

## Lumpy Skin Disease: An insights in Pakistan

MUHAMMAD JAMIL<sup>1</sup>, NOMAN LATIF<sup>1</sup>, RAHEELA BANO<sup>2</sup>, SYED AKBAR ALI<sup>3</sup>, M. AHSAN QAISAR<sup>4</sup>, NAIMAT ULLAH<sup>5</sup>, MUHAMMAD KASHIF<sup>6</sup>, MUBARIK ALI<sup>7</sup>, NORINA JABEEN<sup>8</sup>, ANS NADEEM<sup>6</sup>, FATEH ULLAH<sup>6</sup>

<sup>1</sup>PARC Arid Zone Research Center, Dera Ismail Khan-29050-Pakistan

<sup>2</sup>Assistant Professor, Department of Pathology, Gomal Medical College, Dera Ismail Khan-29050-Pakistan

<sup>3</sup>Department of Agriculture and Agribusiness Management University of Karachi, Pakistan

<sup>4</sup>Agriculture & Agribusiness Management UoK

<sup>5</sup>Department of Parasitology, University of Veterinary and Animal Sciences (UVAS), Lahore-54000-Pakistan

<sup>6</sup>Department of Clinical Sciences, Sub Campus Jhang, University of Veterinary and Animal Sciences, Lahore-54000-Pakistan

<sup>7</sup>Animal science Institute, National Agricultural Research Center, Islamabad, 54000-Pakistan

<sup>8</sup>Regional lead Faisalabad, GESA Department, KASHF Foundation, Pakistan

Corresponding author: Dr. Muhammad Jamil, Email: [jamilmatrah@gmail.com](mailto:jamilmatrah@gmail.com)

### ABSTRACT

Lumpy skin disease (LSD) is an enzootic infectious, seldom fatal and eruptive disease in Pakistan reported in 2022. It can result in variably high mortality and morbidity rates in animals characterized by nodules on their skin. LSD caused by Lumpy skin disease virus (LSDV), together with goatpox virus and sheeppox virus, belongs to genus Capripoxvirus and Poxviridae family. The disease affects a wide variety of domestic and wild animals, including buffaloes and cows. The main symptoms are high fever, nodular lesions on the skin, and mucous membranes of the respiratory and digestive tracts. The outbreak of lumpy skin disease caused severe economic losses among Pakistan's animal keepers by reducing milk, beef production, causing sterility in males and abortions in females. Crossbreed and female cattle had significantly higher disease prevalence than their male counterparts. The introduction of new animals into farms was discovered to be one of the most significant risk factors in disease transmission. The aim of current review was to provide the information about LSDV because no study has conducted in Pakistan as it is new disease reported in 2022. The current review of literature will be useful to field veterinarians, herders, and animal health decision makers in Pakistan, as well as in taking appropriate measures to prevent future outbreaks of this disease.

**Keywords:** Domestic animals; Cattle; Lumpy skin disease; Poxviridae; Pakistan

### INTRODUCTION

The livestock industry is the largest sub-sector of the country's agricultural production, contributing Rs.1466 billion in value addition, 2.5 percent increase over the previous years, while contributing 60.6 percent in value addition in agriculture and having an 11.7 percent share in GDP with 3.1 percent share in total exports of the country as a cradle of foreign exchange. Approximately 8 million families are directly involved with livestock and earn 35-40% of their income from this sector. A five-million-farmer outbreak of Lumpy Skin Disease. List of top 10 countries with the largest buffalo and cattle population is given in table 1.

Lumpy skin disease (LSD) is an infectious, and eruptive viral disease of cattle and buffalo's industry, belong to genus Capripox and family Poxviridea (Salib and Osman, 2011, Body et al., 2012; Tuppurainen et al., 2017; Givens, 2018). According to the observations of Tuppurainen et al. (2011), all sex, breeds and ages of animals are affected by LSD. The highest LSD infestation has recorded in the young calves, underweight and lactating animals. LSD caused significant economic losses and wide spread disease (Tuppurainen & Oura, 2012; Sprygin et al., 2019). Lumpy skin disease virus (LSDV) is a double-stranded DNA enclosed in a lipid envelope and belongs to genus Capripoxvirus, which resemble to the goat pox (GTPV) and sheep pox (SPPV) viruses (Buller et al., 2005; Bhanuprakash et al., 2006).

**History of LSDV:** LSDV has started from Zambia in 1929 (Morris 1931) and insects were considered the main vector of disease spread. Later, virus was observed in Zimbabwe, Botswana and South Africa between 1943-1945 (Von Backstrom, 1945). In this outbreak approximately eight million cattle were affected and disease continued till 1949 (Thomas and Mare 1945; Diesel, 1949). In 1957 and 1972, LSD was reported in Kenya and Sudan, respectively (Ali and Obeid 1977) while West Africa in 1974, Somalia in 1983 (Davies 1991 a and b) and Senegal, Mauritius and Mozambique in 2001. Now LSD has been widely spread and invaded majority countries especially African countries except Algeria, Libya, Tunisia and Morocco (Tuppurainen and Oura 2012). It has reported in Oman, Kuwait, Egypt, Israel, and Bahrain in 2009, 1991, 2006, 2002-2003, respectively (Kumar 2011; Tageldin 2014; Fayez and Ahmed 2011; Ali and Amina 2013; Shimshony

and Economides 2006; Sherrylin et al 2013). This virus has then re-emerged in 2009 from a farm population of 3200 cattle in Oman (Tageldin et al 2014). Now this virus has spread in many countries including Pakistan. In these days, Pakistan is facing dangerous problems of LSDV almost in all districts.

**Pathogenesis and clinic pathology:** The following symptoms such as viremia, virus replication, shedding of the virus via oral and nasal discharge, cutaneous localization of the virus, presence of virus in semen, fever, vasculitis, development of nodules as shown in figure 3, damage hides of host, lowered fertility in bulls, damage to animal hides reduction in milk production and weight, lymphangitis and regional lymphadenopathy have reported by many researchers in the globe (Abutarbush et al., 2013; Annandale et al., 2014; Tasioudi et al., 2016; Tuppurainen et al., 2017; Constable et al., 2017) while some researchers reported abortion, pneumonia, orchitis and mastitis. Sevik and Dogan (2017) had reported that nodules were not recorded in aborted fetuses. The various internal parts of animals especially lungs, gastrointestinal tract, muzzle, trachea, nasal cavity, dental pad, abomasum, larynx, inside of the lips, udder, testes, liver, spleen, heart, kidney, gingiva, teats, abomasum, uterus and vagina have highly infested parts of animals (Al-Salihi and Hassan, 2015; Zeynalova et al., 2016). Attack of LSDV on body parts of animals is shown in figure 1 and 2.



Figure 1: (A) indicates the large skin nodules on calf affected in Egypt, while (B) illustrates LSD lesion in the tracheal mucosa. Source: Hunter and Wallace (2001)

**Transmission of Lumpy skin disease (LSD):** Lumpy skin disease can affect buffalo, cattle, and many wild animals. Small ruminants like goats and sheep were not affected by the virus as reported by El-Nahas et al. (2011) and Lamien et al. (2011) while Baldacchino et al. (2013) observed LSD in sheep and goats. During trade of various products such as contaminated meat, hides, fresh milk, carcasses, offal, susceptible hosts are come into contact with these poisonous or contaminated products. It has been reported that hematophagous arthropods like insects and ticks feed on the blood of infested animals and transmit toxic materials to other animals during blood feeding (Annandale et al., 2013; Lubinga et al., 2015).



Figure 2: Presence of lesion on the neck of animal. Source: Al-Salihi (2014)



Figure 3: Appearance of LSD nodular lesion on the whole body of cattle. \*Source: Coetzer and Tuppurainen (2004)



Figure 4: Circles on cattle body indicate the lesion spots after being raptured.

Table 1: List of top 10 countries with the largest buffalo and cattle inventory in East, South, and Southeast Asia.

Sr. no.	Country	Stock of cattle and buffalo in head	% of buffalo	% of cattle
1	Pakistan	84 932 000 (+)	54	46
2	China	90 536 564 (-)	30	70
3	India	298 615 805 (-)	38	62
4	Bangladesh	25 571 000 (+)	6	94
5	Indonesia	17 327 223 (+)	5	95
6	Myanmar	21 208 395 (-)	18	82
7	Nepal	12 654 125 (+)	42	58
8	The Philippines	5 436 592 (+)	53	47
9	Thailand	5 914 926 (-)	21	79
10	Viet Nam	8 228 012 (+)	30	70

Figures are based on either imputation methodology (-) or official data (+). Source: FAOSTAT, 2020

**Geographical distribution of LSD:** Many developing and developed countries are invaded by LSDV as given in table 2.

Table 2: Geographical distribution of LSD

Location/country	References
Zambia, Saudi Arabia, Africa, Turkey	Al-Salihi and Hassan, 2015; OIE WAHID, 2018, Ben-Gera et al., 2015
Russia, Azerbaijan, Jordan, Lebanon, Iraq, Iran, Egypt	Zeynalova et al., 2016; OIE WAHID, 2018; Wainwright et al., 2013; Sameea et al., 2017
Armenia, Greece, Bulgaria, Israel	Tasioudi et al., 2016; OIE, 2015; Ince et al., 2016; Abutarbush et al., 2013
Albania, Kosovo, Sudan	Ripani and Pacholek, 2015
Serbia and Montenegro	Beard, 2016; Sherrylin et al 2013
Bangladesh, Pakistan, Bahrain	Hasib et al., 2021; Khan et al., 2021
Europe, Oman, Israel, Kuwait	APHIS 2006; Fayez and Ahmed 2011

**Morbidity and mortality rate of LSD:** Morbidity and mortality rate of LSD varies according to climatic conditions. Morbidity and mortality rate of LSD varies between 45%-100% and 10%-40% (Coetzer, 2004). It has been reported 8.7% and 0.4%, morbidity and mortality, respectively, in Greece (Tasioudi et al., 2016) while 12.3% and 6.4% reported in Turkey by Sevik and Dogan (2017).

**Risk factors and source of LSD:** LSD spread in domestic and wild animals through different risk factors. The description of risk factors is given in table 2. It has been documented that wild animal such as African buffaloes, eland, blue wildebeest, giraffe, greater kudu and impala are the source of LSD spreading (Fagbo et al., 2014) while some researchers investigated that wildlife never play any kind of role in virus dispersion. The major sources of LSD are flying insects (*Aedes aegypti*, *Culex mirificens*, *Stomoxys calcitrans*), ticks (*Amblyomma hebraeum*, *Rhipicephalus sanguineus*, *R. appendiculatus*, *Boophilus decoloratus*). This disease can transmit from infected host to healthy host by direct contact to the skin lesions as shown in figure 4, nasal discharge, saliva, semen and milk of infected animals. The main risk factors through which disease can spread are given in table 3.

Table 3: List of risk factors associated with spread of LSD

Risk factors	References
Season	Gari et al., 2010
Climate change	Ince et al., 2016
Introduction of new animals in herd	Tuppurainen et al., 2011
Vector population	Chihota et al., 2003
Transport of contaminated products and infected animals	Ochwo et al., 2019
Water source	Rouby and Aboulsoud, 2016
Infested wind/air	Ince et al., 2016
Age, breed, sex, management type	Gari et al., 2010
Pastures	Sevik and Dogan, 2017
Wildlife	Lamien et al., 2011

#### How can Lumpy Skin Disease be controlled in Pakistan?

Due to the recent outbreak of the disease in Pakistan, the livestock industry is on the verge of collapse. In Pakistan, following are a few tips that can help you control the spread of lumpy skin disease. Vaccination is the best tool to manage the virus spread in affected regions along with removal of infected animals, banned the trading of live animals and movement restrictions. In addition to antibiotics, NSAIDs can also be helpful in preventing secondary infections. Bulls used for breeding must be tested for LSDV. The effects of the disease can be alleviated through good nursing care.

**Economic losses of LSD:** LSD is very dangerous and emerging disease, spreading very quickly in various countries like Pakistan. LSD has led to serious economic losses in many developed and developing countries. During high fever and mastitis disease caused abortion, 10-85% milk reduction, decline growth

development, damaged hides, decline infertility, death of infected hosts, emaciation, high cost of vaccination, reduced quality and quantity of skin and hides, which are not bearable to the small and large herdsmen (Alemayehu et al., 2013; Sajid et al., 2012) in affected countries (Turkey, Ethiopia, Pakistan etc.).

**Stability of LSDV:** LSDV is resistant to high temperature and desiccation but viral particles die when exposed to direct Sunlight. It has been reported that virus becomes inactivated at 55 °C within 2 hours while takes 30 min at 65°C temperature or direct contact with lipophilic detergents. Many disinfectants (iodine compounds, formalin, quaternary ammonium compounds, phenol, chloroform, sodium hypochlorite and ether are highly effective against LSDV (Oie, 2013; Mulatu and Feyisa, 2018).

**Treatment, measures and Control methods of LSD:** LSDV is widely spreading in different areas of Pakistan due to poverty in farming communities, lack of measure facility and limited access to effective vaccines in endemic regions, as well as the increased trading of various products of animals and live animals. Vector borne diseases can be controlled by adopting different control measures. LSDV can be managed by using antimicrobial therapy. Salib and Osman (2011) performed experiment to control LSDV, they reported that combination of anti-inflammatory, antimicrobials, anti-septic solutions and supportive therapy give satisfactory results. Mastitis, Myiasis, Pneumonia, dysentery and lameness can recover within 2-3 weeks (Salib and Osman, 2011).

The treatment of LSDV is very costly and not accessible to every farmer in the country, so proper preventive measures should be adopted which give effective control of virus and minimize the milk loss, hide, skin damage and the substantial economic losses. Another study was conducted by Gari et al. (2010), they reported that loss of milk and animal product due to fever, death, myiasis and abortion can be reduced through vaccination. Gari et al. (2011) had also reported the similar findings.

## CONCLUSION AND RECOMMENDATIONS

Lumpy disease or cow disease is a skin condition that affects animals. It has significant implications for the livestock industry. In present times, this disease poses a significant challenge for the livestock industry. In any case, Pakistan is capable of becoming the world's largest exporter of Halal meat, which is an emerging market, only if we control the spread of cow disease in Pakistan and other diseases. Moreover, it is also necessary to educate dealers regarding the diseases, especially in cases where the diseases are zoonotic.

Lumpy skin disease (LSD) is an infectious disease in cattle caused by a virus of the family Poxviridae, also known as Neethling virus. Fever, swollen superficial lymph nodes, and many nodules on the skin and mucous membranes (including those of the respiratory and digestive tracts) with a diameter of 2 to 5 centimetres (1-2 in) are the disease's hallmarks. Antibiotics, anti-inflammatory drugs, or a vitamin shot are used in some cases to treat secondary bacterial infections, fever, or inflammation, and to improve the animal's appetite. Vaccination is the best tool to manage the virus spread in affected regions along with removal of infected animals, banned the trading of live animals and movement restrictions (Beard, 2016; Sevik and Dogan, 2017; Tuppurainen et al., 2017). Risk factors like season and climate change should be considered in control techniques. Bulls used for breeding must be tested for LSDV. The basic information of LSDV like transmission should be discussed with the herdsmen or veterinarians or livestock workers, so they able to adopt management methods to minimize the virus attack.

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