Ciência Animal Brasileira
Ciência Animal Brasileira
Brazilian Animal Science
e-ISSN 1809-6891

DOI: 10.1590/1809-6891v23e-72731E

Section: Veterinary medicine
Research article

Occurrence of foot diseases in cattle attended at the Clínica de Bovinos de Garanhuns: epidemiological, clinical, therapeutic and economic aspects

Ocorrência de afecções podais em bovinos atendidos pela Clínica de Bovinos de Garanhuns: aspectos epidemiológicos, clínicos, terapêuticos e econômicos

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Abstract
The objective was to study the occurrence of foot disorders in cattle treated at the Clínica de Bovinos de Garanhuns, campus of the Universidade Federal Rural de Pernambuco from 1999 to 2021. A retrospective study of the medical records was carried out, with a total of 334 cases, in which 613 lesions were diagnosed. A frequency distribution, with simple mean and standard deviation was performed to evaluate the data. Interdigital dermatitis was more frequent in 12.4% (76/613), double sole in 9.79% (60/613), chronic laminitis in 8.81% (54/613), sole ulcer in 7.83% (48 /613), and interdigital hyperplasia in 7.24% (45/613). Laminitis and its consequences accounted for 45% of the total injuries identified, followed by 36% of injuries of secondary or uncertain cause, and 19% from infectious diseases. The distribution of lesions between the limbs was 68% in the pelvic and 32% in the thoracic limbs. Females, raised in a semi-intensive system, Holstein, with a body score of III, and large size were more affected. Lameness was present in 78% (260/334), while 10% (33/334) did not present lameness. The case fatality and recovery rates were 9% (31/334) and 73% (243/334), respectively. In total, 51% of cases occurred in the rainy season and 49% in the dry season. The main cities of origin were Bom Conselho 22.75% (76/334), Garanhuns 18.86% (63/334), and Brejão 12.57% (42/334). The estimated cost of treatment was US$ 150.13/case. Diseases are probably directly linked to management failure on the property due to the nature of the diagnosed diseases, in addition to the significant cost of the treatment of these animals, with the need for prophylactic measures in order to avoid the economic losses associated with foot diseases.
Keywords: hoof diseases; bovine podiatry; digital disorders; digital horny case

Resumo
Objetivou-se estudar a ocorrência das afecções podais em bovinos atendidos na Clínica de Bovinos de Garanhuns, *Campus* da Universidade Federal Rural de Pernambuco, no intervalo de 1999 a 2021. Realizou-se estudo retrospectivo dos prontuários, com total 334 casos, dos quais foram diagnosticadas 613 lesões digitais. Foi realizada a distribuição de frequência, média simples e desvio padrão para avaliação dos dados. A dermatite interdigital foi a mais frequente, sendo observada em 12,4% (76/613) dos casos, seguida por sola dupla 9,79% (60/613), laminite crônica 8,81% (54/613), úlcera de sola 7,83% (48/613) e a hiperplasia interdigital 7,24% (45/613). A laminite e suas consequências representaram 45% do total de lesões identificadas, acompanhadas por 36% das injúrias de causa secundárias ou incertas e de doenças infecciosas com 19%. A distribuição das lesões entre os membros foi de 68% nos pélvicos e 32% nos torácicos. As fêmeas criadas em sistema semi-intensivo, holandesas, com escore corporal III e porte grande eram mais acometidas. A claudicação estava presente em 78% dos animais, enquanto 10% não claudicavam. As taxas de letalidade e recuperação foram de 9% (31/334) e 73 % (243/334), respectivamente. No período chuvoso foram 51% dos casos e 49% na época seca. Os principais municípios de origem foram Bom Conselho 22,75% (76/334), Garanhuns 18, 86% (63/334) e Brejão 12,57% (42/334). O custo estimado com tratamento foi de US$ 150,13/caso. Provavelmente falhas de manejo nas propriedades foram importantes fatores de risco para as doenças. Sugere-se a implementação de medidas profiláticas para evitar as perdas econômicas associadas às enfermidades podais.
Palavras-chave: doenças de casco; podologia bovina; afecções digitais; estojo córneo digital

Received: May 5, 2022. Accepted: July 5, 2022. Published: September 13, 2022.

Introduction

Among the main health challenges that cattle herds face, lameness stands out in properties with intensive production systems [1]. The economic losses are from milk production, decrease in weight gain, involuntary culling, and increases in calving interval, treatment costs, and labor [2,3], as well as compromises to well-being [4,5].

Foot disorders can be classified into three groups: infectious diseases, laminitis and its sequelae, and diseases of uncertain or secondary origin [6]. Lesions are multifactorial in origin and include environmental, genetic, nutritional, and infectious factors. Among the infectious agents, bacteria of the genus *Treponema spp*, *Fusobacterium necrophorum,* and *Dichelobacter nodosus* are highlighted [7,8].

In Brazil, several studies have reported the prevalence of foot disorders in dairy herds. In Rio Grande do Sul, the occurrence of sole ulcers was highlighted [9]; in Minas Gerais and the Federal District, heel horn erosion [10, 11]; in Pará, interdigital hyperplasia and interdigital necrobacillosis [12]; and in Pernambuco, chronic laminitis [13]. In beef cattle raised extensively in southeastern Pará, septic pododermatitis was the most frequent foot disorder [14].

Some retrospective studies have been carried out in hospital care units; Gargano et al. [15] at the University of São Paulo described that interdigital hyperplasia was the most recurrent disease. Similarly, Oliveira et al. [16] pointed to interdigital hyperplasia as the most common digital lesion in cattle treated at the Federal University of Tocantins. In Brazil, the estimated cost of treatments associated with cows with foot diseases, added to the deficit in milk production was US$95.80/cow, which totaled US$52.69 per housed cow/year in animals reared in a *free stall* confinement system [17].

In view of the above and the scarcity of studies that address foot disorders in the Agreste region of Pernambuco, mainly in the Garanhuns microregion, the objective of the current study was to investigate the occurrence of foot disorders in cattle treated by the Clínica de Bovinos de Garanhuns of the Universidade Federal Rural de Pernambuco (CBG-UFRPE).

Materials and methods

The retrospective study took place at the Clínica de Bovinos de Garanhuns Campus of the Universidade Federal Rural de Pernambuco (CBG-UFRPE). Information contained in the individual clinical care records (253 cattle) and from visits to properties (81 cattle) of animals affected with foot diseases from January 1999 to July 2021 was retrieved, totaling 334 documented cases.

The clinical data collected in this study were: diagnosis of the disease, age, weight, sex, body score, size, number of deliveries, pregnancy, gestation period, lactation, dry period, rectal temperature, comorbidities, degree of lameness, affected limb and claw (lateral and medial claw), treatment (conservative or surgical), number of bandage changes, use of hoof blocks, length of stay, exicosis, and final outcome of the case (discharge, slaughter, or euthanasia). Considering the management and origin of the animals, information was collected on food (forage, concentrate, mineral supplement, and/or agro-industry residue), type of management, municipality of origin, and the annual climatic period (dry and rainy). Information regarding management and clinical data were absent from some medical records, and as a consequence there is a percentage of cases with information not provided. Lameness degree and body score were evaluated according to Dirksen et al. [18]

It was established that the dry season corresponds to the months of September to February (average rainfall of less than 75 mm) and the rainy season between March and August (average of rainfall of more than 75 mm). This standardization was based on meteorological data (Instituto Nacional de Meteorologia)[19]. The fasting bovines were contained in the lateral decubitus position in the Götze equipment, where the hooves were cleaned with soap and water. The exploration of the hooves was then carried out to identify the lesions, and after the diagnosis, the treatment was established according to the severity of the lesion. Clinical examinations of the animals were performed according to Dirksen et al., [18].

In cases of conservative treatment, a paste consisting of an ointment based on penicillin and dihydrostreptomycin (Ganadol®) was applied, combined with copper sulfate topically on the lesion, in addition to protecting claw with hydrophilic cotton dressings wrapped in strips to make the bandages; corrective trimming was performed when necessary. The entire claw was covered up to the distal portion of the metatarsal or metacarpal and then waterproofed with asphalt emulsion (tar).

The hoof block was used to relieve pressure on the injured claw. Antibiotics and anti-inflammatories were prescribed according to the severity of the lesion. Surgical procedures consisted of amputation of digits in situations of bone involvement, removal of interdigital hyperplasia and surgical debridement of necrotic claw tissue. In cases where there was no economic viability for the treatment or poor prognosis,

slaughter or euthanasia was recommended. On the properties, containment of the animals was carried out with the aid of the bovine containment tipper trunk mobile.

Due to the huge number of terms applied to digital diseases, it was necessary to standardize the nomenclature of diagnoses according to the classification proposed by the *International Committee for Animal Recording* [20] and adapted by Borges et al. [21] The data were tabulated in *Microsoft Excel* 2016® spreadsheets and then a descriptive statistical analysis of the variables collected was performed for the calculation of absolute frequencies, simple mean, and standard deviation.

Lethality was calculated considering the number of deaths over the total number of sick animals, with the result expressed as a percentage. The deaths occurred due to complications of the foot disorders that led to euthanasia, depending on the cost-benefit of the treatment, or the death of the animal according to the severity of the injury and impairment of the animal's general condition. The recovery rate was obtained through the quotient between the total number of recovered individuals and the number of sick cattle. The effect of seasonality on the occurrence of foot diseases was analyzed using a time series. The cost of treatment was estimated through the amounts charged for veterinary services provided by CBG-UFRPE, with drug prices updated considering only cases of hospital care (253 cattle).

Results and Discussion

During the evaluated period, 11,471 cattle were treated at the CBG-UFRPE, of which 334 presented foot disease, corresponding to 2.91% of the hospital care series. In total, 613 foot injuries were identified. The animals originated from properties that adopted semi-intensive production management (38.02% [127/334]), and intensive (35.63% [119/334]) and extensive regimes 11.08% (37 /334). The semi-intensive management regime is the most commonly adopted in the properties in the region and predominates due to the low supply of roughage in the pastures as the dry season approaches. Of the cattle treated, 52.4% (175/334) received concentrate, consisting of corn, soybean, and wheat bran, while 8.7% (29/334) did not receive concentrate in the diet. An excess of fast-fermenting carbohydrates in the diet predisposes to ruminal lactic acidosis and, consequently, to secondary diseases such as laminitis, which may be a possible cause of stratum corneum lesions [22].

All animals (100%) received roughage in the diet, of which elephant grass, native pasture, signal grass, palm, and corn silage were the most widely used. Palm was used in 24.25% (81/334) of cattle with foot problems. Due to its low fiber content, when mixed with the concentrate and supplied to lactating cows, forage palm reduces fiber consumption, and as a consequence, there is shorter chewing and rumination time [23]. Berchiell, Pires and Oliveira [24] highlight the importance of effective fiber intake for saliva production, providing buffering and dilution of rumen content. Other ingredients used in the diet were cassava husks and agro-industrial residues (e.g., brewery residues). Domingues and Meneghetti, [25] reiterated the importance of agricultural by-products, due to their economic viability and reduced environmental impact, however, the authors address the need for rational use without exceeding the recommended limits.

Mineral supplement was provided to 51.2% (171/334) of the cattle, while 7.49% (25/334) did not have access to this component, and in 41.31% (138/334) this information was not provided. Minerals such as sulfur, zinc, copper, and selenium and vitamins E, A, and biotin are known to be essential for maintaining claw health [4, 22, 26], justifying the importance of mineral supplementation as a preventive measure. The cattle mainly originated from the municipalities of Bom Conselho (22,75% [76/334]), Garanhuns (18.86% [63/334]), Brejão (12.57% [42/334]), Pedra (9.58% [32/334]), São João (6.59 % [22/334]), Venturosa (5.39% [18/ 334]), São Bento do Una (3.89 % [13/334]), and Canhotinho (2.4% [8/334]). Figure 1 presents the spatial distribution of cattle and their cities of origin.

In the rainy season, the occurrence of cases of foot disorders was 51% (170/334), and in the dry season it was 49% (164/334). Figure 2 shows the distribution of the number of cases per month and the average monthly rainfall in the region. Although the highest percentage of cases was in the rainy season, it should be noted that the month of January (dry season) was the month with the highest attendance. During the dry season, the occurrence of infectious digital lesions was more frequent in cows housed in properties located in the state of Minas Gerais, Brazil. During this period, there is greater food supplementation and the animals spend more time inside, exposing them to the accumulation of waste on the floor of the pens, making them susceptible to infectious agents [27]. This condition occurs in the region of the current study; however, forage scarcity is more intense due to lower rainfall.

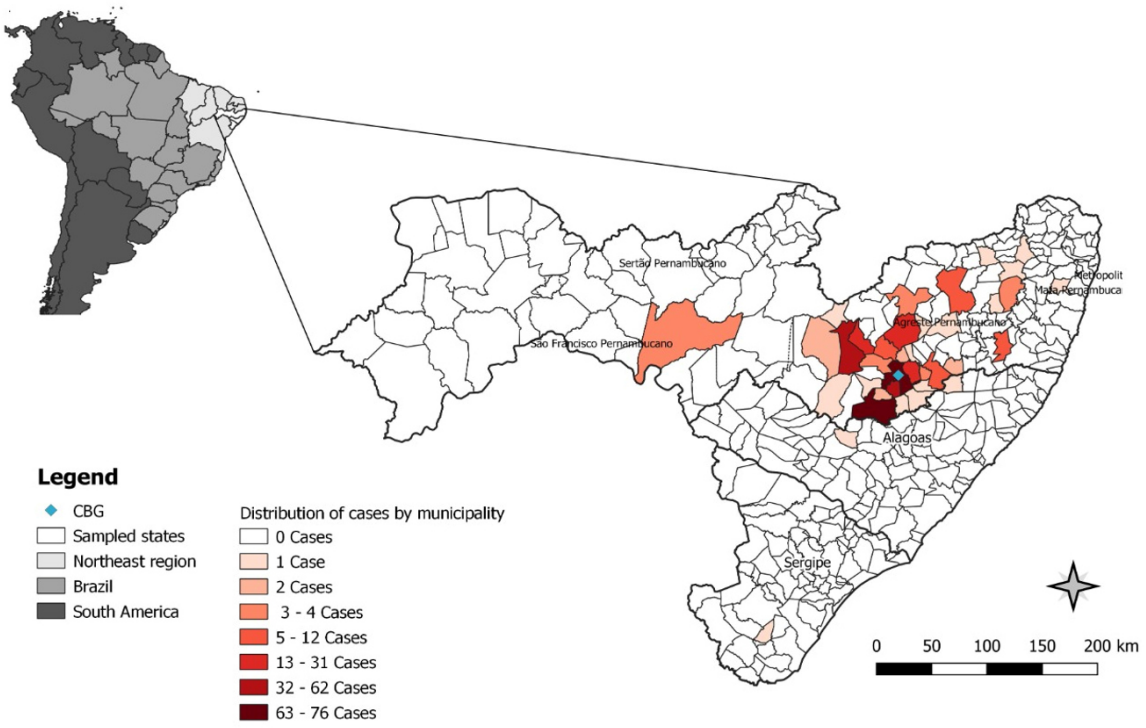

Figure 1. Spatial distribution of cases of foot diseases treated by the Clínica de Bovinos de Garanhuns (Universidade Federal Rural de Pernambuco, Brazil) and their respective municipalities of origin from January 1999 to July 2021.

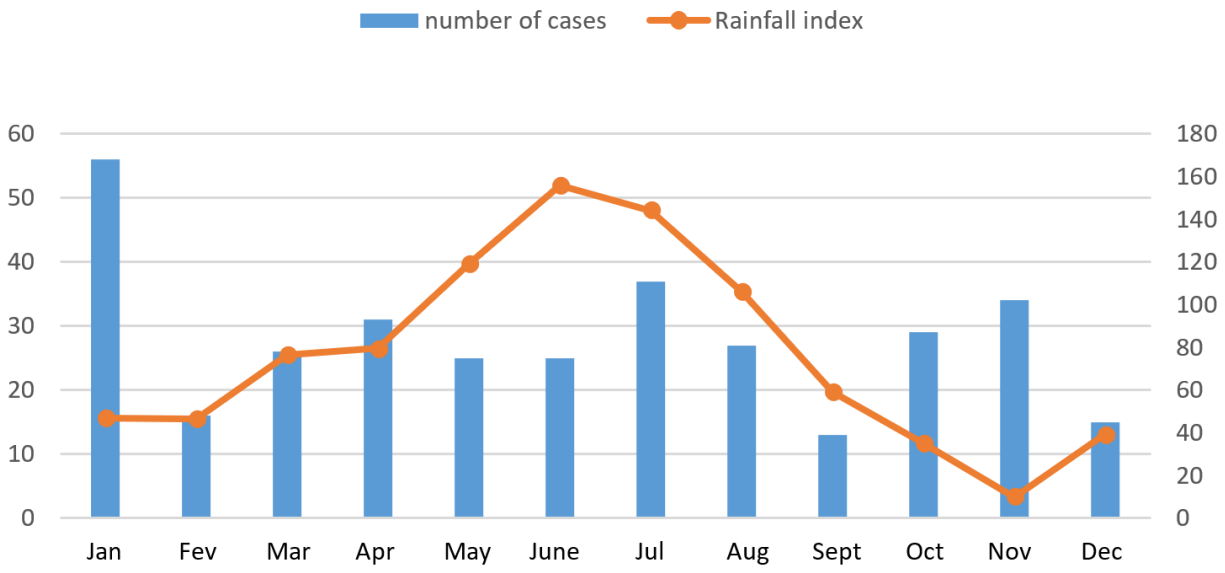

Figure 2. Distribution of the number of cases treated by the Clínica de Bovinos de Garanhuns (Universidade Federal Rural de Pernambuco, Brazil) in relation to the rainfall in the period from January 1999 to July 2021.

The main breed affected was Holstein (39.02% [127/334]), followed by mixed breed (Holstein and Zebu) (32.93% [110/334]), Swiss Brown (11.08% [37/334]). 334]), Girolando (7.78% [26/334]), Gir (2.10% [7/334]), Nelore (2.10% [7/334]), Guzerat (0.9% [3/334]), Jersey (0.9% [3/334]), Sindhi (0.9% [3/334]), and Marchigiana (0.30% [1/334]). In the northern region of Pernambuco, female Holstein cows presented 14.05% of the total lesions identified in relation to females of the Brown-Swiss (3.68%) and Girolando (3.10%) breeds [13]. Males represented 11% (38/334) of the total number of visits, and females 89% (296/334). In total, 17% (51/296) of the females had a pregnancy diagnosis at different stages of fetal development, while 21% (62/296) were not pregnant, and for 62% (206/296) this information was not recorded. The Agreste Meridional de Pernambuco is characterized by holding 70% of the state's milk basin [28].

The most frequent body score was grade III (45.81% [153/334]), followed by grade II (20.36% [68/334]), IV (8.08% [27/334]), I (29% [11/334]), and grade V (0.90% [3/334]). Regarding the size of the cattle, the lesions were more present in large animals, with 76.05% (254/334), while medium and small animals represented 11.38% (38/334) and 2.99% (10/334), respectively. Body weight is an important risk factor for foot diseases (Table 1). Pérez-Cabal and Charfeddine [29] emphasized that the heavier the cows, the greater the probability of acquiring diseases such as sole ulcer or white line disease. The mean age of the animals in this study was approximately 57 months ± 31 months (Table 1). Old age is one of the predisposing factors for digital diseases. A 10-year-old cow is four times more likely to have a horny case lesion [4].

Table 1. Parameters evaluated in cattle affected with foot disorders from January 1999 to July 2021 at the Clínica de Bovinos de Garanhuns - Universidade Federal Rural de Pernambuco

	Mean	*SD (±)	Minimum	Maximum
Age (months)	57	31	3	168
Weight (kg)	442	123	86	885
Clinical evolution (days)	23	21	1	94
Lameness (days)	20	19	1	93
No. of foot injuries per cow	2	1	1	6

*SD: Standard deviation

The mean calving number verified in this study was approximately 3 (±1.51) per cow. The increase in the number of deliveries is an important component for foot diseases, especially for the occurrence of sole ulcer and white line disease [30]. In the parameter non-lactating females (dry period), only 7% (20/296) had lesions on the hooves, while 29% (86/296) were in other stages of lactation, and 64% (106/296) had no information recorded on this factor. Although the frequency is low, this is a high risk phase for cows [31]. Table 2 presents the productive and reproductive parameters of sick females.

Table 2. Reproductive and productive parameters of bovine females affected with foot disorders from January 1999 to July 2021 attended at the Clínica de Bovinos de Garanhuns - Universidade Federal Rural de Pernambuco

	Mean	*SD (±)	Minimum	Maximum
Number of deliveries	3	2	1	8
Last calving (days)	132	92	3	530
Gestation period (months)	5	2	1	9

*SD: Standard deviation

Table 3 presents the occurrence of foot disorders recorded during the study period in descending order, in which interdigital dermatitis was the most frequent (12.4%), followed by double sole (9.79%), chronic laminitis (8, 81%), sole ulcer (7.83%), and interdigital hyperplasia (7.24%). Oliveira et al., [16] and Gargano et al., [15] described that interdigital hyperplasia was the most frequent condition seen in their respective hospital units. It was observed that in the medical records there were foot injuries that do not fit the nomenclature proposed by the ICAR [20] and by Borges et al., [21] these being the subsolar abscess, heel abscess, interdigital abscess, and corkscrew claws. It is worth mentioning the need to expand the nomenclatures, contributing to more specific diagnoses and more accurate treatments.

Diseases associated with laminitis accounted for 45% (276/613) of the diagnosed lesions, while 36% (218/613) consisted of lesions of secondary or uncertain cause, and 19% (119/613) were of infectious origin. Correa–Valência et al., [32] identified that in 94.4% of the lesions found in their study, the cause was non-infectious, while 5.6% had an infectious origin. Possibly, the high occurrence of metabolic-traumatic diseases (laminitis) is associated with the precarious conditions and lack of technical assistance in a large number of properties in the Agreste region of Pernambuco [33].

Of the total number of affected cattle, 44.91% (150/334) had a single lesion in the stratum corneum, 34.13% (114/334) had two, 15.27% (51/334) three, 4.19% (14/334) four, 1.20% (4/334) five, and 0.30% (1/334) had six different lesions. The average number of lesions diagnosed per patient observed in this study was approximately two (Table 1). In patients with more

than one diagnosed claw lesion, the most common combinations are described in Table 5. Due to the chronicity of foot diseases, during the examination of the limbs it is possible to identify lesions from different causes, making it difficult to determine which lesions are primary or secondary [4].

Table 3. Occurrence of foot disorders treated at the Clínica de Bovinos de Garanhuns-UFRPE from January 1999 to July 2021

Foot disorders	No. of diagnosed injuries	Relative frequency
Interdigital dermatitis	76	12.40%
Double sole	60	9.79%
[1]Chronic laminitis	54	8.81%
Sole ulcer	48	7.83%
Interdigital hyperplasia	45	7.34%
Septic pododermatitis	43	7.01%
Digital dermatitis	40	6.53%
Heel horn erosion	33	5.38%
Scissor claw	27	4.40%
Distal interphalangeal septic arthritis	23	3.75%
Myiasis	20	3.26%
Toe ulcer	18	2.94%
White line fissure	16	2.61%
Asymmetric claw	14	2.28%
Sole hemorrhage	11	1.79%
Wall fissure	11	1.79%
Bulb ulcer	8	1.31%
Horizontal horn fissure	8	1.31%
Claw deformity	7	1.14%
Acute laminitis	6	0.98%
White line abscess	6	0.98%
Vertical horn fissure	5	0.82%
Corkscrew claw	4	0.65%
Axial horn fissure	4	0.65%
Dewclaw pododermatitis	3	0.49%
Interdigital phlegmon	3	0.49%
Subsolar abscess	3	0.49%
Swelling of coronet and/or bulb	2	0.33%
Thin sole	1	0.16%
"Other non-specific lesions"	14	2.28%
Total	[2]613	100%

[1] The cases of chronic laminitis and slipping (concave dorsal wall) were summed into a single category.

[2] This number corresponds to the total number of lesions diagnosed in cattle treated during the study period.

Figure 3 illustrates the distribution of the number of foot injuries per affected limb. Pozzati et al., [34] also found that injuries were more frequent in the pelvic limbs (82.10%) than in the thoracic limbs (17.90%). The high frequency of injuries to the pelvic limbs is due to the coxofemoral joint being a rigid structure with a reduced capacity to absorb biomechanical shock during locomotion, compared to the thoracic limbs [35]. According to Martins et al., [36] the proximity of the limbs to environmental contaminants such as feces and urine contributes to the increase in the number of lesions in the stratum corneum of these limbs.

Figure 4 illustrates the distribution of the number of lesions according to the affected claws. Machado et al. [37], reported that claw involvement occurred mainly on the lateral digits (41.7%). As described by Ebling et al., [9] the lateral digits of the hind limbs and the medial digits of the forelimbs bear most of the weight, so are more likely to be injured.

Lameness was present in 78% (260/334) of the patients seen, while only 10% (33/334) were not lame. Of the lame animals, 20% (67/334) had grade II lameness, 19% (65/334) III, 15% (50/334) IV, 13% (45/334) I, and 5% grade V (18/334). Souza et al., [38] reported that they did not observe a direct correlation between the clinical sign of lameness and foot injuries in Jersey cattle raised in a *free stall* and semi-confinement system, that is, a bovine with a stratum corneum lesion is not necessarily lame. This result is possibly related to the nosocomial origin of the data, in which the producers bring the animals when they perceive a change in posture.

Table 6 presents the number of cases and the period of lameness reported by the producers on the properties since they noticed a change in posture. The clinical evolution (Table 1) of the animals comprising the period of hospitalization was approximately 23 days, and the duration of lameness was approximately 20 days. The severity of the lesions directly interferes with the clinical evolution of stratum corneum diseases and the lameness period in cattle [4, 39, 40].

The majority of the animals presented alterations in the degree of dehydration, in which the most frequent degree of exicosis was I, 25% (83/334), with the degrees II with 21% (70/334) and III with 5% (16 /334), in addition, in 24% (81/334) of the animals there was no change in the degree of dehydration. This condition is related to the decrease in water intake, due to the difficulty of locomotion arising from the pain caused by the hoof injuries [41]. The mean rectal temperature in that study was 39.0°C. [18]

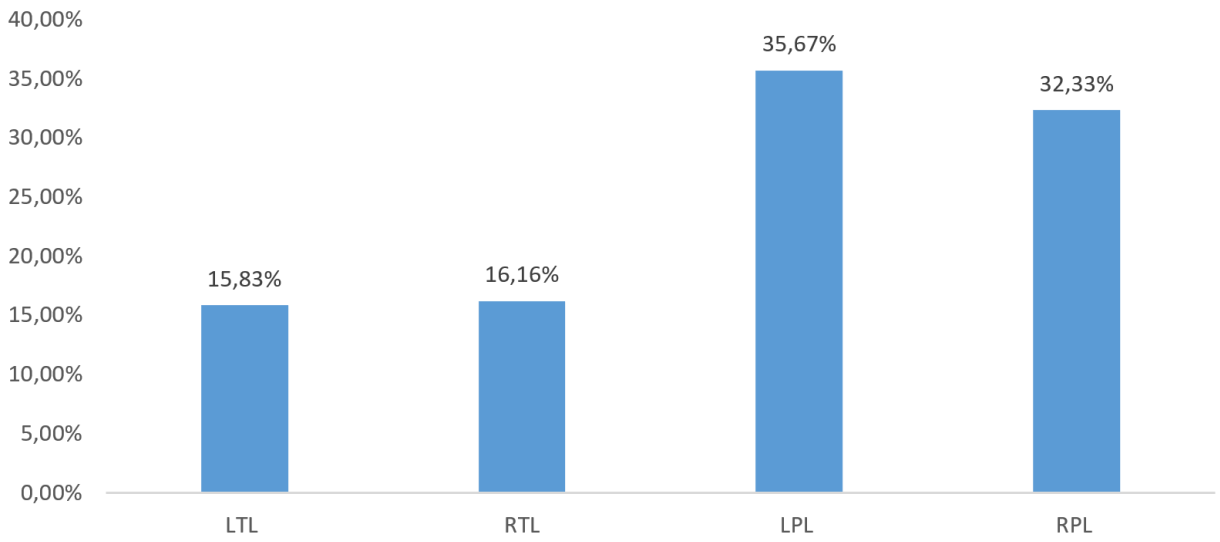

Figure 3. Distribution of the number of foot injuries according to the affected limbs of cattle treated at the Clínica de Bovinos de Garanhuns- UFRPE from January 1999 to July 2021. LTL (Left thoracic limb), RTL (Right thoracic limb), LPL (Left Pelvic Limb) and RPL (Right Pelvic Limb).

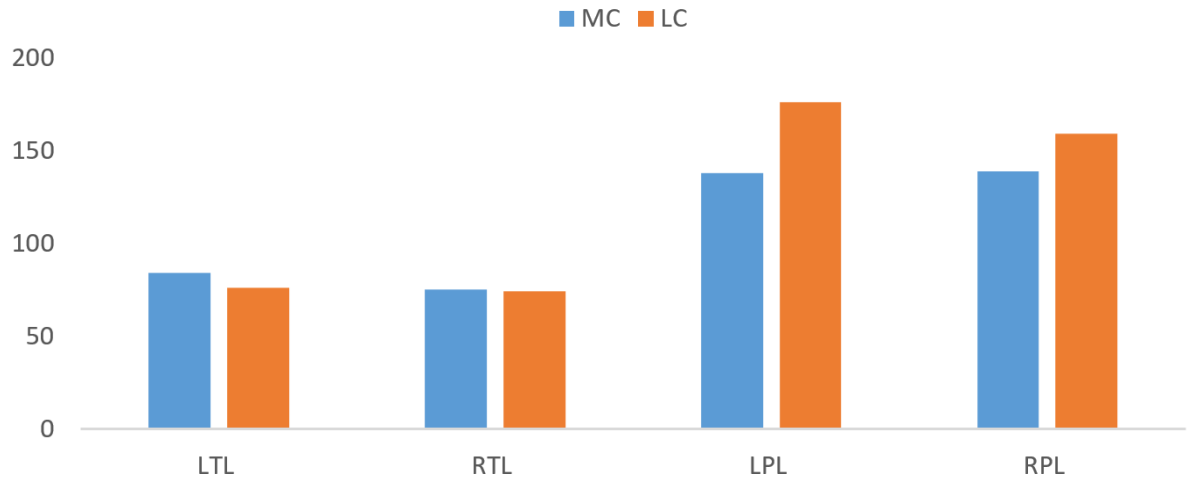

Figure 4. Distribution of the number of foot injuries according to the claws of the affected limbs in cattle treated at the Clínica de Bovinos de Garanhuns-UFRPE from January 1999 to July 2021. MC (medial claw), LC (lateral claw), LTL (left thoracic limb), RTL (right thoracic limb), LPL (left pelvic limb), RPL (right pelvic limb).

Among the intercurrent conditions, the most frequent was clinical mastitis (12.57% [42/334]), followed by displacement of the abomasum to the left (1.2% [4/334]), papillomatosis (1.2% [4/334]), vagal indigestion (1.2% [4/334]), metritis ([0.60% 2/334]), and reticulitis (0.60% [2/334]). Foot diseases force cattle to spend more time lying down and reduce the teat cleaning interval, thus increasing contact with the ground, leading to an increase in mastitis cases [42]. According to Refaai et al., [43] digital diseases characterized as infectious are associated with increases in cases of subclinical mastitis in dairy cows. Mastitis is an important cause of endotoxemia that can contribute to damage to the claw chorion [2].

The lethality in this study was approximately 9% (31/334), a result lower than that estimated by Gargano et al., [15] which was 21.5% (26/121). Deaths occur due to complications linked to the severity of the injury and in situations in which the treatment was not successful, and the animal are submitted to euthanasia [44].

Table 4. Distribution of the number of foot injuries according to the etiological category of digital diseases [1]

Etiology	Absolute frequency	Relative frequency
Laminitis and its sequelae	276	45%
Illnesses of uncertain or secondary origin	218	36%
Infectious diseases	119	19%
Total	613	100%

[1]Borges et al. [10].

The recovery rate of cattle was approximately 73% (243/334), close to that reported by Gargano et al., [15] who observed 78.5% (95/121). Considering the treatment, both surgical and conservative were used. Surgical cases were the most frequent and corresponded to 56% (187/334) of the case series, while 38% (126/334) of the animals received conservative treatment.

Given the need for surgical resolution, the main procedures performed were surgical debridement, performed in 38.32% (128/334) of cases, followed by digit amputation, with 8.38% (28/334), and excision of the interdigital hyperplasia in 8.68% (29/334) of situations. In two patients, 0.60% (2/334), in addition to the amputation of the digit, the hyperplastic tissue was removed. Thus, surgical debridement was the most commonly practiced procedure. Weaver et al. [45], emphasize that debridement of necrotic tissue contributes to maximizing the effect of antimicrobials and assists in injury recovery.

Conservative treatment consisted of the use of injectable drugs associated with topical treatment or not. Parenteral antibiotics were used in 49% (163/334) of patients, while 43% (145/334) did not require their use. The main drugs used were florfenicol, ceftiofur, oxytetracycline, quinolones, and amoxicillin, as recommended by Greenough [1] and Constable et al. [46].

Table 5. Association of the most frequent multiple lesions in cattle affected with foot disorders treated at the Clínica de Bovinos de Garanhuns-UFRPE from January 1999 to July 2021

Multiple foot lesions	No. of cases
Chronic laminitis - scissor claws	7
Interdigital dermatitis - double sole	5
White line abscess - double sole	4
Digital dermatitis - heel horn erosion	4
Interdigital dermatitis – myiasis	4
Interdigital dermatitis – interdigital hyperplasia	4
White line fissure - double sole	4
Interdigital dermatitis – heel horn erosion	3
Septic pododermatitis-myiasis	3
Sole ulcer – double sole	3

Regarding anti-inflammatory drugs, 41% of patients received some type of drug in order to reduce pain, however, in 53% of cases there was no record of administration, probably due to mild or less severe conditions. Among the most commonly used drugs were phenylbutazone, flunixin meglumine, dipyrone, and meloxicam. Marçal et al. [47] point out that phenylbutazone is effective in controlling intense pain and inflammatory processes in animals diagnosed with lameness, regardless of the lesions in the horny case.

Topical treatment was used in 90% (300/334) of patients and consisted of applying a mixture of penicillin-based ointment (Ganadol®) with copper sulfate to the lesion site (surgical or not), covered by dressings and bandages. In only 5% (18/334) of the cases, this type of treatment was not applied, with local wound cleaning or application of Formoped® spray (monomethylol dimethyl hydantoin). Copper sulfate is an astringent product that degrades the granulation tissue of lesions, however, its prolonged use can damage the healing of the corium and delay the growth of new corneal tissue [2].

Bandages were applied in 71% (238/334) of the cattle, while in 21% (69/334) there was no need, with the average number of bandage changes used in the treatments being approximately four per animal. Greenough [1] highlights that the bandage has the function of protecting the wound and fixing the antimicrobial agents. The hoof block is another device used to promote the recovery of foot disorders, however, it was only used in 13% (43/334) of the animals and in 68% (228/334) of the cases it was not used. This device has the function of

relieving the pressure on the diseased claw, applying it to the healthy claw [48]. Presumably, the hoof block was used in cases where it was deemed necessary to raise the healthy claw in order to reduce the pressure of the weight on the compromised claw due to the severity and extent of the injuries.

Table 6. Numbers of cases and the period of lameness of bovines on the properties according to the reports of rural producers before attendance at the Clínica de Bovinos de Garanhuns

Lameness interval (days)	*No. of cases
1-15	33
20-45	20
50-240	27
Total	80

The mean total cost associated with animal treatments was estimated in this study at US$104.19. Ferreira et al. [49] estimated the costs of treating the sequelae of laminitis at US$ 44.68 per cow. Hoof diseases impact the total costs on the property due to the loss of milk production, reduced weight gain, early disposal, and cost with additional labor [7, 48, 3]. According to Bonita, Beaglehole and Kjellstrom, [49] descriptive studies are the first step in the epidemiological investigation process with the intention of detailing the health status of communities, although studies of this aspect do not analyze the association between the exposure and the effect. Descriptive epidemiology is an important tool for tracing the epidemiological profile of populations, establishing patterns of disease distribution, and listing the possible causes that lead to the involvement of individuals, in addition, these studies make it possible to propose preventive and corrective measures. [50].

Conclusion

The current study allowed us to identify the main foot disorders of the treated cattle and the clinical and epidemiological profile, in addition, to characterizing the negative economic impact that this entity causes on a dairy farm. Interdigital dermatitis was the main cause of foot lesions, however, diseases associated with laminitis had a high occurrence. Studies of this nature are important for understanding the dynamics of foot diseases in populations and are the first step towards understanding the situation in cattle affected with foot problems in the southern Agreste region of Pernambuco.

Conflict of interests

The authors declare that there is no conflict of interest.

Author contributions

Conceptualization: R. J. C Souto, J. A. B. Afonso and J. A. R. Dionizio. *Formal analysis*: J. A. B. Afonso and G. S. L. Soares. *Investigation*: R. J. C Souto and J. A. R. Dionizio. *Methodology*: J. F. P. Cajueiro, L. T. Coutinho, B. P. e Silva and G. S. L. Soares. *Project management:* R. J. C Souto and J. A. B. Afonso. *Resources*: N. A. Costa and J. A. B. Afonso. *Supervision*: R. J. C Souto. *Validation*: J. A. B. Afonso, G. S. L. Soares, R. J. C Souto and J. A. R. Dionizio. *Visualization*: J. A. B. Afonso and R. J. C Souto. *Writing (original draft):* J. A. R. Dionizio. *Writing (review and editing)*: R. J. C Souto and J. A. R. Dionizio.

Acknowledgment

The present work was carried out with the support of the Coordination for the Improvement of Higher Education Personnel - Brazil (CAPES) with funding of the research grant.

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