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Prevalence and Risk Factors of Lumpy Skin Disease in Pakem District, Yogyakarta

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ABSTRACT

Lumpy Skin Disease (LSD) is an infectious dermatological condition affecting ruminant animals, particularly cattle, and is caused by the Lumpy Skin Disease Virus (LSDV). This virus possesses DNA genetic material derived from the *Capripoxvirus* genus within the *Poxviridae* family. The World Organization for Animal Health (WOAH) states that LSD has a mortality of 1-5% and a morbidity of 10-20% and can spread quickly if not handled properly. This study aimed to determine the prevalence of LSD and to identify associated risk factors in Pakem District, Yogyakarta. This research used a cross-sectional study. Samples were taken using a double-stage sampling technique with a total sample of 262 cattle. The study employed primary data collected through interviews with farmers. Data was analyzed descriptively and analytically. Data in the form of frequencies and percentages were analyzed using univariate methods. The relationship between risk factors and the incidence of LSD was analyzed using bivariate Chi-Square methods. The results showed that the prevalence of LSD in the Pakem District was 7.6%. The presence of ticks was identified as a risk factor for LSD disease, with a probability value of $p<0.05$. The association's strength was indicated by an odds ratio (OR) of 2.64, suggesting that ticks may elevate the risk of contracting LSD by a factor of 2.64. The prevalence of LSD in Pakem District was 7.6%, and the presence of ticks 2.64 times increases the risk of LSD incidents. Control measures can be improved by carrying out livestock management in handling vectors.

Key words: Risk Factors, *Lumpy Skin Disease*, Prevalence, Pakem District

ABSTRAK

Lumpy Skin Disease (LSD) merupakan salah satu penyakit kulit infeksius pada hewan ruminansia, seperti sapi, yang disebabkan oleh *Lumpy Skin Disease Virus* (LSDV). Virus ini bermateri genetik DNA dari genus *Capripoxvirus* dan famili *Poxviridae*. *World Organization of Animal Health* (WOAH) menyebutkan LSD memiliki mortalitas 1-5% dan morbiditas 10-20%, serta dapat menular dengan cepat jika tidak ditangani dengan baik. Penelitian ini bertujuan untuk mengetahui prevalensi dan mengidentifikasi faktor risiko LSD di Kecamatan Pakem, Yogyakarta. Penelitian ini menggunakan kajian lintas seksional. Sampel diambil menggunakan teknik sampling tahapan ganda dengan jumlah sampel sebanyak 262 ekor sapi. Penelitian menggunakan data primer dengan melakukan wawancara terhadap peternak. Data dianalisis secara deskriptif dan analitik. Data berupa frekuensi dan persentase dianalisis secara univariat. Asosiasi faktor risiko dengan kejadian LSD dianalisis secara bivariat menggunakan Uji *Chi-Square*. Hasil penelitian menunjukkan bahwa prevalensi LSD di Kecamatan Pakem sebesar 7,6%. Penyakit LSD memiliki faktor risiko berupa keberadaan caplak dengan nilai probabilitas (p_value < 0,05). Kekuatan asosiasi ditunjukkan dengan nilai *odd ratio* (OR) sebesar 2,64 sehingga caplak dapat meningkatkan risiko terjangkit LSD sebesar 2,64 kali lebih besar. Prevalensi LSD di Kecamatan Pakem sebesar 7,6% dan keberadaan caplak 2,64 kali meningkatkan risiko kejadian LSD. Tindakan pengendalian dapat ditingkatkan dengan melakukan manajemen peternakan dalam penanganan vektor.

Kata kunci: Faktor risiko, *Lumpy Skin Disease*, Prevalensi, Kecamatan Pakem

INTRODUCTION

Lumpy Skin Disease (LSD), referred to as pseudo-urticaria, neethling virus disease, exanthema nodularis bovis, and knopvelsiekte, is a disease caused by the LSD virus (LSDV), which belongs to the Capripoxvirus genus within the Poxvirus family. This disease primarily infects cattle (Bos spp.) and buffalo (Bubalus spp.) (Ratyotha *et al*., 2022).

The clinical symptoms seen in LSD-infected cattle are fever (40.0°C–41.5°C), lacrimation, nasal secretions, hypersalivation, lethargy, anorexia, and weakness. These symptoms are usually followed by nodular lesions on the skin and mucous membranes throughout the body. These lesions can infect down to the muscle layer and cause necrotic tissue and scarring, aggravating clinical symptoms and giving rise to secondary infections such as myiasis (Ratyotha et al., 2022).

The spread of LSD can occur due to the movement of livestock from infected areas, making LSD a transboundary animal disease (TAD). Therefore, LSD is listed as a notifiable disease on the World Organization of Animal Health (WOAH) list (Sendow et al., 2021).

The morbidity rate associated with LSD is approximately 10-20%, while the mortality rate ranges from 1-5% (Bala et al., 2023). The incubation period varies from 2 to 5 weeks; however, experimentally, fever manifests 6 to 9 days after inoculation, while nodules develop between four and 20 days post-inoculation. The OIE establishes the incubation period for LSD at 28 days (Sendow et al., 2021).

The transmission of LSD can occur via various vectors, including mosquitoes (*Aedes aegypti*, *Anopheles stephensi*, *Culex quinquefasciatus*, and *Culicoides nubeculosus*), ticks (*Rhipicephalus appendiculatus*, *Rhipicephalus decoloratus*, and *Amblyomma hebraeum*), and Diptera (*Haematopota* spp. and *Stomoxys calcitrans*). LSDV can persist on skin nodules for up to one month and at least three weeks on air-dried skin. The virus is excreted through blood, nasal secretions, saliva, ear holes, semen, and milk and can be transmitted to suckling calves. In general, vectors facilitate the spread of LSDV through both mechanical and biological transmission (Sendow et al., 2021).

Based on its chemical properties, the LSD virus can be inactivated by the following agents: alcohol, 20% ether, chloroform, 1% formalin, detergent (sodium dodecyl sulfate), 2% phenol, 2-3% sodium hypochlorite, 3% iodine compounds, 2% Virkon®, and 5% quaternary ammonium compounds. Given the characteristics of this virus, it is essential to utilize disinfectants appropriately to decontaminate both workers and the environment during field sampling, laboratory work, and waste treatment, as well as in disinfecting the work environment (Sendow et al., 2021). This study aimed to assessed the prevalence and identify the risk factors associated with LSD in Pakem District, Yogyakarta.

MATERIALS AND METHOD

This study employed a cross-sectional design, utilizing a double-stage sampling technique to obtain 262 cattle in the Pakem District. It utilized primary data collected via questionnaires and interviews conducted with farmers in the villages of Hargobinangun, Purwobinangun, Harjobinangun, and Candibinangun.

The data were analyzed descriptively to assess the characteristics of the respondents (farmers) and analytically to evaluate the risk factors for DSD. They were analyzed univariately and presented as frequencies and percentages. The relationship between risk factors and the incidence of DSD was analyzed using bivariate chi-square analysis.

RESULTS

Univariate Analysis

The mean age of farmers in this study was 55.54 years, with a standard deviation of 11.54. According to Utama (2020), this figure encompasses the productive age of farmers, specifically ranging from 20 to 65 years. The gender distribution among farmers was 80.7% male and 19.3% female. The percentage of farmers based on their highest level of education was as follows: S2 at 2.5%, S1/D2/D3 at 3.5%, SMA/SMK at 36.1%, SMP at 20.3%, SD at 33.2%, and those who did not complete SD at 4.5%. The highest level of education attained by farmers in the Pakem District was SMA/SMK.

Prevalence of LSD

The prevalence LSD was assessed in each village within the Pakem District. Table 2 indicates that the prevalence of LSD in Pakem District was 7.63%. The highest prevalence was observed in Purwobinangun Village at 27.5%, whereas the lowest was recorded in Candibinangun at 0.0%.

The distribution of LSD was measured in each village in the Pakem District. Figure 1 illustrates that Purwobinangun Village exhibits the highest prevalence of 27.5%, indicated by the darkest color (dark red), while Candibinangun shows the lowest prevalence at 0.0%, represented by white. Additionally, there was no data available regarding LSD disease in Pakembinangun Village.

Table 1. Respondent Characteristics

Variables		Number	Percentage (%)	
Age		202		55.54±11.54
Gender	Male	163	80.7	
	Female	39	193	
Education	S2	5	2.5	
	S1/D2/D3	7	3.5	
	SMA/SMK	73	36.1	
	SMP	41	20.3	
	SD	67	33.2	
	Incomplete SD	9	4.5	
Duration of Farming	< 1 year	4	2	
	1-3 years	11	5.4	
	> 3 years	187	92.6	

Table 2. Prevalence of LSD in Pakem District, May 2024

Village	Cattle with LSD	Sample	Prevalence
Hargobinangun	3	143	2.09%
Purwobinangun	11	40	27.5%
Harjobinangun	6	74	8.10%
Candibinangun	0	5	0.00%
Pakem	20	262	7.63%

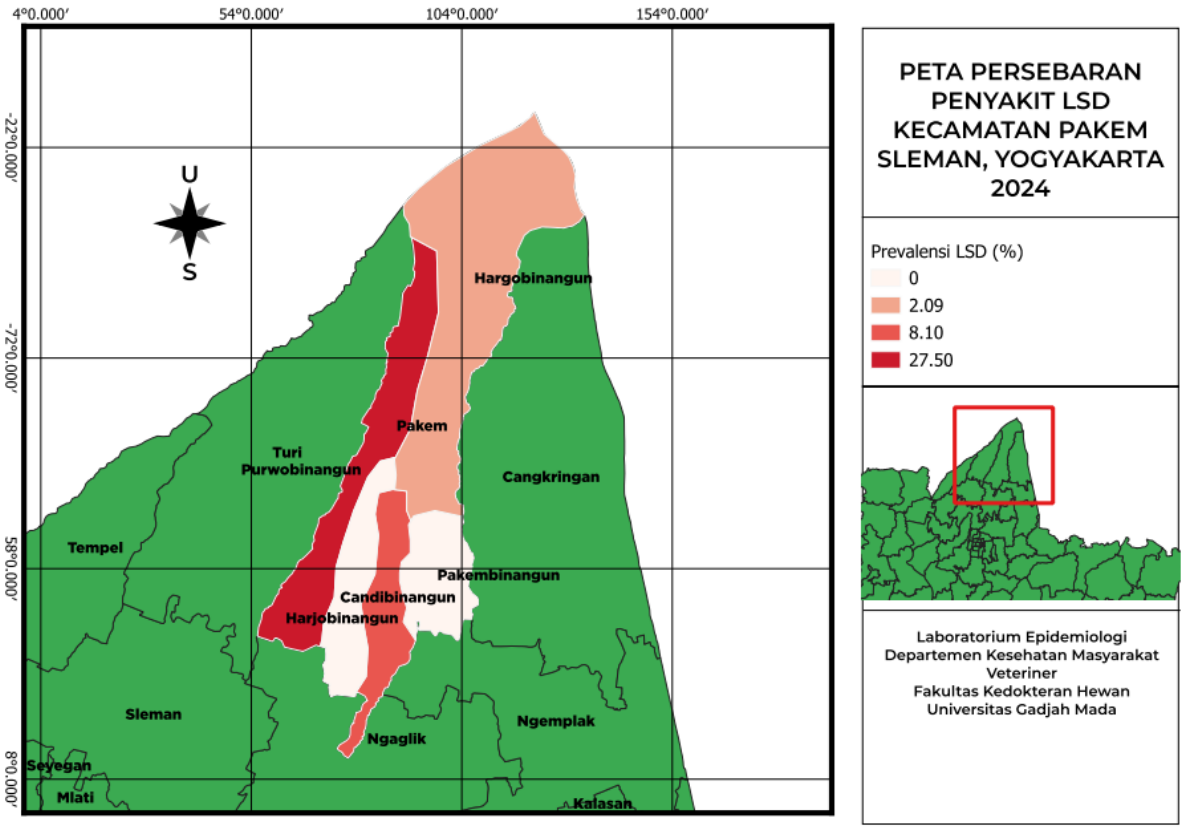

Figure 1 Map of LSD Disease Distribution in Pakem District.

Bivariate Analysis

The analysis of the variables conducted through a bivariate test (Table 3) indicates a significant association between ticks and LSD disease, evidenced by a p-value of 0.04 and an odds ratio (OR) of 2.64 (95% CI 1.02-6.84).

DISCUSSION

Univariate Analysis

Daulay and Ermansyah (2022) report that the livestock subsector comprises 3,011,826 male workers (60.61%) and 1,957,166 female workers (39.39%). This indicates a higher number of male farmers compared to female farmers. Data from Mulyawati (2016) shows that farmers are predominantly elementary school graduates (71.05%). Kanisius (1993) asserts that knowledge of animal husbandry is a crucial factor in the success of a livestock business, as farmers must possess the necessary knowledge, skills, and experience to navigate the challenges they encounter.

Prevalence of LSD

The prevalence of LSD in the Pakem District was 7.63%. This may be due to the incubation period of LSD disease lasting 1-4 weeks with a morbidity rate varying between 3-85%, while the mortality rate was 1-3% (Abutarbush, 2017). The prevalence rate of LSD disease ranged from 1% -2% to 80-90%, depending on the situation in the area where the disease occurs. The prevalence of LSD in the Pakem District is moderate in comparison to other regions. The prevalence rates of LSD in other regions are as follows: 24% in Egypt, 29% in Russia, 19.5% in China, 13.93% in India, 78% in Bangladesh, 4.17% in Thailand, 5.9% in Mongolia, and 36.2% in Ethiopia (Ratyotha *et al,* 2022). A study conducted by Murti et al. (2024)especially leading up to Eid al-Adha because the legal requirements for sacrificial animals are that they are healthy and without defects. The aim of this paper was to determine prevalence and progression of LSD in cattle in Cirebon District from January to June 2023 or over the six months leading up to Eid al-Adha in 2023. Data on LSD infected, recovered, forcibly slaughtered and killed cattle due to LSD were needed. During this period, LSD has spread to 82 villages in 32 sub-districts with 454 cases out of a total cattle population of 4373 (prevalence was 10.83% states that the prevalence of LSD in cattle in the Cirebon area, West Java, reached 10.83%.

Bivariate Analysis

The transmission of the LSDV is mainly facilitated by hematophagous insects. Multiple hematophagous arthropods have been recognized as vectors for LSDV on farms (Akther et al., 2023; Bianchini et al., 2023; Sohier et al., 2019), including house flies (*Musca domestica*), horn flies (*Haematobia irritans*), mosquitoes (*Aedes aegypti*), and various ticks (*Dermacentor marginatus*, *Hyalomma asiaticum*, *Rhipicephalus appendiculatus*, *Rhipicephalus decoloratus*, and *Amblyomma hebraeum*) (Annandale et al., 2013; Gubbins, 2019; Gupta et al., 2020; Sultankulova et al., 2022).

The LSD virus can be transmitted by insect vectors both from sick to sick animals and from sick to healthy animals that are susceptible to LSD (Haegeman et al., 2023; Sanz-Bernardo et al., 2021; Sohier et al., 2019). Spatial research in Thailand shows insect vectors influence LSD outbreaks in densely populated or adjacent livestock areas. It is estimated that LSD transmission in the outbreak area occurs within a radius of 0.2-0.8 km, so insect vectors play a major role in increasing the risk of LSD transmission (Modethed et al., 2023; Punyapornwithaya et al., 2023).

The transmission mechanism of the LSD virus via ticks is complex and varies by species. At each life cycle stage, larvae, nymphs, and adult female ticks may utilize different hosts, including various host species, distinct individuals of the same species, or the same individual host. Ticks are capable of transmitting the LSD virus transcardially, allowing nymphs that develop from larvae infected with the LSD virus to transmit the virus to the adult stage (Lubinga et al., 2013).

Virulence factors of the tick are located in the saliva, hematocytes, synganglia, ovaries, testes, fat bodies, and midgut. The presence of the LSD virus in these organs confirms that the transmission pathways of the LSD virus from ticks differ (Lubinga et al., 2014). Female organisms can pass LSDV to the subsequent generation of larvae via their eggs, enabling the larvae to subsequently infect other cattle (Tuppurainen et al., 2013). The virus may also transfer to the male's mouth while consuming an infected animal. During copulation, the LSD virus is transmitted to the female via the seminal sac, which is situated around the mouth and enters through the genital opening (Sprygin et al., 2019).

Ticks significantly contribute to the risk of LSD transmission, evidenced by an odds ratio of 8.6 in Hulu District, Riau Province, in 2022 (Susanti et al., 2023). Consequently, it is essential to enhance insect vector control in regions vulnerable to LSD, particularly for unvaccinated cattle. Tick control can be attempted

Table 3. Risk Factor of Lumpy Skin Disease

Aspects	Variables	LSD (+)	LSD (-)	CI 95%	P-Value	OR
Farmer Knowledge	Attend LSD Counseling					
	No	7	13	0.17-1.15	0.85	-
	Yes	13	10			
Farm Management	**Types of Cattle**					
	Dairy Cattle	19	22	0.18-11.381	1.00	-
	Beef Cattle	1	17			
	Sex of Cattle					
	Female	14	16	0.41-2.99	0.84	-
	Male	6	78			
	Disinfection once a week					
	No	3	50	0.19-2.40	0.54	-
	Yes	17	19			
	Sanitation of Cattle Shed					
	Dirty (cattle feces > 50% in the stall)	5	50	0.44-3.69	0.86	-
	Clean (cattle feces < 50% in the stall)	15	19			
	Source of Water					
	River	9	11	0.36-2.26	0.83	-
	Wells	11	12			
	Floor Condition					
	Poor (potholes, muddy, waterlogged > 30%)	6	42	0.74-5.62	1.60	-
	Decent (no potholes, dry, waterlogged < 10%)	14	20			
	Lighting of Cattle Shed					
	Poor (dim during the day, sunlight cannot enter)	3	13	0.81-11.97	0.21	-
	Decent (bright, sunlight can enter)	17	22			
	Manure Management					
	Left around the cage	15	18	0.35-2.90	1.00	-
	Processed into biogas/fertilizer	5	61			
	Cattle Having Contact with Cattle from Other Farms					
	Yes	5	59	0.36-2.97	1.00	-
	No	15	18			
	Waste Disposal Location					
	Near	13	143	0.50-3.34	0.60	-
	Far	7	99			
LSD Vector	**Flies**					
	Yes	19	207	0.42-24.77	0.40	-
	No	1	35			
	Mosquitoes					
	Yes	18	173	0.81-15.88	0.13	-
	No	2	69			
	Ticks					
	Yes	13	100	1.02-6.84	**0.04**	2.64
	No	7	142			

by adding chemicals, namely lindane, toxaphene (chloro-hydrocarbon), coumadioksation, diazinon (organo-phosphate), carbaryl arbiters (carbonate), and pyrethroid synthesis and control by dipping using a suitable acaricide (Kristina, A. D and Setiyono, A., 2020). Furthermore, starlings can control ticks, as these birds help decrease the tick population by consuming parasites found in cattle (BPTU-HPT, 2022).

CONCLUSION

The prevalence of DHF in the Pakem District was 7.6%. In Pakem District, ticks are a risk factor for DHF, increasing the likelihood by a factor of 2.64. Effective farm management in vector handling can enhance control measures.

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