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Epidemiology of Lumpy Skin Disease in Cattle: Prevalence, Risk Factors, and Implications for Control in Karachi, Pakistan

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Abstract

A cross-sectional study was conducted to determine the prevalence, associated risk factors, and treatment practices of LSD in cattle in three areas of Karachi, Pakistan: Landhi Cattle Colony, National Highway Cattle Colony, and Memon Goth Cattle Colony. A total of 60 farms (30 dairy and 30 beef cattle farms) were randomly selected from each area, and data were collected through a structured questionnaire administered to farmers. The results indicated that the prevalence of LSD was higher in dairy farms (90%) compared with beef cattle farms (33.33%). Among the study areas, the highest prevalence was recorded in Landhi Cattle Colony, where 95% of dairy farms and 45% of beef cattle farms were affected. Farm-level analysis showed particularly high prevalence in Madina Dairy Farm (94.77%) and Sikander Cattle Farm (91.09%) in Landhi Cattle Colony. In comparison, Abu Bakar Dairy Farm (94.82%) and MM Cattle Farm (53.33%) showed the highest prevalence in the National Highway Cattle Colony. In Memon Goth Cattle Colony, the highest prevalence was observed in Danyal Dairy Farm (94.11%) and Dil Pasand Cattle Farm (50%). Gender-wise analysis revealed a higher prevalence in females (98.4%) compared with males. Age-wise prevalence was highest in cattle aged 2-5 years (95.55% in dairy farms and 64.63% in beef farms), with significant differences among age and gender groups. Risk factors associated with LSD included poor farm hygiene, large herd size, common water sources, and seasonal occurrence, particularly in May (63.33%). Exotic breeds showed higher morbidity (69.03%) and mortality (52.34%) compared with indigenous breeds. Farmers reported the use of antibiotics, meloxicam, ivermectin, and injectable vitamins for treatment, with an average recovery period of approximately 15 days.

Keywords: Epidemiology, Lumpy skin disease, prevalence, risk factor, Karachi

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Introduction

Cattle production is a cornerstone of agricultural systems across tropical and subtropical Asia, serving as a vital source of livelihood and economic stability. The sector relies on a mix of indigenous breeds, such as Sahiwal and Red Sindhi for dairy, and Zebu for beef, as well as exotic and crossbred animals to meet the growing regional demand for beef and dairy products. This livestock-based economy, however, is persistently threatened by infectious diseases that incur substantial production losses. Among these, Lumpy Skin Disease (LSD) has emerged as a significant transboundary animal disease of increasing concern (Calistri et al., 2020; Ogahi et al., 2025).

LSD is caused by the Lumpy Skin Disease virus (LSDV), a member of the genus Capripoxvirus within the Poxviridae family. The disease is characterised by acute-to-subacute clinical manifestations, including fever, cutaneous nodules, lymphadenopathy, and oedema, which can lead to secondary infections, reduced milk yield, weight loss, temporary or permanent infertility, and mortality (Mulatu & Feyisa, 2018). Although cattle (Bos indicus and Bos taurus) are the primary susceptible hosts, with the former showing somewhat greater innate resistance, Asian water buffaloes (Bubalus bubalis) are also affected, albeit with generally lower morbidity. The global footprint of LSD has expanded dramatically from its first identification in Zambia in 1929. After becoming endemic across Africa, it spread into the Middle East and, more recently, into Southeast Europe, the Caucasus, and Asia (Singh 2022; Bhutto et al., 2025). The first major outbreak in Egypt in 1988 marked the virus's establishment outside Africa, and it has since been reported across the Asian continent, including a significant outbreak in Pakistan in 2022 that affected tens of thousands of animals (Allam et al., 2020; Selim et al., 2021). The transmission of LSDV is primarily mechanical, facilitated by a wide range of hematophagous arthropod vectors, including mosquitoes (Aedes aegypti), biting flies (Stomoxys calcitrans), and ticks. This vector-dependent spread results in marked seasonality, with higher incidence during warm, humid periods conducive to vector proliferation (Moar et al., 2017; Sprygin et al., 2019). Direct contact, contaminated fomites, and iatrogenic means also contribute to transmission within herds. Diagnosis is based on clinical signs and confirmed using molecular techniques (e.g., PCR) on samples from skin lesions or through serological assays. Despite the availability of live attenuated homologous (Neethling strain) and heterologous (sheep/goat pox virus) vaccines, control remains challenging in many endemic regions due to logistical, economic, and surveillance constraints. There is no specific antiviral treatment, making supportive care and prevention through vaccination and vector control critical. The economic impact of LSD is profound and multifaceted, affecting small-scale and commercial farmers alike (Sevik and Dogan 2017; Ali and Gumbe 2018; Azeem et al., 2022). Direct losses stem from reduced milk production, damaged hides, poor weight gain, abortion, and infertility. Indirect losses arise from the costs of vaccination campaigns, treatment of secondary infections, movement restrictions, and trade embargoes. The socio-economic burden is particularly severe in developing Asian economies, where cattle are integral to mixed farming systems (Sevik & Dogan 2017; Farooq et al., 2022).

In Pakistan, the recent and severe LSD epidemic underscores the urgent need for enhanced understanding of the disease's

epidemiology at a local level. While clinical disease and virology are well described globally, region-specific data on prevalence and associated risk factors, including breed, age, husbandry practices, seasonal patterns, and vector activity, are scarce for key metropolitan production zones, such as Karachi. This gap hinders the development of targeted and effective control strategies.

Therefore, this study aims to: determine the prevalence of Lumpy Skin Disease in cattle within the Karachi region; evaluate the potential risk factors associated with its spread; and analyse retrospective treatment records to inform effective management protocols. The findings will contribute crucial epidemiological data to support evidence-based surveillance and control programs for LSD in Pakistan and the wider region.

Material and methods

Area of sampling

Karachi, the capital of the Sindh province in Pakistan, is selected for the survey. The livestock population consists of 287,000 cattle and 449,000 buffalo (Moustafa et al., 2017). Karachi is divided into eighteen towns, five of which are peri-urban areas with numerous dairy farms (Bin Qasim, Gadap, New Karachi, Korangi, and Superhighway). The Landhi Cattle Colony is approximately 1,600 acres. (6.5 km) around 2,000 dairy farms. It has a dairy animal population exceeding 400,000 (almost 95% buffaloes and 5% cows), with a daily milk production of approximately 4,000,000 litres and 7,200 tons of manure, making it the largest dairy colony in Pakistan (Fareed et al., 2017). A cross-sectional survey was conducted to collect data from dairy farms and the Livestock Department, Government of Sindh, regarding the prevalence of lumpy skin disease (LSD) in Karachi. A total of 60 dairy cattle farmers/owners were interviewed across three different locations in Karachi (National Highway, Memon Goth, Landhi Cattle Colony, Fig. No 1, Table No.1). A questionnaire proforma was used to collect data on farm practices, including the animals' nutrition, feeding schedule, water sources, breed information, vaccination history, morbidity and mortality rates, disease prevalent and history of presumptive cases of LSD on the farm.

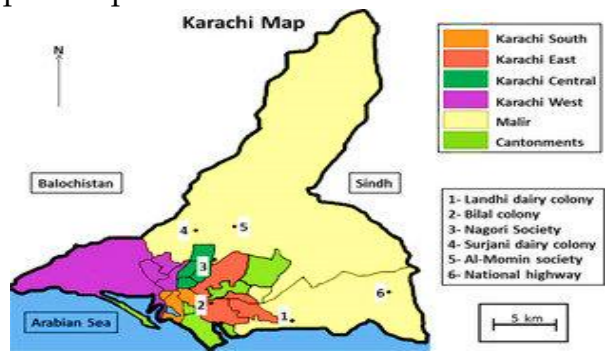

Fig. No. 1. Map of Karachi, the capital of Sindh, Pakistan

Data collection and Risk factors

Demographic information was gathered using a standard questionnaire proforma. This included data on the number of cattle kept, husbandry practices, introduction of new animals, sources of water and feed, LSD outbreaks, use of contaminated needles, seasonal variations, vector populations, transmission from an infected host to a healthy host by direct contact, and the potential role of vaccination in controlling outbreaks on the farms. The data were collected through face-to-face interviews with animal attendants/dairy farmers and physical examination of the animals.

Treatment recommendation

Questionnaires carried out retrospective surveys to document the most effective treatment protocols for LSD within the study area. Based on clinical outcomes, farmers were recommended the most effective treatment regimens. The effectiveness of treatment was recorded based on the disappearance of clinical signs.

(Annexure A)

Statistical design

The data obtained from the questionnaires were entered into Excel 2010 (Microsoft) and analysed using the statistical package Statistix. 8.1. Chi-square tests were applied to the data to check the level of significance at $p<0.05$.

Results

Overall prevalence of LSD in dairy and beef cattle farms in the study area

Overall, 60 dairy farms were visited, of which 30 were dairy farms, and 30 were cattle beef farms. Among the 30 dairy farms, 27 (90%) were infected with LSD, whereas 10 (33.33%) of the 30 beef cattle farms were infected. The highest prevalence was recorded in dairy farms compared with beef cattle farms (Fig. No. 2).

Chi-Square: 1.94, P-value: 0.5851, DF: 3

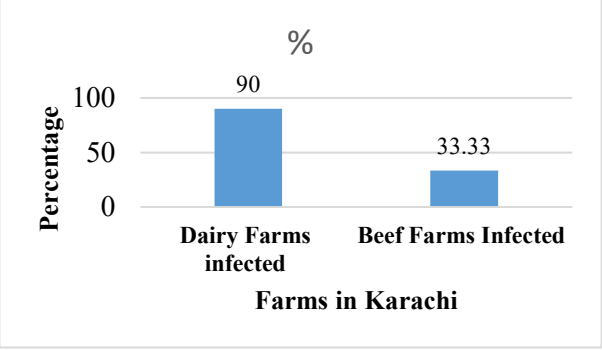

Fig. No. 2. Overall prevalence of LSD in dairy and beef cattle farms in Karachi.

Prevalence percentage of LSD in dairy and beef cattle farms in selected areas

Three areas were selected: National Highway, Memon Goth, and Landhi Cattle Colony, Karachi. In each area, 10 dairy farms and 10 beef cattle farms were selected. The highest prevalence was recorded in Landhi Cattle Colony, with 9.5 (95%) of dairy farms and 4.5 (45%) of beef cattle farms infected. The lowest prevalence percentage was recorded in the National highway, where 8 (80%) dairy farms and 4 (40%) beef cattle farms were infected with LSD (Fig. No. 3).

Chi-Square: 8.71, P-value 0.335, DF: 5

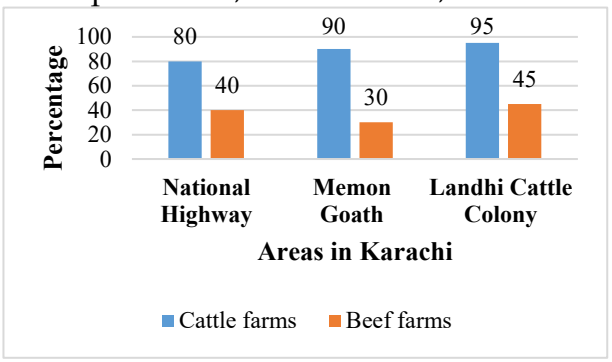

Fig. No. 3. Prevalence percentage of LSD in dairy and beef cattle farms in selected areas

Farm-wise prevalence of Lumpy skin disease in the Landhi cattle colony, Karachi

Table No. 2 shows the farm-wise prevalence of LSD in Landhi Cattle Colony. The highest prevalence was recorded in Madina dairy farms, where 290 of 306 animals (94.77%) were infected. The lowest prevalence was recorded at Mehran Dairy Farm, with 72 of 86 animals (83.72%) infected. In beef cattle farms, the highest prevalence was recorded in Sikander Cattle Farm, with 58 of 200 animals (91.09%) infected. While Imtiaz Cattle Farm recorded the lowest prevalence, with 38 of 80 animals (36.43%) infected with LSD.

(Annexure B)

Farm-wise prevalence of Lumpy skin disease in National Highway Cattle Colony, Karachi

Table No. 3 shows the farm-wise prevalence of LSD in the National Highway Cattle Colony. The highest prevalence was recorded in Abu Bakar Dairy Farms, with 110 of 116 animals (4.82%) infected. The lowest prevalence was recorded at Nadir Dairy Farm, with a total of 60 animals, and 40 (66.66%) were infected. On beef cattle farms, the highest prevalence was recorded at the MM cattle farm, with 32 (53.33%) infected animals; the lowest prevalence was recorded at the ES cattle farm, with 12 (21.68%) infected animals.

(Annexure C)

Farm-wise prevalence of Lumpy skin disease in Memon goth cattle colony, Karachi

Table No. 4 shows the prevalence of LSD in Memon Goth Cattle Colony. The highest prevalence was recorded in Danyal Dairy Farm, with 160 of 170 animals (94.11%) infected, while the lowest prevalence was at Zeab Dairy Farm, where 62 of 86 animals (72.09%) were infected. In beef cattle farms, the highest prevalence percentage was recorded in Dil Pasand Cattle Farm, with 54 (50%) of 108 infected animals, and the lowest prevalence percentage was recorded in the Brohi Cattle Farm, with 12 of 88 animals, 12 (13.63%) infected.

(Annexure D)

Gender wise prevalence of Lumpy skin disease in dairy and beef cattle farms in selected areas

The gender-wise prevalence of LSD in Landhi cattle colony, National Highway Cattle Colony, and Memon Goth Cattle Colony is presented in Table No. 5. A total of 30 dairy farms containing 653 male and 4332 females and infected 464 (71.05%) and 4263 (98.4) respectively, in case of 30 beef cattle farms containing 3434 male and 356 were females and infected 1201 (34.97%) and 157 (44.1%) respectively were infected with LSD, statistical results shows highly significant difference among male and female of dairy and beef cattle farms.

		Male				**Female**		
	No of examined animals	No infected animals	Expected	Prevalence %	No of examined animals	No of infected animals	Expected	Prevalence %
Dairy cattle farms	653	464	266.02	71.05	4332	4263	4084.35	98.4
Beef cattle forms	3434	1201	1398.97	34.97	356	157	335.64	44.1
Total	4087	1665	1665.00	40.73	4688	4420	4419.00	94.28

Table No. 5. Gender wise prevalence of Lumpy skin disease in selected areas in Karachi

Age-wise prevalence of Lumpy skin disease in dairy and beef cattle farms in selected areas

The prevalence of LSD was perceived in three age groups i.e under 1 year, 2-5 years and > 4 years (Table 6), as indicated by the information that the general prevalence of LSD was high in age group (2-5 years) (95.55%) in dairy farms followed by (>4 years) (85.2%) and (under 1 year) (64%) and similarly in it was high in same age group of beef cattle farms 64.63%, 42.53% and 34%. Statistical results show a highly significant difference among different age groups of dairy and beef cattle farms.

	A (under 1 year)			**B (2-5 years)**			**C (>4 years)**		
	No of examined animals	No. of infected animals	%	No of examined animals	No. of infected animals	%	No of examined animals	No. of infected animals	%
Dairy Cattle Fa	1712	1090	64	2250	2150	95.55	1744	1487	85.26

rms									
Beef cattle Farms	1168	394	34	707	457	64.63	1192	507	42.53
Total	2880	1484	52	2957	2607	88.16	2936	1994	67.91

Table No. 6. Age-wise prevalence of Lumpy skin disease in selected areas in Karachi

Farmers' knowledge about the clinical sign features of Lumpy skin disease

Fig. No. 4 presents farmers' knowledge of LSD from the survey conducted in the selected areas of Karachi. 30% farmers said that they observed the nodules on skin, nodules on mucus membrane, nodules on internal organs, high fever, lameness and low milking drop in infected animals, 16.67% farmers said they observed nodules on skin, 13.33% said that nodules on mucus membrane, 11.67% were said that nodules on internal organs and low milking drops, 10% said that lameness and 6.67% were said that high fever were observed during the outbreak of LSD.

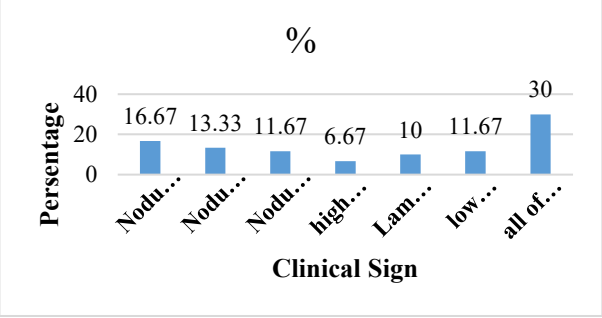

Fig. No. 4. Farmers' knowledge about the clinical signs and features of LSD

Farmers' knowledge about the routes of transmission of LSD

Fig. No. 5 indicates the knowledge regarding the routes of transmission of LSD, from 60 farmers 18 (30%) said that transfer from animal to animal, 10 (16.67%) said that it is a vector born disease, 20 (33.33%) farmers said through biting fillies, 8 (13.33%) said used same needle 4 (6.67%) said that during export and import of the animals.

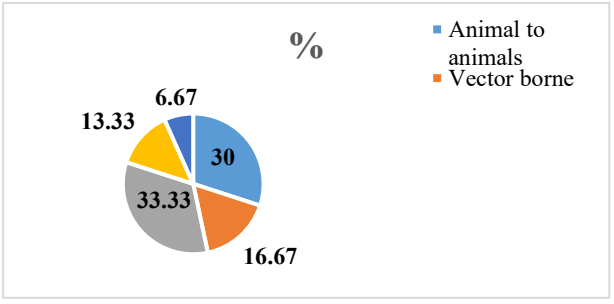

Fig. No. 5. Farmers' knowledge about routes of transmission of LSD

Association of risk factors with LSD disease in dairy and beef cattle farms in Karachi

The prevalence of LSD was non-significantly varied between farms, with 30 out of 60 responses, 30 (50%) farmers having poor farm hygiene (Table No. 7). Analysis between cattle herd size mostly small cattle herd 25 (41.66%) are most infected with LSD in study area in beef and dairy farms shows significant difference between different cattle herd size (P = 0.2185), mostly farmers are done the LSD vaccination on time the statistical results shows highly significant different among resonance 60 (100%), The months showed significant association with prevalence of LSD where the highest prevalence rate was found to be in May (63.33%) April (21.66), June (15%) when compared with other months during outbreak.

In addition, 50 farmers (83.33%) responded that LSD infection is spread mainly from their own herd, and 10 (16.66%) responded that spread from outside of the farm was significantly higher. Moreover, the number of infected cattle significantly increased in cattle with a common water source, 52 (86.66).

Variables	Category	Response /60	%	Statistics
Farm Hygiene				
	Good	10	16.66	X^2 7.62
	Medium	20	33.33	P-Value 0.0222
	Poor	30	50	DF 2
Cattle herd size				
	Small	25	41.66	Chi-Square 3.04
	Medium	13	21.66	P-Value 0.2185
	Large	22	36.66	DF 2
LSD vaccination				
	Yes	60	100	Chi-Square 45.00 P-values 0.000
	No	00	00	DF 1
	April 2022	13	21.66	Chi-Square 17.19
	May 2022	38	63.33	P-Value 0.0002
	June 2022	9	15	DF 2
Replacement cattle				
	From one's own herd	50	83.33	Chi-Square 18.70
	From outside	10	16.66	P-values 0.000
Watering system				DF 1
	Common drinking place	52	86.66	Chi-Square 21.70
	Separate drinking place	8	13.33	P-values 0.000 DF 1

Table No. 7. Association of risk factors with LSD disease in dairy and beef cattle farms in Karachi

Epidemiological features of LSD outbreaks in dairy and beef cattle farms in Karachi

Table No. 8 present the epidemiological features of LSD in the study area, highest prevalence were recorded in exotic breed a total 4550 animals were examined in which 3141 (69.03%) infected, followed by indigenous breed 4223 were examined and 2037 (48.23) the morbidity and mortality rate was higher in exotic breed 69.03% and 52.34% respectively, similarly in indigenous breed the rate were recorded 48.23 and 51.25% respectively.

S.no	Breeds of cattle	No of examined animals	No of infected animals	%	No of dead animals	Morbidity rate %	Mortality rate %
1.	Indigenous breeds	4223	2037	48.23	1044	48.23	51.25
2.	Exotic breeds	4550	3141	69.03	1644	69.03	52.34
	Total	8773	6085		2688	69.36	44.17

Table No. 8. Epidemiological features of LSD outbreaks in dairy and beef cattle farms in Karachi

Percentage of effective treatment and cases recovered in a day.

Table No. 9 shows the percentage of effective treatment used by the dairy and

beef cattle farms. 16 (26.66%) farmers replied that antibiotics are more effective. Animals recovered in 8 days, 14 (23.33%) farmers replied that injectable vitamins are adequate. Infected animals are recovered within 15 days, whereas 13 (21.66%) farmers responded that meloxicam injection is effective during the outbreak of the LSD and animals were recovered within twelve days, 12 (20%) farmers used the ivermectin injection and the recovery rate was 6 days, and 5 (8.33%) farmers used wound spray on the infected areas on the animal body during then outbreak of LSD, and recovered in 10 days.

Treatment	Total # of farms/response	Effective %	Recovery in days
Antibiotics	16	26.66	8 days
Meloxicam	13	21.66	12
Vitamins	14	23.33	15
Ivermectin	12	20	6
Wound spray	5	8.33	10
Total	60	100	

Table No. 9. Percentage of effective treatment and cases recovered in a day by dairy farmers.

Discussion

This study provides an epidemiological analysis of Lumpy Skin Disease (LSD) within the cattle population of Karachi, Pakistan. The findings indicate a significant disease burden, with notable variations linked to farm type, location, and animal demographics. A markedly higher prevalence was observed in dairy farms (27/30; 90%) compared to beef cattle farms (10/30; 33.33%). This disparity is statistically significant ($P < 0.05$) and aligns with patterns observed in other intensive production systems. The elevated prevalence in dairy units may be attributed to higher animal density, heightened physiological stress from sustained lactation, and potentially greater vector attraction in environments associated with feed and waste management. These results corroborate findings from Egypt, where high intra-herd prevalence was documented in dairy settings (Selim et al., 2021), and contrast with lower prevalence rates reported in more extensive beef production systems in Ethiopia (6.4%) and Uganda (8.7%) (Ochwo et al., 2019).

Geospatial analysis within Karachi revealed the highest prevalence in the Landhi cattle colony, where 95% of surveyed dairy farms and 45% of beef farms were affected. The lowest prevalence was recorded along the National Highway (80% and 40%, respectively). This geographical clustering likely reflects differences in farm management practices, biosecurity levels, vector density, and animal movement patterns. Such focal hotspots are consistent with outbreaks reported in Turkey and Saudi Arabia, in which specific provinces bore a disproportionate disease burden due to similar risk factors (Kasem et al., 2018; Vessae et l., 2024).

Concerning host factors, the prevalence of LSD infection was higher in female cattle (98.4% in dairy, 44.1% in beef) compared to males (71.05% and 43.97%, respectively). However, this difference was not statistically significant for sex alone. This observation aligns with some studies (Elhaig et al., 2017; Kiplagat et al., 2020) but contradicts others that identified males as more susceptible, possibly due to work-related stress (Acharya et al., 2020; Gari et al., 2010). The higher prevalence in females in our study may be linked to the physiological stresses of lactation and pregnancy, which can modulate immune competence (Kasem et al., 2018). Age was a significant factor, with the highest infection

rates in cattle aged 2-5 years and the lowest in animals under 1 year old. This pattern is well-documented (Selim et al., 2021; Elhaig et al., 2017) and is likely due to waning maternal immunity in young adults combined with increased exposure, whereas calves may benefit from both maternal antibodies and management practices that limit their exposure to vectors.

A critical finding was the significantly higher morbidity (69.03%) and mortality (52.34%) observed in exotic and crossbred cattle compared to indigenous breeds. This confirms the well-established greater susceptibility of Bos taurus and their crosses to severe LSD (Klement, 2018; Tageldin et al., 2014; Siyal et al., 2021). The lower innate resistance in these high-producing breeds, possibly compounded by heat stress and intensive management, underscores a significant production risk in dairy-focused systems. The clinical presentation observed, characterised by skin nodules, fever, lameness, and milk drop, was pathognomonic for LSD and consistent with classic descriptions (Hunter & Wallace, 2001). Regarding transmission dynamics, farm-level risk factors such as the introduction of new animals, shared water sources, and poor biosecurity were implicated, supporting previous evidence (Gari et al., 2010; Ahmad et al., 2025). The widespread presence of biting insects noted across farms strongly suggests mechanical vector transmission played a significant role in the outbreak, a primary driver recognised in LSD epidemiology (Alkheraije, 2025; Yilmaz et al., 2025).

The treatment protocols implemented during the outbreak, which included antibiotics (to control secondary bacterial infections), ivermectin (for parasite control), meloxicam (as an anti-inflammatory and antipyretic), and vitamin supplements, represent a standard supportive care approach. As no specific antiviral exists, such supportive and prophylactic measures are the cornerstone of clinical management (Das et al., 2021; Imran et al., 2021).

Innovation statement

This study provides an updated epidemiological assessment of Lumpy Skin Disease in major cattle production areas of Karachi, Pakistan. The research contributes to disease surveillance by generating farm-level prevalence data and identifying key risk factors associated with LSD outbreaks. The structured questionnaire-based data collection and comparative analysis between dairy and beef cattle farms provide valuable insights for improving disease monitoring and management strategies. The findings may support improved livestock health management practices, vaccination programs, and evidence-based control strategies for LSD in cattle populations.

Conclusions

It was concluded from the present study that dairy farms are more infected (90%) in the study area for LSD. Landhi Cattle Colony is the most infected area of LSD in Karachi as compared to other study areas. Infection with LSD was higher in females, young, and old animals. Mostly, farmers know the clinical signs and routes of transmission of LSD. Associated risk factors that contribute to the spread of the disease include farm hygiene, cattle herd size, timing of vaccination, seasons, movement of animals within or between farms, vectors, and familiar water sources. The infection rate was higher in exotic breeds compared to indigenous breeds. Morbidity percentages were recorded in the study area. Mostly, farmers used antibiotics, antipyretics, ivermectin, and vitamins in LSD-infected animals. The average recovery time was 15 days.

Recommendations

A strategy should be designed to manage the farm. Sanitation, hygiene, and proper vaccination programs should be followed. Further studies on LSD should be conducted in other species of livestock in Sindh Province. Further genetic analysis of the LSD virus should be performed to demonstrate the presence of genotypes of viruses that were identified.

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Conflict of interest

The authors have declared no conflict of interest.

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(Annexure A)

Selected Areas	S. No.	Dairy Farms	number of animals	S. No.	Beef Farms	number of animals
	1.	Ajmar Dairy Farm	150	11.	Ayoob Memon Cattle Farm	86
	2.	J.D Dairy Farm	200	12.	Imtiaz Cattle Farm	80
	3.	Gujjar Dairy Farm	82	13.	Takal Farm	180
	4.	Memon Dairy Farm	210	14.	Farroq Cattle Farm	120
Landhi cattle colony	5,	Hussain Khoja Dairy Farm	186	15	Noor Nagori Cattle Farm	96
	6.	Mushtaque Dairy Farm	170	16.	Landhi Cattle Farm	68
	7.	Mehran Dairy Farms	86	17.	Shahnawaz Cattle Farm	88
	8.	Madina Dairy Farm	306	18.	Ghulam Farm	140
	9.	Zeshan Dairy Farm	166	19.	Sikandar Cattle Farm	200
	10.	M.D.F Dairy Farm	156	20.	Sultaan Cattle Farm	110
	1.	Hanan Dairy Farm	310	11.	Farasko Cattle Farm	80
	2.	Haji Shabeer Dairy Farm	206	12.	UDF Cattle Farm	90
	3.	haji Nawaz Dairy farm	300	13.	FIBBT Cattle Farm	330
National highway	4.	Golden Star Dairy Farm	76	14.	Al.Noor Cattle Farm	205
	5.	Abdul Jabbar Ghabool Dairy Farms	220	15.	Shakis Cattle Farm	86
	6.	Abu Bakar Dairy Farm	116	16.	ES Cattle Farm	60
	7.	MashaAllah Dairy Farm	160	17.	Paradise Cattle Farm	90
	8.	Hoor Dairy and Cattle Farm	260	18.	RJ Cattle Farm	86
	9.	Allah Dino Gabool Cattle Farm	76	19.	MM Cattle Farm	60
	10.	Nadir Dairy Farm	60	20.	Markhor Cattle Farm	86
	1.	Indus Dairy Farm	170	11.	Brohi Cattle Farm	88
	2.	Zeab Dairy Farm	86	12.	Amir Cattle Farm	92
	3.	Shah Dairy Farm	110	13.	Dil Pasand Cattle Farm	108
	4.	Danyal Dairy Farm	170	14.	Badal Cattle Farm	156
Memon Goth	5.	Major Dairy Farm	146	15.	Jamal Cattle Farm	130
	6.	Chudhuary Dairy Farm	200	16.	Kundhi Cattle Farm	100
	7.	Shakeel Dairy Farm	300	17.	Afridi Cattle Farm	150
	8.	Haji Haroon Dairy and Cattle Farm	300	18.	Jinnah Cattle Farm	160
	9.	Ghul Dairy and Farm	176	19.	Shah Cattle Farm	128
	10	Farhan Dairy and Cattle	86	20	Khan Cattle Farm	80
		Total dairy farms (30)	5240		Total dairy farms (30)	3533

Table No 1: Examination of study areas for lumpy skin disease, in Karachi, Sindh **(Annexure B)**

Dairy Farms	number of examined animals	Number of animals infected	Expected	Prevalence %	Beef Farms	number of examined animals	Number of animals infected	Expected	Prevalence %
Ajmar Dairy Farm	150	130	137.03	86.66	Ayoob Memon cattle farm	86	46	39.17	53.48
J.D. Dairy Farm	200	182	182.71	91	Imtiaz cattle farm	80	38	36.43	47.5
Gujjar Dairy Farm	82	72	74.91	87.80	Takal farm	180	82	81.98	45.55
Memon Dairy Farm	210	198	191.845	94.28	Farroq cattle farm	120	60	54.65	50
Hussain Khoja dairy farm	186	174	169.92	93.54	Noor Nagori Cattle Farm	96	32	43.72	33.33
Mushtaque Dairy Farm	170	160	155.30	94.11	Landhi cattle farm	68	36	30.97	52.94
Mehran Dairy Farms	86	72	78.56	83.72	Shahnawaz cattle farm	88	34	40.08	38.63
Madina Dairy Farm	306	290	279.54	94.77	Ghulam farm	140	82	63.76	58.57
Zeshan Dairy Farm	166	144	151.64	86.74	Sikandar cattle farm	200	58	91.09	29
M.D.F. dairy farm	156	142	142.51	91.02	Sultaan Cattle Farm	110	64	50.10	58.18
Total	1712	1564	1564	91.3	Total	1168	532	532	45.54

Chi-Square:142.84, P-value: 0.0000, DF: 19

Table No. 2. Farm-wise prevalence of Lumpy skin disease at Landhi cattle colony, Karachi

(Annexure C)

Dairy Farms	number of examined animals	Number of animals infected	Expected value	%	Beef Farms	number of examined animals	Number of animals infected	Expected value	%
Hanan dairy farm	310	280	280.45	90.32	Farasko cattle farm	80	32	28.91	40
Haji Shabeer Dairy Farm	206	186	186.36	90.29	UDF cattle farm	90	32	32.53	35.55
haji Nawaz Dairy farm	300	280	271.41	93.33	FIBBT cattle farm	330	120	119.28	36.36
Golden Star Dairy Farm	76	62	68.75	81.57	Al.Noor Cattle Farm	205	52	74.10	25.36
Abdul Jabbar Ghabool dairy farms	220	200	199.03	90.90	Shakis cattle farm	86	28	31.08	32.55
Abu Bakar Dairy Farm	116	110	104.94	94.82	ES cattle farm	60	12	21.68	20
MashaAllah Dairy Farm	160	152	144.75	95	Paradise cattle farm	90	32	32.53	35.55
Hoor dairy and cattle farm	260	242	235.22	93.07	RJ cattle farm	86	42	31.08	48.83
Allah Dino Gabool Cattle Farm	76	62	68.75	81.57	MM cattle farm	60	32	21.68	53.33
Nadir Dairy Farm	60	40	54.28	66.66	Markhor cattl	86	42	31.08	48.83

					e farm				
Total	1784	1614	1614.00	90.47	Total	1173	424	424.00	36.14

Chi-Square: 215.33, P-value: 0.0000, DF: 19

Table No. 3. Farm-wise prevalence of Lumpy skin disease at Superhighway cattle colony, Karachi

(Annexure D)

Dairy Farms	**number of animals**	**Infected animals**	**Expected value**	**Prevalence %**	**Beef Farms**	**number of animals**	**Infected animals**	**Expected value**	**Prevalence %**
Indus Dairy Farm	170	154	150.99	90.58	Brohi Cattle Farm	88	12	29.67	13.63
Zeab Dairy Farm	86	62	76.38	72.09	Amir Cattle Farm	92	32	31.02	34.78
Shah Dairy Farm	110	100	97.70	90.90	Dil Pasand Cattle Farm	108	54	36.42	50
Danyal Dairy Farm	170	160	150.99	94.11	Badal Cattle Farm	156	56	52.61	35.89
Major Dairy farm	146	136	129.67	93.15	Jamal Cattle Farm	130	30	43.84	23.07
Choudhury Dairy Farm	200	175	177.63	87.5	Kundhi Cattle Farm	100	26	33.72	26
Shakeel Dairy Farm	300	250	266.45	83.33	Afridi Cattle	150	74	50.58	49.33

					Farm				
Haji Haroon Dairy and Cattle Farm	300	274	266.45	91.33	Jinnah Cattle Farm	160	44	53.95	27.5
Ghul Dairy Farm	176	162	156.32	92.04	Shah Cattle Farm	128	48	43.16	37.5
Farhan Dairy and Cattle	86	76	76.38	88.37	Khan Cattle Farm	80	26	26.97	32.5
Total	1744	1549	1549.00	88.81	Total	1192	402	402.00	33.72

Chi-Square: 239.13, P-value: 0.0000, DF: 19

Table No. 4. Farm-wise prevalence of Lumpy skin disease at Memon Goth cattle colony, Karachi