ISSN: 2574-1241
DOI: 10.26717/BJSTR.2019.13.002385
Zelalem Abera. Biomed J Sci & Tech Res

Research Article Open Access

Survey on Distribution, Associated factors of Lumpy Skin Disease Occurrence and Its Vaccine Efficacy in selected Districts of East Wollega Zone, Western Oromiya

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Received: January 03, 2019; **Published:** January 18, 2019

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Abstract

Lumpy skin disease (LSD) is an economically devastating emerging viral disease of cattle caused by a virus associated with the Neethlig poxvirus in the genus Capripoxvirus of the family Poxviridae. The study was conducted to assess the factors that contribute the occurrence of lumpy skin disease and to determine the efficacy of its vaccine. This questionnaire survey assesses the status of LSD in two districts (Limmu and Leka Dulecha) of East Wollega Zone. Animal movement, Contact of animals, common grazing or watering points, Season, presence of wild life contact with the domestic animals, livestock marketing and vaccine efficacy were included in the study as variables. Eight (8) Peasant Associations (PAs) were randomly selected from the two (2) districts for the survey. Three hundred eighty (n=380) households were randomly selected to be interviewed. 195 (51.3%) and 185 (48.7%) of them were chosen from Limmu and Leka Dulecha districts, respectively. Majority of the respondents (97.4%) were running mixed agriculture. Agro climatic condition of the area was observed and highland was the dominant one or 46.8% (P=0.000; OR=2.92; CI=1.16-7.33). Higher large herd size which exposes the animals for the disease was recorded as 70.5% (P=0.004; OR=8.47; CI=1.12-64.06). Almost, all the selected households (99% and 90.3%) have the knowledge of LSD in Limmu and Leka Dulecha, respectively.

The result shows that 73.7% of respondents had vaccinated their cattle for the disease (P=0.018; OR=3.00; CI=1.21-7.44). 61.6% of them were did not buy animals from open markets (P=0.01; OR=12.8; CI=1.70-96.8) which shows the ineffectiveness of the vaccine. 77.6%, 56.3%, 69.7% and 93.7% of herd owners were reported the absence of animals contact with different areas, PAs, district and Zones or regions, respectively. As 99.5% of the respondents reported, there was no seasonal movement of animals from place to place for search of feed and water. Even though, 73.8% and 73.5% participants are practicing vaccination of animals in Limmu and Leka Dulecha, the disease is occurring in the areas. As analysis indicated, 82.7% of the respondents of Leka Dulecha district were replied as the vaccine was not effective against LSD (P=0.006; OR=8.05; CI=1.84- 35.21). Result of the finding provides preliminary information on the factors associated for the occurrence of LSD infection in Limmu and Leka Dulecha districts. Some of the risk factors like seasons, herd size, vaccination, introducing new animals into the herds were found to be associated with the occurrence of disease. Detail study on the transmission of the disease, vaccine efficacy and teaching the community with the basic knowledge of risk factors is warranted.

Keywords: Cattle; Efficacy; Ethiopia; Leka Dulecha; Limmu; LSD; Risk factors; Vaccine

Abbreviations: LSD: Lumpy Skin Disease; PAs: Peasant Associations; GDP: Gross Domestic Product; EMDTI: Ethiopian Meat and Dairy Technology Institute

Introduction

Background

Livestock production constitutes one of the principal means of achieving improved living standards in many regions of the developing world [1-3]. The livestock sector globally is highly dynamic, contributes 40% of the global value of agricultural output, and support the livelihoods and food security of almost a billion people [4]. In many developing countries (In Sub-Saharan African countries), livestock keeping is a multifunctional activity and plays a crucial role both in national economies and the livelihood of rural communities. Beyond their direct role in generating food

and income, livestock are a valuable asset, serving as a store of wealth, provides drought power, clothing, transport and serve as a source of manure for energy and soil fertility, collateral for credit and an essential safety net during times of crisis [1,3]. In Ethiopia, Livestock production is an integral part of the agricultural system. The livestock sub sector accounts for 40% of the agricultural gross domestic product (GDP) and 20% of the total GDP without considering other contribution like traction power, fertilizing and mean of transport [5-6]. The livestock sector is now has significant contribution to the total foreigner currency of the country.

In the future, livestock production will increasingly be affected by competition for natural resources, particularly land and water, competition between food and feed and by the need to operate in a carbon-constrained economy [7]. Currently the overall livestock production constraints in Ethiopia are feed shortages, livestock diseases, low genetic potential of indigenous livestock, and lack of marketing infrastructure and water shortages [8-10]. Among the many other diseases, which are known in causing economic losses and of poor productivity in livestock specifically in cattle is the presence of lumpy skin disease in many parts of the country [11-13]. Lumpy skin disease (LSD) 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 [14-17]. The economic losses due to this disease is associated with decreased milk production, traction power loss, weight loss, poor growth, abortion, infertility and skin damage. Pneumonia is a common sequel in animals with lesions in the mouth and respiratory tract [18-23].

LSD was first observed in the western part of Ethiopia (southwest of Lake Tana) in 1983 [24]. It has now spread to almost all the regions and agro ecological zones [10,25]. Some epidemiological studies have been carried out since the disease has become established in the country, with the diverse agro-ecological and production systems [10]. Study based on sero-prevalence in southern Ethiopia reported a prevalence of 6% [26]. Targeted sampling from outbreak areas around Southern Range land, Wolliso town and north Ethiopia reported prevalence's of 11.6%, 27.9% and 28%, respectively [26,27-28]. A recent prevalence study [13] results showed higher herd prevalence recorded in Afar (51%) and Tigray (37%) regions. Published information on the factors that influence the occurrence of LSD are not many as general, however some studies indicated that LSD is a disease which affect all age group, in Africa imported Bos Taurus appear to be more susceptible than the indigenous breeds [18]. The LDSV was found to be associated with Capri poxvirus outbreaks in Kenya [29]. A clinical case of LSD has been reported in other animals: Asian water buffalo from Egypt [30].

Antibodies have been demonstrated in black and blue wild beests, Elan, Giraffe, greater Kudu and others [31,32]. Some researchers have made attempt the transmission of the disease with different flies [14,33-35]. Recently, [36] reported the potential role of ixodic tick in the transmission of LSDV. Weather changes such as cold may adversely affect the insect vector and infected saliva may contribute to the spread of the disease [37]. Lumpy skin disease is one of the taransboundry diseases which cause economic loss in livestock industry. Hence, the study area interfaces with Benishangul Gumuz Regional State of Ethiopia and other neighbouring African countries (Sudan and South Sudan). However, there is no preliminary information about the disease in East Wollega zone except few informal outbreak reports from the area. Thus, it needs to assess its magnitude, the factors those contribute to the occurrence of the disease in the study areas and to determine the efficacy of its vaccine.

Material and Methods

Description of Study Areas

The study was conducted in two (2) randomly selected districts (Limu and Leka Dulecha) of East Wollega Zone, Oromiya regional state of Ethiopia. Nekemte is the capital city of the zone which is found at 331 km of west of Addis, the capital city of Ethiopia [38]. Agriculture is the main livelihood in which cattle and sheep are kept as the major livestock. The rearing system of cattle in study sites depends on natural grass and crop residues that kept in traditional management system [39]. Leka Dulecha is one of the districts of Eastern Wollega Zone. It's part of the East Wollega Zone and it was part of former Diga Leka district. The 2007 national census reported a total population for this district of 72,057, of whom 35,479 were men and 36,578 were women; 4,056 or 5.63% of its population are urban dwellers.

The majority of the inhabitants observed Protestantism, with 44.3% reporting that as their religion, while 43.15% observed Ethiopian Orthodox Christianity, and 8.58% were Muslim. Limmu is one of the second largest districts in the East Wollega Zone. It is bordered by the Benishangul-Gumuz Region on the northwest on the south by Guto Wayu, on the west by Limmu, by Ibantu, on the north, and on the east by Horo Gudru Wollega Zone. Gelila is the administrative centre. This district is characterized by undulating hills north of Dicho Ridge and by plains south of it; it was once covered by extensive forests, but as of 2005 only a few fragments remain. The majority of the inhabitants were Ethiopian Orthodox Christianity, with 59.33% of the population reporting they observed this belief, while 23.4% of the population said they were Protestant, and 16.17% were Moslem [40].

Study Design and Population

A cross-sectional study was conducted to assess the distribution, risk factors and vaccine efficacy of LSD occurrence in the study area. Random sampling method was followed to select two (2) districts and eight (8) PAs to be included in the study in consultation with the respective district Livestock and Fisheries Development and Resource office experts. Households of the randomly selected PAs were the sampling units for questionnaire survey.

Sampling Technique and Sample Size Determination

The random sampling technique was followed, to select households to be used for the survey. Minimum sample size for this study was calculated using the formula by [41] with 95% confidence level and 5% absolute precision. The sample size was achieved by assuming the risk factors associated with observed clinical lumpy skin disease in Ethiopia which was 55.2% [11].

$$n = \frac{1.96^2 * Pexp\ (1 - Pexp)}{d^2}$$

Where: n = required sample size; exp = expected prevalence; d = desired absolute precision.

Therefore, n = (1 .96)2* 0.552*(0.448) = 380(0.05)2

Accordingly, 380 desired sample sizes for the study was calculated.

Questionnaire Survey

Questionnaire was administered to a total of 380 households. Face to face interview using local language (Afan Oromo) which took 10-15 minutes was conducted. Twenty (20) major questions were designed to capture the necessary information. The contents of the questionnaire survey like socio-demographic data and history of diseases occurrence (common constraints of livestock, major livestock diseases, season of occurrence and duration of outbreak) were included. Additionally, information based on herd management (Herd size, herd structure, introduction of new animal, vaccination status, watering or grazing points, contact of animals with different areas and wild life, presence of disease transmission, Biting flies & existence of livestock markets), breed and sex were collected. The selected farmers then were asked questions related to the above concept. Additionally, they were asked to explain the symptoms of the disease. Clinical observations of sick animals related to LSD were observed during sample collection in order to cross check whether the disease is surely LSD or not. Finally, valuable information was collected through questionnaire from randomly selected household owners found in each PAs of the districts.

Data Quality Assurance and Control

The quality of the data was assured via careful development of the questionnaire format for data collection after a thorough literature review. The questionnaire was first prepared in English and the interviewers were asked using local language (Afan Oromo). The quality of data collection was supervised by the principal investigators during data collection process. Cross checking of some randomly selected filled questionnaires were made as appropriate and a necessary correction was made.

Data Management and Analysis

Collected data was entered into excel Microsoft word and analyzed using Statistical Package for Social Science (SPSS 2007, version 20). Descriptive statistics like percentage was computed as appropriate to calculate the proportions of these factors in relation to the occurrence of LSD. Outcome variables with factors were analyzed as necessary. Univariable and multivariable logistic regression models were fitted containing the appropriate independent variable/s with 95% confidence interval. The level of significance for statistical tests is set at 0.05.

Results

Study Participants Based on their Districts and Peasant Associations

Table 1: Study participants based on their districts.

Districts	Numbers of respondents	Percentage (%)	P-value	OR	95%CI
Limmu	195	51.3	0.002	10.4	2.38 - 45.49
Leka Dulecha	185	48.7	-	-	-
Total	380	100.00			

Note: NB: OR= Odds Ratio; CI = Confidence Interval.

Table 2: Address (Peasant Associations) of Study Participants in the Study Areas.

Districts	Peasant Associations of respondents	Numbers of respondents	Percentage (%)
Limmu	Lemiti	53	13.9
	Dibisa Biya	47	12.4
	Saketa Kiltu Babo	44	11.6
	Mukarba Dima	51	13.4
Sub-total	**4**	**195**	**51.3**
Leka Dulecha	Digga Fododo	46	12.1
	Migna Kersa	51	13.4
	Jarso Liya	44	11.6
	Jarso Gute	44	11.6
Sub-total	4	185	48.7
Total	8	380	100

Table 3: Common constraints of the livestock production system in the study areas.

Districts	Diseases (%)	Disease and feed shortage (%)	Disease, Water and feed shortage (%)	Total (%)
Limmu	38 (19.5)	86 (44.1)	71 (36.4)	195 (51.3)
Leka Dulecha	59 (31.9)	36 (19.5)	90 (48.6)	185 (48.7)
Total	97 (25.5)	122 (32.1)	161 (42.4)	380 (100.00)

During this study period, a total of 380 (n=380) households were selected from two districts (Limmu and Leka Dulecha) of the Zone and interviewed. The study was significantly higher (P<0.05, OR=10.4, CI=2.38-45.49) in Limmu district as compared to Leka Dulecha district (Table 1). Eight (8) Peasant Associations (PAs) were randomly selected from two (2) districts and the households were also randomly selected from each PAs to be interviewed (Tables 2 & 3).

Demographic Characteristics of the Respondents

Table 4: Socio-Demographic Characteristics of the Respondents in the Study Areas.

Socio- demographic characteristic	Categories	Districts		Frequency (%)	P-value	OR	95% CI
		Limmu (%)	L/Dulecha (%)				
Sex	Males	152 (77.9)	168 (90.8)	320 (84.2)	0.92	0.9	0.27-03.31
	Females	43 (22.1)	17 (9.2)	60 (15.8)	-	-	-
Age	Young (15-30)	84 (43.1)	7 (3.8)	91(23.9)	0.34	1.8	0.53-6.40
	Adults (>30)	111 (56.9)	178 (96.2)	289 (76.1)	-	-	-
Education	Literate	145 (73.4)	135 (73)	280 (73.7)			
	Illiterate	50 (25.6)	50 (27)	100 (26.3)			
Livelihood (Occupation)	Livestock's only	-	4 (2.2)	4 (1.1)	-	-	-
	Mixed Agriculture	195 (100)	175 (94.6)	370 (97.4)	0.24	3.7	0.41-33.2
	Trading only	-	6 (3.2)	6 (1.6)	-	-	-
Agro climate of the area	Highland	56 (28.7)	122 (65.9)	178 (46.8)	0.000 *	2.9	1.16-7.33
	Midland	112 (57.4)	63 (34.1)	175 (46.1)	-	-	-
	Lowland	27 (13.8)	-	27 (7.1)	-	-	-
Total		195 (51.3)	185 (48.7)	380 (100)			

Note: NB: * = Statistically significant.

Other socio-demographic characteristics of study participants like sex, age, educational status and livelihood (occupation) were included in the study. Generally, majority of them were males (84.2%), individuals greater than thirty years (76.1%), literate (73.7%) and respondents those running their livelihood with mixed agriculture (97.4%) were included (Table 4). Highland was the dominant agro climatic condition (46.8%) and showed statistically significant difference (P=0.000; OR=2.92; CI=1.16-7.33) in this study.

Herd Level Information of Animals

Majority of the respondents were reported that 88.2% and 78.9% of the herds were local breed in Limmu and Leka Dulecha distracts, respectively. The analysis revealed that 85.3% of the herd involves all structures (Ox, Bull, Beef, Lactating cow, Dry cow, Heifer, Calf) in both districts. But, as the respondents informed, 70.5% large herd size was recorded in the study areas and the herd size was statistically significant (P=0.004; OR=8.47; CI=1.12-64.06) (Table 5).

Table 5: Herd Level Information of Animals in both Districts.

Parameters	Categories	Districts		Frequency (%)	P-value	OR	95% CI
		Limmu (%)	L/Dulecha (%)				
Breed	Local	172 (88.2)	146 (78.9)	318 (83.7)	-	-	-
	Cross	23 (11.8)	39 (20.1)	62 (16.3)	-	-	-
Herd size	Small	104 (53.3)	8 (4.3)	112 (29.5)	0.04*	8.47	1.12-64.06
	Large	91 (46.7)	177 (95.7)	268 (70.5)	-	-	-
Herd structure	Almost all	170 (87.2)	154 (83.2)	324 (85.3)	0.24	0.29	0.04-2.22
	Ox	25 (12.8)	31 (16.8)	56 (14.7)	-	-	-
Total		195 (51.3)	185 (48.7)	380 (100.00)			

Note: NB: L/Dulecha = Leka Dulecha; * = Statistically Significant.

Common Constraints of Livestock Production System in the Study Areas

Major constraints were disease and feed shortage, diseases, water and feed shortage in livestock production system in both districts (Limmu and Leka Dulecha) were identified during this study period. Relatively majority of the constraints were reported by respondents from Leka Dulecha district (48.6%) as compared with Limmu district (36.4%) Diseases, water and feed shortage (42.4%) were the main constraints of livestock production identified in the study areas (Table 3).

Associated Risk Factors of Lumpy Skin Disease Occurrence

Majority of respondents (94.7%) have knowledge of LSD in both districts. 73.7% of respondents were replied that, their cattle had been vaccinated for the disease and vaccination was statistically significant (P=0.018; OR=3.00; CI=1.21- 7.44). And also 61.6% of them were informed as they did not buy animals from open markets. However, buying new cattle from the market showed statistically significant association (P=0.01; OR=12.8; CI=1.70-96.8). The result showed that 46.6% interviewers were informed as they are introducing new cattle to their herds. 92.6% respondents were practicing communal watering and grazing points with other herds in the areas (Table 6). As the result indicated that, 77.6%, 56.3%, 69.7% and 93.7% of herd owners were reported the absence of animals contact with different areas, PAs, district and Zones or regions, respectively. As 99.5% of the respondents reported, there was no seasonal movement of animals from place to place for search of feed and water; that means most of the farming system in the area was sedentary.

Majority of the herd owners (94.5%) were didn't know any disease that can be transmitted from wild life to domestic animals and about 84.2% of them were assured the existence of livestock marketing place in the study areas (Table 5). In both districts, 45% of study participants are practicing vaccination of their animals at winter season of the year in which it was higher in Leka Dulecha (60.5%) and 43.2% of them are using both (Communal and Separate) grazing type in the areas. But, communal grazing type was statistically significant (p=0.00; OR=2.0; CI=5.58-6.94). As 67.1% of the study participants said, animals contact each other in summer season of the year, but it was higher in Limmu district (79%). A proportion of 91.8% respondents were agreed as livestock marketing place can be way of disease transmission (Table 6). The result revealed that summer was the season at which an activity of biting flies high (41.3%).

Table 6: Summary of Major risk factors for the Occurrence of LSD in the study areas.

Major Risk Factors for LSD	Districts				Total Number of respondent (%)		P-value OR 95% CI	
	Limmu		Leka Dulecha					
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)		
Do you know LSD	193 (99)	2 (1)	167(90.3)	18(9.7)	360(94.7)	20(5.3)	0.34 14.4	0.53-6.40
Have vaccinated your animals?	144 (73.8)	51 (26.2)	136(73.5)	49(26.5)	280 (73.7)	100(26.3)	0.018* 3.00	1.21- 7.44
Did you buy new cattle	121 (62.1)	74 (37.9)	25(13.5)	160 (86.5)	146 (38.4)	234(61.6)	0.01* 12.8	1.70- 96.8
An introduction of new cattle	120 (61.5)	75 (38.5)	57(30.8)	128 (69.2)	177 (46.6)	203(53.4)	0.75 0.87	0.35- 2.13
Do you have common grazing or	179 (91.8)	16 (8.2)	173(93.5)	12 (6.5)	352 (92.6)	28(7.4)	0.56 0.4	0.51-0.61
Watering Points with other Herds								
Contact with animals of different	180 (92.3)	15 (7.7)	115(62.2)	70 (37.8)	295 (77.6)	85 (22.4)	0.09 0.17	0.02 - 1.31
area								
Contact of animals with different	94 (48.2)	101 (51.8)	72(38.9)	113 (61.1)	166 (43.7)	214 (56.3)	0.733 1.17	0.47 - 2.94
PAs								
Contact of animals with different	54 (27.7)	141 (72.3)	61 (33)	124 (67)	115 (30.3)	265 (69.7)	0.98 1.01	0.38 - 2.71
District								
Contact with different Zone or	24 (12.3)	171 (87.7)	-	185 (100)	24 (6.3)	356 (93.7)	1.00 24.3	0.99-1.00
Regions								
Did you move your cattle to other	2 (1)	193 (99)	-	185 (100)	2 (0.5)	378 (99.5)	0.50 1.9	0.45-0.55
Grazing Place Seasonally								
Do you know any disease that can	9 (4.6)	186 (95.4)	12 (6.5)	173 (93.5)	21 (5.5)	359 (94.5)	0.000 0.04	0.02- 0.12

be Transmitted from Wild Life to								
livestock								
Existence of livestock marketing	168 (86.2)	27 (13.8)	152 (82.2)	33(17.8)	320 (84.2)	60 (15.8)	0.31 1.3	0.26-0.35
NB: * = Statistically significant								

Effectiveness of the Lumpy Skin Disease Vaccine: Majority of the study participants (54.7%) were confirmed that LSD vaccine was not effective against the disease. About 82.7% of the respondents of Leka Dulecha district were replied as the vaccine was not effective against the disease. This was higher as compared with Limmu district (28.2%). However, 54.7% of the study participants were replied as the vaccine was not effective, vaccine efficacy showed statistically significant association (P=0.006; OR=8.05; CI=1.84-35.21) (Table 7).

Table 7: Summary of Major risk factors for the Occurrence of LSD Based on Seasons.

Major Risk Factors for LSD Occurrence	Categories	Districts		Frequency (%)	P- value	OR	95%CI	
		Limmu (%)	Leka Dulecha (%)				Lower	Upper
At which season you vaccinate your animals?	Winter	59 (30.3)	112(60.5)	171 (45.0)	0.03	0.09	0.01	0.8
	Summer	23 (11.8)	43 (23.2)	66 (17.4)	0.06	0.14	0.02	1.07
	Autumn	34 (17.4)	1(0.5)	35 (9.2)	0.13	0.15	0.01	1.76
	Spring	79 (40.5)	29 (15.7)	108 (28.4)	-	-	-	-
Grazing type	Separate	12 (6.2)	67 (36.2)	79 (20.8)	-	-	-	-
	Communal	108 (55.4)	29 (15.7)	137 (36.1)	0	2	5.58	6.94
	Both	75 (38.5)	89 (48.1)	164 (43.2)	-	-	-	-
Seasons of animals contact	Summer	154 (79)	101(54.6)	255 (67.1)	0.41	2.15	0.35	13.12
	Winter	12 (6.2)	-	12 (3.2)	0.32	0.28	0.02	3.38
	Autumn	5 (2.6)	28 (15.1)	33 (8.7)	0	0.04	0.01	0.17
	Spring	24 (12.3)	56 (30.3)	80 (21.1)	-	-	-	-
Season at activity of biting flies high	Summer	83 (42.6)	74 (40)	157 (41.3)	0.09	7.65	0.72	81.46
	Winter	39 (20)	27 (14.6)	66 (17.4)	0.25	4.2	0.37	48.16
	Autumn	30 (15.4)	48 (25.9)	78 (20.5)	0.79	1.36	0.14	12.87
	Spring	34 (17.4)	36 (19.5)	70 (18.4)	0.14	6.8	0.52	88.54
	Winter & Spring	3 (1.5)	3 (1.6)	6 (1.6)	-	-	-	-
	Autumn & Spring	6 (3.1)	-	6 (1.6)				
Livestock marketing place can be way of disease transmission	Agree	172 (88.2)	177 (95.7)	349 (91.8)	0.92	0.94	0.27	3.31
	Disagree	23 (11.8)	8 (4.3)	31 (8.2)	-	-	-	-
Effectiveness of the vaccine	Effective	140 (71.8)	32 (17.3)	172 (45.3)	-	-	-	-
	Not effective	55 (28.2)	153 (82.7)	208 (54.7)	0.006*	8.05	1.84	35.21

Discussion

In the present study, questionnaire survey was under taken to identify major risk factors that contribute to the occurrence of Lumpy Skin Disease (LSD) and to determine the efficacy of its vaccine in two administrative districts of East-Wollega Zone (Limmu and Leka Dulecha). During this study period, a total of 380 (n=380) respondents (Households) were randomly selected from 8 Peasant Associations (PAs) of two (2) districts and they were interviewed. Relatively higher respondents were participated from Limmu (51.3%) than form Leka Dulecha district (48.7) and the study was significantly higher (P=0.02, OR = 10.4, CI = 2.38-45.49) in Limmu as compared to Leka Dulecha district (Table 1). Different risk factors that contribute to the occurrence of lumpy skin disease were identified. This has been reported [30,42] that the outbreak of the disease was mostly associated with the prevalence of insect vectors, host susceptibility, livestock density at the grazing and watering points, husbandry systems, wet seasons and agro ecologic conditions, presence of moist, humidity, market conditions and an introduction of new animals without any examination.

Relatively higher respondents were recorded in Lemiti (13.9%) and Migna Kersa peasant associations (13.4%) of Limu and Leka Dulecha districts, respectively. Based on their sex and age, 84.2% of them were males while 15.8% of them were females and 76.1% of them were adults (>30 years) while 23.9% of them were

young (15-30 years). According to their educational status, the respondents were classified as literate; 73.7% while about 26.3% illiterate. Additionally, based on their livelihood (Occupation); 1.1%, 97.4% and 1.6% of them were practicing Livestock's only, mixed agriculture and trading, respectively. The study areas were classified in to three agro climate has highland (46.8%), midland (46.1%) and lowland (7.1%). This agrees with the report of [10] who reported majority of the respondents (93.3%, 80.2%, 81.3%, 83.3%, 73.8%) were Christian, literate, males, adult and practicing mixed agriculture, respectively in Gimbi and Lalo Assabi districts of West Wollega zone.

Major constraints commonly encountered in livestock production system in both districts (Limu and Leka Dulecha) were identified during this study period. These main problems or constraints of livestock in the area were diseases, disease and feed shortage, disease, water and feed shortage. Disease and feed shortage was the highest constraint identified in Limu district (44.1%) but, disease, water and feed shortage was the highest constraint in Leka Dulecha district (48.6%). The result of this finding is in line with the report of [10,43-44] who stated that diseases were the main constraints of livestock. Some other constraints observed in both districts were lack of veterinary extension services and poor breeds. So, the findings of the major constraints limiting livestock production during the present study in the area was tended to agree with findings found [43]. As the questionnaire survey result indicated Lumpy Skin Disease (LSD) was dominates the area due to one or more factors those attributes the occurrence of the disease. From the result, 94.7% of respondents in both districts were informed presence of the disease (LSD) in their areas.

This agrees well with the finding of [11], in which about 42.8% of the interviewees reported occurrence of LSD in their herd and [10] who reported about 65.1% of the respondents were knew the disease in their areas. However, vaccination is widely prescribed as an effective control measure for Lumpy Skin Disease (OIE 2010); little is known on the immunological response and immune dynamics against this disease. During this study, about 73.7% of respondents were informed as their cattle had been vaccinated for the disease (LSD), but 54.7% of the study participants complained on the efficacy of the vaccine against the disease in both districts. About 82.7% of the respondents of Leka Dulecha district were replied as the vaccine was not effective against Lumpy Skin Disease. This was higher as compared with Limmu district (28.2%) Strongly they informed that, the vaccine has no potential to develop immunity and protect the animals from the disease. This was due to continuous occurrence of the disease even after vaccination in the areas. Veterinary professionals were also asked for the reason of poor efficacy of the vaccine and they have shared what the farmers have said, but the vaccine might develop immunity after booster vaccination.

But, the result of finding conducted by [45] at Bishoftu Agriculture Research Centre and Ethiopian Meat and Dairy Technology Institute (EMDTI) on towards effective vaccine production showed as the vaccinated animals were able to produce antibodies before day 7 of post vaccination. Additionally, some literatures have indicated that vaccinated animals produce neutralizing antibodies before day 7 of post vaccination [46]. As result of the study showed, about 46.6% respondents were informed as they are introducing new cattle to their safe herds without identifying whether the animal was vaccinated or not. This indicated that, most herd owners from both districts acquired cattle through purchasing from auction markets and very few of them claimed that they acquired cattle from inheritance or dowry. Similar finding was reported by [10], as the frequency of introduction of new animals was higher in the midland agro-climate zone (40.6%) than in the highland and the lowland zones (25.2% and 21%, respectively). The same authors also reported that the introduction of new animals to a herd had a strong association with an increased risk of disease in the herd and a noticeable proportion of farmers (32.1%) reported introducing new animals to their herd following purchase (for replacement, herd expansion, fattening), receiving cultural gifts or cattle exchange without any screening for the health status of the new animal. However, it was not statistically significant ($p>0.05$) for the occurrence of the disease in the area.

During this study, higher proportions of respondents (92.6%) have reported as they are practicing communal watering and grazing points with other herds in both districts. Even though there was an increment report found with communal grazing and watering points, multivariate logistic regression analysis revealed statistically insignificant effect among these risk factors and occurrence of the disease in the area. However, [10] mentioned that communal grazing and watering points were found to be associated with the occurrence of LSD. But communal grazing type (36.1%) was statistically significant ($p>0.000$, OR=2.0, CI=5.58-6.94). Additionally, different authors [33,47-48] were reported as sharing watering points, grazing plots and post-harvest fields would allow contact and intermingling of different herds that would probably increase the risk of exposure. As the result indicated that, 77.6%, 56.3%, 69.7% and 93.7% of herd owners were reported the absence of animals contact with different areas, PAs, district and Zones or regions, respectively. This could be due to animal's movement from place to place for the purpose of vaccination, trade activity, searching for feed and water during dry season and other activities, which is a risk factor in contracting cattle diseases such LSD. The result of this finding agrees with the report of [10].

An 84.2% of respondents were declared, as there was existence of livestock marketing in the area. This is another opportunity for the occurrence of contagious and infectious diseases including LSD. About 91.8% of them were agreed as this livestock marketing place can be way of disease transmission among animals in the study areas. As 99.5% of the respondents were reported, there was no seasonal movement of animals from place to place for search of feed and water; that means most of the farming system in the area was sedentary. This is supported by the result of [10] in which 68.3% (172) herd owners have informed the absence of seasonal movement of animal. Result of this finding indicated that, most of the herd owners (94.5%) had no information about the disease that can be transmitted from wild life to domestic animals and about 84.2% of them were assured the existence of livestock marketing place in the study areas. It is in line with the finding of [49], who

reported the actual number of LSDV-infected wild ruminants may be considerably higher than that revealed by this test. Wild animals showing clinical signs of LSD are likely to be more susceptible to predators, which could explain the lack of reports of clinical disease in wildlife species.

In addition, the presence of clinical signs of LSD in wildlife is easily missed. The seasons were also compared and about 67.1% of the study participants were said, animals contact each other in summer season of the year in which it was higher in Limmu district (79%). The result revealed that summer was the season at which an activity of biting flies high (41.3%). The result of this finding is in agreement with the report of [10] about 67.1% of respondents reported that, a summer (wet season) was a season at which the activity of biting flies is high. Flies activity was four times (4x) more likely to be high in the summer (wet) as compared to other seasons for the occurrence of the disease in the area. Similar to this finding, [42,11] mentioned, LSD outbreaks were associated with wet and warm weather conditions due to an abundance of blood-feeding arthropod populations in the summer season [50] also mentioned that, epidemics of LSD are associated with rainy seasons. Additionally, [51] reported the occurrence of the disease at the herd level during the rainy season which might be due to the increment of the vector population.

Conclusion and Recommendations

The questionnaire survey result indicated that Lumpy Skin Disease (LSD) is an important disease in Limmu and Leka Dulecha districts. It was aimed to assess magnitude of LSD, the factors those contribute to its occurrence and to determine efficacy of LSD vaccine in the study areas. Sex, age, educational status and livelihoods were observed. Some of the risk factors such as Agro climatic condition, herd size, practicing vaccination of animals, LSD vaccine efficacy, buying cattle from the open markets were found to be associated in this study. Also, cattle management practices executed by livestock owners of the study area, namely: introduction of new animal to the herd, mixing of cattle in watering and grazing areas, free movement of animals to different areas and others are very common in the areas. These can be risk factors and could aggravate the spread of lumpy skin disease in the study areas. The result also indicated as the vaccine has no efficacy. So, the finding provides preliminary information on the factors associated for the occurrence of LSD infection in Limmu and Leka Dulecha districts.

It also gives attention on the distribution of the disease in the areas and can assist planners, decision-makers, practitioners and researchers in their efforts. In addition, it could help them in disease surveillance and control activities for risk mitigation and to improve the health of animals. Finally, LSD Vaccine production should be qualified and/or examined at its production table, mass vaccination should be applied for all cattle in both districts using an effective specific vaccine against LSD (Attenuated Neethling strain vaccine). The use of insecticides to control biting flies before raining season should be practiced, livestock owner need to be aware with the basic knowledge of risk factors those contribute to disease (Limiting movement of animals, communal watering and grazing points, etc) and due to the biggest challenge, that was poor infrastructure that facing during this study, further research is needed to assess the status of the disease and to suggest implementation of appropriate control and prevention methods in the areas.

Compliance with Ethical Standards

The research was conducted in accordance with the ethical standards of Wollega University; Research and Technology Transfer (approval number WU/RD/27/07).

Acknowledgement

We are very much grateful to the Wollega University for the research fund and all staff of Wollega University, School of Veterinary Medicine who assisted us, including moral support, in one way or another during our study period. Also we are greatly in debated to Limmu and Leka Dulecha Livestock and Fisheries Development and Resource office especially veterinary clinic workers, for their valuable advice, encouragements, provision of materials and co-operation in different aspects during our work. Finally, our thanks have to reach all of our friends and others for their all sided support.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2019.13.002385

Zelalem Abera. Biomed J Sci & Tech Res

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