

*ORIGINAL ARTICLE*

**Prevalence, duration of illness, and mortality of lumpy skin disease at Chuadanga Sadar Upazila, Bangladesh**

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**Abstract**

**Background:** Lumpy skin disease (LSD) has emerged as a significant threat to cattle production in Chuadanga Sadar Upazila, Bangladesh. Our study aimed to assess the prevalence, mortality, and demographic distribution of LSD in the study area.

**Materials and Methods:** A total of 634 cattle were observed during the study period. Data were collected using a well-prepared questionnaire through face-to-face interviews conducted in Chuadanga Sadar Upazila, Bangladesh, from August 7, 2022, to October 6, 2022.

**Results:** The prevalence of LSD was 22.24% with variations observed between indigenous (51.77%) and cross-bred cattle (48.23%). The overall LSD mortality was 7%. Cross-breed male cattle showed a higher prevalence of LSD (57.35%) in comparison to cross-breed female-cattle (42.65%). The LSD prevalence was relatively higher in age-group > 6 months than other age groups. The average duration of illness varied among indigenous and cross-bred cattle. Indigenous cattle showed a longer average illness duration (6.79 days) compared to cross-breed cattle (5.5 days). The highest prevalence was observed in cattle aged up to 30 days (4.4%), with indigenous cattle accounting for 43% and cross-bred cattle for 57%.

**Conclusion:** The findings of this study provide valuable insights into the prevalence, mortality, and demographic distribution of LSD in cattle at Chuadanga Sadar Upazila. The results offer a foundation for developing targeted interventions to control and manage LSD, thereby safeguarding cattle production in the region. Specifically, to optimize LSD vaccination strategies, it is recommended to prioritize indigenous cattle and male cross-bred due to their elevated susceptibility. Furthermore, particular emphasis should be placed on cattle aged below one month, with a specific focus on prioritizing treatment for male cross-bred to effectively mitigate the risk of fatalities.

**Keywords:** LSD, mortality, age, breed, gender

## **Introduction**

The lumpy skin disease (LSD) is an economically important transboundary, and deadly disease of cattle caused by the lumpy skin disease virus (Family: Poxviridae and Genus: Capripoxvirus) (Tuppurainen *et al.*, 2017). LSDV is transmitted by blood-feeding insects and some ticks (mechanical transmission); fomites, for example, contaminated water, feed, and environment; and iatrogenic transmission by repeated use of the same needle or syringe on different animals (Coetzer and Tuppurainen, 2004; Gubbins, 2019; Rahman, 2020). It was first diagnosed in 1929 in Zambia, and then spread south to southern African countries and north to Sudan (Molini *et al.*, 2018). Lumpy skin disease was identified solely in Africa prior to 1989. However, later, the disease was transferred outside Africa to Madagascar and the Middle East and caused devastating economic losses to the livestock industry (Beard, 2006; Sevik and Dogan, 2017). Since 2012, LSD has been disseminating from the Middle East to Southeast Europe (Tuppurainen and Oura, 2012).

The LSD virus produces nodular lesion typically called the “lump” throughout the body including all visceral organs depending the severity. When the lump burst, the nodule opens up and the exposed flesh acts as open wound in the whole body allowing secondary bacterial and maggot infestation (Haque *et al.*, 2021; Parvin *et al.*, 2022). The morbidity in LSD affected cattle is up to 90%, and mortality is less than 10%. (Sprygin *et al.*, 2018).

LSD is an economically important disease of food animals. The LSD outbreak was reported in Bangladesh for the first time in the last quarter of 2019. It was identified by the laboratory of the Central Disease Investigation Laboratory (CDIL), Bangladesh, using real-time PCR on August 27, 2019 (WOA, 2019; European Food Safety Authority and Calistri *et al.*, 2020; Chouhan *et al.*, 2022). In 2019, the outbreaks infected several cattle populations all over the country, resembling a new threat to livestock health. In 2020, LSD outbreaks were reported in various parts of Bangladesh, where the disease was spreading rapidly among thousands of cattle, resulting in at least 50 deaths in the northern and north-eastern provinces of the country (Dhaka Tribune, 2020).

Fever, skin nodules, lacrimation, skin edema, nasal

discharge, and enlarged lymph nodes are some of the clinical symptoms of LSD-affected cattle. It drops the milk production too (Babiuk *et al.*, 2008; Abutarbush *et al.*, 2015). Almost every time of the year LSD encounter the cattle, however, it becomes more severe with moderate temperatures and humid climatic conditions, which is the peak breeding period for blood-feeding insects. The likelihood of the LSD depends on the virus's virulence and risk factors that affect the host's susceptibility, such as host immunity, age, and breed of cattle (Biswas *et al.*, 2020). Due to the prolonged weakness, stunted growth, decreased milk and meat production, increased treatment costs brought on by secondary infections, severe and permanent damage to the hides, severe emaciation of the affected cattle cause a significant economic loss (Chouhan *et al.*, 2022). Therefore, prevention of the LSD from future outbreak and control of the affected animals has become essential in the current situation. Chuadanga is a densely cattle populated area which share its border with India thus it is at risk of further outbreak of LSD. Therefore, this present study will help prevention and control of the future outbreak of LSD in Chuadanga.

## **Materials and methods**

### ***Ethical approval***

This study was conducted strictly maintaining the rules and regulations under the Animal Welfare and Experimentation Ethics Committee (AWEEC), Bangladesh Agricultural University. The ethical approval number for the present study is AWEEC/BAU/2023(60).

### ***Study area and duration***

The study was performed at Upazila Livestock Offices and Veterinary Hospitals, Chuadanga Sadar, Chuadanga, Bangladesh, from August 7, 2022, to October 6, 2022.

### ***Recording cases and data analysis***

A total of 634 cattle were observed during the study period. A well-prepared questionnaire was used for data collection. The investigator interviewed the owner of the patients face-to-face for a clinical history, clinically examined the patients, and recorded all the required data (breed, age, sex, body weight, and types of animals) for the study. The owner of the LSD-

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affected cattle was kept in touch for following-up and final outcome until recovery or death. The total number of death animals was counted for overall mortality percentage in the present study. After collecting all necessary information, the data were sorted, coded, and recorded in an Excel sheet (Microsoft Excel Version, 2013) and further analyzed.

**Results and Discussion**

***Prevalence of Lumpy Skin Disease (LSD)***

In this study, a total of 634 cattle was purposively selected for investigation. This population comprised 203 clinically suspected cattle (32.02%) and 431 apparently healthy cattle (67.98%). (Fig. 1). Among the clinically suspected cattle, 141 were confirmed to be infected with LSD, based on clinical history, clinical signs, and clinical examination. Consequently, the prevalence of LSD in the cattle population under study was determined to be 22.24% (Figure 1). The prevalence of LSD in cattle in the present study was 22.24%. This aligns closely with a similar prevalence of LSD (21%) observed in the Barishal District, Bangladesh (Khalil *et al.*, 2021). However, higher LSD prevalence of 63.33% and 52.38% were reported in Monirampur and Avoy nagor Upazila, Jashore, by Biswas *et al.*, (2020) respectively, surpassing the rates found in our study. Beyond Bangladesh, studies conducted in Saudi Arabia, Ethiopia, and Turkey reported LSD prevalence in the range of 6–12% in their respective cattle populations (Abera *et al.*, 2015a; Al-Salihi and Hasan 2015; Kasem *et al.*, 2018). The overall mortality observed in this study was 7.00%, primarily attributed to secondary bacterial infections in both calves and adults, as well as respiratory distress in calves (Parvin *et al.*, 2022; Khan *et al.*, 2022).

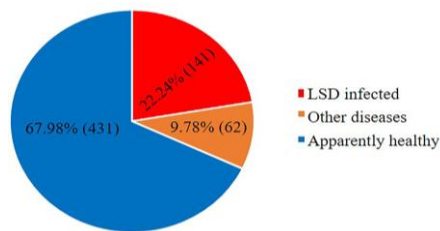


Figure 1. Prevalence of lumpy skin and other diseases in cattle at Chuadanga Sadar, Bangladesh.

***Prevalence of LSD according to gender***

Cattle vulnerability to LSD showed variations based on gender (Fig. 3). Among LSD-affected crossbreds, 57.35% (39) were male, while 42.65% (29) were female. Similarly, among LSD-affected indigenous breeds, the percentage of males was 56.16% (41), and females were 43.84% (32) (Fig. 3). This indicates that male crossbred cattle were more susceptible to LSD compared to their female counterparts and indigenous breeds (Fig. 2). Our findings indicate that male crossbred cattle exhibited a higher susceptibility to LSD compared to female crossbred cattle and indigenous breeds. This aligns with the results from other authors (Gari *et al.*, 2010; Abera *et al.*, 2015b; Khalil *et al.*, 2021). These studies have justified the observed higher disease susceptibility in male cattle by attributing it to repeated exposure to stress factors, such as fatigue from heavy work. The consistent agreement between our findings and previous research highlights the potential impact of gender and stress-related factors on LSD susceptibility in cattle populations.

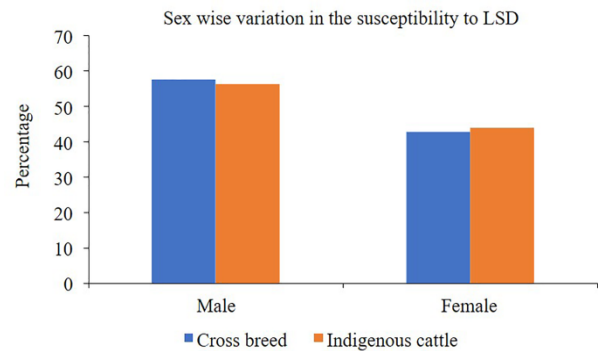


Figure 2. Prevalence of lumpy skin in relation to sex of cattle at Chuadanga Sadar, Bangladesh

***Prevalence of lumpy skin disease (LSD) in relation to breed***

The cattle population in the study area primarily consisted of cross-breeds and indigenous breeds (Fig. ). Among the clinically suspected cattle (141), cross-breeds accounted for 43.35% (88), while indigenous cattle constituted 56.65% (115) of this population. the percentage of cross-breeds was 48.23% (68), and indigenous cattle represented 51.77% (73) of the affected population (Fig. 3).

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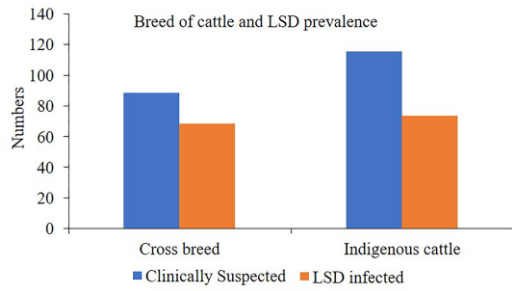


Figure 3. Prevalence of lumpy skin in relation to breed of cattle at Chuadanga Sadar, Bangladesh

Interestingly, the percentage of LSD-affected cattle was slightly higher among indigenous cattle compared to cross-breeds in the present study. In the current study, LSD-affected cattle exhibited a higher prevalence among indigenous cattle compared to crossbred. Notably, one study reported high susceptibility to LSD across all cattle breeds (Khan *et al.*, 2022). However, some authors have observed that crossbred cattle tend to be more susceptible to LSD infection than indigenous cattle (European Food Safety Authority and Calistri *et al.*, 2020; Kiplagat *et al.*, 2020; Chouhan *et al.*, 2022). The observed variation among breeds in our study could be attributed to factors such as geographical location, sampling variability, and differences in the study period. Furthermore, the farmers raising indigenous cattle in the area are predominantly illiterate and rely on health care services from the Upazila Livestock Offices and Veterinary Hospitals. In contrast, moderately literate farmers who raise crossbred cattle often prefer medical services on their own premises. These socio-economic factors may contribute to the observed differences in LSD susceptibility among indigenous and crossbred cattle in the study area.

**Prevalence of LSD according to age**

The clinically suspected cattle in our study were categorized into four age groups: group I (0–30 days), group II (31–90 days), group III (91–180 days), and group IV (more than 180 days) (Fig. 4). In cross-breed cattle, LSD infection occurred at 7.35% (male 7.69%; female 6.89%) in group I, 19.11% (male 23.07%; female 13.79%) in group II, 32.35% (male 30.77%; female 34.48%) in group III, and 41.17% (male 38.46%; female 44.83%) in group IV, respectively (Fig. 4).

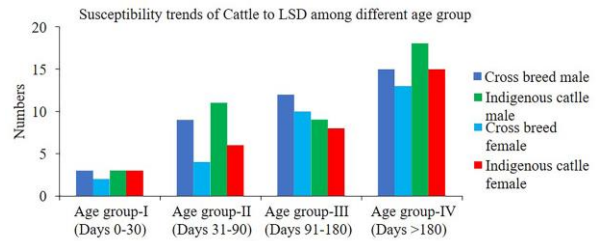


Figure 4. Prevalence of lumpy skin disease (LSD) in different age, breed and sex of cattle at Chuadanga Sadar, Bangladesh

Conversely, in indigenous cattle, LSD prevalence were reported as 8.21% (male 7.32%; female 9.38%) in group I, 23.28% (male 26.83%; female 18.75%) in group II, 23.28% (male 21.95%, female 25%) in group III, and 45.20% (male 43.90%; female 46.88%) in group IV, respectively (Fig. 4). Analyzing susceptibility trends across age groups revealed the highest frequency of LSD occurrence in age group IV (43.26%), followed by age group III (27.66%), age group II (21.28%), and age group I (7.80%) (Fig. 4). In our study, the highest prevalence of LSD was noted in age group IV (43.26%), followed by age group III (27.66%), age group II (21.28%), and age group I (7.80%). Haque and Gofur (2020) conducted a similar study in the Naogaon district of Bangladesh, revealing that the highest occurrence of LSD was in the age group of 5 years. They also observed a higher occurrence of LSD in calves (0 to 1 year), suggesting that both calves and older cattle are highly susceptible to LSD infection compared to other age groups. Similarly, Prank *et al* (2020) reported that calves at an early age of 4 to 6 months (33.9%) are more susceptible than adults and citing underdeveloped and premature body immunity and malnourished conditions as factors contributing to their heightened susceptibility to the LSD virus (Sarkar *et al.*, 2020). Ochwo *et al* (2019) reported the highest number of LSD infections in aged cattle above 25 months of age, attributing the variation to differences in study place, time, and other factors, which aligns with our findings (Sarkar *et al.*, 2020). The prevalence of LSD infection and the susceptible age group may be associated with the rate of cattle exposure to biting flies (*Stomoxys calcitrans* and *Biomyia fasciata*), mosquitoes (*Culex* and *Aedes*), and male ticks

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(*Rhipicephalus appendiculatus*) (Rweyemamu *et al.*, 2000; Troyo *et al.*, 2008; Alkhamis, 2016; Sarkar *et al.*, 2020).

**Duration of illness in lumpy skin disease (LSD) in relation to breed and gender**

In our study, LSD-infected cattle were classified into four groups based on the duration of illness: group I (Illness duration = 1-10 days), group II (Illness duration = 11-20 days), group III (Illness duration = 21-30 days), and group IV (Illness duration more than 30 days (Fig.5). The majority of LSD-affected cattle experienced an illness duration in the range of 1-10 days (group I) among all reported cases (Fig. 5). The morbidity, mortality, management cost, and associated economic loss due to LSD infection in cattle are directly influenced by the duration of illness (Chouhan *et al.*, 2022). The primary indicators for assessing the progression of illness duration include cutaneous skin lesions (lumps) and enlargement of regional lymph nodes. In our study, the duration of illness was measured from the onset of fever and visible skin lesions to the recovery from fever, excluding the total duration required for the healing of skin lesions due to the shorter study period compared to other studies and reports. Nevertheless, the trends in illness duration in our study align with the results reported by other authors (Salib and Osman, 2011; Gupta *et al.*, 2020). The multiplication of the LSD virus inside the lymph nodes after the primary viremia may contribute to lymph node enlargement, extending the overall illness period (Gupta *et al.*, 2020). Parvin *et al* (2022) reported a variation in illness duration ranging from 3 to 110 days, emphasizing that this variability is influenced by the consideration of illness duration defining periods, i.e., from the sampling day to the complete recovery of skin lesions.

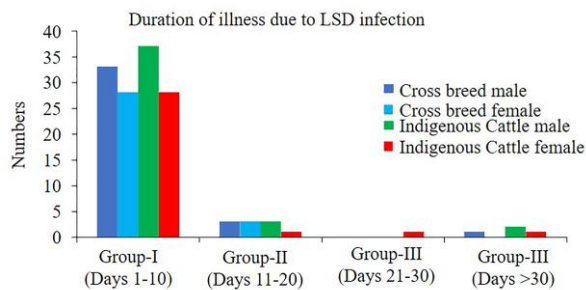


Figure 5. Duration of illness in LSD affected cattle in relation to breed and sex of cattle at Chuadanga Sadar,

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The average duration of illness for crossbreds was 5.19 days for males and 5.81 days for females. In contrast, the average duration of illness for indigenous cattle was 6.95 days for males and 6.62 days for females (Fig. 6).

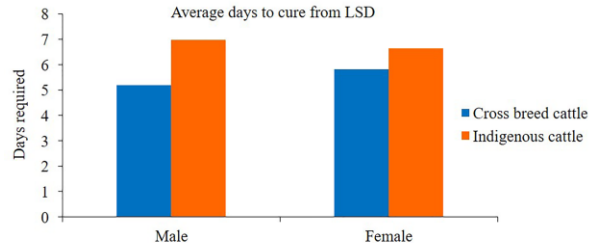


Figure 6. Average duration of illness in lumpy skin disease in relation to breed and sex of cattle at Chuadanga Sadar, Bangladesh

The average illness duration was prolonged in indigenous male cattle, followed by indigenous females, crossbred females, and crossbred males. This variation in illness duration is attributed to factors such as secondary bacterial infection, maggot infestation in the cutaneous skin lesions, and diverse management practices in some cases (Salib and Osman, 2011; Parvin *et al.*, 2022). Previous studies have reported that skin lesions generally persist for 3 to 110 days, with an average duration of 19.9 days. The overall illness duration, on average, lasts 2.9 weeks, ranging from 1 to 14 weeks. This variability is likely influenced by the host-specific immune response, the quality of care and management practices post-onset of skin lesions, and treatment response in some cases.

**Mortality due to LSD among different age group**

The overall mortality among LSD-affected cattle in various age groups was found to be 7.00%. The highest mortality was observed in age-group I (4.4%), comprising 43% indigenous cattle and 57% crossbred cattle, followed by age-group II (2.2%) with 48% indigenous cattle and 52% crossbred cattle, and age-group III (0.4%) with 49% indigenous cattle and 51% crossbred cattle (Fig. 7). No mortality was reported in age-group IV (Fig. 7).

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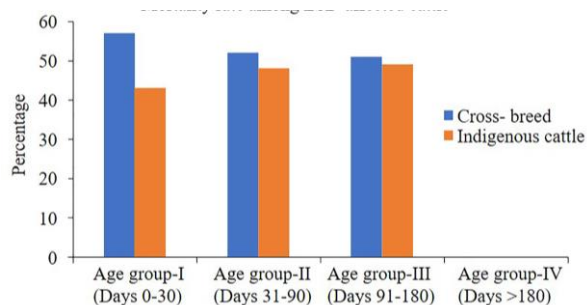


Figure 7. Mortality among different age group of lumpy skin disease (LSD)-affected cattle at Chuadanga Sadar, Bangladesh.

In our present study, the highest mortality of cattle due to LSD was observed in calves up to 30 days old (age-group I) of crossbred male cattle compared to indigenous cattle and other age groups of cattle. However, the mortality varied within a range of 0.5-12.5% among different age groups in previous study reports from Barishal, Gaibandha, Mymensingh, and Naogaon districts of Bangladesh (Khalil *et al.*, 2021; Parvin *et al.*, 2022; Chouhan *et al.*, 2022). Similar to the present study findings, Chouhan *et al.* (2022) reported that the mortality was highest (12.5%) in calves (Day 0- Day 30). Geographical variation and differences in the total number of populations at risk during the study period may account for the percentage variation in the mortality rate observed in our study results (Haque *et al.*, 2021). Additionally, the mortality rate is influenced by factors such as breed, host susceptibility and immune response, herd immunity, and repeated exposure to insects (especially biting flies) for virus transmission (Biswas *et al.*, 2020).

### Conclusion

Lumpy skin disease (LSD) has emerged as a disease of paramount significance among all infectious diseases of cattle in Bangladesh. Male crossbred cattle are particularly susceptible to LSD infection in the study area. Calves aged up to one month were found having highest mortality rate to LSD infection. The highest mortality was observed in the age group of up to one month. The overall management practices in the study area were observed to be very poor.

### Acknowledgments

We would like to acknowledge Upazila Livestock Officer (ULO), Veterinary Surgeon (VS), and

Veterinary Field staff (VFA) of Chuadanga Sadar Upazila, Chuadanga, Bangladesh.

### Funding

The study was conducted by the financial assistance of DR. Nazmul Hasan Siddiqi.

### Conflict of interest

The authors declare no conflict of interest.

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