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Research Article

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Retrospective Study of Lumpy Skin Disease in South Sodo District, East Guraghe zone Central Ethiopia from 2020-2025

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Abstract

Ethiopia owns the largest livestock population in Africa and stands tenth in the world. Livestock diseases are the major production constraints in Ethiopia in addition to poor nutrition, low genetic potential of indigenous livestock, lack of marketing infrastructure and water shortages. Lumpy skin disease (LSD) is one of the most economically important viral diseases listed as trans-boundary animal diseases by the World Organization for Animal Health (WOAH) and the second significantly important cattle disease in Ethiopia. This study was designed to assess the burden and distribution of lumpy skin disease in the study area. A retrospective study was carried out from 2020-2025 to determine the burden and distribution of disease. The study indicates that adult and female cattle were higher morbidity and mortality proportion. According to current study, cross breeds have ahigher mortality and morbidity rate than local breed. In general, in current study 2.1%morbidity rate and mortality rate 0.28% were recorded. As this finding, 42 LSD outbreak occurrences were observed in different 17 kebeles, from this 26.8% (12/42), 14.3% (6/42), 11.9% (5/42) were seen in chelelk, kola nurnia and dega nurena respectively. According to present finding 26.3% suspect LSD case observed in Junethis were due to suitable season and months for vector lifecycle which main and transmission of the virus. The current study indicates uncontrolled movement of animal, market, low vaccination coverage per year increase disease outbreak and number of cases. Therefore, Regular scheduled based vaccination and strategically control measurement must apply.

Keywords: lumpy skin diseases; outbreak; retrospective; mortality; morbidity

1. Background

1.1 Introduction

Ethiopia owns the largest livestock population in Africa and stands tenth in the world (Adem *et al*., 2006). The size of the livestock population is roughly 65 million heads of cattle, 39 million head of sheep and 32 goats, and many camels, equines, poultry and honeybee colonies (CSA, 2021). Livestock diseases are the major production constraints in Ethiopia in addition to poor nutrition, low genetic potential of indigenous livestock, lack of marketing infrastructure and water shortages (Gebreegziabhare, 2010).

Lumpy skin disease is one of the most economically important viral diseases listed as trans-boundary animal diseases by the World Organization for Animal Health (WOAH) and the second significantly important cattle disease in Ethiopia (Gelaye *et al*., 2015; OIE, 2017). The virus that causes LSD is an enveloped, linear, ovoid, Double-stranded DNA virus under the family Poxviridae and genus Capri poxvirus (Yilmaz H, 2017). The sole Serotype of LSDV; "Neethling" was first identified in South Africa and represented similar antigenic Properties with goat and sheep pox virus (Abdulqa HY *et al*., 2016).

Cattle are susceptible to the infectious disease lumpy skin virus, which is brought on by the lethal lumpy skin disease virus (LSDV) (Das M *et al*., 2021). This illness, which affects only certain animals like cattle, is acute or subacute and is characterized by fever and the sudden emergence of solid, powerful skin nodules that cause necrosis. They may also be found on the mucosae ofthe respiratory and digestive tracts, as well as on skeletal muscles. Subcutaneous oedema of the limbs, ventral body regions, and lymphadenitis are additional symptoms of the illness (Weiss KE, 1968).

In endemic areas, LSD is a re-emerging transmissible infection that results significant socio economic impairment to small-scale and courtyard agrarians (Negesso G *et al*., 2016) Considering the disease burden, morbidity and mortality cattle are found as more sensitive to the illness compared to buffalos and other ruminants (Kardjadj M, 2016).

1.2 Statement of Problems

Lumpy skin disease case brought to clinic/vet post of district and also there is annual vaccination program practice. But, the distribution and burden of disease still present in the study area. So, this research aim to know epidemiological trends,seasonal variations and factor contributed to occurrence of disease in area.

2. Objectives

2.1 General Objective

To assess the burden and distribution of lumpy skin disease in the study area

2.2 Specific Objective

- To assess the distribution of the disease in the district
- To determine the trend of diseases in the past years
- To assess the vaccination practice

3. Materials and Methods

3.1. Study Area

This was conducted in south sodo district selected vet posts/kebeles, central Ethiopia from September 2025 to November 2025. The district is located 112Km southwest of Addis Ababa and generally characterized by highlands and mid-lands. Geographically, at latitude of $8^0$19'60" N and longitude of $38^0$39'59.99" E. The border area located on south of meskan,onsouth east of east meskan, onwestOromia region, onnorth and onnorth east ofsodo district (Figure 1). The area has annual rainfall of 1.44mm, altitude of 2130m asl and to vary with 15 to 20^0c.The total population of the Woreda is estimated to be 64200 of this 90% of the population resides in the

rural part of the district, the rural life of the area depends on Enset(Kocho) and other crops like sorghum, maize, teff and wheat are common (SSWPDO,2025). The area had 108,814 cattle population, 37,157 sheep population, 34,908 goat population, 178,770 poultry population, 2212 horse, 536 mule, 24,826 donkey(The south sodo district agriculture Office annual report, 2025)

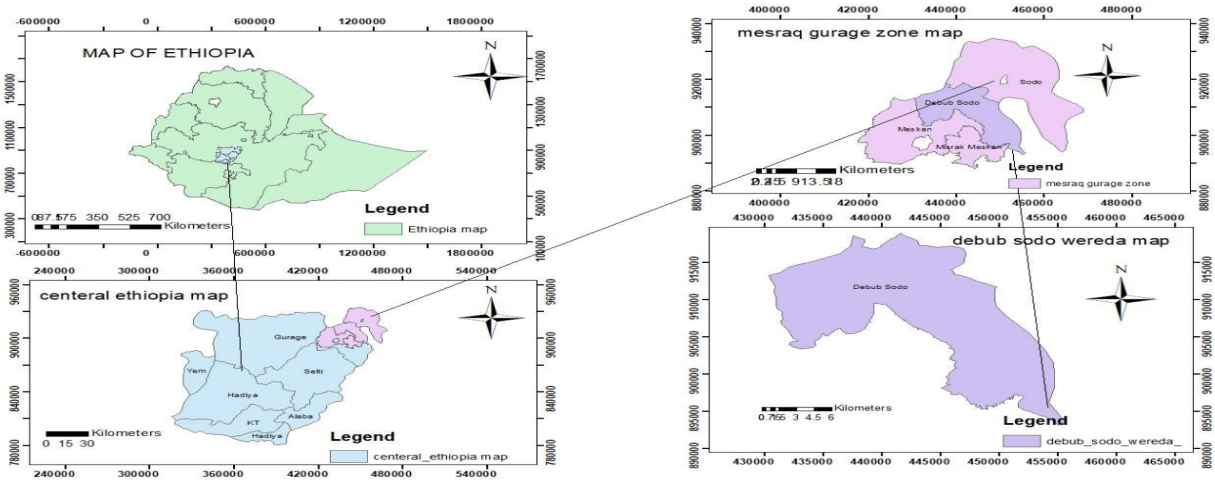

Figure 1. Map of study area

3.2. Operational Definitions

Lumpy skin disease**:**highly infectious viral diseases affecting cattle clinically characterized by fever, skin nodules, enlarged superficial lymph node, persistent dribbling salvia and reduce in milk production as asuspected and epidemiologically suitable condition for biting insect and screening test as probable and examination of the case using standard golden test as confirmed

Breed: a specific group of domestic animalswithin species that share similar heritable characteristics

Age: measure duration, it important variable to identify the trend and characteristic of disease

Case: individual or group of animals gets infection in specific diseases

Season: natural division of the year by weather pattern and climate condition

Vaccinated: immunization of animal against specific disease

Non- vaccinated: non immunized animals against specific disease

Study kebele**:** All veterinary records from clinics and animal health posts registered under the south sodo District Agriculture Office

3.3 Source and Study Population

All records in veterinary district or kebelerelated lumpy skin disease outbreak and case reports, and vaccination reports. In this study, all available records from veterinary district offices and kebele veterinary posts that documented lumpy skin disease (LSD) outbreaks, individual case reports, and vaccination activities were reviewed. The retrospective study population includes cattle populations registered in the selected kebeles or veterinary posts, and cases of LSD that were identified based on clinical signs and official veterinary reports.

3.4. Study Design and period

Retrospect stud design:case records related to LSD were collected and lumpy skin disease distribution in animal-time place the selected kebele of south sodo district from 2020 to 2025

3.5. Sampling Technique and Sample Size Determination

The study covers all LSD cases recorded in the animal health or veterinary posts of study area.

3.6. Method of Data Collection

Relevant data such as age, sex, breed, treatment history, prognosis of animals, clinical signs of disease, year and month case registered, number of sick/case animals, lumpy skin disease vaccination coverage of selected vet posts/kebele, no of death,PAR and season of disease outbreak were collected by acceptable structural format in selected vet posts/kebele.

3.7. Data management and Analysis

The data collected using retrospective studies in selected vet posts/kebele were transferred into a spreadsheet program (Microsoft excel). The main variables in this study were the number of animal at risk, number of suspected cases and deaths due to LSD, month and year of LSD outbreak, breed, age and species of animal affected. Finally, descriptive data analysis was done using Microsoft excel and presented in table, histogram, chart and graph.

4. Results

4.1 LSD Outbreak across the years and District Kebele

The present finding shows that 40.5%(17/42) LSD outbreak occurred in 2024, 19%(8/42) of LSD outbreak in 2023, 14.3%(6/42) of LSD outbreak were seen in 2025, similar value 9.5%(4/42) of LSD outbreak were observed in 2020 and 2021,in 2022 least value 7.1%(3/42) of LSD outbreak had occurred. This could be associated to security problems in the district border, so that movement of unvaccinated cattle into district high(fig: 2A).

The current study indicated that higher LSD occurrence observed in summer, then following, spring, winter and autumn.This was due to suitable season for vector which is the main agent for transmission of the virus (fig: 2B).

When we see the month pattern, from April to august higher number of LSD occurrence frequency were observed and from September to November only 6 LSD occurrence were seen between 2020 and 2025.This is due to in summer and spring months insect and arthropods(mainly tick) suitable environment (fig: 2C).

As this finding, 42 LSD outbreak occurrences were observed in different 17 kebeles, from this 26.8% (12/42), 14.3% (6/42), 11.9% (5/42) were seen in chelelk, kola nurnia and dega nurena respectively. These may bedue to area were border. So, the nearest border district has security problems (fig: 2D).

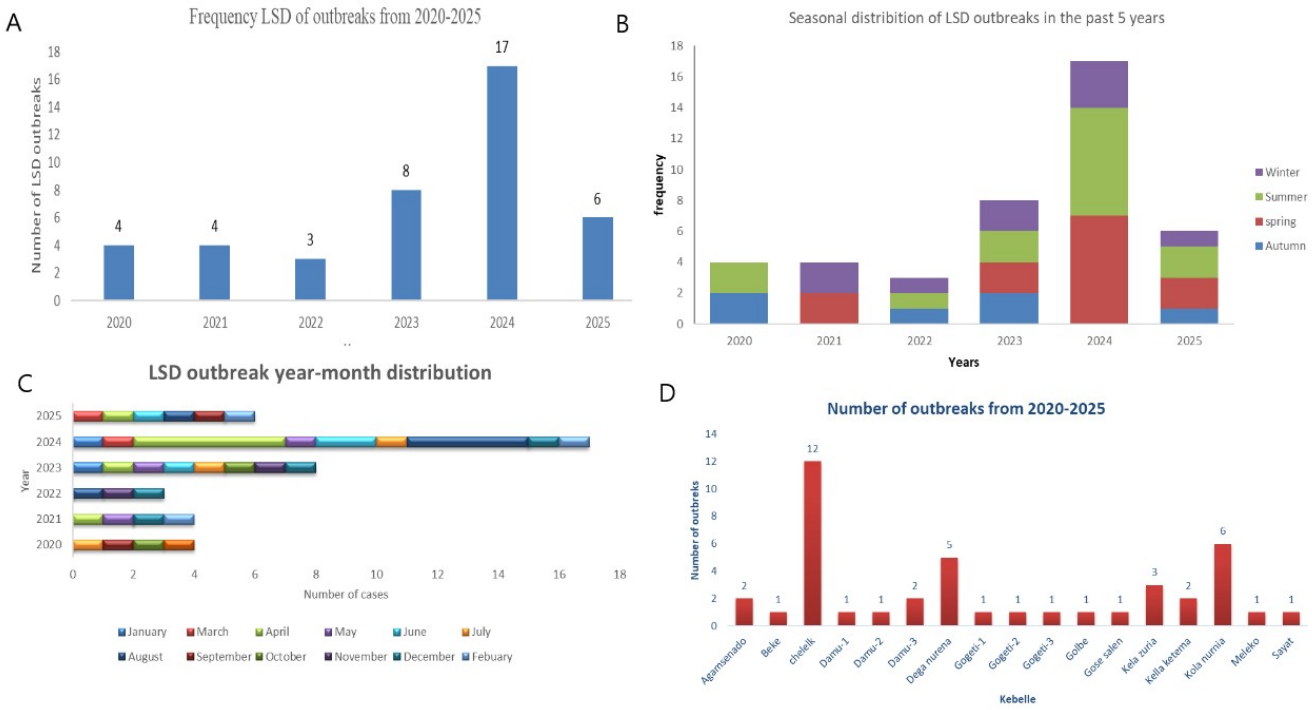

Figure 2.LSD outbreaks distribution across the years and kebele of the district.
A). The number of outbreaks in each year B). Seasonal distribution of the outbreaks in the past five years C). Monthly distribution of the outbreaks over the months D). Outbreak distribution across the kebele.

4.2 Total LSD Case In Related To Month, Year and Kebele

According to this finding, 88.8% LSD case and 100% death proportion(fig: 4c) recorded in 2024, following 3.63%, 2.88%, 2%, 1.75% and 0.87% LSD cases were observed in 2025, 2023, 2021, 2022 and 2020 respectively. This due to 40.5% of LSD occurrence also recorded in 2024 (fig: 3A).

When we trend of disease, a slight increase from 2020-2021and 2022-2023, a slight decrease 2021-2022and in 2024 peak and drop in 2025 (fig: 3B).

The study shows that 26.3% suspect LSD case observed in June, 16.75% suspect LSD case in April, 15.63% of suspect LSD case in May, 12.5% suspect LSD case in July, 4.5% suspect LSD case in august. This due to large number of occurrence also observed in this month (fig: 3C).

The present study indicates that higher number of suspected LSD case recorded in kela zuria and kella ketema i.e.12.75% (102/800), 12.13% (97/800) respectively. This is due to the kebeles were near to kella huge livestock market and share common grazing area and watering site, which is lebu weneze. In other hand, the rest keble gogeti-3, kola nurenia, gogeti-2, chelelek, agamenado, gogeti-1, globe, gose salen, beke, dega nurena, sayat, damu-3, damu-2, damu-1, and meleko following accordingly. The least number of LSD case registered kebeles beke, dega nurena, sayat, damu-3, damu-2, damu-1, and meleko had highland geography (fig: 3D).

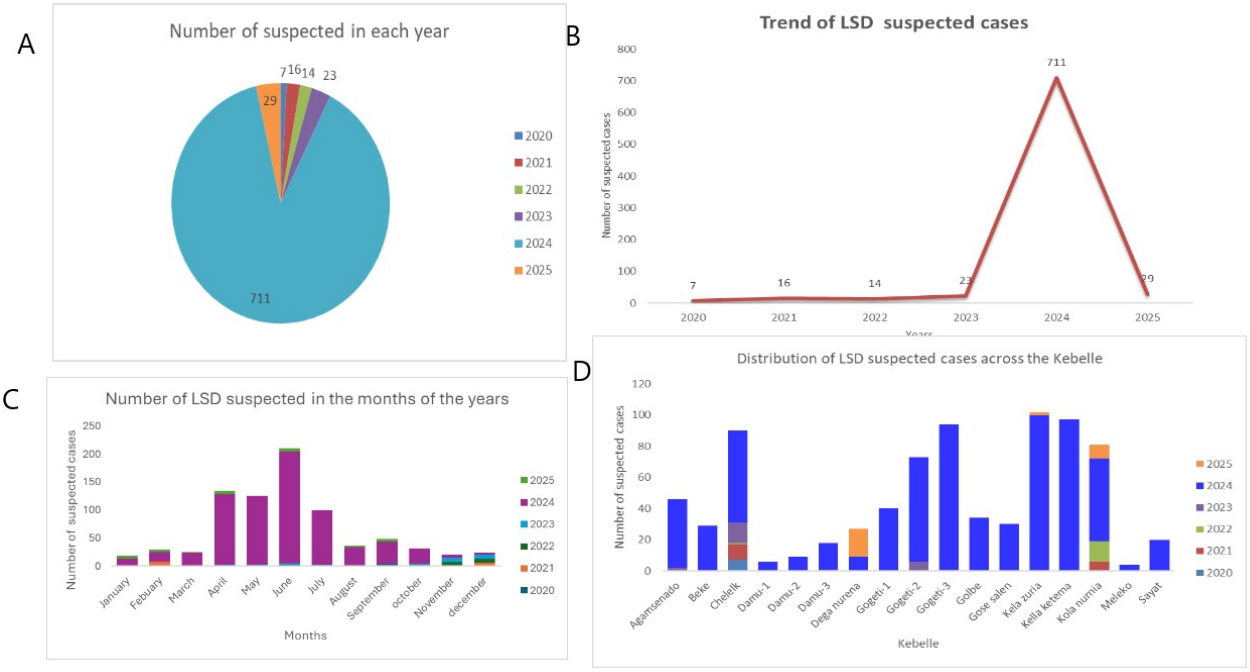

Figure 3. LSD suspected cases in the past five years
A). Number of suspected LSD cases over five years B). Trend of LSD suspected cases C). Monthly distribution of LSD cases D). LSD suspected cases distribute across the kebele of the district.

4.3 PAR and Vaccination Coverage In Related To Year and Kebele

As a result shows higher population 19561 at risk recorded in 2024 flowed by 6860 cattle population were at risk in 2023 and 3637 in 2022, 2900 in 2020, 2378 in 2025 and 2130 in 2021. From total population at risk 2149 cross and holistine firige and 35317 local breed. This may be due to high LSD occurrence recorded in 2024 (fig: 4A).

The present finding that higher number of population at risk reported in chelelk kebele around 11794 and 5075 kola nurenia, following the rest kebele. These due to the area also high LSD occurrence frequency were recorded and high cattle population number was in this kebele, which share common watering source(fig: 4B).

The study show that low vaccination coverage recorded in 2024 and 2025, 11800 doses and 15800 doses respectively. Whereas, 16882, 17100, 18483, 16500 cattle were vaccinated against LSD in 2020, 2021, 2022 and 2023 respectively(fig: 4D). as figure 4D shows vaccination practice decrease in recent years from 2023 to 2025

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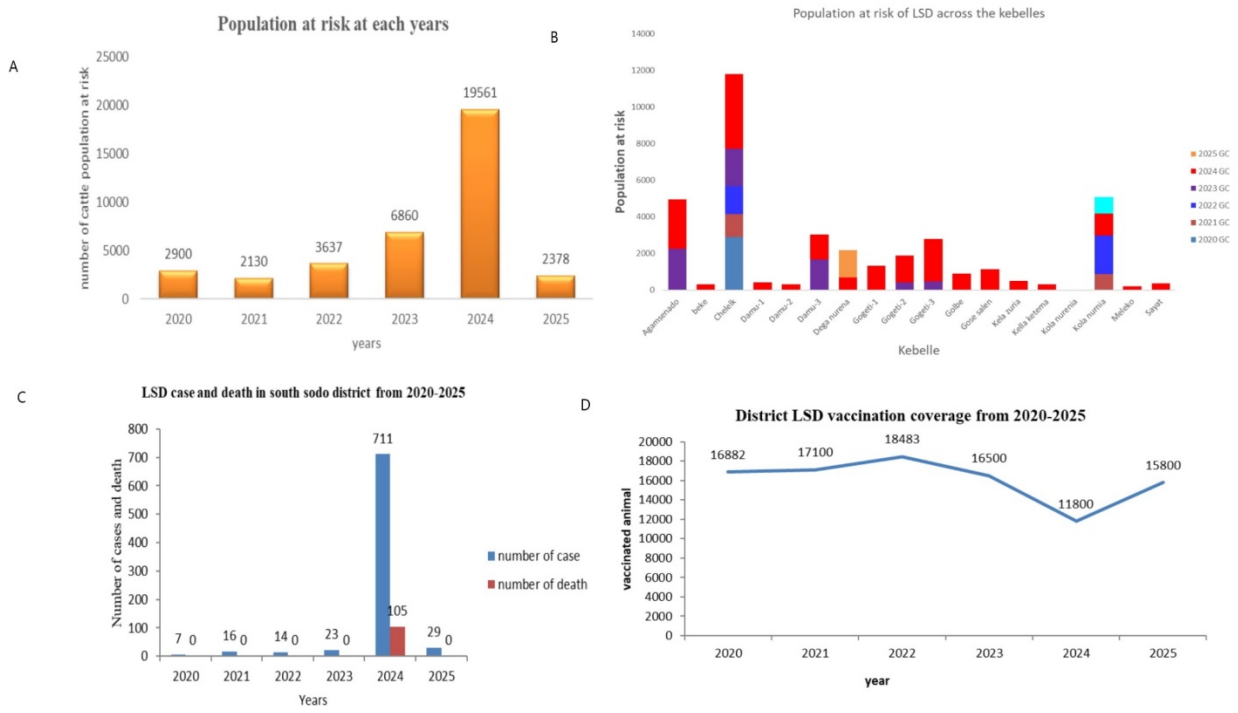

Figure 4Population at risk over years, LSD suspected cases and death
A). Population at risk over the years B). Population at risk at the kebele level C). Suspected cases death

4.4 LSD Cases In Related To Animal Sex, Age and Breed

According to study, adult cattle were higher morbidity proportion than young cattle and also higher mortality proportion. Comparing sex of animal, male were more morbidity and mortality proportion than female. This may be due to males/oxes were used as draft power and plowing land without rest and with stress.In other hand, local breed were 87.4% morbidity proportion and 65.7%mortality proportion. While, cross breed had 12.6% morbidity proportion and 34.3% mortality proportion. This may be due to, in study area only 6.5% of cattle were cross and holistein friesian(Table: 1).

Table 1. Age and sex of animal in related to LSD cases

variable	category	Number of case	Proportion (%)	Number of death	Proportion (%)
Age	**Adult**	753	94.1	96	91.4
	young	47	5.9	9	8.6
sex	**Male**	457	57.1	62	59
	female	343	42.9	43	41
breed	**Local**	699	87.4	69	65.7
	cross	101	12.6	36	34.3

Mortality rate, morbidity rate and CFR higher in cross than local breed.In general, morbidity rate, mortality rate and CFR of LSD in the district were 2.1%, 0.28% and 13.13% respectively (Table: 2).

Table 2. mortality rate, morbidity rate and CFR in related to breed of animal

Breed	Morbidity rate	Mortality rate	CFR
Local	**2**	**0.2**	**9.87**
Cross	**4.7**	**1.67**	**35.6**
total	**2.14**	**0.28**	**13.13**

5. Discussion

In this study, we displayed all LSD occurrence in the district between 2020 and 2025, In the retrospective study, during 2020–2025, the total number of 42 LSD outbreaks recorded of this the highest recorded outbreaks per year being 40.5%(17/42) in 2024. This due to security problem in the district borderwhich affect control program.

The currentstudy indicates that low LSD vaccination coverage recorded in 2024 only 11800 doses vaccinated and in this year high number of population at riskwere observed. Effective control measure of the disease is achieved through mass vaccination though separation and culling of infected animals (Abeya, A*et al*., 2018).

The present study indicated that higher LSD occurrence observed in summer, then following, spring, winter and autumn. When we see the month pattern, from April to august higher number of LSD occurrence frequency were observed and from September to November only 6 LSD occurrence were seen between 2020 and 2025. This due to high rainfall recorded in the area during summer, which is suitable for vector/arthropod life cycle. The seasonal LSD outbreak variation might be related to the variation in temperature and rainfall between seasons leading to varying arthropod densities in the environment (Grassly and Fraser, 2006). Identification of temporal patterns can indicate times when particular attention should be paid to control the disease (Thrusfield, 2007).

As this finding, 42 LSD outbreak occurrence were observed in different 17 kebeles, from this 26.8% (12/42), 14.3% (6/42), 11.9% (5/42) were seen in chelelk, kola nurnia and dega nurena respectively. These due to area were border and movement of animal from other district and vicverse. This statement support Samuel, E. *et al* 2024 that report uncontrolled livestock movement from unvaccinated to the vaccinated area in the earlier year and vaccine cold chain could not be properly handled may increase outbreak.

The present study show that higher number of suspected LSD case recorded in kela zuria and kella ketema i.e.12.75% (102/800), 12.13% (97/800) respectively. This is due to the kebeles were near to kella huge livestock market and share common grazing area and watering site, which is lebu weneze. In the case of LSD, the distribution of its pathogen is also influenced by human economic activities, such as the movement of infected cattle and virus carriers, vaccination campaigns, and vector eradication. These circumstances indicate the presence of many factors that can influence the spread of pathogens (Podshibyakin D *et al*., 2024). In other hand, the rest keble gogeti-3, kola nurenia, gogeti-2, chelelek, agamenado, gogeti-1, globe, gose salen, beke, dega nurena, sayat, damu-3, damu-2, damu-1, and meleko following accordingly. The least number of LSD case registered kebeles beke, dega nurena, sayat, damu-3, damu-2, damu-1, and meleko had highland geography.The warm and humid climate in midland and lowland agro-climates has been considered as more favorable environment for the occurrence of large populations of biting flies than the cool temperature in the highlands (Gumbe and A.A.F, 2018).

According to study, adult cattle were higher morbidity proportion than young cattle and also

higher mortality proportion. This is supported by Adult cattle were found more infected with the infection rate of 69.6% than young 30.4% from the present finding(Samuel, E. *et al*., 2024). This finding in consistent with statement Traditional calf management practices that segregate calves from the herd might have contributed to a decreased exposure risk of calves to the source of infection. Calves in the endemic area can obtain certain protective passive immunity from their dam (CSA, 2022).

When we see sex of animal, male were more morbidity and mortality proportion than female. This is due to oxs in uses for draft and plowing, this stress condition suppresses immunity. This agree with Abrahim Ahmed M and Ahmed C2024 that reported In local zebu cattle, male animals have a higher cumulative incidence of LSDV compared to females, possibly due to stress factors such as exhaustion and fatigue rather than biological reasons. Male animals are often used as draft oxen for heavy labor, making them more susceptible to infection. Additionally, draft oxen may be more vulnerable to biting flies when harnessed in a yoke, and the skin abrasions they sustain during plowing could attract flies capable of transmitting LSDV (Gari G *et al*., 2011). The severity of the disease generally depends on the susceptibility, immunological status, and age of the host population, as well as the dose and route of virus inoculation (CFSPH, 2008).

The study indicated higher that cross breed had morbidity rate, mortality rate than local breed. indigenous breeds such as zebu and zebu hybrids may possess some inherent resistance to the virus (Gari G *et al*., 2011). The genetic factors influencing disease severity are not yet fully understood. Factors such as high ambient temperatures, farming practices, and high milk-yielding cows could contribute to the severity of the disease in Holstein-Friesian cattle (Tageldin MH *et al*., 2014).

The present study shows that the trend of LSD slightly increased from 2020-2023, peak in 2024 and decreased in 2025.The epidemiological trend of LSD indicates that it is currently endemic in most African countries and is spreading further into North Africa, Middle East countries, and Mediterranean regions due to global trade movement in animals and animal products (Tuppurainen ESM and Oura c, 2012).

In general, morbidity rate, mortality rate and CFR of LSD in the district were 2.14%, 0.28% and 13.13% respectively. The morbidity and mortality were lower Wassie et al 2017 who reported morbidity (21.2%), and mortality rates (4.5%)) in Ethiopia. On the other hand, morbidity rate of the disease in the current study was higher than the reported result from 0.65% in Turkey (Ince et al., 2016)

6. Limitation

During this study, geographical location of the study area(district kebele) very difficult, some of the highland kebele had no transport access, in some kebele had no well documented retrospective data in both quality and quantity, which means poor case book righting. The time also not enough accomplish the research. As woreda, zone, region new administrative structure, there were harsh to get necessary data.

7. Conclusion and Recommendation

The main goal of the current study was to know trend of LSD outbreak based on retrospective data from 2020-2025. The age, sex, breed, month, year and season were risk factor. Male, adult and cross breed were more infected than female, young and local breed. In current study human activity such as market, uncontrolled movementof animal and low vaccination coverage increase LSD outbreak. The study show 800 LSD case and 42 outbreaks were observed from 2020-2025. According to the current finding 105 cattle loss were recorded, which negative impact in economy of country. Based on above conclusion the following recommendation forwarded.

- Regular scheduled based vaccination and strategically control measurement must applied.
- More susceptible breed must protect from biting insect applying different methods
- Animals must free from stress and discomfort
- Farther study should be undertaken using confirmatory diagnosis to understand its serotype and post vaccination sero-monitoring

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9. Annexure

Structured format to collected data for LSD case in selected vet posts

Disease name	year	month	breed	spp	Age	sex	case/ sick	death	LSD vaccination	PAR	
LSD	.	.	.	.		.	.		...		
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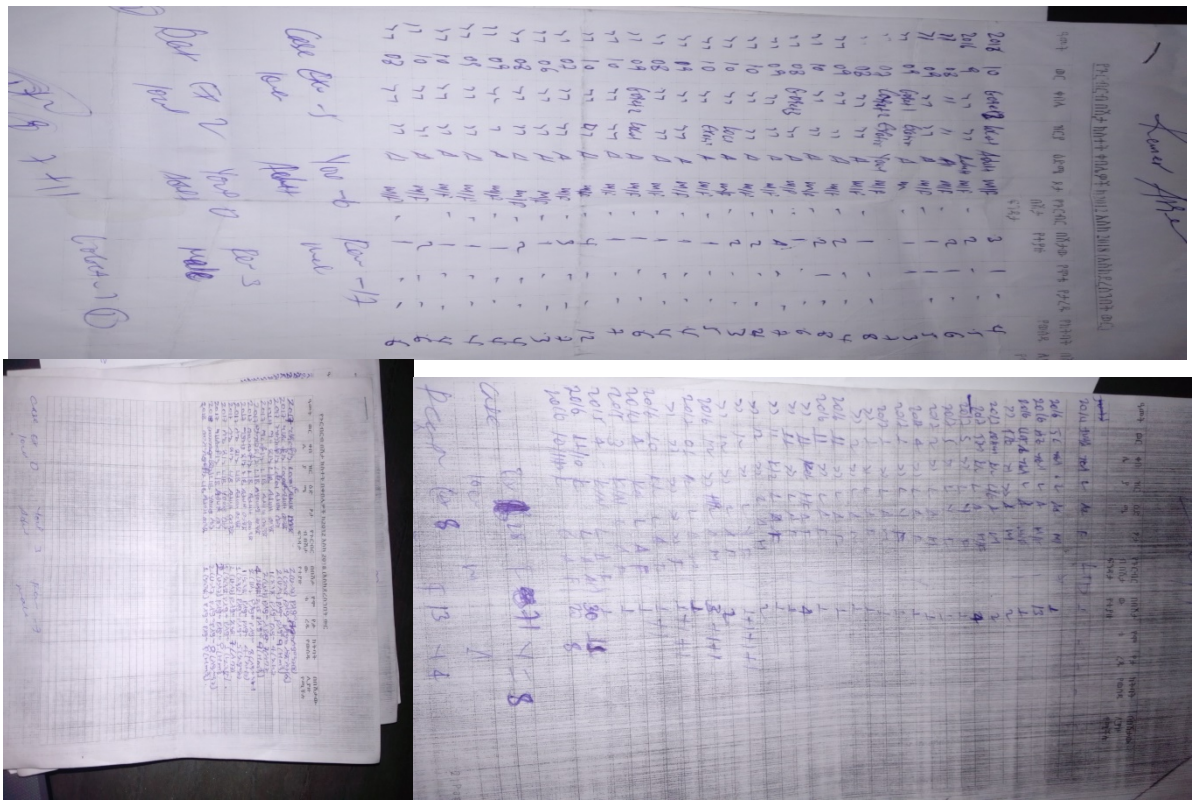

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