Financial Impacts and Epidemiological Characteristics of Lumpy Skin Disease in Cattle in Ampara District of Sri Lanka

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Abstract

Cattle farming is a major economic sector in the Ampara district of Sri Lanka, yet there is limited information on lumpy skin disease (LSD) in the region. This study addresses this gap by investigating the prevalence, mortality rate, distribution, and age-related factors of LSD, as well as assessing the financial impacts of outbreaks. Data of LSD from nineteen government veterinary offices were collected through surveys and interviews. The data was analysed using Microsoft Excel 2021 and Minitab 19. Findings indicate that LSD had spread to nineteen out of twenty ranges in the Ampara district. The highest prevalence was observed in the Irakamam range (20.77%), while the lowest was in the Alayadivembu range (3.81%), with an overall prevalence of 8.59%. Nintavur and Addalaichenai had significantly higher mortality rates of 6.5% and 3.5%, respectively, compared to other regions in the Ampara district, where the mortality rate was much lower at 1.7%. Statistical analysis revealed that the affected animals were predominantly under one year of age. Financial impact assessment showed that 78% of affected farms experienced reduced growth rates in their cattle, while 22% faced infertility issues. Major risk factors for LSD spread included animal transportation, communal grazing lands, and presence of ticks. These findings provide valuable insights into the epidemiology and economic burden of LSD in Ampara, offering a basis for developing targeted interventions to protect livestock farmers' livelihoods and sustain the local economy.

Keywords: ***Lumpy Skin Disease (LSD), Cattle, Financial impacts, Ampara district of Sri Lanka***

I. INTRODUCTION

Lumpy Skin Disease (LSD) is a severe systemic illness in cattle caused by the Lumpy Skin Disease virus, which belongs to the Capripoxvirus genus within the Poxviridae family. Key symptoms of LSD include fever, nodular lesions on the skin and mucous membranes, and lymph node enlargement (Molla et al., 2017). Morbidity rates can range from 10% to 85%, depending on factors such as regional differences, cattle population density, and the effectiveness of control measures. While LSD generally has a low mortality rate of 1% to 5%, it can still cause significant economic losses due to reduced milk production, weight loss, and secondary infections, particularly in regions with high morbidity (Sherrylin et al., 2013; Namazi & Khodakaram Tafti, 2021).

Ampara District of Sri Lanka, where livestock farming plays a crucial role in the local economy, the spread of LSD has raised concerns due to its potential impact on dairy farmers' livelihoods. The variation in morbidity and mortality rates during LSD outbreaks depends on several factors, including geographic location, climate, cattle management conditions, and the virulence of the virus. Reported morbidity rates range from 5% to 45%, with mortality rates typically between 1% and 5%. However, higher rates have been observed in certain regions, such as in Oman, where a 2009 outbreak in a Holstein cattle population saw morbidity and mortality rates of 30-45% and 12%, respectively (Sherrylin et al., 2013).

LSD primarily affects cattle and buffaloes, with all breeds being susceptible, although imported breeds with thinner skins, such as Bos Taurus, are more vulnerable than indigenous breeds. Young calves are particularly susceptible, developing characteristic lesions within 24 to 48 hours of infection. In rare cases, wild species like impalas, Thomson's gazelles, and giraffes have also developed LSD lesions following experimental inoculation (Ali et al., 1990; Greth et al., 1992; Young et al., 1969).

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The exact transmission mechanism of LSDV is not fully understood, but it is believed to be mechanically spread by flying insects, with epidemics often coinciding with periods of high insect activity. Variations in attack rates, ranging from 10-15% to nearly 100%, may be attributed to differences in vector species across regions. Blood-sucking ticks have also been implicated in the transmission of LSDV in sub-Saharan Africa (Lubinga et al., 2013). While transmission through semen has not been experimentally confirmed, the virus has been isolated in the semen of infected bulls, suggesting potential intrauterine infection. The movement of animals from infected herds has frequently introduced the virus to new areas, with old skin lesions serving as a source of infection (Weiss, 1968; Kitching & Mellor, 1986; Carn & Kitching, 1995).

Pathologically, the acute stage of LSD is characterized by thrombosis, vasculitis, perivascular fibroplasia, and infarction, with inflammatory cells infiltrating affected areas. Gross pathology includes edema, congestion, and enlargement of lymph nodes, as well as nodular lesions in fascia and musculature. The incubation period for LSD is approximately 28 to 35 days in natural infections and 4 to 7 days in experimental settings (Al-Salihi, 2014; Mulatu & Feyisa, 2018; Ratyotha et al., 2022).

Clinically, LSD manifests as anorexia, fever, salivation, nasal discharge, enlarged lymph nodes, weight loss, and decreased milk production. The most distinctive sign is the presence of firm, raised skin nodules that appear on the legs, neck, back, and tail. These nodules can lead to complications such as myiasis, abortion, mastitis, and orchitis. Postmortem examinations often reveal lung edema, congestion, and nodules throughout the lungs and gastrointestinal tract (Namazi & Khodakaram Tafti, 2021).

The objective of this study is to assess the prevalence and mortality of LSD in the cattle population of Ampara district of Sri Lanka, analyze the risk factors contributing to the spread of LSD, and relate the occurrence with age, and evaluate the economic impact of LSD on livestock farming in the Ampara district.

II. MATERIALS AND METHODS

A. Study area and Study Population

The study focused on cattle farms affected by Lumpy Skin Disease (LSD) in the Ampara district over three months from September to December 2023. Data was collected from 19 selected Veterinary ranges within the district, based on the number of reported LSD cases in each farm. The Veterinary ranges included in the study were Addalaichenai, Akkaraipattu, Alayadivembu, Ampara, Dehiattakandiya, Irakkamam, Kalmunai, Karaitivu, Lahugala, Mahaoya, Navithanveli, Nintavur, Padiyathalawa, Pottuvil, Uhana, Sainthamaruthu, Sammanthurai, Damana, and Thirukkovil. These ranges were specifically chosen to provide comprehensive data from farms significantly impacted by LSD.

B. Data Collection

Epidemiological data were systematically gathered, focusing on cattle demographics, clinical signs of LSD, vaccination status, and management practices. This information was obtained through a combination of veterinary records and on-site farm visits. During sampling, details such as the sex, age, and management system of the cattle were meticulously recorded.

To assess the financial impact, data collection involved conducting surveys and interviews with farmers. These methods provided insights into production losses, veterinary expenses, and other economic consequences associated with LSD.

A well-structured questionnaire was prepared and completed to gather detailed information. This questionnaire covered various aspects including the owner's particulars, herd composition, management practices, and the health, disease, and vaccination status related to LSD.

In addition, an interview guide was meticulously developed and utilized. This guide focused on gathering insights about experiences with LSD, identifying which types of animals were affected, and assessing production losses.

C. Statistical Analysis

Qualitative data were analysed using a cohort study design to evaluate the independence of various epidemiological factors. Quantitative data were processed and analysed using Microsoft Excel. For the financial impact analysis, survey data and interview responses were meticulously examined in combination to provide a comprehensive assessment.

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Figure 01: Jerzy Crossbreed Cow in Kalmunai Infected with LSD Exhibiting Multiple Skin Nodules

Figure 02: Jerzy Crossbred Calf in Ampara infected with LSD reveals multiple skin nodules

III. RESULTS

A. Prevalence of Lumpy Skin Disease (LSD) in Ampara District

The data on LSD prevalence in the Ampara district is illustrated in Figure 03. The highest prevalence of LSD was observed in the Irakamam veterinary range, with a rate of 28.46%. The second highest prevalence was reported in the Samanthurai veterinary range at 20.77%. Overall, the prevalence of LSD in the Ampara district from September to December 2023 was 8.59%.

B. Mortality Rate of Lumpy Skin Disease

The highest mortality rate was reported in the Ninthavur veterinary range at 6.50%, followed by the Addalaichenai range with a mortality rate of 3.46% (Figure 04). The overall mortality rate in the Ampara district for the same period was 1.70%.

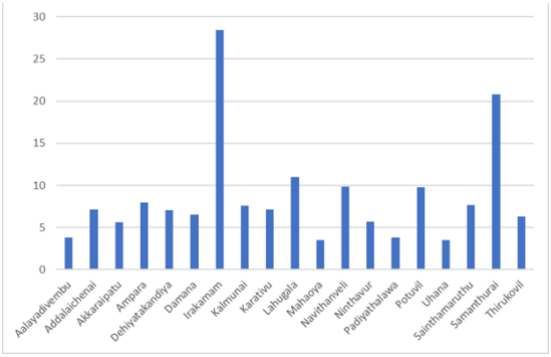

Figure 03: Prevalence (%) of Lumpy Skin Disease in Cattle in Ampara district: September to December 2023

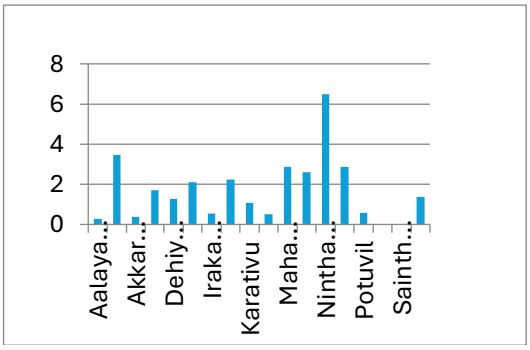

Figure 04: Mortality rate (%) of Lumpy Skin Disease in Cattle in Ampara district: September to December 2023

C. Age Distribution of Affected Animals

The analysis, as illustrated in Table 01, reveals that the highest percentage of Lumpy Skin Disease (LSD) cases were observed in animals under one year of age, while the lowest number of affected animals were in the over one-year age category.

D. Financial and Production Impacts

Figure 05 shows the impact of Lumpy Skin Disease (LSD) on farms in the Ampara district. The data indicate that 78% of LSD-affected farms experienced a reduction in growth rates among the affected animals. In contrast, 22% of the affected farms reported issues related to infertility in their livestock.

Table 01: Reported LSD in Two Age Groups: "Animals below one year and Animals above one year in cattle in Ampara district'' (September to December 2023)

Affected Ranges	**No. of cattle below one year**	**No. of cattle above one year**
Aalayadivembu	265	95
Addalaichenai	277	70

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Akkaraipatu	206	64
Ampara	196	36
Dehiyatakandiya	86	16
Damana	117	62
Irakamam	68	36
Kalmunai	307	50
Karativu	107	78
Lahugala	310	75
Mahaoya	565	65
Navithanveli	582	30
Ninthavur	89	34
Padiyathalawa	188	20
Potuvil	302	58
Uhana	289	58
Sainthamaruthu	24	6
Samanthurai	760	117
Thirukovil	987	113

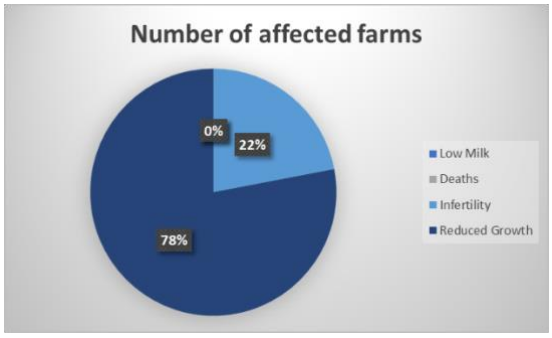

Figure 05: Financial Impact of Lumpy Skin Disease in Cattle on affected Farms in Ampara district of Sri Lanka

IV. DISCUSSION

This study, conducted across nineteen veterinary ranges in the Ampara district from September to December 2023, provides a comprehensive assessment of the prevalence, mortality, and impact of Lumpy Skin Disease (LSD) in cattle. The data collected from this three-month survey, along with interviews with local farmers, highlights significant variations in LSD prevalence and mortality rates across different ranges. The study corroborates previous findings that the morbidity rate for LSD ranges from 5 to 45% (Sherrylin et al., 2013). same as this study found notable differences in LSD prevalence across veterinary ranges in the Ampara district. The Irakamam range had the highest prevalence at 20.77%, while the Alayadivembu range had the lowest at 3.81%. The overall prevalence of LSD in the district was 8.59%. These figures suggest substantial regional variability, which may be influenced by local environmental, management, and biosecurity factors. Conversely, the mortality rate due to LSD varied significantly, with the highest rate observed in the Nintavur range (6.50%) and zero mortality recorded in the Sainthamaruthu and Uhana ranges. The total mortality rate across the district was 1.7%. Like that, the previous study reveals that mortality rates of 1 to 5% are considered more usual (Sherrylin et al., 2013). The absence of mortality in some ranges indicates effective local management or lower virulence of the virus in those areas, while higher mortality in other ranges suggests more severe outbreaks or less effective control measures.

The study corroborates previous findings that younger animals are more susceptible to LSD (Badhy et al., 2021). The data revealed that the majority of affected cattle were below one year of age, consistent with the heightened vulnerability of younger animals to the disease. In contrast, older cattle were less frequently affected. This age-related susceptibility underscores the need for targeted vaccination and preventive strategies for younger cattle to mitigate the impact of LSD.

The economic consequences of LSD on farms include not only direct losses from animal deaths but also secondary impacts such as reduced growth rates and infertility (Namazi & Khodakaram Tafti, 2021). In this study, 78% of LSD-affected farms reported reduced growth in affected animals, while 22% experienced infertility issues. The lack of reported issues with milk production suggests that milking animals were not significantly affected by LSDV during the study period, which may be due to the timing of the outbreak or effective vaccination coverage in dairy herds.

The spread of LSD is influenced by several known risk factors, including insect populations, communal grazing, the introduction of new animals, and vehicle movements (Ratyotha et al., 2022). According to government records and farmer interviews, the initial introduction of the LSD virus in the Ampara district is believed to have occurred through animal transportation from the Batticaloa district. Subsequent spread likely occurred via arthropod vectors, communal grazing, and shared watering sources. These findings emphasize the importance of controlling vector populations and managing communal resources to prevent the spread of LSD.

The findings of this study highlight the need for targeted control strategies tailored to the specific conditions and risks of different veterinary ranges. Effective vaccination programs, vector control measures, and improved biosecurity practices are essential to reducing both the prevalence and mortality of LSD. Additionally, farmer education on the importance of early reporting and prompt treatment of affected animals can help mitigate the spread of the disease.

In conclusion, the study underscores the significant regional variability in LSD prevalence and impact within the Ampara district. Addressing these variations through targeted interventions and enhanced management practices will be crucial for controlling future outbreaks and minimizing the economic impact of LSD on local cattle populations.

V. CONCLUSION AND RECOMMENDATION

The LSD outbreak in the Ampara district resulted in high morbidity but low mortality among the cattle population. The primary modes of transmission included the transportation of animals from affected areas, as well as further spread through ticks, communal grazing, and shared water sources. Calves under one year of age were particularly vulnerable, resulting in significant financial losses due to stunted growth and infertility. To control the outbreak effectively, we recommend implementing vaccination programs, restricting animal movement, and culling infected animals. Strategic government policies should be developed, alongside further research on vector insects and robust quarantine practices. Educating herd owners about prevention measures and prioritizing vaccination efforts are also essential for mitigating future outbreaks.

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