Evaluating Cattle Farmers' Awareness of Lumpy Skin Disease: Insights on Transmission, Prevention, and Control in Tiruvarur District, Tamil Nadu, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

The present study aimed to evaluate the level of awareness among cattle farmers about Lumpy Skin Disease (LSD), including its general aspects, transmission, and preventive measures, in the Tiruvarur district of Tamil Nadu. The study involved 218 cattle farmers who visited the various Veterinary Dispensaries in Tiruvarur district of Tamil Nadu. Data were collected through personal interviews using a pre-tested and semi-structured interview schedule. The level of awareness was assessed based on the mean scores obtained from the respondents. The findings revealed that while respondents demonstrated a higher level of awareness regarding LSD affecting cattle, they lacked knowledge about viral diseases that cause abortion in dairy animals. Respondents showed greater awareness about the 'introduction of infected animals into the herd.' Still, they had less awareness about the role of 'contaminated feed and water' in disease transmission, as well as the movement of cattle and the impact of ticks, mosquitoes, and flies in transmitting the disease. Concerning preventive and control measures, respondents were more aware that vaccination is an effective method for controlling LSD but had less awareness regarding the role of fomites in transmitting the LSD virus between animals and the effectiveness of controlling ticks, flies, and mosquitoes in disease prevention. "Social media was identified as one of the significant sources of information for farmers. However, it needs to be streamlined to ensure the dissemination of accurate and scientific information about the disease, facilitating more effective disease prevention and control."

1. INTRODUCTION

The World Organization for Animal Health (WOAH) defined Lumpy skin disease (LSD) as a transboundary, notifiable, contagious, vector-borne, non-zoonotic, viral disease of significant concern, primarily affecting cattle and buffalo [1]. It is characterized by the eruption of skin nodules, high fever, lacrimation, and nasal discharge [2,3]. Sheep and goats were generally resistant to the LSD virus [4]. It affects cattle of all ages and breeds, young cattle and those in peak lactation are particularly vulnerable and the milk yield may decrease up to 50 per cent [5,6]. The disease leads to considerable economic losses in the cattle industry, including reduced milk production, chronic emaciation, stunted growth, mastitis, infertility, abortion, and, in severe cases, death [7,8]. Extensive outbreaks of this disease are often driven by the presence of immunologically naive animals, an abundance of active blood-feeding vectors, and uncontrolled animal movement [9]. The initial case is typically linked to the introduction of new animals into a herd or their close proximity. Morbidity rates for LSD range from 2 per cent to 45 per cent, with mortality rates generally below 10 per cent [10]. Host susceptibility varies with immune status, age, and breed. High milk-producing European cattle breeds, such as Jersey and Holstein Friesian, are particularly susceptible compared to indigenous African and Asian breeds [11]. Cows with high milk production are usually the most severely affected. Although this virus is host-specific and mixed herds of cattle, sheep, and goats are common, there is no epidemiological evidence to suggest that small ruminants serve as reservoirs for LSDV [12,13]. "Animal disease surveillance" is essential for assessing the disease burden within a country and guiding authorities in implementing prevention and control strategies [14]. In recent years, LSDV caused huge outbreaks and economic losses in India [15]. The 'Integration of information and communication technology' (ICT) tools also play a crucial role in enabling the timely dissemination of data on disease outbreaks and forecasts [16]. Training and capacity-building initiatives are essential for enhancing farmers' knowledge and awareness regarding LSD [17]. In this context, the current research study was conducted to assess the awareness level of cattle farmers about LSD and to enhance their knowledge, as well as that of other stakeholders, regarding various control and prevention measures. This knowledge is critical for the effective containment of the disease.

2. METHODOLOGY

2.1 Sampling Area, Size and Data Collection

The present study was conducted on cattle farmers who visited the various Veterinary

Dispensaries within Tiruvarur district, Tamil Nadu, India from April 2024 to August 2024. semi-structured and pre-tested interview schedule was developed and a total of 218 respondents were interviewed. A set of twenty-two questions regarding Lumpy Skin Disease (LSD) which includes the important recommendations given by the experts, various published documents, and reports on the general disease awareness, transmission, and prevention and control measures of this disease were presented to the respondents. The awareness level was measured using a binary scoring system, where each correct answer was assigned a score of '1' and each incorrect answer a score of '0'. This scoring was applied to responses such as "Yes" and "No," or "Agree" and "Do not agree," respectively. The awareness score of general disease awareness, disease transmission, and prevention and control measures of a respondent was added to explore the awareness level of cattle farmers about Lumpy Skin Disease.

The awareness mean score of respondents was calculated using the following formula:

Awareness mean score = (Respondent's total obtained score) ÷ (Maximum possible score)

The numerator represents the total number of correct answers given by all respondents. The denominator, which is the maximum possible score, represents the total number of respondents in the study (218), denominator remains unchanged.

2.2 Statistical Analysis

The data collected were analyzed by chi-square test using the SPSS version 29. The results were used to assess the relationship between education level and awareness of Lumpy Skin Disease (General aspects); awareness level of LSD transmission and the awareness on prevention and control of LSD and its relation with independent variables.

3. RESULTS AND DISCUSSION

3.1 Awareness Level of Lumpy Skin Disease Related to General Disease Aspects

The awareness about the name "Lumpy Skin Disease" (LSD) affecting cattle had an awareness mean score of 0.96 and ranked first.

The awareness about the economic importance of disease had an awareness mean score of 0.83 and ranked second. The awareness of the causative agent is about 0.75 and secured third rank. Awareness about 'Lumpy skin disease causing a drastic reduction in milk yield' (0.72), Awareness about symptoms of LSD in cattle' (0.62), Awareness about 'Lumpy skin disease affecting cattle' (0.55), and Awareness about 'Lumpy skin disease leading to abortion in cattle' (0.42) secured fourth, fifth, sixth and seventh position respectively. Almost an equivalent result was reported by Gnare et al. [18] that the awareness of LSD among cattle keepers was 71.64 per cent.

The results of the study unveiled that, cattle farmers were more aware of the name "Lumpy skin disease" and least aware of the host affected by LSD, its symptoms, and the ability to cause abortion in cattle.

3.2 Awareness Level of Lumpy Skin Disease Related to Disease Transmission

The study revealed that respondents were most aware of the potential for disease transmission through the introduction of infected animals into the herd, which received the highest awareness score of 0.87. This was followed by awareness of disease transmission through direct contact between animals, which had a score of 0.79. Awareness regarding the consumption of milk from cattle affected by lumpy skin disease (LSD) was scored at 0.66, while awareness that arthropods such as ticks, mosquitoes, and flies can transmit the disease was scored at 0.62. Awareness of disease transmission through the movement of cattle and the contaminated feed and water received scores of 0.59 and 0.52, respectively, ranking them third, fourth, fifth, and sixth.

Respondents in the study area showed a greater understanding of the risk posed by infected animals when introduced into a herd and the increased risk of infection through direct animal contact. They were also aware that consuming milk from infected cattle is safe after thorough boiling (Table 2). However, there was less awareness among respondents regarding the transmission of disease through contaminated feed and water, cattle movement, and arthropods like ticks, mosquitoes, and flies.

Table 1. Distribution of respondents based on their general disease awareness

S. No	General Disease Awareness	Awareness mean score	Rank
1.	Did you hear of Lumpy Skin Disease?	0.96	I
2.	Lumpy skin disease is caused by a virus	0.75	III
3.	Awareness about Lumpy skin disease affecting cattle	0.55	VI
4.	Lumpy skin disease is considered an economically important disease of cattle	0.83	II
5.	LSD can lead to abortion in cattle	0.42	VII
6.	LSD can cause a drastic reduction in milk yield in dairy cattle	0.72	IV
7.	Symptoms of LSD in cattle	0.62	V

Table 2. Distribution of Respondents based on their Awareness of Disease Transmission

S. No	General Disease Awareness	Awareness mean score	Rank
1.	Introduction of infected animals to the herd can transmit the disease	0.87	I
2.	Contaminated feed and water can transmit disease to animals	0.52	VI
3.	Direct contact between animals can transmit the disease	0.79	II
4.	Movement of cattle	0.59	V
5.	Ticks, mosquitoes, and flies can transmit the disease	0.62	IV
6.	Milk from LSD-infected cattle is safe for consumption after boiling	0.66	III

It is suggested that while long-distance spread of the lumpy skin disease virus (LSDV) may occur through the movement of infected animals, the distinct seasonal patterns observed indicate that arthropod-borne transmission likely plays a significant role in the rapid, localized spread of the disease [19]. The findings underscore the need for educating cattle farmers on the importance of restricting cattle movement during the rainy season, the potential for virus survival in contaminated feed and water, and the implementation of control measures against ectoparasite infestations.

3.3 Awareness Level of Lumpy Skin Disease Related to Prevention and Control Measures

The study further indicated that vaccination is the most effective method for the prevention and control of Lumpy Skin Disease (LSD) in cattle, with an awareness mean score of 0.89, ranking first. This finding is consistent with a similar mean score of 0.86 reported in a study by Gunaseelan and Thilakar [20]. The awareness mean score for ethnoveterinary treatments as a supportive approach in conjunction with allopathic medicine for managing LSD was 0.83, ranking second. Ethno-veterinary medicines practices in conjunction with allopathy medicine may effectively counter the severity of the lumpy skin disease, thereby avoiding financial loss in the form of treatment costs and production losses to the farmers [1].

The mean awareness score for isolating cattle infected with the LSD virus was 0.82, placing it third. Cleaning and disinfection of animal shelters ranked fourth with a score of 0.72. The understanding that there is no specific treatment for LSD had a mean score of 0.69, ranking fifth. The recommendation that newly purchased animals should be vaccinated 28 days before introduction into the herd had a mean score of 0.68, ranking sixth. In contrast, the quarantine of newly purchased animals scored 0.65, ranking seventh. Awareness of arthropod control had a mean score of 0.56, ranking eighth, and the understanding that fomites can transmit the LSD virus scored 0.46, ranking ninth.

Table 3 demonstrates that respondents in the study area were more knowledgeable about vaccination as an effective method for controlling Lumpy Skin Disease in cattle, but had lower

awareness regarding the role of fomites in LSD virus transmission and the importance of arthropod control measures. Fomites play an alternative route to the transmission of LSD virus [21]. The combined use of vaccination, strict quarantine protocols, and vector control strategies has been suggested as an effective approach for preventing the spread of Lumpy Skin Disease.

Table 4 details the sources from which respondents obtained information about Lumpy Skin Disease (LSD). The results show that the majority (53.7%) identified veterinary doctors as their primary source of information, followed by social media (22.5%). Print media, such as newspapers and magazines, were the least utilized sources of knowledge about the disease.

The educational level of farmers was found to have a significant association with knowledge about lumpy skin disease (LSD). Farmers with higher education levels were more aware that LSD can cause a drastic reduction in milk yield, that milk from LSD-infected cattle can be safely consumed after thorough boiling, and that cattle movement can amplify the spread of infection. Additionally, they were more likely to understand that isolating infected cattle can help prevent the spread of the disease. These associations were statistically significant, with a p-value of less than 0.05.

Table 3. Distribution of respondents based on their awareness towards LSD prevention and control measures

S. No	General Disease Awareness	Awareness mean score	Rank
1.	Vaccination is an effective way to control Lumpy skin disease in cattle	0.89	I
2.	Ticks, flies and mosquito control measures can prevent the disease to some extent	0.56	VIII
3.	Fomites can able to transmit the LSD virus from one animal to another animal	0.46	IX
4.	Quarantine of newly purchased animals can prevent the entry of disease into the farm	0.65	VII
5.	Newly purchased animals should be vaccinated 28 days before the introduction to the herd.	0.68	VI
6.	Cleaning and disinfection of animal shelters will protect the animals from the LSD virus	0.72	IV
7.	Isolation of the Lumpy skin disease virus-infected cattle can prevent the spread of infection to other animals	0.82	III
8.	There is no specific treatment for Lumpy skin disease	0.69	V
9.	Ethnoveterinary treatments can be effective as a supportive approach when used in conjunction with allopathic medicine for managing Lumpy Skin Disease.	0.83	II

Table 4. Sources from which farmers got to know information about LSD

S. No	Sources of Information about Lumpy Skin Disease	Frequency (in numbers)	Percentage (%)
1.	Veterinarian	117	53.7
2.	Neighbours	20	9.2
3.	Mass Media (Television, Radio, etc.)	11	5
4.	Social media (WhatsApp, Facebook, etc.)	49	22.5
5.	Print media (Newspapers, Magazine)	4	1.8
6.	Awareness Campaigns	17	7.8

Table 5. Relationships between different variables analyzed by the chi-square test

Variables	Awareness level	Educational qualification of the cattle farmers					Total (n=218) n (%)	Chi-square Value	P value
		Primary level n (%)	SSLC n (%)	HSC n (%)	Graduate n (%)	Uneducated n (%)			
Awareness of LSD (General aspects)									
LSD is considered an economically important disease of cattle	Yes (n = 181)	30 (13.8)	35 (16.1)	37 (17.0)	47 (21.6)	32 (14.7)	181 (83.0)	6.507	0.164 (ns)
	No (n = 37)	9 (4.1)	9 (4.1)	11 (5.0)	4 (1.8)	4 (1.8)	37 (17.0)		
LSD can cause a drastic reduction in milk yield in dairy cattle	Yes (n = 157)	29 (13.3)	29 (13.3)	28 (12.8)	43 (19.7)	28 (12.8)	157 (72.0)	9.800	0.044[*] (ns)
	No (n = 61)	10 (4.6)	15 (6.9)	20 (9.2)	8 (3.7)	8 (3.7)	61 (28.0)		
LSD can lead to abortion in cattle	Yes (n = 93)	10 (4.6)	18 (8.3)	22 (10.1)	25 (11.5)	18 (8.3)	93 (42.7)	6.507	0.164 (ns)
	No (n = 125)	29 (13.3)	26 (11.9)	26 (11.9)	26 (11.9)	18 (8.3)	125 (57.3)		
Awareness of LSD transmission									
Arthropods can transmit the disease to animals	Yes (n =136)	23 (10.6)	23 (10.6)	30 (13.8)	36 (16.5)	24 (11.0)	136 (62.4)	3.855	0.426 (ns)
	No (n = 82)	16 (7.3)	21 (9.6)	18 (8.3)	15 (6.9)	12 (5.5)	82 (37.6)		
Contaminated feed and water can transmit disease to animals	Yes (n = 114)	22 (10.1)	16 (7.3)	25 (11.5)	31 (14.2)	20 (9.2)	114 (52.3)	6.369	0.173 (ns)
	No (n = 104)	17 (7.8)	28 (12.8)	23 (10.6)	20 (9.2)	16 (7.3)	104 (47.7)		
Milk from LSD-infected cattle is safe for consumption after boiling	Yes (n = 145)	26 (11.9)	25 (11.5)	30 (13.8)	44 (20.2)	20 (9.2)	145 (66.5)	13.087	**0.011**
	No (n = 73)	13 (6.0)	19 (8.7)	18 (8.3)	7 (3.2)	16 (7.3)	73 (33.5)		
Movement of infected cattle amplify infection	Yes (n = 130)	26 (11.9)	17 (7.8)	29 (13.3)	34 (15.6)	24 (11.0)	130 (59.6)	10.660	**0.031**
	No (n = 88)	13 (6.0)	27 (12.4)	19 (8.7)	17 (7.8)	12 (5.5)	88 (40.4)		
Awareness on prevention and control of LSD									
Vaccination is an effective way to control LSD	Yes (n = 196)	34 (15.6)	39 (17.9)	41 (18.8)	48 (22.0)	34 (15.6)	196 (89.9)	3.278	0.512

Variables	Awareness level	Educational qualification of the cattle farmers					Total (n=218) n (%)	Chi-square Value	P value
		Primary level n (%)	SSLC n (%)	HSC n (%)	Graduate n (%)	Uneducated n (%)			
	No (n = 22)	5 (2.3)	5 (2.3)	7 (3.2)	3 (1.4)	2 (0.9)	22 (10.1)		(ns)
Isolation of the LSD-infected cattle can prevent the spread	Yes (n = 179)	29 (13.3)	35 (16.1)	39 (17.9)	49 (22.5)	27 (12.4)	179 (82.1)	9.829	0.043[*]
	No (n = 39)	10 (4.6)	9 (4.1)	9 (4.1)	2 (0.9)	9 (4.1)	39 (17.9)		
Newly purchased animals should be vaccinated 28 days before the introduction to the herd.	Yes (n = 150)	26 (11.9)	28 (12.8)	32 (14.7)	38 (17.4)	26 (11.9)	150 (68.8)	1.702	0.793 (ns)
	No (n = 68)	13 (6.0)	16 (7.3)	16 (7.3)	13 (6.0)	10 (4.6)	68 (31.2)		

*Significant (p≤0.05), ns=Non-significant, LSD = Lumpy Skin Disease

The involvement of educated family members in understanding both existing and emerging infectious diseases in farm animals, as well as their economic impact on farmers, plays a crucial role in managing disease outbreaks. Additionally, raising awareness about zoonotic diseases among livestock farmers is of paramount importance for effective disease control and prevention [22].

4. CONCLUSION

The findings of this study concluded that the majority of cattle farmers were small-scale farmers who were well-informed about Lumpy Skin Disease (LSD) and recognized vaccination as the most effective control measure. However, most respondents lacked awareness about several critical aspects, including the viral causes of abortion in dairy animals, the role of contaminated feed and water in virus transmission, the spread of the disease through cattle movement, and the involvement of vectors such as ticks, mosquitoes, and flies. Additionally, there was limited awareness about the importance of quarantining newly purchased animals and the role of fomites in the transmission of the LSD virus. Hence to minimize these knowledge gaps, the study strongly recommends an urgent effort to raise awareness among cattle farmers about the various transmission routes and the preventive and control measures for LSD. This can be accomplished through intensive awareness campaigns utilizing social media, print media, radio, and TV broadcasts, and targeted training programs with eminent subject matter specialists as invited speakers for delivering scientific facts to farmers.

5. RECOMMENDATIONS BASED ON THE PRESENT STUDY

1. This study identifies a communication gap between farmers and field veterinarians regarding the disease. To address this, it is recommended that continuous veterinary education be prioritized for field veterinarians to ensure they remain updated about the technical aspects of emerging and re-emerging diseases. Regular workshops and training sessions on these diseases will better equip veterinarians to educate farmers about LSD, ultimately improving livestock health and contributing to enhanced livelihoods.

2. Streamlining of Social media to ensure the dissemination of accurate and scientific information about the disease, facilitating more effective disease prevention and control."

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

ETHICAL APPROVAL

Since it is survey-based, the study did not require ethical approval; however, all participants obtained informed consent before data collection.

ACKNOWLEDGEMENTS

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/123750