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A Cross-Sectional Study of Lumpy Skin Disease and Knowledge of Livestock Farmers Regarding the Disease in Istalif District of Kabul, Afghanistan

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ABSTRACT

Background: Lumpy skin disease (LSD) is an infectious and viral disease of cattle and water buffaloes. The disease was first noted in the southern provinces of Afghanistan in May 2022. Information concerning the epidemiological characteristics of the outbreak and knowledge of the livestock farmers about the disease is limited. The aim of this study was to describe the morbidity and case fatality rate of the disease, risk factors for the disease, and community awareness regarding the disease.

Materials and Methods: A cross-sectional questionnaire-based survey was carried out in the Istalif district of Kabul Province. A total of 400 questionnaires were filled out by a trained veterinarian enumerator, using a systematic random house-to-house sampling method. Descriptive statistics of the collected data were done using MS Excel and SPSS (Version 25) statistical software.

Findings: A total of 1305 cattle were surveyed, the disease's morbidity rate was 22.3%, the case fatality rate was 9.3%, and the mortality rate was 2.07%. More than 90% of the sampled population stated they consume the milk of LSD clinically affected cattle while all of them said they don't consume the meat of such cattle. Their practice regarding the isolation of clinically affected cattle was very low and less than 5% of them were segregating the affected cattle from the rest of the herd. Case fatality rate was higher in milking cows compared to males and non-milking cows.

Conclusion: The prevalence rate of the disease was high compared to other countries and the level of livestock owners' awareness regarding the disease, especially regarding the consumption of meat and the isolation of the clinically affected cattle from the rest of the herd was at a very low level.

Keywords: Awareness, Lumpy skin disease, Morbidity, Prevalence, Risk factors

INTRODUCTION

Livestock production supports the livelihood of around one billion people across the globe (Abera et al., 2019). According to 2018 reports from the Duch Committee for Afghanistan (DCA), about 74% of Afghans live in rural areas and majority of them provide their daily needs from livestock and agriculture. Based on the data from DCA, there were 22 million sheep, 10 million goats, and 3.7 million cattle in Afghanistan in 2018 (Emmerzaal et al., 2018). In addition to their direct role in food and income production, livestock is a valuable asset that is essential as a store of wealth, clothing, transportation, and a source of fertilizer for energy and soil

fertility (Abera et al., 2019). In recent years, the emergence of different infectious diseases affected the livestock population in Afghanistan, mainly the cattle population (Bayry, 2013). Lumpy skin disease (LSD) is one of them, which infected thousands of cattle across the country (FAO, 2022).

Lumpy skin disease is an infectious disease of cattle and water buffaloes, which is caused by a virus called lumpy skin disease virus (LSDV) also known as Neethling virus (Abera et al., 2019). LSDV is a double-stranded DNA virus belonging to the *Capripoxvirus* genus of the *Poxviridae* family (Das et al., 2021). LSDV is antigenically similar to the Goatpox virus (GTPV) and Sheeppox virus (SPPV) of the *Capripoxvirus* genus (Al-Salihi, 2014; Imran, 2022). Because of its substantial economic losses and rapid spread, LSD is classified by the World Organization for Animal Health (WOAH) as a notifiable viral disease of cattle (Arjkumpa et al., 2022). The disease causes economic losses mainly by reducing milk and meat production, infertility, miscarriage, damaging hides of animals, and deaths (Abdulqa et al., 2016; Ahmed et al., 2020). Cattle of all breeds and ages are affected, but lactating cattle, underweight animals, and calves are more vulnerable (Khan et al., 2022).

Fortunately, LSD is not transmitted to humans (Al-Salihi, 2014; Das et al., 2021); but it transmits from an infected animal to a healthy one by direct and indirect contacts (Elhaig et al., 2017). Blood-feeding arthropods such as flies, mosquitoes, and ticks are the most common vectors of LSD transmission (Data, 2017). The disease is more commonly seen in the summer and autumn seasons due to increased arthropod activities (Pory et al., 2021). All of the infected animals' secretions including blood, saliva, semen, nasal discharge, lachrymal discharge, milk, and skin lesions contain the virus (Gammada et al., 2022). Artificial insemination can play a major role in disease transmission to breeding stock which lowers the rate of pregnancy (Das et al., 2021).

The morbidity and mortality rates fluctuate depending on the immune status of the host, susceptibility, and the number of arthropod vectors (Elhaig et al., 2017). The morbidity rate of the disease is highest in humid and warm weather, and lowest in the dry seasons (Gammada et al., 2022). The morbidity rate is between 1 and 5% but may reach up to 100% in some cases; whereas the mortality rate is commonly below 5% and may reach 40% (Ahmed et al., 2020). Vaccination, quarantines, animal movement restriction, vector management, cleaning, and disinfection of the premises are common prevention strategies. According to reports, vaccination is the most efficient way to manage LSD in both endemic and nonendemic areas (Dubie et al., 2022). Due to antigenic similarities, Goatpox and Sheeppox vaccines can also be used in cattle (Elhaig et al., 2017).

The disease was initially identified in 1929 in Northern Rhodesia (Zambia) and it was thought to be due to an allergic reaction in cattle caused by biting insects (Ahmed et al., 2020). It remained endemic to Sub-Saharan Africa until 1990 when it spread to North Africa and later to the Middle East (Abdulqa et al., 2016). In the Middle East, LSD outbreaks were reported in Oman in 1984 and 2009 (Gammada et al., 2022). In South Asia, the first case of the disease was reported in Bangladesh in July 2019. (Das et al., 2021). Later on, in August 2019, the disease was first reported in India and then in China (Ahmed et al., 2020). In October 2021, the disease was reported in Pakistan (Imran, 2022).

In May 2022, the disease was first reported in the southern provinces of Afghanistan (FAO, 2022), which bordered Pakistan; but information on the epidemiological characteristics of the outbreak and knowledge of the livestock farmers about the disease was very limited. The present study was designed to describe the prevalence and case fatality rate of LSD, the risk factors of the disease, and community awareness regarding the disease.

MATERIALS AND METHODS

Study area

The current study was conducted in the Istalif district of Kabul province (**Figure 1**). The approximate geographical location of the area is between 34° 49' 57" N and 69° 4' 39" E and has a warm and dry summer. It is 29 kilometers away from Kabul City. Istalif has a population of 65000 and has 36 major villages and is 1693 meters above sea level. Istalif district is bordered to the north and west by Qarabagh district, to the east by Guldara district, and to the south by Parvan province (UNHCR, 1990). The area is rich in vegetation and trees that comprise mainly grape and other fruit trees.

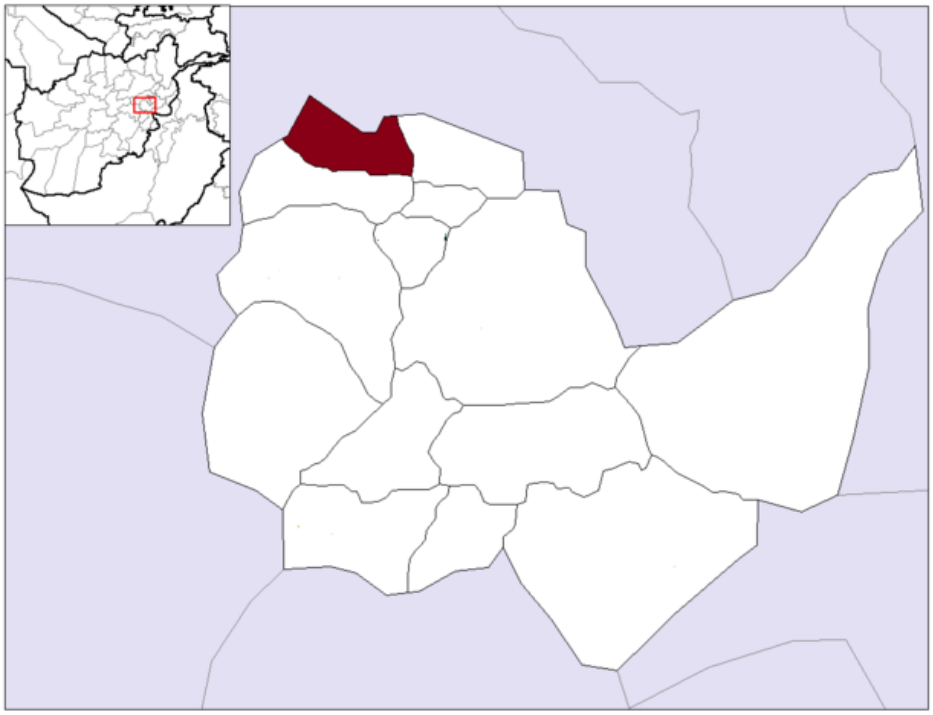

Figure 1. The location of the Istalif district in Kabul Province, Afghanistan (Wikipedia, 2023).

Study design

A cross-sectional study was conducted between 7 September and 5 October 2022 and included 22 out of 36 villages of the Istalif district. A structured questionnaire was designed to determine possible risk factors that may be related to the prevalence and mortality of LSD among the cattle population of the district. The questionnaire form had twenty-eight closed-ended questions that were divided into three sections. The first section included 11 questions regarding the location, size of the herd, number of sick and dead animals, and questions regarding the knowledge of the ranchers. The second and third sections were about the evaluation of the risk factors regarding sick and dead animals, respectively.

Sample size and data collection

With the 95% confidence interval, 5% margin of error, and 50% expected prevalence, a sample size of 384 was computed using the Raosoft calculator (http://www.raosoft.com/samplesize.html) and it was increased to 400 for better accuracy. The data was collected by a trained veterinarian and two helping individuals. The questionnaires were filled out after the oral consent of the livestock farmers and a systematic random house-to-

house sampling method was applied. A total of 400 livestock farmers and ranchers were interviewed in the study. All of our respondents were above 18 years old and were eligible to be included in the study. For better understanding, the questionnaire was written in the Dari language (the formal language of the country). Sick animals are identified and registered based on the clinical signs of the disease, especially fever and the presence of nodules on the skin.

Statistical analysis

The data were collected, tabulated, coded, and analyzed using MS Excel and SPSS statistical software (version 25). The prevalence of the disease was calculated by dividing the number of clinically affected animals by the total number of animals that were at the risk of getting the disease. The case fatality rate was computed by dividing the number of dead animals by the number of clinically affected animals. The mortality rate of the disease was calculated by dividing the total deaths of cattle due to LSD by the total number of cattle surveyed.

RESULTS

Morbidity and case fatality rate

In this study, a total of 400 animal owners were interviewed who were selected randomly in 22 out of 36 villages of the Istalif district. Throughout the investigation, a total of 1305 cattle were surveyed, out of which 33.2% were males and 66.8% were females. All of our respondents were male and the average number of cattle per rancher was 3 with a minimum and maximum of 1 and 18, respectively. In addition, 53% of the ranchers stated their cattle were clinically affected by LSD while only 7% of them said at least one of their cattle died of disease. The majority (29%) of the sample population had a herd size of 2 cattle per family followed by 3 (23%), 4 (17%), 5 (12%), and 1 (11%) cattle per family. Of the total 1305 cattle, 291 were clinically affected by the disease and only 27 of the clinically affected cattle were died. Based on these data, the morbidity and case fatality rate of the disease was calculated at 22.3% and 9.3%, respectively. The mortality rate of LSD was computed as 2.07%.

Community awareness

Out of 400 respondents, 56% said they had some information about LSD while the remaining 44% said they do not have any information regarding the disease. Almost all of the respondents (98.75%) stated that LSD is not a zoonotic disease, while 1% of them said it is a zoonosis. In response to the question regarding the consumption of the milk of clinically affected cattle, 90.5% of them stated they consume the milk while, 8.75% of them were not consuming it. When asked about the view of the participants regarding the meat consumption of the affected cattle, exactly all of the participants (100%) said they don't use the meat. The majority of the respondents (95.5%) didn't separate the clinically affected cattle from the rest of the herd, while 4.5% of them were segregating the clinically affected cattle from other healthy animals. Ninety-four percent of the interviewees whose animals were clinically affected by the disease used to not separate diseased animals from the rest of the herd.

Risk factors for morbidity

Out of 291 sick cattle, 69% were from indigenous breeds and 31% were from crossbreeds. Among 39.2% of infected pregnant cows, none of them were aborted during the study time. Two-fifths of the infected cattle were between the ages of 2 and 5 years. In addition, more than half of the diseased animals were active milking cows.

Moreover, 93% of clinically affected cattle were not vaccinated and less than 2% of them were tick (Ixodidae) infested (**Table 1)**. In terms of gender, the morbidity rate in males was 18% while in females it was 24%. The neck and dewlap area, backbone, and either side of the backbone (loin) were among the parts that had more nodules than other parts of the body. (**Figure 2**).

Table 1. The risk factor associated with the prevalence of LSD in cattle.

Factor	Category	Frequency	Percentage (%)
Breed	Indigenous	201	69.1
	Crossbreed	90	30.9
Sex	Male	78	26.8
	Female	213	73.2
Age	Lower than 1 year	106	36.4
	Between 2 & 5 years	172	59.1
	Older than 5 years	13	4.5
Milk production	Yes	162	55.7
	No	51	17.5
	Not applicable	78	26.8
Pregnancy	Yes	114	39.2
	No	99	34
	Not applicable	78	26.8
Vaccine	Yes	19	6.5
	No	272	93.5
Tick presence	Yes	5	1.7
	No	286	98.3

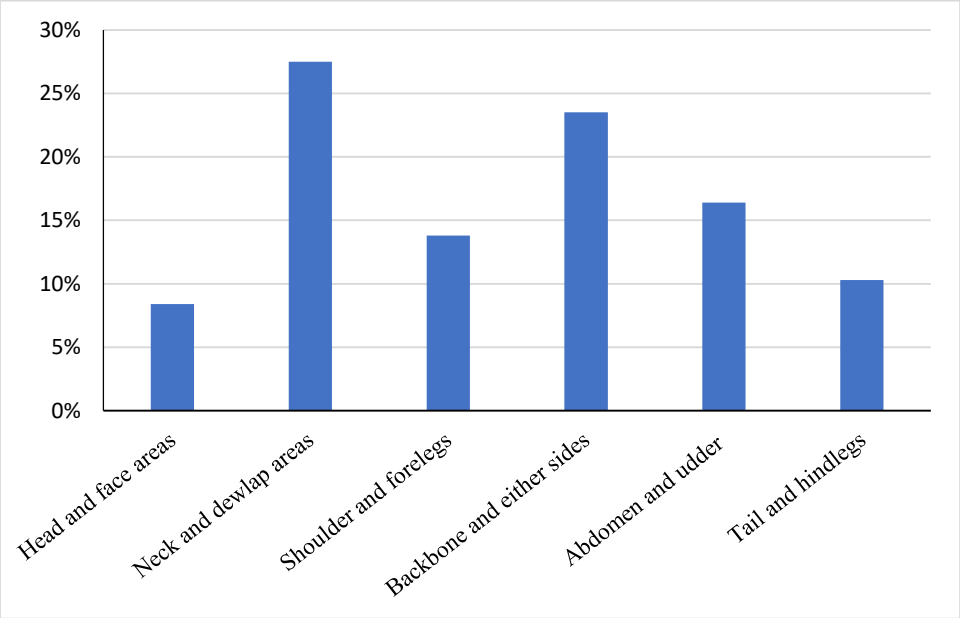

Figure 1. Presence of LSD nodules in different parts of a cattle body.

Risk factors for case fatality rate

Of the total 27 dead cattle, 20 were from indigenous breeds and 7 were from crossbreeds (**Tabel 2**). The case fatality rate of the indigenous breed was 10% whereas that of the crossbreeds was 7.7%. Considering gender, the case fatality rate of the disease in male was 13% while in females it was 8%. Furthermore, 12 of 17 female dead cattle were milking, 5 of them were pregnant and none of the pregnant were aborted. Moreover,

except for one cattle, all of them (26) were unvaccinated against LSD. Forty-eight percent of the dead cattle were between the age of 2 and 5 years while, close to half of them were above the age of 5. The average price of each cattle lost due to LSD was 350$.

Table 2. Risk factors for cattle died of LSD.

Factor	Category	Frequency	Percentage (%)
Breed	Indigenous	20	74.1
	Crossbreed	7	25.9
Sex	Male	10	37
	Female	17	63
Age	Lower than 1 year	1	3.7
	Between 2 & 5 years	13	48.1
	Older than 5 years	13	48.1
Milk production	Yes	12	44.4
	No	5	18.5
	Not applicable	10	37
Pregnancy status	Yes	5	18.5
	No	12	44.4
	Not applicable	10	37
Abortion status	Yes	0	0
	No	17	63
	Not applicable	10	37
Vaccination	Yes	1	3.7
	No	26	96.3
Price of the dead cattle	Minimum price	~200 $	
	Maximum	~700 $	
	Average	~350 $	

DISCUSSION

In this research, only the cattle that had nodules in different parts of their body and showed clinical symptoms related to LSD such as fever, lacrimation, decreased milk production, etc., were considered positive. In addition to the fact that the nodules present on the skin were closely observed to distinguish LSD from other skin diseases such as demodicosis, dermatophilosis, and ringworm; tissue samples of nodules were also taken. Due to limited facilities, we couldn't analyze the collected tissue samples. For the reason that the diagnosis of the disease was based on clinical symptoms especially, the presence of nodules on the skin, it is possible that some positive animals with sub-clinical disease might not be considered positive, which can be considered as a limitation of this research. The coverage of only one district of Kabul province in this study can be another limitation of the research.

The findings of this investigation showed that the morbidity rate of lumpy skin disease in Afghanistan was 22% while the case fatality rate of the disease reached 9%. The morbidity rate of the disease in this study was higher compared to the morbidity rate of 7.6% in Ethiopia (Dubie et al., 2022), and 8.7% in Uganda (Ochwo et al., 2019). The main reason for the higher prevalence of the disease in this research might be the lower vaccination rate against LSD and inadequate knowledge of ranchers regarding the prevention of contagious diseases like LSD; because almost all of the participants (95%) said they don't segregate the infected cattle from the clinically healthy individuals. The prevalence rate of 18% in males and 24% in females was a little bit different from those reported by Elhaig et al., (2017) who computed the prevalence rate of 16% in males and 18% in females. The prevalence rate of 1.35% in male and 2.76% in female cattle reported by Shah & Khan

(2022) from Bangladesh is much lower compared to the findings of this study. From the whole argument, one thing can be extracted that the prevalence of the disease is higher in females compared to males. The case fatality rate of the disease was almost the same as that of Abdulhameed et al., (2020) who reported the case fatality rate of 11% from Basra, Iraq. In terms of gender, the case fatality rate of males in this study (18%) was in agreement with the case fatality rate of males (17%) reported by Abdulhameed et al., (2020) while the case fatality rate of female cattle in our study (24%) was three times higher. The mortality rate due to LSD in this study was less than 1% while it is reported 2% and 1.2% in the study of Abdulhameed et al., (2020) and Arjkumpa et al., (2022), respectively.

No abortion case was reported, neither in infected nor in dead cattle while, the abortion rate in infected pregnant cows was about 10.5% in the study of Abdulhameed et al., (2020). The present study showed that 36% of the infected cattle were one year or below the age of one year. These results are not consistent with the findings of Abdulhameed et al., (2020) who reported that 60% of animals in their study were ≤1 year. Moreover, the higher rate of LSD prevalence in old animals is in accordance with the results of Sayed et al., (2023). Nearly, two percent of the infected cattle in this study were tick-infested while 21% of the participants in the study of Abdulhameed et al., (2020) reported their cattle were infested with ticks, which is much higher compared to the results of present study. Of the total 291 clinically infected cattle in this study, 6.5% of them were vaccinated against LSD, whereas 74% of interviewed ranchers in the study of Abera et al., (2019) stated they vaccinated their animals against LSD. Lack of access to a certified and valid vaccine by the Ministry of Agriculture, Irrigation and Livestock (MAIL) and rumors of importing fake vaccines to the country early in the outbreak were the reasons behind the lower rate of vaccination. The neck, backbone, flank, abdomen, and foreleg areas were the parts of the body where most of the nodules were observed, these results are in accordance with those reported by Arjkumpa et al., (2022).

Little more than half of the participants stated they have some information regarding LSD which is much lower compared to Abera et al., (2019) whose study population knowledge regarding the disease was above 94%. The main reason for the lower rate of knowledge about the disease is the lower rate of literacy in the country; the ranchers who are literate are not professionals in the field of veterinary. Ninety-five percent of ranchers in this study stated they don't separate the clinically infected cattle from the clinically healthy ones, which is almost consistent with the results of Abdulhameed et al., (2020) who reported that around 92% of their respondents didn't keep apart infected animals from the herd. Although more than 98% of participants knew that LSD is not a zoonotic disease and 90% of them stated they use the milk of infected cattle, but all of the respondents stated that they don't use the meat of cattle suffering from this disease. It was a very interesting response, when asked about the reason for not eating the meat, the vast majority of them replied that cattle are slaughtered when they reach their worst condition, so consuming meat at this stage might be dangerous for consumers.

In this study because of limited facilities, we couldn't cover more than one district of the province, in the future by extending the questionnaire and inclusion of questions related to demographic characteristics of participants like education level, age, and questions related to disease prevention strategies and covering a large area (more than three districts of the province), a more accurate data can be collected and a more accurate prevalence and morbidity rate will be computed.

CONCLUSION

This cross-sectional questionnaire survey revealed that LSD is prevalent in Afghanistan at a higher rate and causes economic loss, especially by a fatality rate of close to 10%. Age, sex, and milking status of the cattle were the prominent risk factors for the disease. In general, based on the result of the study, the knowledge and practice level of the livestock farmers regarding the LSD is lower. Therefore, it is strongly recommended for the relevant authorities to held awareness campaigns in the area to improve the knowledge of the livestock farmers regarding contagious diseases of animals, specifically about general prevention strategies like isolation of sick animals from healthy ones and vaccination programs.

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