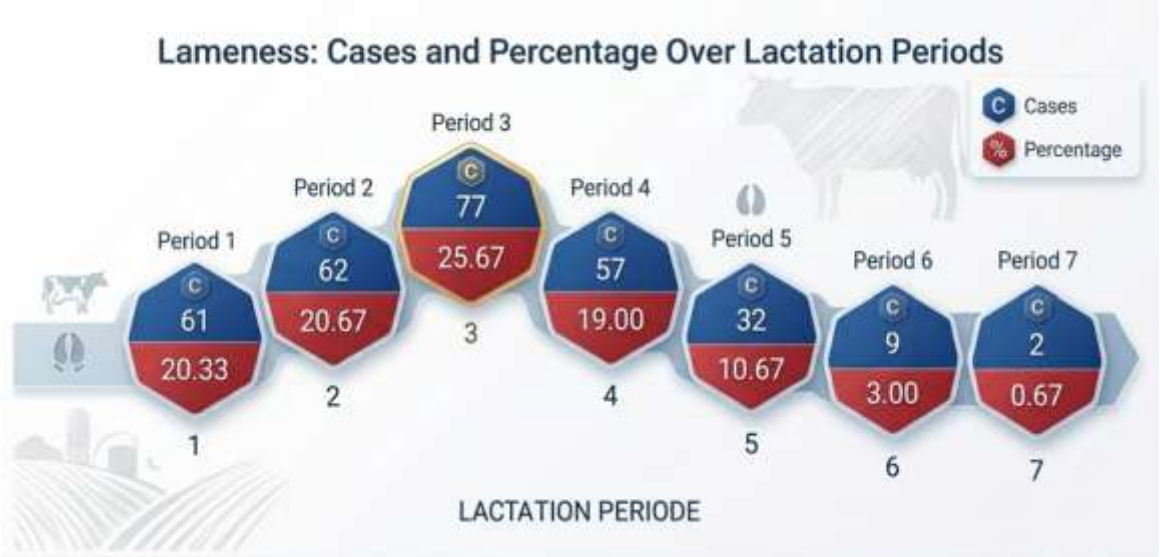

Fig. 1. Lameness: Cases and Prevalence Over Lactation Periods

Similar results were found from research on Irish pasture-based dairy farms, which reported a median herd-level lameness prevalence of 7.9% during the grazing period and 9.1% during the housing period [13]. The lameness prevalence in Blitar seems closer to the range observed in pasture-based systems, which are generally associated with lower lameness rates. Conversely, lameness was claimed to be more common in more intense dairy production. Although lameness is less common in this study, early identification and intervention are crucial to prevent the development of lameness.

Lameness Incidence Rate Based on Lactation Level

This study showed that the highest lameness prevalence was reached during the third lactation (25.67%), then followed by the second (20.67%), first (20.33%), and fourth (19.00%) lactations. This result, to the same extent, is consistent with a previous study found that the first-lactation cows had the lowest risk, and lameness prevalence increased significantly with parity [14]. Lameness in uniparous cows is often lower than in multiparous cows. Older cows had prolonged exposure to risk factors, like standing on hard surfaces, which can induce trauma and scratch wear. According to a Germany-based study, fourth or higher lactation cows were 2.46 times more likely to be diagnosed with lameness than first-lactation cows [9]. Against the typical pattern, this study shows a slight decrease in lameness frequency during the fourth lactation compared to the third.

Lameness Based on Lactation and Days in Milk (DIM)

Days in Milk (DIM) has a positive correlation to the occurrence of lameness, namely, $y = 7.0103X + 148.4$, meaning that the higher the DIM in dairy cows, the higher the risk of lameness (Fig. 2). The highest incidence of lameness in cows beyond 180 days in milk (DIM) in this study is in line with the results of previous studies, which stated that increasing DIM increases the risk of lameness. Cumulative stressors such as prolonged standing, metabolic demands, and hoof wear are subject to blame for the highest incidence of lameness. Figure 2 demonstrates the count case of lameness by DIM.

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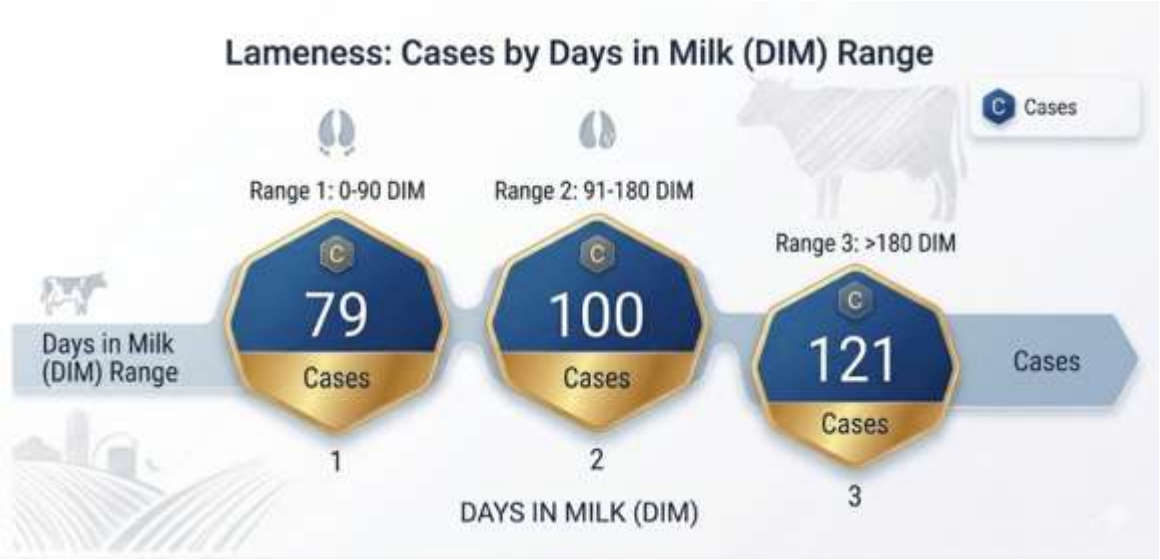

Fig. 2. Lameness Cases by DIM

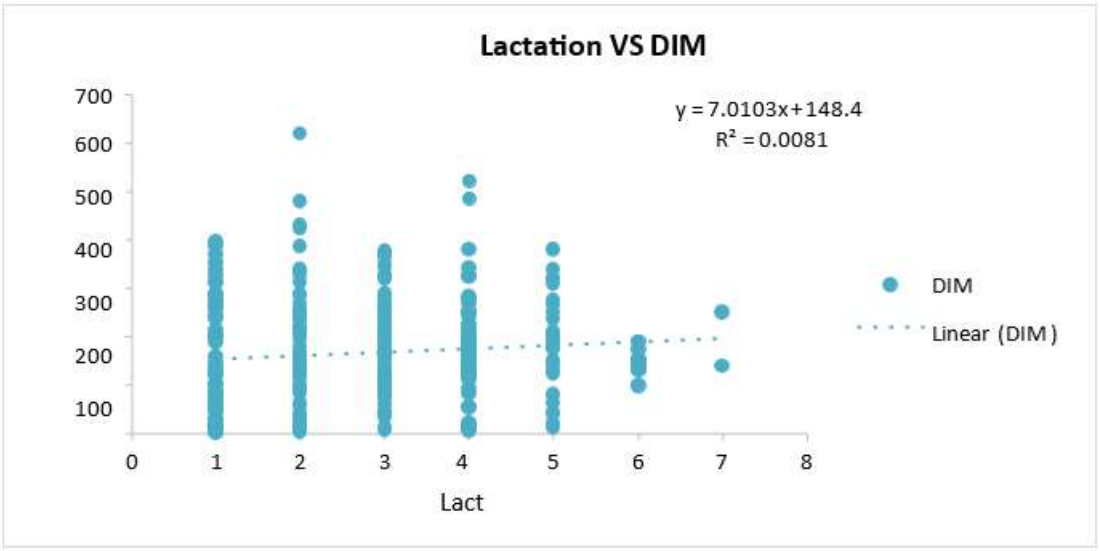

Fig. 3. Lameness Based on Lactation and Days in Milk (DIM)

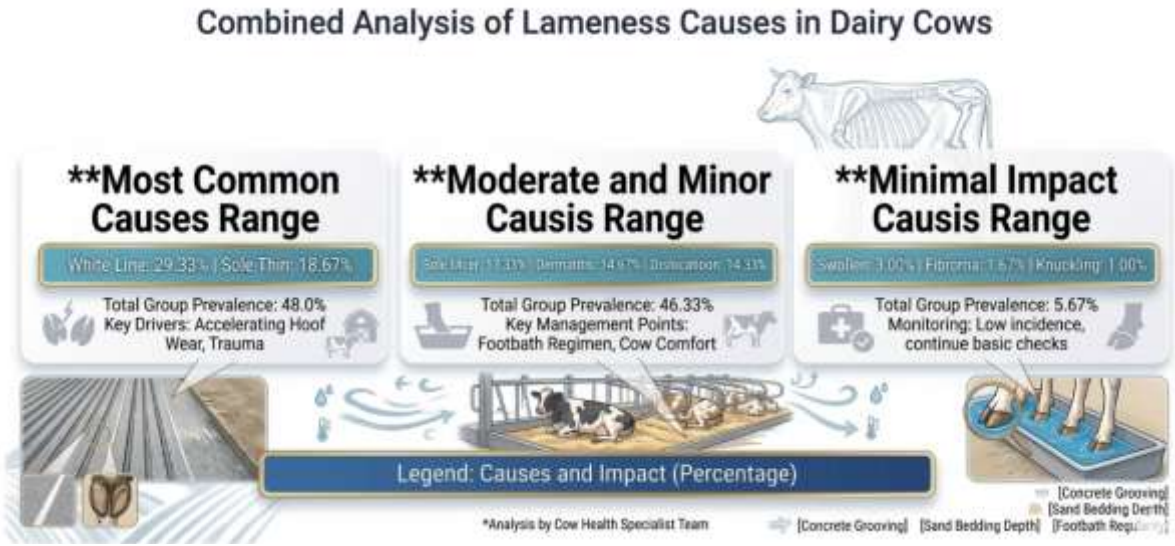

Fig. 4. Percentage of Causes of Lameness in Dairy Cows

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Similar results were found from a study in Canada, which found that increasing parity and days in milk production were accompanied by an increased risk of lameness prevalence, with a higher likelihood of lameness being observed in cows with greater DIM. Regular hoof trimming, providing comfortable resting areas, and minimizing time spent on hard surfaces can mitigate the risk of lameness as lactation progresses.

Percentage of Causes of Lameness in Dairy Cows

The study's findings that the most prevalent causes of lameness among Friesian Holstein dairy cows in Blitar were White Line (29.33%), Sole Thin (18.67%), Sole Ulcer (17.33%), Dermatitis (14.67%), and Dislocation (13.33%). The results of this study are in line with research in the USA and Switzerland, where thin soles, sole ulcers, and white lines are the most common types of lameness [15,9,16].

This study according to [16] had the most common claw lesions observed in cattle are sole ulcers, white line disease, and traumatic injury to the sole caused by overuse. Intensive dairy farm management, where cows are housed, given concentrate, and higher production is believed to be the main cause [17].

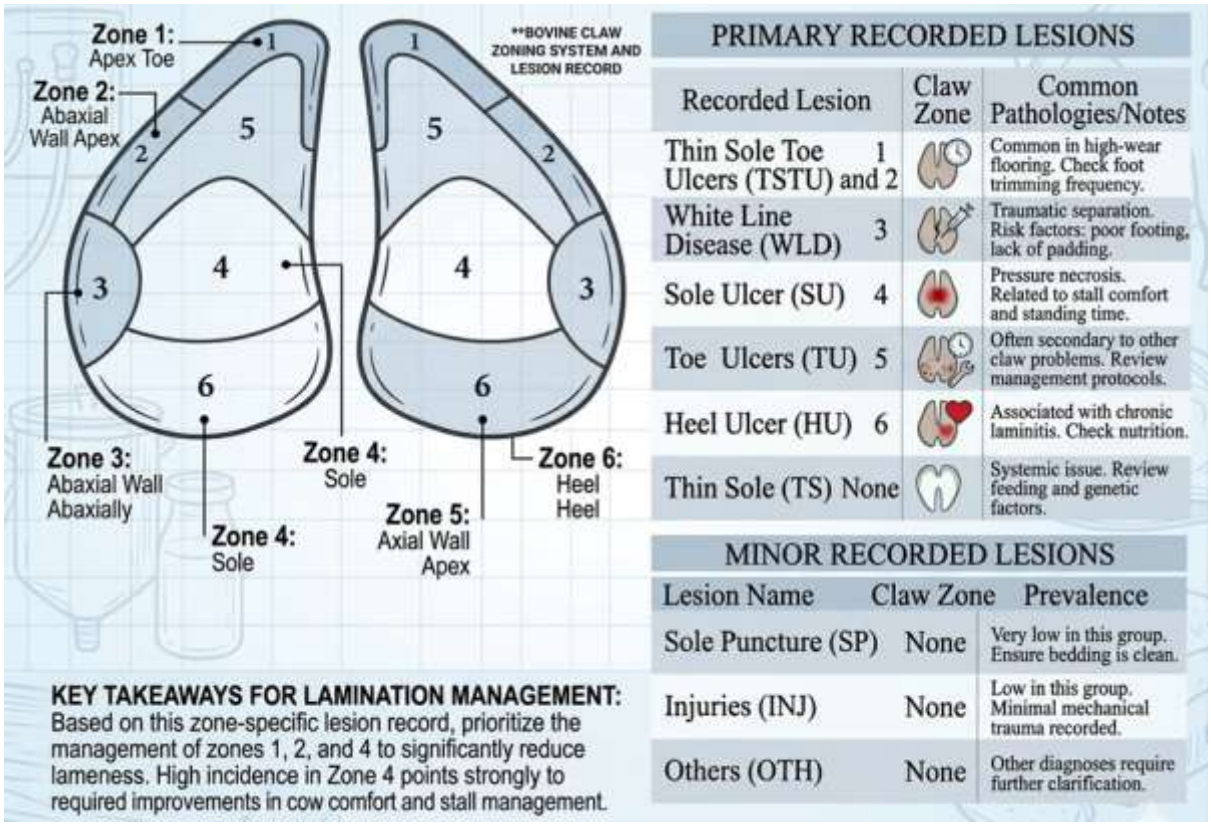

Fig. 5. Claw diagram showing the claw zones used in recording lesions causing lameness [18]

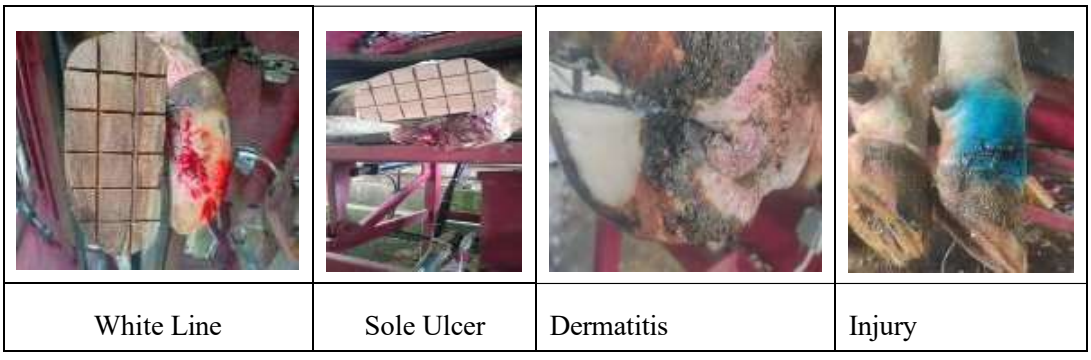

Fig. 6. Visual representations of White Line, Sole Ulcer, Dermatitis, and Injury

Meanwhile, the lowest sole ulcer prevalence in Blitar is most likely due to the preventive hoof trimming program at 150 DIM. White line lameness in lactating dairy cows is characterized by signs of pain and heat in the heel, and separation of the white line of the hoof, as seen in Figure 6.

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IV. Conclusion

Although the prevalence of lameness during the study was not too high, which was only 300 out of 4,100 lactating cows or around 7.32%. However, because it can be economically detrimental in the form of decreased milk production and animal welfare, serious control efforts are needed. The incidence of lameness was associated with the level of lactation, showing the most lameness occurred in the 3rd lactation (25.67%), followed by the 2nd (20.67%), 1st (20.33%), and 4th lactation (19.00%). The highest type of lameness was White Line (29.33%), Sole Thin (18.67%), Sole Ulcer (17.33%), Dermatitis (14.67%), and Dislocation (13.33%).

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