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Clinical Signs and Economic Impact of Lumpy Skin Disease

(Review Article)

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Abstract:

Lumpy skin disease (LSD) is a viral disease that mainly affects livestock. This virus, which belongs to the Poxavidy family's Capropoxavira genus, is the cause of lumpy skin disease (LSDV). High fever, inflammatory lymph nodes, and distinctive nodulated skin lesions are characteristics of the illness. The disease is usually transmitted by insect vectors, such as mosquitoes and flies, and has a significant economic impact on the agricultural sector, especially in the spatial regions of Africa, Middle East and Southeastern Europe. Clinical symptoms of LSD include fever, ruin, anorexia, hypersalation and skin nodes, and its severity varies depending on factors such as host sensitivity, vector density and viral load. Economically, LSD causes significant damage to livestock productivity, including direct costs such as product dividends, infertility and mortality. Vaccination is still the only security measure, especially when used in high risk or spatial regions. A comprehensive understanding of epidemiology, causes and effects of the disease is important to develop effective management strategies to protect livestock and ensure stability in agricultural industries in affected areas. Economically, LSD causes significant damage to

livestock productivity, including direct costs such as product dividends, infertility and mortality. Vaccination is still the only security measure, especially when used in high risk or spatial regions. A comprehensive understanding of epidemiology, causes and effects of the disease is important to develop effective management strategies to protect livestock and ensure stability in agricultural industries in affected areas.

Keywords: Lumpy skin disease**,** Vaccination, Poxavidy family

Introduction

Cattle are the primary victims of Lumpy Skin Disease (LSD), a viral disease brought on by the Lumpy Skin Disease Virus (LSDV), a member of the Poxviridae family's Capripoxvirus genus. Affected cattle's general health and production may be seriously impacted with the aid of the disorder, which is typified by way of the improvement of nodular lesions on the pores and skin [1].

Skin lesions such as high fever, enlarged lymph nodes and specific lumps appear among the clinical signs of LSD. Clinical signs appear after the incubation phase of the disease, which usually remains between two and four weeks [2]. The virus is sent in spatial regions of insect vectors, especially mosquitoes and some flies, required in animal-cum-ms. [3].

LSD has a huge negative economic effect on the agriculture enterprise, ensuing in decrease output of meat and milk. Farmers in lots of areas are critically threatened with the aid of the high prices of treating diseased farm animals and managing its aftereffects [4]. To lessen LSD's affects at the livestock business, it's far vital to understand its nature and use green control strategies.

Literature Review

Epidemiology of LSD

In the majority of African nations, especially those in the sub-Saharan area, LSD is an endemic illness. Since 2012, it has quickly expanded throughout the Caucasus, Russia, Kazakhstan, the Balkans, the Middle East, and southeast Europe [5, 6].

Although field outbreaks are usually more severe with the first infection, they can also entail widespread, severe illnesses with high rates of morbidity and mortality. In other circumstances, there may be a limited number of infected animals and few or no reported deaths. When an illness is initially brought to a place, field outbreaks are typically more severe. This is followed by a reduction, most likely as a result of broad immunity developing. However, in certain instances, there can be few afflicted animals and few or no deaths reported. In other situations, field outbreaks may result in widespread, serious diseases with elevated rates of morbidity and death. (fig. 1). In endemic locations, morbidity rates are closer to 20%, but during epizootics, they can approach 80%.[7].

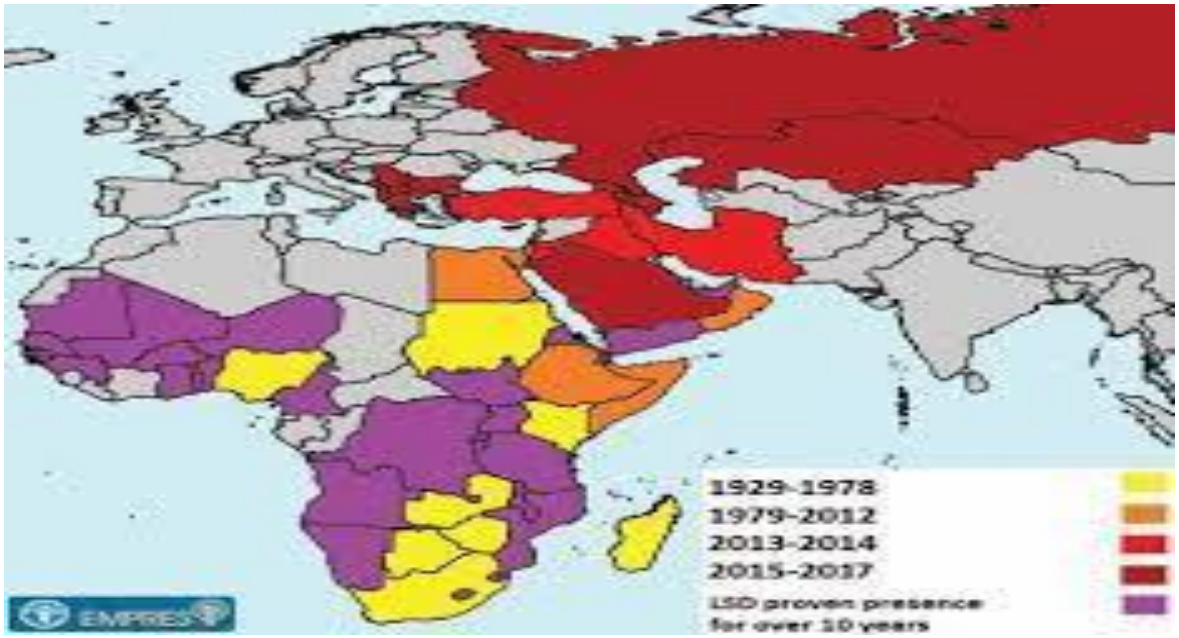

Figure 1: Global distribution of LSD by geography Source:(8)

Due to persistent debility and widespread malaises, lumpy skin disease is a significant, economically disastrous, and reportable condition that has reduced cow output [9]. A thorough grasp of the pathogen, host, and environmental epidemiology elements of LSD may help with preventative measures. Exposure of the virus and hosts in an environment that was conducive to the disease's spread and transmission was given special

attention [10]. It has been noted that the disease's geographic range, mechanism of transmission, and frequency of illness and mortality in big herds of cattle result in significant financial losses [9,11].

1

- Pathogenesis and Clinical Signs

Pathogenesis

Viral LSDV generates viremia and a febrile reaction when it enters the body by the skin or GIT mucosa, which results in lumpy skin disease. After then, the virus travels to the nearby lymph nodes, where it causes edema [12]. Viral replication in a particular cell, such as endothelial cells of lymphatic and blood artery walls, is how the virus produces skin lesions, which result in the formation of inflammatory nodules on the skin [13]. A global epitheliotrophic condition, lumpy skin disease causes both regional and systemic reactions, including vasculitis and lymphadenitis, which lead to edema and necrosis. Thrombosis and other symptoms may be seen in certain extreme situations. LSD nodules may become grey-pink and have caseous necrotic centers. Ulceration may occur in circumscribed necrotic lesions. The epitheliotrophic characteristic of LSDV is responsible for skin localization [14].

2-Clinical Signs

In experimentally infected cattle, the time between inoculation and the beginning of wide clinical indications is 7–14 days [14], regardless of the route of infection, whereas in natural cases it is 2–5 weeks [15,16]. Depending on the amount of lumps (no dules), the frequency of problems, the i noculum dose, the host's fragility, and t he density of the insect population, LS D can be categorized as moderate or se vere. This can lead to emaciation, sadness, anorexia, excessive salivation, ocular and nasal discharge, agalactia, and the development of one or two lumps in poorly affected animals (Figure 2), or nodules within two days of the fever's beginning (1 to 5 cm in diameter).

Additionally, the animal's body may ha

ve painful, hyperemic nodular lesions, particularly in the skin of the jaw, nare s, head, legs, scrotum, perineum, eyelid s, lower ear, nasal and oral mucosa, an d tail [11]. In severe instances, which can last for seven to twelve days, there are multiple (more than hundreds) nodules that are often quite uniform in size across the animal's body, along with persistent high pyrexia (40–41.5°C), severe depression, and anorexia [17].

Figure 2: Severity-indicating characteristic LSD nodular lesion

A serious lesion that covers the entire body

Isolation of viruses

The gold standard for diagnosing LSDV is viral isolation in cell culture or embryonated chicken eggs, however this process can take weeks. Bovine, ovine, or caprine tissue cultures can be used to isolate LSDV. LSDV produces a characteristic cytopa thic effect and intracytoplasmic inclusi on bodies, in contrast to bovine herpes virus-2 infection, which causes syncytia and intranuclear inclusion bodies in cell cul ture, as well as a pseudo-lumpy skin condition. [18]. Primary cow testicular (PCT) cells are the most sensitive cell line for isolating LSDV, whereas vero cells are not suitable for this purpose, according to [19].

Risk Factors

considerations Zebu-type calves born in Africa had a greater survival rate and less severe clinical sickness than cattle imported from other continents, but they are also less likely to contract LSD and may develop extensive skin lesions [20]. Similar findings were seen in studies conducted in Oman, Turkey, and Ethiopia [21].Despite the fact that the vaccination had no protective effect on crossbreeds, the morbidity rate among vaccinated zebu cattle was more than four times greater than that of unvaccinated cattle.. A lack of confounding effect control and an imprecise definition of morbidity may be the cause of these findings [22]. There is conflicting evidence about age-related LSD susceptibility. Some research studies [22,23] reported higher morbidity in young animals. There is also conflicting information about the impact of gender on LSD susceptibility. [22,23,24] For Bangladesh's cow herd, breed is also considered a major host factor since crossbred cattle are more vulnerable to LSD than native cattle [25]. Additionally, animals of different ages have shown differing levels of susceptibility to LSD infection. LSD kills animals more quickly. Compared to bulls, who are nearly immune to LSDV, female milking cows are more susceptible to its effects. [26].

Measures of Control

Since LSD is a viral disease, there isn't a particular therapy for it at the moment. The sole therapy for LSD is symptomatic, and antibiotics are necessary to halt any bacterial issues later on.[11] started doing research on treatments in 2011 in an effort to lessen the negative effects of LSD and save lives. They worked well, using a combination of drugs that cure infections, reduce inflammation and germs, and offer comfort [27]. Additionally, they recommended using non-steroidal anti-inflammatory drugs and antihistaminics.
An antipyretic medication, such as paracetamol, was given to reduce fever.
Recovery from anorexia requires regular usage of multivitamins and liver-supporting medications. [28]. To minimize significant financial losses from hide damage, milk loss from mastitis, and food product losses from mortality, miscarriage, fever, and myiasis, avoidance is more effective than treatment of LSD (and its consequences), which is expensive and does not necessarily lead to a full recovery.

Economic Impact

Lumpy skin disease is one of the economically significant conditions that significantly lowers cow productivity in the Middle East and Africa.. Due of the illness's significant financial losses, the World Organization for Animal Health (OIE) recognizes it as an illness that has to be reported.. The disease's high morbidity rate, not its high fatality rate, was the primary factor contributing to its economic significance [9]. Herd owners, customers, and the indust rial sectors that can handle the cattle pr oducts and byproducts are all financiall y impacted by these losses.

[29] Emaciation-related harm to the hide, temporary or permanent sterility in both males and females, miscarriage, mastitis, loss of milk supply, and mortality of up to 40%—though mortality seldom surpasses 3%—LSD results in significant economic losses. Therefore, lumpy skin disease is one of the economically significant disorders that drastically lowers cow productivity in Middle Eastern and African countries.The World Organization for Animal Health (OIE) has designated th e sickness as a modifiable disease beca use of the substantial financial losses it causes.

The disease's high morbidity rate, not its high fatality rate, was the primary factor contributing to its economic significance. 9 These losses thus have substantial fina ncial ramifications for herd owners, co nsumers, and the industrial sectors that can manage the cattle products and byp roducts. According to Ethiopian reports, the anticipated financial losses for each local zebu head were 6.43 USD and for the Holstein Friesian, 58 USD, respectively, based on milk, meat, beef, draught power, mortality, treatment, and immunization expenditures [30].

The illness mostly affects cattle, and its morbidity and decreased productivity have an impact on output [31]. The disease's main effects include delayed genetic improvement, reduced animal productivity, draught power and traction loss, miscarriage in pregnant cows, and a significant decrease in milk production.

Chronic debility in beef cattle, irreversible damage to hide, and sterility and infertility in both sexes of cattle during the active case of the disease (16; 32). One key strategy to

lower losses and boost cattle owners' revenues is to control the illness, paying particular attention to endemic areas.

Loss of Milk Production

The milk Production of dairy cows afflicted with LSD is significantly reduced. According to this study, in around 53.061 percent of the farms, the LSD epidemic reduced milk output by 0 to 3 liters per animal per day. According to calculations, the average daily decrease in milk output per impacted animal was 4.173 liters. The milk loss in percent was calculated to be 32.086% during the period of LSD infection. Since the cost of a litre of cow milk was determined to be Rs 94.15, the daily loss per cow as a result of lower milk output was projected to be Rs 202.66. There were an average of 25.84 days during which the sickness afflicted the cows. (33). An estimated Rs 5236.79 was lost economically as a result of each afflicted cow's decreased milk output over the course of LSD. Table (1) displays the computation results:

Table 1: Loss of milk production

Loss of milk per day in litre	Frequency(n=49)	Percentage
Low(0-3)	26	53.06
Medium(3-6)	12	24.49
High(6-9)	6	12.24
Very High(>9)	5	10.20
Mean ± SD	4.173 ± 4.157	
Total number of cows affected	95	
Loss of milk production per day in affected cows (in litres)	204.5	
Average Milk loss (%)	32.09	
Average selling price of cow milk (in Rs)	94.15	
Economic loss due to loss of milk production per affected cow per day (in Rs)	202.66	
Average number of days for which the cows were affected with the disease	25.84	
Economic loss due to loss of milk production per affected cow during entire course of LSD (in Rs)	5236.79	

Control of animal migration and exodus

Animals from endemic locations should be limited to crossing borders to reduce the potential for spreading transboundary disease. A quarantine policy should be implemented for a comprehensive investigation if such lesions are believed to be present inside the nation . It cannot be argued that eradicating disease vectors is the sole way to stop disease outbreaks or emergence. But fighting the condition requires doing this. We can somewhat stop the transmission of illness by reducing the vector. Even though no quantifiable figures can be established for the transmission of viruses by vectors, the role of vectors in the transmission of illnesses can be extremely dangerous [34]. Vectors may play a very harmful role in the spread of diseases.

Vaccination

The most effective way to stop the spread of LSD is to vaccinate cattle with an approved vaccine, particularly if this is done before the virus infects a country or area that is already at danger. [35] have begun a research on the economic impacts and epidemiological features of lumpy skin diseases in Ethiopia, highlighting the role that vaccination plays in reducing LSD in endemic areas [36]. Live vaccinations are helpful in preventing illness because they produce a strong and sustained immune response [37]. Live vaccines, however, have the potential to cause mild skin disorders and localized pain [37]. illness was 25.84.

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