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Retrospective Study of Lumpy Skin Disease in Kaffa Zone, South Western Ethiopia; 2017-2021

Alemberihan G/Mariam Haile

South West Ethiopia Regional State, Kaffa Zone Agricultural Department,
Animal Health Case Team, Bonga, Ethiopia

Abstract: Lumpy skin disease (LSD) is the fatal disease of cattle caused by a virus associated with the ‘’neethlig'' poxvirus in the genus *Capripoxvirus* of the family *Poxviridae* and one of the most economically important viral diseases of cattle because it affects production in different ways. In Ethiopia, LSD was first documented in 1981 in the northwestern part of the country near Lake Tana. After the occurrence, it has spread widely throughout the country and it is the problem of almost all the regions and agro-ecological zones. The retrospective study was carried out to describe LSD trends by animal, place and time in Kaffa Zone from 2017 to 2021. Relevant data of five years were collected from the DOVAR II report. A total of 86 outbreaks of LSD were recorded at the woreda level with 3297 cases and 13 deaths. The highest number of cases was recorded in 2020, which was 2,525 (76.6%) and the least in 2017 which was 21 (0.63%). The highest number of deaths was recorded in 2020, 7(53.84%). The highest LSD outbreaks were reported in November 18(21%) and the least were on February 3(3.5%). The highest morbidity rate was in 2020 (1.55%) and the lowest was in 2021(0.62%). The highest case fatality rate was in 2021 (66.67%). This retrospective study showed that there were LSD outbreaks reported during nine months of the year from 2017-2021. The highest outbreak were reported during Spring months includes September, October and November. The average morbidity and mortality rates observed during the outbreak reports were 0.92% and 0.003 % respectively with a mean crude fatality rate of 15.6%. The disease was highly reported every year in Chenna and Gimbo woreda at Kaffa Zone. Based on the above conclusion the following recommendations are forwarded:- Trainings and creating awareness for veterinary professionals, Seasonal vaccination of animals.

Key words: Ethiopia · Kaffa Zone · Lumpy Skin Disease · Retrospective Study

INTRODUCTION

The livestock sector globally is highly dynamic contributes 40% of the global value of agricultural output and supports the livelihoods and food security of almost a billion people [1]. Beyond their direct role in generating food and income, livestock is a valuable asset, serving as a store of wealth, collateral for credit and an essential safety net during times of crisis [2, 3].

In Ethiopia, with a total of about 59.5 million cattle population, livestock production constitutes a vital part of the agricultural system and it accounts for about 40% of the agricultural gross domestic product GDP [4, 5]. The livestock sector now has a significant contribution to the total foreign currency of the country. However, the economic gains from these animals remain insignificant when compared to their huge number. This low productivity is a reflection of disease, limited genetic potential and husbandry standards [6].

Lumpy skin disease (LSD) is one of the most economically important viral diseases of cattle because of the loss of production, permanent damage of hides, infertility and death and listed as a notifiable transboundary animal diseases by the World Organization for Animal Health (OIE) and the second significantly important cattle disease in Ethiopia [7, 8, 9]. In Ethiopia, LSD was first documented in 1981 in the northwestern part of the country near Lake Tana [10]. After the first occurrence in 1981, it has spread widely throughout the country and now it is the problem of almost all the regions and agro-ecological zones [11]. Its spread was mainly enhanced by cattle movements, communal grazing and watering and pastoralist ways of life [10, 11].

Corresponding Author: Alemberihan G/Mariam Haile, South West Ethiopia Regional State, Kaffa Zone Agricultural Department, Animal Health Case Team, Bonga, Ethiopia.

Epidemiologically the disease is usually more prevalent during wet summer and autumn months, particularly in low-land and mid-land areas and around water courses, but outbreaks may also occur during the dry season and winter months [11, 12]. Outbreaks are usually seasonal but may occur at any time because, in many affected regions, no season is completely vector-free [13].

LSD is a transboundary high-impact cattle disease characterized by fever, nodular formation, a rapid eruption of skin nodules, enlarged superficial lymph nodes, generalized lymphadenitis and oedema with great economic losses [14, 15, 16]. It is a generalized skin disease which is an infectious, eruptive, occasionally fatal disease of cattle caused by a virus associated with the ‘’neethlig'' poxvirus in the genus *Capripoxvirus* of the family *Poxviridae* [11, 17].

LSD is manifested by the prompt explosion of multiple circumscribed cutaneous nodules and is accompanied by a febrile reaction [18]. The main clinical signs include fever, the appearance of nodules in the skin, lesions in the mouth and pharynx, enlarged superficial lymph nodes, edema in the skin and sometimes death [8].

The clinical courses of LSD may vary and these are acute, sub-acute, or in-apparent. Typical LSD is characterized by high body temperature (>40.50°C) and skin nodules (10-50 mm diameter) that usually undergo necrosis, affecting the cranium, internal ear, eyelids, muzzle, neck, udder, limbs, perineum, genitalia and so on [19].

LSD has a limited host range and does not infect non-ruminant hosts [20]. Both sexes and all ages of cattle breeds are susceptible to LSDV. Although the mortality rate is usually less than 10%, the disease morbidity rate can be as high as 100% [13]. The degree of disease severity is determined by the hosts' susceptibility and immunological condition [18]. Indigenous (*Bosindicus*) breeds are less vulnerable to clinical disease compared to the *Bos Taurus* [21, 22].

Therefore, the objectives of this study is to describe the Trend of Lumpy Skin Disease outbreak by time, age of animal and place across the woredas in Kaffa zone, South Western Ethiopia.

MATERIALS AND METHODS

Description of Study Area: The study was conducted in Kaffa Zone which is located 464 km South West of Addis Ababa and geographically; between 6°24’ to 8°13’ North Latitude and 35°30’ to 36°46’ East Longitude in South Western Part of South, Nation, Nationalities and peoples Region. The Zone has a total area of 10,602 Km^2 which accounts 7.06 % of the Total area of the Region. Administratively, Kaffa zone is divided in to ten districts and has three conventional climatic zones based on variations in altitude and temperature. These are highland (2500-3000 m a.s.l), mid land (1500-2500 m a.s.l) and lowland (500-1500 m a.s.l) [23]. Out of the total area of the zone, high land, mid land and low land cover 11.6 %, 59.5% and 28.9 %. The mean annual temperature of the area ranges 10.1°C-27.5°C. The warmest month on February, March and April while the coldest months are July and August. According to the meteorological data obtained from zone, the annual rain fall ranges from 1001-2200 mm [23]. Kaffa zone is rich in livestock with a population of cattle 5,200, 138, sheep 3,583,714, goat 1,447,186, poultry 9,805,863, horse 502,378, mule 86,355 and donkey 49,131 [23]. Kaffa zone is a part of South West Ethiopian regions which receive the highest amount of rain fall. This is attributable to the presence of evergreen forest cover on top of the wind ward location to the monsoon winds [24].

Study Population: Animals involved in this retrospective study were all indigenous and cross-bred cattle population of all age groups above twelve months. The area were purposively selected based on the accessibility, lack of sero-prevalence information, presence of livestock markets activity, production and management system, history of contact with wild life and trans-boundary animal’s movement from other area of neighboring Jimma zone; Oromia Regional State of Ethiopia and South Omo Zone (South Nations nationalities and Peoples Region of Ethiopia). These districts share different farming system and different in agrological locations.

Study Design and Study Period: Retrospective study design was carried out to describe Lumpy Skin Disease (LSD) trend by animal, place and time in Kaffa Zone from 2017 to 2021.

Data Collection: Relevant data such as the disease (LSD) occurring periods/years, different districts and the type of species affected by the disease of five years were collected by the DOVAR report data from different districts (Woredas) of Kaffa Zone Animal and Fisheries Resource Office and Mizan Regional Veterinary laboratory center.

Data Management and Analysis: The data were obtained from DOVAR II in Microsoft access data base maintained by Federal Agriculture Minister, Animal health department. Those data were transferred into a spreadsheet program (Microsoft excel 2010). 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, district in the zone and age and species of animal affected. Analysis of the data was performed by using pivot table on the excel-sheet.

RESULT

LSD Outbreak Trend by Time: The results of this retrospective study showed that a total of 86 outbreaks of LSD were recorded at the woreda level from 2017 to 2021 with 3297 cases and 13 deaths were reported. The highest number of cases was recorded in 2020, which was 2,525 (76.6%) and least in 2017 which was 21 (0.63%). On the other hand, highest number of deaths was recorded in 2020, 7(53.84%); whereas no death was reported in 2017, 2018 and 2019 (Table 1).

The highest number of outbreaks were reported from 2021, 37 (43.02%). The lowest report were 2017 2 (2.33%). Others, 2019 were reported 15 (17.44%) and 2020 were 32(37.21%) and There were no LSD outbreaks reported in 2018 as shown in Table 1 and Figure 1.

During the period from 2017-2021, 86 LSD outbreaks were reported in nine months. The most LSD outbreaks were reported in November 18(21%) and the least were in February 3(3.5%) and No outbreak occurrences were reported in April, May and June during the period 2017-2021 as illustrated in Figure 2.

When the overall data were grouped by season, the highest occurrence was reported in spring 37(43%) followed by winter 27(31%) and Summer 18(21%). The lowest occurrence was in Autumn 4 (5%) as indicated in (Figure 3).

LSD Trend by Districts: Spatial Distribution: LSD outbreaks were reported from eight districts out of 10 woredas in Kaffa zone, from 2017-2021. From the eight districts, LSD outbreaks were reported from Chenna district was the highest, 32(37.2%) and the lowest was reported in Telo district, 1(1.16%). No occurrences of disease were reported in two woredas such as; Bonga and Decha woreda.

Animals Were Grouped into Two Age Categories: Young (1-3 years) and adult (>3 years). The most LSD outbreak were reported from Adult age groups 57(66%) and the remaining 29 (34%) were from all age groups. Highest LSD cases were reported from adult age groups 3098(94%) where as the lowest cases were from all age groups 199(6%).

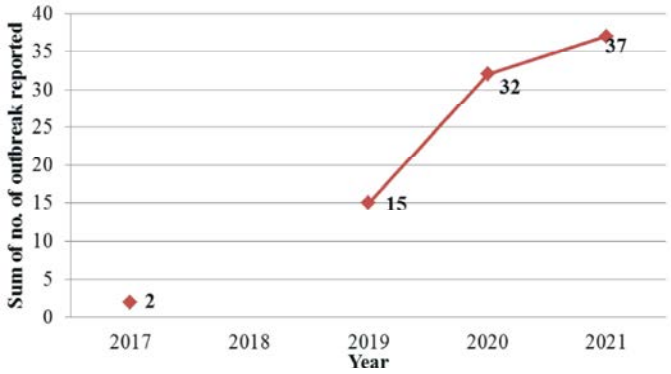

Fig. 1: Number of LSD outbreaks by Year, Kaffa zone; 2017-2021

Table 1: LSD outbreaks by year, suspected cases and death; 2017-2021

Year	Number of Outbreak reported	Number of cases	Number of deaths
2017	2	21	
2018			
2019	15	93	
2020	32	2525	7
2021	37	658	6
Total	86	3297	13

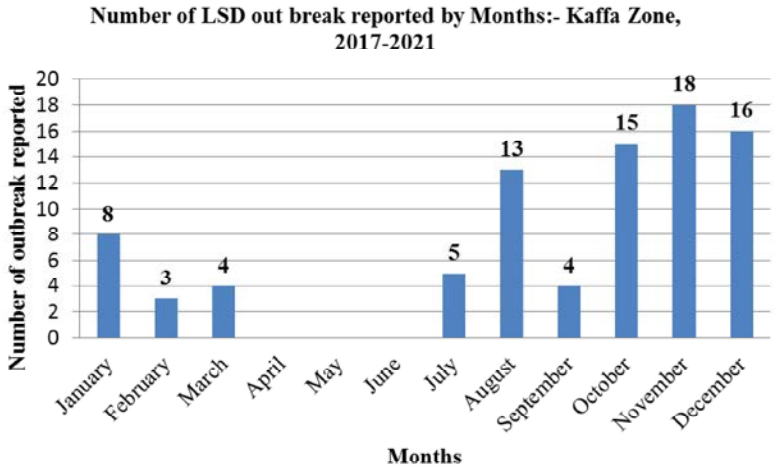

Fig. 2: LSD outbreaks by months:-Kaffa zone, 2017-2021

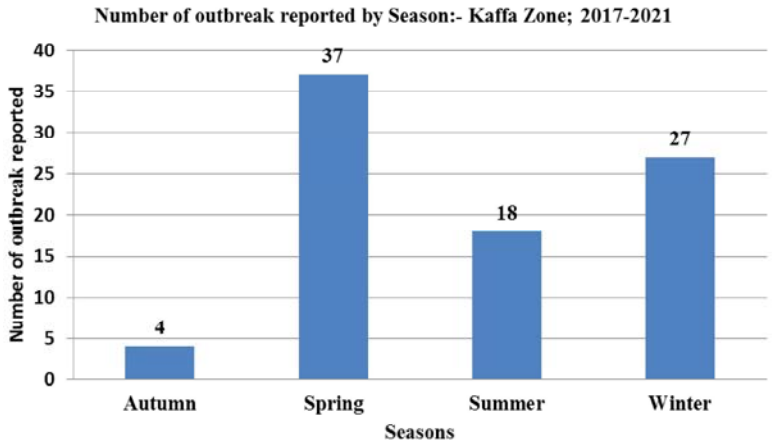

Fig. 3: LSD outbreaks by season of the year, Kaffa zone; 2017-2021

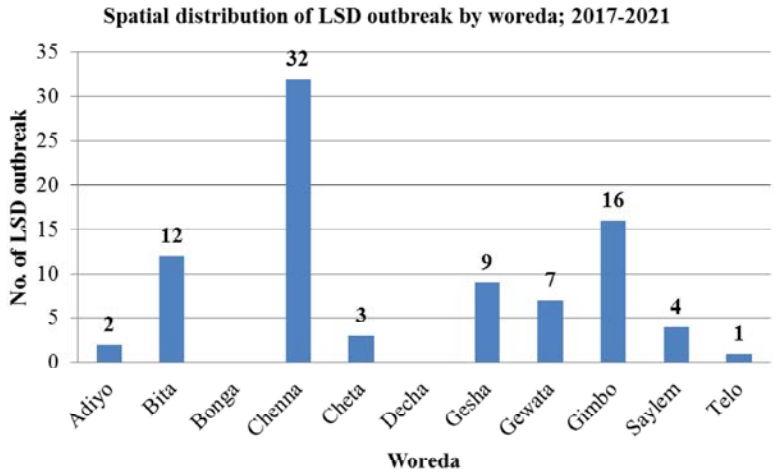

Fig 4: LSD outbreaks by woredas, Kaffa zone, 2017-2021

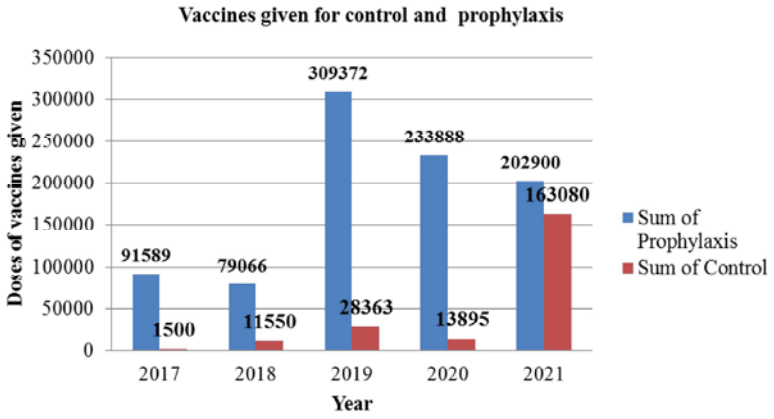

Fig. 5: LSD vaccination, Kaffa zone; 2017-2021

Table 2: LSD Morbidity rate, Mortality rate and CFR by year, Kaffa zone; 2017-2021

Year	Average of Mortality rate	Average of Morbidity rate	Case Fatality Rate (CFR)
2017	0	1.4	0
2018			
2019	0	1.05	0
2020	0.0062	1.55	11.3
2021	0.0090	0.62	66.67

Morbidity and Mortality: As shown in Table 2 below, the highest morbidity rate was in 2020 (1.55%) and the lowest was in 2021(0.62%). The highest case fatality rate was in 2021 (66.67%).

LSD Vaccination: The result of analysis showed that a total of 1,135,203 doses of vaccine were given during the 5-year period as a control and prophylaxis against LSD. Highest number of prophylaxis vaccination was recorded in 2019 year (309,372 doses of vaccine). As shown on the figure, vaccine given for prophylaxis of LSD (n= 916,815 doses, 80.76%) was higher than that of vaccine given as control (n= 218,388 doses, 19.24%).

DISCUSSION

The result of this retrospective study showed that there were LSD outbreaks reported during nine months of the year from 2017-2021. This is due to the humid weather conditions of the area as the Kaffa zone has a long rain season which is comfortable for reproduction and the existence of vectors for disease transmission easily and high number of LSD outbreaks occurred from August to January and this is comparable with the finding of Wasie, *et al.* 2017 [25]. Temporal distribution of LSD outbreaks varies based on the seasons of the year highest outbreaks were reported during the Spring months including September, October and November. The average morbidity and mortality rates observed during the outbreaks reports are 0.92% and 0.003 % respectively with a mean crude fatality rate of 15.6%.

The LSD cases reported were higher in adult cattle than in all age groups. As direct contact and Communal grazing and sharing water resources in the forest may have further facilitated the transmission. Isolation of sick animals and vector control would necessitate animal keepers staying at home to look after the ill and segregated animals [26, 27].

Most LSD outbreak reports were reports from the low midlands of the woredas, as there is a long rain season which is conducive to weather conditions with humidity contents favorable for vector multiplication that leads to disease transmission. The study showed high outbreaks (66.3%) in adults, which is comparable with the finding of Teshale in Guraghe zone, [28] in which the maternal immunity level drops and exposed to diseases, as the age increases and because of common grazing and watering areas which increase direct contact that aggravates the disease distribution sporadically.

The average morbidity rate of this retrospective study (0.92%) was lower than reported from the study in central Ethiopia with 13.61% Ayelet *et al.* [29] and morbidity (21.2%) and mortality rates (4.5%) Wasie *et al.* [25] from Ethiopia than the current study were previously reported. On the other hand, the morbidity rate of the disease in the current study was higher than the reported result of 0.65% in Turkey [30]. According to the result of this retrospective study, the doses of prophylaxis vaccination

given to the animals increased and the number of LSD outbreaks reported in the zone also increased; this finding is comparable with the research finding of Ayelet, *et al.,* [31] that vaccine used in Ethiopia is not fully protective. There were also the main challenges of vaccinating animals before the start of the rain season and the end of the rain season for full protection of the cattle from LSD disease.

CONCLUSSION AND RECOMMENDATIONS

Prevention of animals from disease is a crucial point for veterinary professionals and livestock owner has economic significance for animal production sectors. From 2017-2021 86 LSD outbreaks were registered and reported. The outbreaks were reported in most parts of the zone, especially from the dry midlands and the warm highlands. The disease was highly occurred and reported every year in Chenna woreda followed by Gimbo woreda at Kaffa Zone. LSD mostly occurred during the spring and winter seasons and; adult ages of cattle were mainly affected by the disease.

Based on the above conclusion the following recommendations are forwarded:

- Training and creating awareness about timely reporting of disease outbreaks for district animal health workers (animal health professionals, animal health assistances and community animal health workers).
- Seasonal (using disease calendar) vaccination of animals.

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