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Original Research

Prevalence and risk factors of Lumpy skin disease in cattle at Chuadanga Sadar Upazila Veterinary Hospital, Bangladesh

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Abstract

Lumpy skin disease (LSD) is an emerging transboundary viral infection that causes significant economic losses in cattle populations across Asia. In Bangladesh, outbreaks of LSD have increased in frequency, yet localized epidemiological data remain limited. This study aimed to determine the prevalence of LSD and assess associated risk factors in cattle presented to the Upazila Veterinary Hospital in Chuadanga, Bangladesh. From December 2023 to May 2024, a total of 690 cattle were clinically examined for LSD using visual inspection, palpation, history, and systemic signs. Data were collected through structured interviews and analyzed using Microsoft Excel to evaluate prevalence by month, age, sex, breed, and lesion distribution. Of the 690 examined cattle, 94 (13.62%) exhibited clinical signs consistent with LSD. The highest prevalence was recorded in May (36.30%), with a seasonal peak during the summer months. Cattle aged 1.5–3 years showed the highest prevalence (17.14%), followed by those over 3 years (14.45%). Males were more frequently affected (17.74%) than females (10.26%). Crossbred cattle (15.22%) had a higher prevalence compared to indigenous breeds (11.65%). Lesions were most commonly distributed across the entire body surface (36.17%). The findings indicate that LSD prevalence in Chuadanga is influenced by age, sex, breed, and seasonality, with peak occurrence in summer. Although the diagnosis was based solely on clinical criteria due to the lack of laboratory confirmation, this study provides essential baseline data for future surveillance and control strategies in Bangladesh.

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1. Introduction

Lumpy skin disease (LSD) is an economically significant infectious viral disease affecting cattle. It is highly contagious, causing substantial economic losses and posing a considerable threat to livestock industries worldwide (Moudgil *et al.*, 2024). The first documented outbreak of LSD occurred in Bangladesh in 2019 (Pal *et al.*, 2024). The causative agent, lumpy skin disease virus (LSDV), belongs to the Capripoxvirus genus within the Poxviridae family. LSD is a significant transboundary infection that primarily impacts cattle and water buffaloes, as well as experimentally infected sheep and goats (Kumar *et al.*, 2021). The virus is predominantly spread mechanically through the bites of arthropods such as mosquitoes, flies, and ticks, which also serve as reservoirs for the virus. Attack rates of LSD can vary significantly, ranging from 10-15% to nearly 100% in different epidemics. These variations are attributed to differences in the active vector species present in various environmental conditions. In purebred Friesian cattle, the disease manifests severely, with a morbidity rate of 37.9% and a mortality rate of 4.2%. In contrast, it appears milder in indigenous cattle (Akther *et al.*, 2023; Khan *et al.*, 2021; Babiuk *et al.*, 2008).

LSD presents symptoms including fever (peaking at 106 °F) and nodules on the skin and mucous membranes of the respiratory and digestive tracts. These painful nodules can cause difficulties in movement and, in severe cases, respiratory distress, particularly in young animals (Pal *et al.*, 2024; Ayelet *et al.*, 2014). Typical LSD lesions are circular, irregularly shaped, and measure approximately 5-50 mm in diameter, characterized by distinct regions of upright hair growth over firm, slightly raised skin areas (Namazi and Tafti, 2021). LSD-infected bulls may experience temporary or permanent infertility and may carry the virus for extended periods, complicating disease control efforts (Akther *et al.*, 2023).

Bangladesh is an agriculture-based country, with a significant portion of its population living in rural areas where agriculture and livestock rearing are central to daily life, livelihoods, and overall socio-economic development (Sobur *et al.*, 2025). The livestock industry, a vital component of the agricultural sector, contributes about 20% of national employment (Arefin *et al.*, 2024). Bangladesh has a substantial livestock population, including approximately 23.64 million cattle, 16.96 million goats, and 261.77 million poultry. These animals produce around 5.68 million metric tons of meat annually, which is still below the estimated national demand of 6.95 million metric tons (Sobur *et al.*, 2024). This sector also significantly contributes to the country's agricultural development, accounting for approximately 12% of Agricultural GDP (Islam *et al.*, 2025).

Extensive LSD outbreaks are typically driven by increasing numbers of native cattle, a high prevalence of active blood-feeding vectors, and unrestricted animal movements. Morbidity in LSD-affected cattle can reach up to 90%, while mortality remains below 10% (Sprygin *et al.*, 2018). The average economic loss per case was

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9384.41 BDT (110.40 US $) (Chouhan *et al.*, 2022). LSD has detrimental effects on both livestock and farmers' economies. To address this pressing issue, it is crucial to prevent future outbreaks of LSD and manage affected animals. Chuadanga, bordered by India and home to a large cattle population, is particularly vulnerable to future LSD outbreaks. This study aims to prevent and control future outbreaks of LSD in Chuadanga, with the objective of determining the prevalence of LSD in the Chuadanga district of Bangladesh.

2. Materials and Methods

2.1 Ethical approval statement

Not applicable.

2.2 Study area

The study was conducted at the Upazila Livestock Offices and Veterinary Hospitals in Chuadanga Sadar, Chuadanga, Bangladesh (Figure 1). Before the partition, Chuadanga was one of the five divisions of the Nadia district. Data were collected from December 2023 to May 2024.

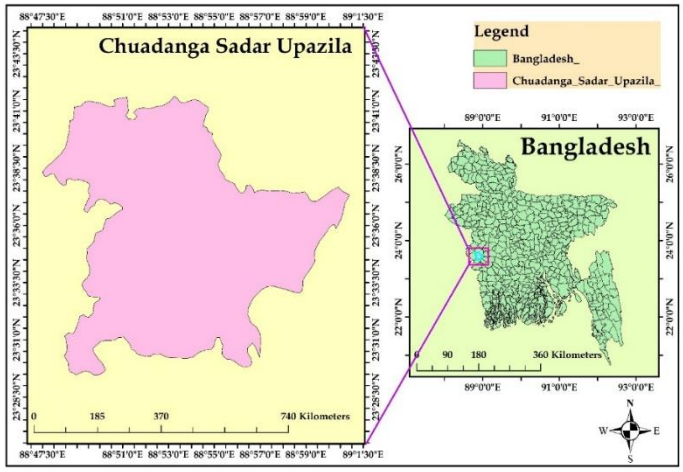

Figure 1. Map of the study area.

2.3 Study population

A total of 690 clinical cases of cattle were examined at the Upazila Veterinary Hospital in Chuadanga during this reporting period, with animals suffering from various diseases. Among these cases, 94 were infected with LSD. Infected animals were assessed through observation of clinical signs and symptoms, palpation of nodules, and evaluation of general body condition. All information regarding the affected animals was recorded using a previously developed questionnaire and conducted through in-depth interviews (Sarkar *et al.*, 2020). A well-structured questionnaire facilitated data collection. The investigator conducted face-to-face interviews with the owners, clinically examined the animals, and recorded essential data for the study, including breed, age, gender, body weight, and type of animal.

2.4 Inclusion and exclusion criteria

Cattle presented to the Upazila Veterinary Hospital in Chuadanga from December 2023 to May 2024 were considered for inclusion in this study. A total of 690 clinical cases were screened, of which 94 animals exhibited signs suggestive of LSD.

Inclusion criteria encompassed cattle of any age, sex, or breed that displayed clinical manifestations consistent with LSD. Diagnostic considerations were based on the presence of characteristic cutaneous nodules identified through meticulous palpation and close visual inspection, elevated body temperature (≥41 °C), enlarged superficial lymph nodes, and systemic signs such as anorexia, depression, emaciation, and reduced milk yield in lactating cows. Additional indicative features included excessive salivation, ocular and nasal discharge, edema of the ventral body regions (e.g., brisket, dewlap, scrotum, and vulva), mucosal erosions, and lameness. Pregnant cows that exhibited abortion and animals with complications such as pneumonia, mastitis, or necrotic dermal lesions were also included.

Exclusion criteria included animals with non-specific or ambiguous clinical signs, those with pre-existing conditions that could confound the diagnosis (e.g., dermatophilosis, photosensitization, or allergic dermatitis), and cases lacking sufficient clinical data. Additionally, animals whose owners did not consent to participation in the study or did not provide complete epidemiological information were excluded.

This clinical screening was conducted by experienced veterinarians following proper animal restraint and examination protocols. A structured questionnaire was utilized to document individual animal characteristics and clinical history, ensuring consistency and reliability in data collection.

2.5 Statistical analysis

The prevalence of LSD was calculated based on the infection rates among cattle. To compare the prevalence of the infection across different sexes, ages, and months, the data were analyzed using Microsoft Excel. After collecting data from individual farms, it was converted into percentages. The processed data were then input into Excel (MS Excel 2013; Microsoft Office Professionals, 2013) for analysis. Prevalence is a statistical concept that refers to the number of cases of a disease present in a specific population at a given time, as determined by the following equation,

$$\text{Prevalence} = \frac{\text{Total no of animals suffered at a given period of time}}{\text{Number of animal suffered due to disease of your interest at same period of time}} \times 100$$

3. Results

3.1 Overall prevalence of lumpy skin disease

Out of 690 cattle examined at the Upazila Veterinary Hospital in Chuadanga, 94 animals were diagnosed with clinical signs indicative of LSD, resulting in an overall prevalence of 13.62% (Figure 2).

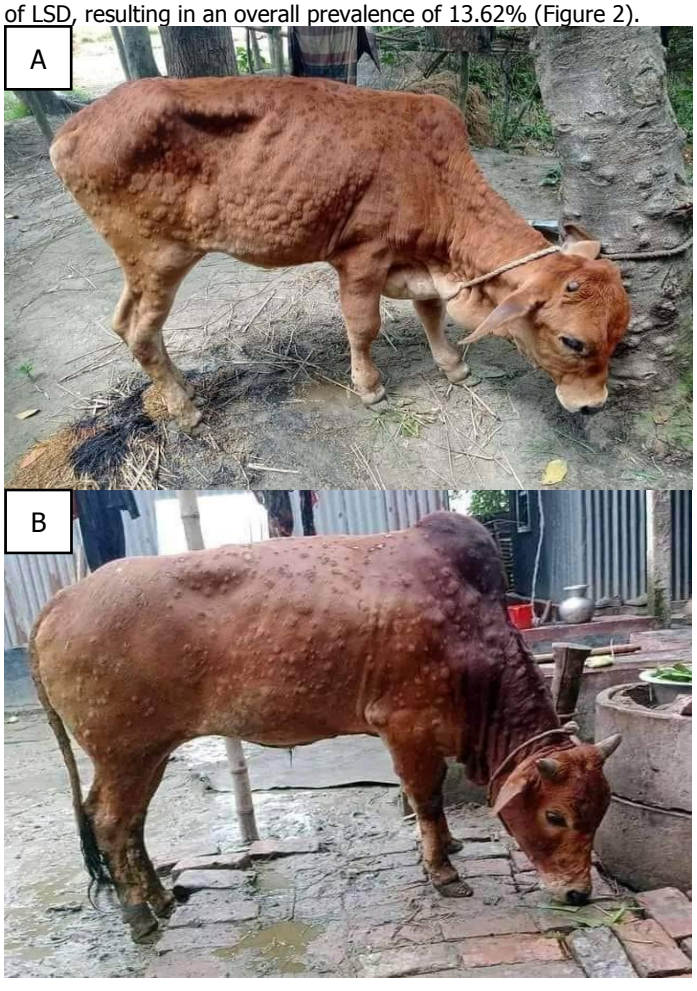

Figure 2. Lumpy skin disease affected cattle.

3.2 Monthly distribution of LSD cases

A progressive increase in LSD cases was observed from January to May 2024, peaking in May at a prevalence of 36.30% (Table 1). The disease showed a sharp increase beginning in March, with peak incidence occurring in April and May. This seasonal pattern indicates a strong correlation between LSD outbreaks and warmer weather, likely due to increased vector activity.

Table 1. Monthly prevalence of LSD.

Month	Total examined	Infected	Prevalence (%)	95% CI
December	98	0	0.00	0.00–3.73
January	109	2	1.83	0.50–6.42
February	113	4	3.54	1.39–8.77
March	120	6	5.00	2.29–10.50
April	115	33	28.70	21.26–37.46
May	135	49	36.30	28.59–44.80
Total	690	94	13.62	11.20–16.49

3.3 Age-wise prevalence

LSD occurrence varied by age group. The highest prevalence was observed in cattle aged 1.5 to 3 years (17.14%), followed by those older than 3 years (14.45%). Calves (0–6 months) and young stock (6 months–1.5 years) exhibited lower prevalence rates (Table 2).

Table 2. Age wise prevalence of LSD.

Age group	Infected (n)	Examined (n)	Prevalence (%)	95% CI
0–6 months	37	275	13.45	9.89–17.99
6 month–1.5 years	21	192	10.94	7.27–16.13
1.5–3 years	24	140	17.14	11.78–24.23
>3 years	12	83	14.45	8.51–23.46

3.4 Sex wise prevalence of LSD

The study found that male cattle were more significantly affected by LSD than female cattle. The percentage of diseased female cattle was lower than that of LSD-infected male cattle, which had a higher prevalence. Overall, LSD prevalence was considerably greater in male cattle compared to females, indicating a significant association between cattle sex and LSD prevalence. Additionally, age also influences LSD susceptibility. According to Table 3, males are 7.48% more prone to LSD than females, with prevalence rates of 17.74% (n = 55) for males and 10.26% (n = 39) for females.

Table 3. Sex wise prevalence of LSD.

Sex	Infected	Total Examined	Prevalence (%)	95% CI
Male	55	310	17.74	13.78–22.52
Female	39	380	10.26	7.57–13.78

3.5 Breed wise prevalence of LSD

In the present study, the prevalence rate of LSD was higher in cross-breed cattle than in Indigenous cattle; however, there was no significant relationship between breed and the occurrence of LSD. LSD prevalence varies by breed (Table 4). Cross-breed animals (n = 58) showed a 15.22% prevalence, while Indigenous breeds (n = 36) had an 11.65% prevalence.

Table 4. Breed wise prevalence of LSD.

Breed	Infected	Examined	Prevalence (%)	95% CI
Crossbred	58	381	15.22	11.89–19.28
Indigenous	36	309	11.65	8.50–15.74

In this examination, small nodules (15-45 mm) appeared on the body surfaces of the probable LSD cattle (36.17%), primarily on the shoulders and abdomen (Table 5). These nodules are elevated and affect both the epidermis and dermis of the skin. Epidermal microvesicles expanded into large vesicles that ruptured rapidly, exposing an ulcerated area infected with pathogens. This led to complications such as bacterial pneumonia, secondary bacterial infections, tracheal stenosis, and mastitis.

Table 5. Occurrence of LSD based on skin lesions.

Lesion Site	Infected (n)	Percentage (%)	95% CI
Whole body	34	36.17	27.16–46.13
Shoulder region	23	24.47	16.94–34.10
Abdominal region	19	20.21	13.23–29.50
Thoracic region	10	10.64	5.59–18.99
Caudal region	8	8.51	4.35–16.10

4. Discussion

The LSD has emerged as a significant transboundary viral disease affecting cattle in Asia, particularly in countries like Bangladesh, where climate, animal husbandry practices, and vector abundance create ideal conditions for transmission. The current study, conducted at the Upazila Veterinary Hospital in Chuadanga, revealed a clinically diagnosed prevalence of 13.62% over a six-month period, consistent with previously reported outbreaks in Bangladesh and elsewhere (Khalil *et al.*, 2021; Hasib *et al.*, 2021; Kayesh *et al.*, 2020). In Dinjpur the overall prevalence of LSD was reported 41.06% in cattle (Sarkar *et al.*, 2020).

A key finding of our investigation was the seasonal trend in LSD occurrence, with peak prevalence observed in April (28.70%) and May (36.30%). This coincides with the pre-monsoon and early monsoon periods in Bangladesh, when vector populations—particularly mosquitoes and biting flies—proliferate due to warm, humid conditions. Similar findings were reported in Jhenaidah by Pal *et al.* (2024), where over 61% of LSD cases occurred in areas with high mosquito and fly prevalence. These observations support the hypothesis that arthropod vectors, such as *Stomoxys* spp. and *Culicoides* spp., are major contributors to LSDV transmission in endemic regions (Sarkar *et al.*, 2020; Tuppurainen *et al.*, 2013). The overall animal level and herd level apparent seroprevalences were 25.4% reported in Ethiopia (Molla *et al.*, 2018).

Another notable finding was the influence of age, sex, and breed on disease occurrence. Our study found that cattle aged 1.5 to 3 years were most affected (17.14%), followed by those over 3 years (14.45%). This slightly differs from Pal *et al.* (2024), who reported the highest prevalence among animals aged 24 months or younger (55.2%). However, both studies underscore the increased vulnerability of young to middle-aged animals, possibly due to stress, incomplete immune development, and outdoor grazing behavior. The slightly higher prevalence in older animals in Chuadanga may reflect cumulative exposure over time or differences in management systems.

In terms of sex-based susceptibility, our results revealed that male cattle (17.74%) were more frequently affected than females (10.26%), a pattern that contrasts with Pal *et al.* (2024), who

reported 70.5% of cases in females. This divergence may be attributed to regional husbandry practices, in Chuadanga, male cattle are often used for labor, increasing their exposure to outdoor vector habitats, while females may be more sheltered due to their role in milk production. This highlights the importance of contextualizing epidemiological data within local farming systems when designing control strategies. In Natore a study in 2020 found that, Female animals that were a larger prone to LSD infection (43.1%) than animals of other ages (Haque *et al.*, 2020). There were no significant differences in LSD prevalence among the cattle with regard to age and sex according to a research in 2017 (Elhaig *et al.*, 2017).

Breed-wise, crossbred cattle were significantly more affected (15.22%) than indigenous ones (11.65%), supporting findings from both our study and previous research (Abera *et al.*, 2015; Gari *et al.*, 2010). The higher susceptibility of crossbreeds, such as Holstein Friesians, is likely due to thinner skin, lower natural immunity, and potentially more intensive rearing practices, which may include close confinement and inadequate biosecurity. Conversely, indigenous breeds may exhibit greater resistance due to evolutionary adaptation to local environments (Mulatu and Feyisa, 2018).

Our study also characterized lesion distribution, with 36.17% of affected animals showing nodules across the entire body. This finding aligns with descriptions in prior studies where widespread cutaneous lesions, lymph node enlargement, and systemic signs are typical of moderate-to-severe LSD infections (Namazi and Tafti, 2021; Zeynalova *et al.*, 2016; Tuppurainen *et al.*, 2013). Lesions serve not only as clinical markers but also have economic significance due to damage to hides, contributing to direct financial losses.

These epidemiological patterns echo findings from Pal et al. (2024), who also emphasized environmental and biosecurity factors as crucial determinants of LSD outbreaks. Farms lacking proper drainage, surrounded by bushy areas, or located near water sources were disproportionately affected. This reinforces the need for vector control, environmental hygiene, and biosecurity education among farmers (Chihota *et al.*, 2001). Notably, only 5.2% of affected farms in the Pal et al. study used regular mosquito repellents, suggesting a missed preventive opportunity—likely reflected in the Chuadanga context.

While both studies collected data from veterinary hospitals, a critical limitation of our study is the lack of laboratory confirmation (e.g., PCR, virus isolation, or serology), which restricts diagnostic specificity. Clinical signs alone, while highly suggestive in outbreak settings, can resemble other dermal conditions such as dermatophilosis or photosensitization (Salib and Osman, 2011). Additionally, the hospital-based nature of the study may not fully reflect LSD prevalence at the community level, particularly in remote areas where owners do not seek veterinary care. This introduces selection bias, potentially leading to an underestimation of mild or subclinical cases. Furthermore, socioeconomic and behavioral data from farmers—such as knowledge of LSD, vaccination practices, and insecticide use—were not systematically collected, which would have enriched the analysis of risk factors.

Despite these limitations, the study contributes to the growing body of evidence highlighting the epidemiological complexity of LSD in Bangladesh. The consistency of patterns—particularly regarding seasonal trends, vector associations, and crossbreed susceptibility—across geographically separate studies (Chuadanga vs. Jhenaidah) strengthens the reliability of the conclusions and emphasizes the urgent need for integrated control strategies, including mass vaccination, community engagement, vector management, and targeted surveillance in high-risk zones.

5. Conclusions

This study provides valuable epidemiological evidence regarding the prevalence and associated risk factors of LSD among cattle in Chuadanga, Bangladesh. It highlights an overall prevalence of 13.62% and identifies age, sex, breed, and seasonal influences as significant determinants. The observed peak during the summer months emphasizes the importance of vector dynamics and environmental conditions in the transmission of LSD. Although reliance on clinical diagnosis without laboratory confirmation is a limitation, the findings are consistent with classical disease presentations and offer practical guidance for field surveillance. These results highlight the urgent need to enhance diagnostic infrastructure, implement targeted vector control, and strengthen vaccination strategies. Future research that integrates molecular tools and comprehensive herd-level analyses is essential for informing effective and sustainable control measures for LSD in Bangladesh.

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Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Informed consent statement

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

Authors' contribution

Nahida Akter: conceptualization, methodology, investigation, and writing-original draft; **Sushmita Ghosh Soma:** data curation and formal analysis; **Sufol Biswas:** field data collection and resources; **Sukanto Kundu:** software and data validation; **Md. Rabby Kul Islam Roni:** data collection, literature review, and statistical analysis; Md. Abu-Hena Mostafa: writing and editing the final manuscript and review. All authors critically reviewed the manuscript and agreed to submit final version of the manuscript.

References

Abera Z, Degefu H, Gari G and Ayana Z, 2015. Review on epidemiology and economic importance of lumpy skin disease. International Journal of Basic and Applied Virology, 4: 8–21. https://doi.org/10.5829/idosi.ijbav.2015.4.1.9117

Akther M, Akter SH, Sarker S, Aleri JW, Annandale H, Abraham S and Uddin JM, 2023. Global burden of lumpy skin disease, outbreaks, and future challenges. Viruses, 15(9): 1861. https://doi.org/10.3390/v15091861

Arefin KSI, Chowdhury D, Islam FB, Devnath B and Sobur KA, 2024. Poultry farm waste management practices: Environmental challenges, health concerns, and farmers' perspectives in Chattogram, Bangladesh. Journal of Bioscience and Environment Research, 1(2): 32-38. https://doi.org/10.69517/jber.2024.01.02.0006

Ayelet G, R Haftu, S Jemberie, A Belay, E Gelaye, B Sibhat, E Skjerve and K Asmare, 2014. Lumpy skin disease in cattle in central Ethiopia: outbreak investigation and isolation and molecular detection of the virus. Revue Scientifique et Techniquea, 33(3): 877-887. https://doi.org/10.20506/rst.33.3.2325

Babiuk S, Bowden T, Boyle D, Wallace DB and Kitching R, 2008. Capripoxviruses: An emerging worldwide threat to sheep, goats and cattle. Transboundary and Emerging Diseases, 55: 263–272. https://doi.org/10.1111/j.1865-1682.2008.01043.x

Chihota CM, Rennie LF, Kitching RP and Mellor PS, 2001. Mechanical transmission of lumpy skin disease virus by *Aedes aegypti*

(Diptera: Culicidae). Epidemiology and Infection, 126(2): 317–321. https://doi.org/10.1017/S0950268801005179

Chouhan CS, Parvin MS, Ali MY, Sadekuzzaman M, Chowdhury MGA, Ehsan MA and Islam MT, 2022. Epidemiology and economic impact of lumpy skin disease of cattle in Mymensingh and Gaibandha districts of Bangladesh. Transboundary and Emerging Diseases, 69(6): 3405–3418. https://doi.org/10.1111/tbed.14697

Elhaig MM, Selim A and Mahmoud M, 2017. Lumpy skin disease in cattle: Frequency of occurrence in a dairy farm and a preliminary assessment of its possible impact on Egyptian buffaloes. Onderstepoort Journal of Veterinary Research, 84: 1-6. https://hdl.handle.net/10520/EJC-72671f238

Gari G, Waret-Szkuta A, Grosbois V, Jacquiet P and Roger F, 2010. Risk factors associated with observed clinical lumpy skin disease in Ethiopia. Epidemiology and Infection, 138(11): 1657–1666. https://doi.org/10.1017/S0950268810000506

Haque MN and Gofur MR, 2020. Investigation of lumpy skin disease outbreak in cattle in Naogaon, Bangladesh. Bangladesh Journal of Agriculture and Life Science, 1: 89-93.

Hasib FMY, Islam MS, Das T, Rana EA, Uddin MH, Bayzid M and Alim MA, 2021. Lumpy skin disease outbreak in cattle population of Chattogram, Bangladesh. Veterinary Medicine and Science, 7(5): 1616-1624. https://doi.org/10.1002/vms3.524

Islam MN, Biswas TK, Mostafa MS, Jabir AA, Sobur KA, Bhuiyan MER, Islam MS and Pranto RA, 2025. Evaluating farmer practices and perspectives in rearing Red Chittagong cattle in Chittagong, Bangladesh. International Journal of Veterinary Medicine and Animal Science, 2: 12–18. https://doi.org/10.54536/ijvmas.v2i1.4103

Kayesh MEH, Hussan MT, Hashem MA, Eliyas M and Anower AKMM, 2020. Lumpy skin disease virus infection: An emerging threat to cattle health in Bangladesh. Hosts and Viruses, 7(4): 97-108. http://dx.doi.org/10.17582/journal.hv/2020/7.4.97.108

Khalil MI, Sarker MFR, Hasib FMY and Chowdhury S, 2021. Outbreak investigation of lumpy skin disease in dairy farms at Barishal, Bangladesh. Turkish Journal of Agriculture - Food Science and Technology, 9: 205–209. https://doi.org/10.24925/turjaf.v9i1.205-209.3827

Khan YR, Ali A, Hussain K, Ijaz M, Rabbani AH, Khan RL and Sajid HA, 2021. A review: Surveillance of lumpy skin disease (LSD) a growing problem in Asia. Microbial pathogenesis, 158: 105050. https://doi.org/10.1016/j.micpath.2021.105050

Kumar N, Chander Y, Kumar R, Khandelwal N, Riyesh T, Chaudhary K and Tripathi BN, 2021. Isolation and characterization of lumpy skin disease virus from cattle in India. PLoS One, 16: e0241022. https://doi.org/10.1371/journal.pone.0241022

Molla W, Frankena K, Gari G, Kidane M, Shegu D and De Jong MCM, 2018. Seroprevalence and risk factors of lumpy skin disease in Ethiopia. Preventive Veterinary Medicine, 160: 99–104. https://doi.org/10.1016/j.prevetmed.2018.09.029

Moudgil G, Chadha J, Khullar L, Chhibber S and Harjai K, 2024. Lumpy skin disease: Insights into current status and geographical expansion of a transboundary viral disease. Microbial Pathogenesis, 186: 106485. https://doi.org/10.1016/j.micpath.2023.106485

Mulatu E and Feyisa A, 2018. Review: Lumpy skin disease. Journal of Veterinary Science Technology, 9(535): 1-8. https://doi.org/10.4172/2157-7579.1000535

Namazi F and Tafti AK, 2021. Lumpy skin disease, an emerging transboundary viral disease: A review. Veterinary Medicine and Science, 7(3): 888-896. https://doi.org/10.1002/vms3.434

Pal SK, Sobur KA, Bose P, Rahman MZ, Hossen MM and Mowdood S, 2024. Epidemiological investigation of lumpy skin disease in Jhenaidah district of Bangladesh. Journal of Bioscience and Environment Research, 1: 3-7. https://doi.org/10.69517/jber.2024.01.01.0002

Salib FA and Osman AH, 2011. Incidence of lumpy skin disease among Egyptian cattle in Giza Governorate, Egypt. Veterinary world, 4(4): 162-167.

Sarkar S, Meher MM, Parvez MMM and Akther M, 2020. Occurrences of lumpy skin disease (LSD) in cattle in Dinajpur Sadar of Bangladesh. Research in Agriculture, Livestock and Fisheries, 7(3): 445–455. https://doi.org/10.3329/ralf.v7i3.51364

Sobur KA, Bose P, Rahman MZ, Hossen MM, Mowdood S and Nobi MA, 2024. Diseases and diseases conditions of treated animals at Upazila Veterinary Hospital, Kaliganj, Jhenaidah, Bangladesh. Journal of Bioscience and Environment Research, 1: 16-20. https://doi.org/10.69517/jber.2024.01.01.0004

Sobur KA, Pal SK, Rahim MA and Bose P, 2025. Exploring the management practices of black Bengal goat husbandry in Jhenaidah district of Bangladesh. Veterinary Sciences: Research and Reviews, 11: 08-13. https://dx.doi.org/10.17582/journal.vsrr/2025/11.1.8.13

Sprygin A, Artyuchova E, Babin Y, Prutnikov P, Kostrova E, Byadovskaya O and Kononov A, 2018. Epidemiological characterization of lumpy skin disease outbreaks in Russia in 2016. Transboundary and Emerging Diseases, 65(6): 1514–1521. https://doi.org/10.1111/tbed.12889

Tuppurainen ES, Lubinga JC, Stoltsz WH, Troskie M, Carpenter ST, Coetzer JA and Oura CA, 2013. Evidence of vertical transmission of lumpy skin disease virus in Rhipicephalus decoloratus ticks. Ticks and tick-borne diseases, 4(4): 329-333. https://doi.org/10.1016/j.ttbdis.2013.01.006

Zeynalova S, Asadov K, Guliyev F, Vatani M and Aliyev V, 2016. Epizootology and molecular diagnosis of lumpy skin disease among livestock in Azerbaijan. Frontiers in Microbiology, 7: 1022. https://doi.org/10.3389/fmicb.2016.01022

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