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Review Article

First Epidemiological Report of Lumpy Skin Disease from Jammu & Kashmir, India: A Notifiable Disease

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Abstract: Lumpy Skin Disease (LSD) is a viral disease caused by lumpy skin disease virus (LSDV), a member of Capripoxvirus genus of Poxviridae family. It is a transboundary disease of the economic importance affecting cows, water buffaloes and deer. The disease is transmitted by arthropod vectors and causes high morbidity and low mortality. LSD was known to be once endemic in Saharan regions of Africa. However, over the past decade, it spread to the Middle East and Turkey. From 2015 onward, it has impacted the Balkan (southeast Europe) countries, Caucus (Eastern Europe) and Russia. LSD entered India, Bangladesh and China in July 2019. Since then, outbreaks of the disease have been reported from many Indian states and UTs namely Assam, Andhra Pradesh, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Manipur, Odisha, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal and Jammu & Kashmir. Characteristic lumps on skin and high fever are considered as major signs while reduced milk production, infertility, early embryonic death and anorexia are some of the salient clinical manifestations of the disease. Additionally, nodules on mucosa of oropharynx, udder, genitalia and rectum are usually observed on examination.

Keywords: Lumpy Skin Disease, Morbidity, Mortality, Infertility, Anorexia, Vector, Capripoxvirus.

INTRODUCTION

Lumpy Skin Disease is caused by the Lumpy Skin Disease Virus (LSDV), which belongs to the genus capripoxvirus, a part of the poxviridae family (small pox and monkey pox viruses are also a part of the same family). The LSDV shares antigenic similarities with the sheep pox virus (SPPV) and the goat pox virus (GTPV) or is similar in the immune response to those viruses. It is not a zoonotic virus, meaning the disease cannot spread to humans. It is a contagious vector borne disease spread by vectors like mosquitoes, some biting flies and ticks and usually affects host animals like cows and water buffaloes [1, 2].

According to the United Nations Food and Agriculture Organisation (FAO), infected animals shed the virus through oral and nasal secretions which may contaminate common feeding and water troughs. Thus, the disease can either spread through direct contact with the vectors or through contaminated fodder and water. Studies have also shown that it can spread through animal semen during artificial insemination [1-5].

LSD affects the lymph nodes of the infected animal, causing the nodes to enlarge and appear like lumps on the skin, which is where it derives its name from. The cutaneous nodules, 2-5 cm in diameter, appear on the infected cattle's head, neck, limbs, udder, genitalia and perineum. The nodules may later turn into ulcers and eventually develop scabs over the skin. The other symptoms include high fever, sharp drop in milk yield, discharge from the eyes and nose, salivation, loss of appetite, depression, damaged hides, emaciation (thinness or weakness) of animals, infertility and abortions. The incubation period or the time between infection and symptoms is about 28 days according to the FAO and 4 to 14 days according to some other estimates [1, 3].

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The morbidity of the disease varies between two to 45% and mortality or rate of death is less than 10%, however, the reported mortality of the current outbreak in India is upto 155, particularly in cases being reported in the western part of the country [2, 7]. Virus had caused necrotic vasculitis or death of living tissues in local areas and fibrosis in various organs of infected cattle. Such a situation leads to failure of various organs, and eventually death.

Meanwhile, providing relief to the livestock of the country, the indigenous vaccine Lumpi-ProVac, a live attenuated vaccine to protect livestock from Lumpy skin disease has been developed by the National Equine Research Center, Hisar (Haryana) in collaboration with the Indian Veterinary Research Institute, Izzatnagar (Bareilly).

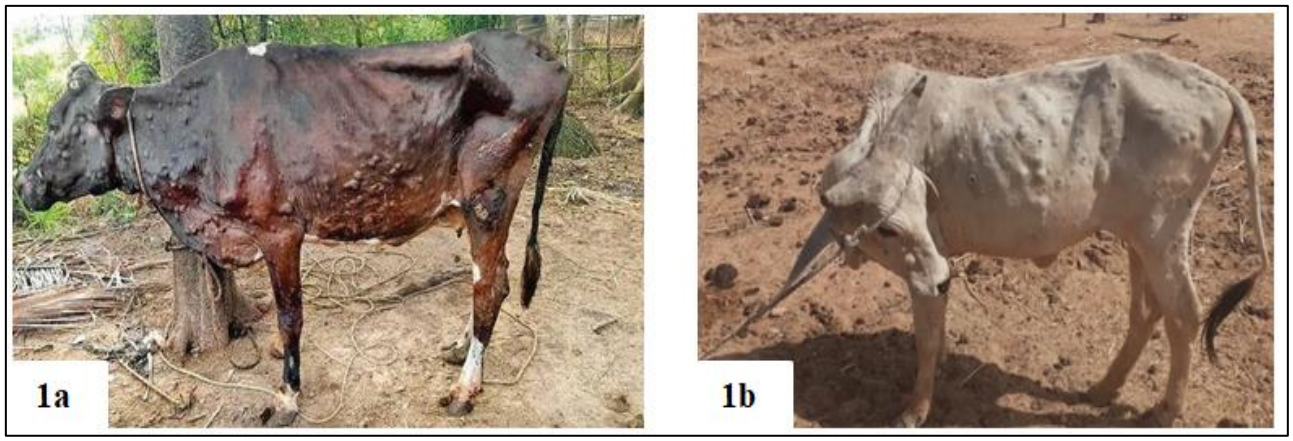

Fig 1 (a-b): Cows with Lumpy Skin Disease

MILK OF AFFECTED CATTLE

Studies say that it has not been possible to ascertain the presence of viable and infectious LSDV virus in milk derived from the infected animal. FAO notes, however, that a large portion of the milk in Asia is processes after collection and is either pasteurised or boiled or dried in order to make milk powder. This process ensures that the virus is inactivated or destroyed. Moreover, it is safe to consume the milk from cattle infected by Lumpy Skin Disease, as it is a non-zoonotic disease. It is safe to consume milk from infected cattle. There is no problem in the quality of milk even if person take it after boiling or without boiling [6].

EVOLUTION OF LUMPY SKIN DISEASE VIRUS

Lumpy Skin Disease (LSD) is a viral disease that predominantly affects cattle. First identified in an outbreak in Zambia in 1929, the disease is caused by the LSD virus (LSDV), a poxvirus of the genus capripoxvirus. Until the 1980s. multiple outbreaks of LSD were confined to the African continent. The first reports of infections outside Africa were in 1989 from Israel. In 2016, LSD was reported from Russia and South-East European nations. In the Indian subcontinent, the disease was initially observed in Bangladesh in 2019, followed by China, India, Nepal, Bhutan, Vietnam, Hong Kong and Myanmar.

The first complete genome sequence of LSDV (Neethling strain) was available in 2001 and suggested a large DNA genome. This strain was originally isolated in Kenya in 1958. Adaptation of poxviruses are dominated by genomic mutations, deletions and recombinations. Subsequent genomes from major outbreaks have provided quite interesting insights into the virus and its evolution [3, 4, 7].

RECOMBINANT VIRUSES

LSD outbreaks were reported in Russia during 2015-2019. The virus isolated from 2015 and 2016 was similar to the earlier genomes. However, the use of homologous (attenuated) LSDV vaccine in 2016 did not end the outbreak and subsequently vaccine-like isolates were obtained from affected cattle in 2017. By 2018, all field isolates of LSDV in Russia were replaced by viruses bearing genetic signatures of the LSDV vaccine, suggesting that the outbreak of LSD in Russia during 2017-2019 was due to a novel LSDV recombinant variant.

LSDV infections in China were first reported following outbreaks in several regions in 2019. Whole-genome sequencing revealed another vaccine-recombinant strain with 25 recombination events between a field strain and a vaccine strain. However, the strain from China was distinctly different from the vaccine-recombinants detected from Russia, implying that a virulent recombinant of LSDV with unknown origin was the cause of LSD outbreaks in China in 2019 and subsequently in 2020. Recombination events are now well catalogued in poxviruses and mediated by the poxvirus DNA polymerases in cells being co-infected by viruses of same or different genus. Recombination of pathogenic and vaccine strains are, therefore, likely when an infected animal is immunised or infection occurs in the pre-immune phase after vaccination. Utmost caution and follow-up genomic studies are

therefore essential before full rollout of homologous attenuated vaccines [10].

GENOMES FROM INDIA

In August 2019, suspected cases of LSD were observed in Odisha. The first laboratory-confirmed outbreak of LSD was subsequently reported in November 2019. The overall infection rate was estimated to be 7%, with little mortality. Sequences of particular genes of the isolated virus from the 2019 outbreak were genetically similar to strains from Kenya. In July 2022, large outbreak of LSD was reported from Gujarat and Rajasthan, which subsequently spread to 11 other States in a short span affecting Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir, Uttarakhand, Uttar Pradesh, Delhi, Madhya Pradesh, Jharkhand, Maharashtra and Andaman & Nicobar with over 80,000 cattle deaths.

In collaboration with the Department of Animal Husbandry in Rajasthan, CSIR-IGIB reported the whole genome sequences of six isolates of LSDV collected from five affected animals. A total of 177 unique mutations were found compared to the Neethling strain from Kenya. Out of these, 47 were not present in any other global genome sequences of LSDV, implying that the mutations are unique to the 2022 outbreak of LSDV infections in India.

Phylogenetic analysis of the isolates showed that the current virus strain is unrelated to the virus found in India as well as other global genomes of LSDV. The closest genomes to the viral isolates from the current outbreak comprise 12 sequences belonging to other Asian and European countries that were collected from 2012-2022. Further, the presence of an additional mutation in two samples from the same animal and the large number of mutations potentially suggests that LSDV may be able to evolve fast within the host [10, 11].

GENOME SURVEILLANCE

COVID-19 pandemic underlined the importance of continuous genomic surveillance for evidence-based public health strategies to combat the disease, and development of diagnostic tools and vaccines. Establishing genomic surveillance of transboundary and emerging infectious agents of high consequence is therefore essential for early detection as well as devising evidence based interventions for limiting their spread and minimising economic and strategic losses. We need to accept that animal and plant health are key to human health and well-being, and forms the basis of One Health. As we move towards industrialised agriculture and animal husbandry in the era of climate change, the need has never been acute for preparedness with newer and better tools like genomics, molecular surveillance and digital technologies to warn, inform, identify and stop emerging pathogens in their tracks [10, 11].

ECONOMIC IMPLICATIONS

The lumpy skin disease has created havoc in India. The disease, which mostly affects cattle, has now spread to over ten states in India. Reportedly, it has already killed 75,000 cattle in the India. The spread of the disease can also lead to ‘substantial’ and ‘severe’ economic losses according to FAO and the World Organisation for Animal Health (WOAH). The disease leads to reduced milk production as the animal becomes weak and also loses appetite due to mouth ulceration. The income losses can also be due to poor growth, reduced draught power capacity and reproductive problems associated with abortions, infertility and lack of semen for artificial insemination. Movement and trade bans after infection also put an economic strain on the whole value chain [2, 10, 11].

A risk assessment study conducted by the FAO based on information available from 2019 to 2020 revealed that the economic impact of LSD for South, East and Southeast Asian countries was estimated to be upto 1.45 billion dollars in direct losses of livestock and production. The current outbreak in India has emerged as a challenge for the dairy sector. India is the world’s largest milk producer at about 210 million tonnes annually. India also has the largest headcount of cattle and buffalo worldwide. In Rajasthan, which is witnessing the worst impact of the lumpy skin disease, it has led to reduced milk production, which lessened by about three to six litres a day. Reports indicate that milk production has also gone down in Punjab owing to the spread of the disease. According to FAO, the disease threatens the livelihoods of smaller poultry farmers significantly. Notably, farmers in Uttar Pradesh and Punjab have incurred losses due to cattle deaths and are seeking compensation from their state governments [10, 11].

CURRENT SPREAD IN INDIA

The current outbreak started in Gujarat and Rajasthan around July and had spread to Punjab, Himachal Pradesh, Andaman & Nicobar and Uttarakhand by early August. It then spread to Jammu and Kashmir, Uttar Pradesh and Haryana. In recent weeks, it was reported in Maharashtra, Madhya Pradesh, Delhi and Jharkhand. The virus has infected over 16 lakhs cattle in 197 districts as of September 11 2022. Of the nearly, 75,000 cattle that disease has killed, more than 50,000 deaths, mostly cows, have been reported from Rajasthan. The FAO has suggested a set of spread control measures for LSD, which involves vaccination of susceptible populations with more than 80% coverage, movement control of bovine animals and quarantining, implementing biosecurity through vector control by sanitising sheds and spraying insecticides, strengthening active and passive surveillance; spreading awareness on risk mitigation among all stakeholders involved, and creating large protection and surveillance zones and vaccination

zones. It has also been reported that the 'Goat Pox Vaccine' is very effective against LSD and is being used across affected states to contain spread. Uptill now, 97 Lakh doses of vaccination have been administered. The affected states have put movement bans in place and are isolating infected cattle and buffaloes, spraying insecticides to kill vectors like mosquitoes [10, 11].

LSD IN JAMMU & KASHMIR

As per report till date, in Jammu and Kashmir, 38,083 animals have been affected by the lumpy skin disease (LSD) of which 28,619 have recovered. Till date, about 2,13,250 doses had been administered across J&K and awareness camps with the help of Panchayats are being held all across the UT. Several districts of Jammu and Kashmir, including Jammu, reported lumpy skin disease that infects cows and buffaloes mainly through vectors like blood-feeding insects. It leads to the formation of nodes on the animal's skin or hide that look like lumps, fever, runny nose, reduced milk yield and difficulty in eating [8, 9]. A vaccination drive of stray cattle against Lumpy Skin Disease (LSD) was started in Doda District of UT of Jammu and Kashmir, in which around 64 stray cattle were vaccinated against the LSD till date. Besides the general public is also being awared about the LSD by Animal Husbandry Department of Doda. Special stress has been laid on to control the flies and mosquitoes that act as vector and main cause of the disease spread.

Fig 2 (a-c): Vaccination Drive against Lumpy Skin Disease

Conflict of Interest: Authors declare that they have no conflict of interest.

REFRENCES

1. Khan, Y. R., Ali, A., Hussain, K., Ijaz, M., Rabbani, A. H., Khan, R. L., Abbas, S. N., Aziz, M. U., Ghaffar, A., & Sajid, H. A. (2021). A review: Surveillance of lumpy skin disease (LSD) a growing problem in Asia. *Microb Pathog*, 158.
2. Sudhakar, S. B., Mishra N., Kalaiyarasu, S., Jhade, S. K., Hemadri, D., Sood, R., Bal, G. C., Nayak, M. K., Pradhan, S. K., & Singh, V. P. (2020). Lumpy Skin Disease (LSD) outbraeks in cattle in Odisha state, India in August 2019: Epidemiological features and molecular studies. *Transbound Emerg Dis*, 67(6), 2408-2422.
3. Badhy, S. C., Chowdhury, M. G. A., Settypalli, T. B. K., Cattoli, G., Lamien, C. E., Fakir, M. A. U., Akter, S., Osmani, M. G., Talukdar, F., Begum, N.,

Khan, I. A., Rashid, M. B., & Sadekuzzaman, M. (2021). Molecular characterization of lumpy skin disease virus (LSDV) emerged in Bangladesh reveals unique genetic features compared to contemporary field strains. *BMC Vet Res*, 17(1), 61.

4. Balwan, W. K., Saba, N., & Sharma, K. (2021). Status of Bluetongue Disease in India: An updated Systematic Review. *East African Scholars J. of Parasitology and Infect Dis*, 3(5), 69-74.
5. Balwan, W. K., & Saba, N. (2021). Elimination of Lymphatic Filariasis. *East African Scholars J Parasitol Infect Dis*, 3(2), 31-36.
6. Saba N., Balwan, W. K., & Mushtaq, F. (2022). An overview of A1 and A2 Milk and its impact on Human Health. *Journal of the Asiatic Society of Mumbai*, 96(06) II.
7. Saba, N., & Balwan, W. K. (2021). Potential Threat of Emerging and Re-emerging Zoonotic Diseases. *Annals of the Romanian Society for Cell Biology*, 25(5), 29-36.
8. 38K animals hit by lumpy skin disease in J&K: The Tribune India.
9. Dulloo Reviews Status of Lumpy Skin Disease in J&K Kashmir Observer.
10. Lumpy skin disease: What is lumpy skin disease? And is it safe to consume milk? - The Economic Times (indiatimes.com).
11. Explained What is lumpy skin disease in cattle? Does it affect milk we consume? - The Hindu.

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