Clinico-epidemiological Features of Lumpy Skin Disease Affecting Cattle in Chattogram District

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List of abbreviations

Abbreviation	Elaboration
LSD	Lumpy skin disease
DLO	District livestock officer
EDTA	Ethylene di-amine tetra acetic acid
P	Probability
DLS	Department of Livestock Services
RBC	Red blood cell
TEC	Total erythrocyte count
ESR	Erythrocyte sedimentation rate
MCV	Mean corpuscular volume
WBC	White blood cell
RDW	Red blood cell distribution width
CI	Confidence interval

Abstract

Lumpy skin disease (LSD) is a contagious viral, eruptive and one of the most economically important cattle diseases in Bangladesh that is characterized by the appearance of nodules on the skin and other parts of the body. The present study was conducted to evaluate the clinical features along with unveiling haematological picture, therapeutic choices to control secondary bacterial infections and the risk factors associated with LSD affecting cattle population in Chattogram district. The study was conducted at Upazila Veterinary Hospital, Boalkhali during 13 October – 12 December, 2019 by collecting clinico-epidemiological data using a pretested questionnaire. The questionnaire was filled in with taking interviews with the owners/farmers concerned. Blood samples were directly collected from 10 animals suffering from LSD and examined different parameters. A total 72 clinical cases of bovine animals were investigated. Out of them 32 were affected with LSD. Data collected were entered into MS excel 2013 and conducted descriptive and univariable statistical analysis by using STATA-IC-13 software. The study revealed that the highest prevalence of LSD was seen in Karnafully upazila (11.66%) and lowest in Mirsarai upazila (0.01%) of Chattogram district. The prevalence of the disease could be higher in cattle on smallholdings compared with on organized farms. Among the risk factors, female animals had a higher prevalence of the disease compared with male and indigenous cattle are comparatively less susceptible to the disease compared with exotic breeds or cross-bread cattle. Fever, skin lumps, lymph node enlargement, salivation, mild dehydration and anorexia were more common clinical signs for LSD. Among several complications identified cutaneous edema (18.7%) was recorded with the highest frequency. Haematological examination of the blood samples collected from LSD-affected animals revealed that the diseased animals were anemic because the erythrocyte count (TEC), hematocrit value (HCT), hemoglobin level (Hb) and RBC distribution width (RDW) parameters were below of their corresponding normal reference ranges. In the field, systemic antibiotics, such as amoxicillin, oxytetracycline and anti-inflammatory drugs were commonly used as supportive treatment for the disease. The findings of this study shed light for a better understanding of clinico-epidemiological picture of LSD that would be helpful in the overall management of LSD cases in Chattogram district.

Keywords: Lumpy skin disease, clinical signs, haematology, risk factors

Chapter 1: Introduction

Livestock is an integrated part of farming system in Bangladesh where it accounts about 13.46% of the agricultural Gross Domestic Product (GDP) as well as contributes about 1.47% of total of GDP (DLS, 2019). The current estimated cattle population in Bangladesh is 24.24 million (DLS, 2019) that plays a key role in employment generation, supply of meat and milk, leather and good source of income for farmers. Among the various constraints in livestock rearing, occurrences of diseases degrade the productivity and cause severe financial loss to the farmers. Lumpy skin disease (LSD) is one of the economically devastating viral diseases of cattle and the World Organization for Animal Health (OIE) categories LSD as a notifiable transboundary animal disease.

LSD is caused by Lumpy skin disease virus (LSDV), a DNA virus of the genus *Capripoxvirus* of the chordopoxvirinae subfamily under the family Poxviridae with a prototype strain of Neethling virus, and this virus has strong similarity to sheep pox and goat pox viruses as they are serologically and antigenically indistinguishable but genetically dissimilar (Maclachlan and Dubovi, 2010; Tuppurainen and Oura, 2011; Salib and Osman, 2011). LSD is characterized by fever, circumscribed skin nodules (lumps) of 1-5 cm in diameter (Tuppurainen and Oura, 2011), lacrimation, enlargement of lymph nodes, edema in legs and brisket, conjunctivitis, anorexia, salivation, depression and nasal discharge. The primary clinical signs of LSD vary which depend on management system rather than animal demographical parameters (Al-Salihi, 2014). Animals that recovered from disease may suffer from mastitis, pneumonia, formation of necrotic skin plugs leaving deep holes that decrease the values of hide, reduction in milk production as lactating cows appear to be severely affected, abortion and temporary or permanent sterility (Tuppurainen and Oura,2011). Therefore, it is a generalized and epitheliotropic disease that causes localized and systemic reaction which results in vasculitis and lymphadenitis (Hailu *et al*., 2015).The incubation period of the disease ranges between 1 to 4 weeks in natural outbreaks while after experimental condition, skin lesions reportedly developed within 1-3 weeks post infection (Haig, 1957).

The disease spreads rapidly with high morbidity ranging from 1 to 90% and low mortality of less than 10% (Davis, 1991b; Coetzer, 2004; Salib and Osman, 2011) and

these ranges are probably owing to cattle breed variation, geography, climate, immunological status of animals, management condition, insect vectors related to the transmission as well as virus strains involved (Gari *et al*., 2010).

The most potential route of transmission of LSDV is mechanical, through biting insects. The virus was detected in stable flies (*Stomoxys* sp.), mosquitoes of the genera *Aedes* and *Culex* and hard tick species namely, *Rhipicephalus appendiculatus* and *Amblyomma hebraeum* during some field outbreaks (Chihota *et al*., 2003; Tuppurainen *et al*., 2011; Coetzer, 2004). During wet season, the incidence of LSD occurrence is high because of the abundance of biting fly population and decreases or ceases in dry season (Ayelet *et al*., 2013). Besides, semen of the infected bull and milk of the infected lactating cow, saliva, nasal discharge are also believed to be possible transmission sources (Jalali *et al*., 2017).

LSD was first reported in 1929 in Northern Rhodesia (currently Zambia) (Body *et al.*, 2012) from where it spreads to south to southern part of Africa in a series of epizootics (Davis, 1991b). Outside of Africa, it was first described in middle-east in 1989 (Jahali *et al.*, 2017). Several outbreaks have occurred in parts of southeast Europe, Turkey and Russia amongst other countries (Ochwo *et al*., 2019). The first outbreak in Bangladesh was reported in July, 2019 and cases occurred in three upazilas (Anowara, Karofully, and Patia) in Chattogram district of Chattogram division. An investigation from the Department of Livestock Services revealed 66 clinical cases of LSD in 360 susceptible animals. But none of the affected animals died. Samples were collected and tested by real-time PCR at the DLS Central Disease Investigation Laboratory (CDIL) (OIE Event summary: LSD 2019).

Although LSD affects cattle of all ages and breeds, *Bos taurus* are particularly more susceptible than zebu cattle (Hailu *et al*., 2015). The clinical treatment of LSD is based on application of antibiotics to stop secondary bacterial complications and the use of anti-inflammatory drugs (Feyisa, 2018). But prevention is better than treatment and effective prevention of LSD can be achieved through vaccination, isolation of infected animals and quarantine practices for exposed animals, vector control, restriction of animal movement and decontamination the farm premises (Ayelet *et al.*, 2013). Among the approaches mentioned vaccination should be the prime choice in any resource limited setting such as Bangladesh. Until a mass vaccination is adopted/started across the country the first and foremost approach should be suggesting an ideal

supporting treatment regimen for the animals affected naturally with the disease. To do that clinical pictures as well as epidemiological factors associated with the disease need to be known. With this background the present study was conducted to achieve the following objectives:

- Estimate the prevalence of LSD affecting cattle in several upazilas of Chattogram district
- Determine potential primary factors associated with LSD
- Describe observable clinical signs, complications, haematological findings and patterns of drugs prescribed by field veterinarians against LSD and their comparative efficacy

Chapter 2: Materials and methods

Study area and population

The study was conducted in Upazila Veterinary Hospital (UVH), Boalkhali over a period of two months (13 October to 12 December, 2019) which was a part of my DVM internship clinical rotation. During this period of rotation, a total of 72 clinical cases of cattle comprising 32 LSD cases that were presented to the upazila veterinary hospital, Boalkhali and reported to the hospital from different farms were included in this study. In addition to LSD, other clinical cases of cattle were recorded to determine the associated factors related to LSD cases.

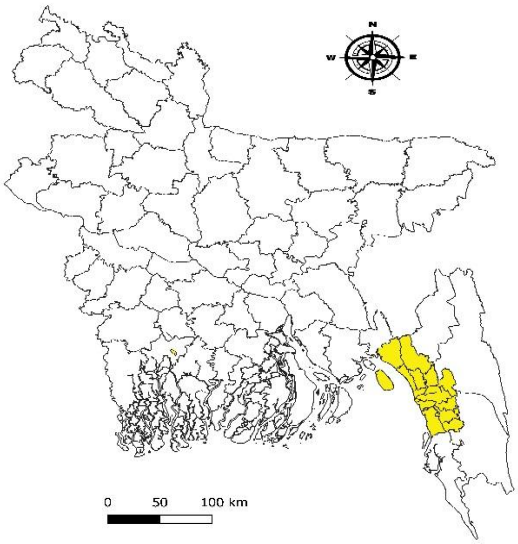

Figure 1: A map of Bangladesh showing the location of the study area (yellow-colored upazilas)

Data collection

Clinico-epidemiological findings of each of the cases were collected by administrating a structured questionnaire. The questionnaire included address of the owner/farmer, date, total population, housing system, animal level data (species, breed, age, sex, body weight), history of vaccination, de-worming, experienced previous disease, duration of illness, defecation, micturition and vomition along with the owner's demographic information (age, sex, education and job). Data of LSD on cattle affected in different upazilas of Chattogram district were collected from the monthly report sent to the District Livestock Office located in Khulshi, Chattogram with the kind permission from the District Livestock Officer.

Clinical and physical examination

All the studied cattle presented at the Upazila Veterinary Hospital, Boalkhali were undergone through physical examination by using the methods of palpation, percussion and auscultation. Diagnosis of a LSD case was performed considering the general and specific signs of LSD including pyrexia, circumscribed skin nodules, anorexia, superficial lymph node enlargement and edema. Along with the physical examinations drugs that were prescribed by clinical treatments against LSD cases were also recorded.

Sample collection

Blood samples were collected from jugular vein of randomly chosen 10 cattle affected with LSD. A blood sample was collected from a jugular vein after disinfecting the area by 70% alcohol or povidone iodine. Blood was collected by a disposable syringe and needle and taken into a sterile test tube containing an anticoagulant, EDTA. After collecting blood into a tube, it was gently rotated to ensure proper mixing of the blood with the anticoagulant and transported to the laboratory.

Haematologic assessment

Hematologic parameters including total erythrocyte count (TEC), hematocrit value (HCT), hemoglobin concentration (Hb), mean corpuscular volume (MCV), and total white blood cells (WBC), RBC distribution width (RDW) were determined by the Nihon Kohdens haematology analyzer Celltac Alpha VET MEK-6550. Differential leukocyte counts and erythrocyte sedimentation rate (ESR) were also estimated, by manually.

Data entry and analysis

The data generated were entered into Microsoft Excel 2013 spread sheet. Data were then cleaned, coded, sorted and checked in MS Excel 2013 and exported to STATA--13 (Statacorp, 4905, Lakeway Drive, College station, Texas 77845, USA) for conducting descriptive and univariable statistical analysis. The prevalence of LSD in each upazila of Chattogram district was computed. Descriptive summary statistics on clinical signs, complications, haematological parameters of LSD and drugs prescribed by field veterinarians was summarized and presented. The results were presented in frequency numbers, percentages and 95% confidence interval (CI). Afterwards, statistical analysis was carried out on the data by Fisher's exact test to assess association between the disease and a selected factor (source, age, sex, breed, rearing system). An association having P value ≤ 0.05 was considered significant.

Chapter 3: Results

Prevalence of LSD

An overview of total cattle populations at risk to LSD and numbers of animals already affected with the disease in different upazilas of Chattogram district is shown in Table 1. The prevalence of LSD was estimated to be 1.3% (95% CI:1.27%-1.32%). Among the upazilas of Chattogram, the prevalence was significantly higher in Karnafully (11.66%), Shatkania(10.88%) and Sitakund (8.95%) and lower in Mirsarai(0.01%) and Boalkhali (0.02%)

Table 1: Overview of the cattle populations at risk and animals affected with LSD in different upazilas/Thanas of Chattogram district*

Upazila/Thana	**Total population at risk**	**No. affected with LSD**	**Prevalence (%)**	**95% CI**
Metropolitan area	36762	34	0.33	0.28-0.39
Chandanaish	10393	20	0.19	0.11-0.30
Double mooring	4100	101	2.46	2.01-2.98
Shatkania	36871	4011	10.88	10.56-11.20
Rangunia	119704	222	0.19	0.16-0.21
Bashkhali	167519	1280	0.76	0.72-0.81
Fatikchhari	97416	3919	4.01	3.90-4.15
Raozan	109450	195	0.18	0.15-0.20
Boalkhali	83477	15	0.02	0.01-0.03
Karnafully	4683	546	11.66	10.75-12.61
Hatazari	163063	717	0.44	0.41-0.47
Anwara	43106	1753	4.07	3.88-4.26
Lohagara	105235	623	0.59	0.55-0.64
Sandwip	18300	44	0.24	0.17-0.32
Mirsarai	26200	5	0.01	0.006-0.04
Sitakund	36084	323	8.95	8.01-9.98
Total	**1062363**	**13808**	**1.3**	**1.27-1.32**

*, Data as of September 2019 from reports to DLS

The spatial distribution of unions in which LSD was reported is presented in Figure 2. With variable intensities the disease was reported from almost all unions of the upazilas affected.

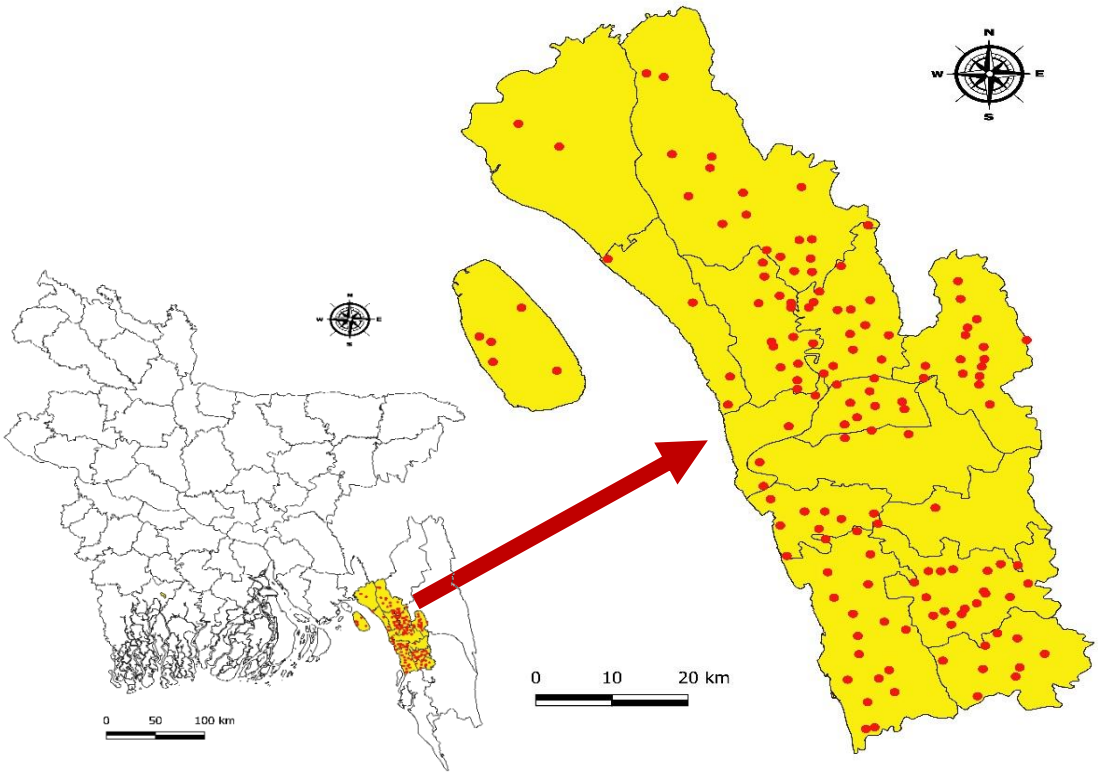

Fig 2: Spatial distribution of unions in which LSD was reported from cattle populations. The closure view of the district of Chattogram is shown on the right hand side displaying the unions as red dots where from the occurrences of LSD were reported

Risk factors

The prevalence of LSD was significantly higher in cattle reared on smallholdings (68.7%), female animals (65.6%), cross-bred animals (56.2%) and cattle reared in semi intensive system (50%) compared with animals on reared on organized farms (31.3%), male animals (34.4%), local indigenous cattle (56.2%) and cattle reared in intensive system (34.3%). The prevalence of the disease in animals of 36 months of age was higher compared with other age groups. On the other hand, some variables, such as source of animals, sex, breed, age group were found to be positively associated ($p<0.05$) with LSD after univariable analysis (Table 2).

Table 2: Univariable analysis on risk factors associated with LSD in cattle in the study population (N=72)

Risk Factor	Categories	Lumpy skin disease		*p*-value
		Yes (%)	**Case number**	
Source	Family livestock	22(68.7%)	34	0.001
	Farm animal	10(31.3%)	38	
Sex	Female	21(65.6%)	37	0.031
	Male	11(34.4%)	35	
Age	1-18months	12(37.5%)	36	0.022
	18-36months	7(21.8%)	18	
	>36month	13(40.6%)	18	
Breed	Cross	18(56.2%)	28	0.007
	Local	14(43.8%)	44	
Rearing system	Semi-intensive	21((50%)	41	0.183
	intensive	11(34.3%)	31	

Clinical manifestations

Most of the animals affected with LSD were brought to the hospital 5-10 days after the onset of the illness (46.8%). The clinical manifestations of the disease in animals as assessed, included elevated body temperature of 103º-105ºF (56.2%) and coughing (9.3%) (Table 3). Most of the cases were mildly dehydrated (78.1%) and salivation was present in 40.6% of the affected animals. The characteristic skin nodules were seen in 96.8% of the affected animals(Figure-3**)**. Among the lactating cows affected a decline in milk production was seen in 85.7% of the animals. Enlargement in peripheral lymph nodes was observed in 84.3% of the LSD cases (Figure-4), and anorexia was present in 81.25% of the animals affected. The presence of any concurrent disease was observed only in 9.3% of the cases.

Table 3: Frequency distribution of clinical signs observed in cattle (N=32) suffering from LSD

Variable/signs	Frequency	% (95%CI)
Duration of illness		
<5days	14	43.7 (28.15-60.69)
5-10days	15	46.8 (29.09-65.26)
>10days	3	9.3(1.98-25.02)
Temp		
98-100ºF	2	6.2(0.77-20.80)
101-103ºF	9	28.1(13.74-46.75)
103-105ºF	18	56.2(37.66-73.63)
>105ºF	3	9.3(1.98-25.02)
Presence of coughing	3	9.3(1.98-25.02)
Dehydration		
Normal	5	15.6(5.27-32.79)
Mild	25	78.1(60.02-90.72)
Moderate	2	6.2(0.77-20.80)
Skin nodules/lumps	31	96.8(83.78-99.92)
Salivation		
Yes	13	40.6(23.70-59.35)
No	19	59.3(40.64-76.30)
Lactation decreased in lactating cows=14)	12	85.7(57.19-98.22)
Presence of lymphadenitis	27	84.3(67.21-94.72)
Feeding habit		
Normal	2	6.2(0.77-20.80)
Anorexia	26	81.25(63.56-92.79)
Off-fed	4	12.5(3.51-28.99)
Concurrent disease	3	9.3(1.98-25.02)

Complications with LSD

Complications, as identified, associated with LSD are shown in Table 4. The predominant complications were cutaneous edema (18.7%) in different sites of the affected animals and sloughing off the lumps developed (12.5%) (Figure 5 and Figure 7, respectively). As complications, cellulitis (15.6%), pneumonia (6.2%), recumbency (3.1%) (Figure-6) and diarrhoea (3.1%) were also observed (Table 4).

Table 4: Clinical complications seen in animals affected with LSD (N=32)

Complication	Frequency	% (95% CI)
Cutaneous edema	6	18.7(7.20-36.44)
Sloughing off lumps	4	12.5 (3.51-28.99)
Cellulitis	5	15.6 (5.27-32.79)
Recumbency	1	3.1 (0.07-16.21)
Pneumonia	2	6.2 (0.77-20.80)
Diarrhoea	1	3.1 (0.07-16.21)

Fig 3: LSD diagnosed in two bovine animals showing typical large circumscribed lumps of variable size covered all over the skin

Fig 4: Enlargement of superficial lymph nodes in two animals with LSD

Fig 5: LSD-affected calf suffering from edematous swelling in the brisket and limb

Fig 6: A calf showing recumbency due to LSD

Fig 7: Sloughing off lumps due to LSD

(A)

(B)

Fig 8 (A): Animals suffered with LSD showing lumps all over the skin before the treatment begun; **(B)** Animals showing regressed lumps at the recovery stage.

Haematological parameters

Haematological analysis was performed by collecting blood from 10 LSD cases. Haemogram revealed that RBC, haematocrit, red blood cell distribution width (RDW), haemoglobin level were significantly decreased in cattle suffered from LSD compared to the reference normal value of healthy cattle. Other blood parameters including total leukocyte count (WBC), erythrocyte sedimentation rate (ESR), differential leukocyte count (DLC) remained within their normal reference ranges (Table: 5)

Table 5: Haematological parameters of cattle (N=10) suffered from LSD

Parameter	**Unit**	**Mean±SD**	**Reference value***
Haemoglobin	g/dl	7.76±0.789	8-15
TEC	$*10^6/\mu L$	3.5±1.49	5-10
ESR (Wintrobe tube method)	mm in 1^{st} hour	0.05±0.158	0-1
Haematocrit(HCT)	%	13.4±7.80	24-48
MCV	fL	42.6±2.90	40-60
RDW	%	9.11±7.14	15.5-19.7
WBC	$*10^3/\mu L$	9.13±3.40	4-12
Neutrophils	%	15.6±2.98	15-33
Lymphocytes	%	73.4±6.18	45-75
Eosinophils	%	7.6±3.92	0-20
Monocytes	%	3±1.82	0-8
Basophils	%	0.2±0.421	0-2

**, Aadapted from: Radostitis et al. (2006), George et al.(2010)*

Therapy regimens

Antimicrobials of different combination and symptomatic therapy were provided to treat animals suffering from LSD. The antibiotics commonly prescribed were amoxycillin (37.5%), oxytetracycline (21.8%), procaine and benzyl penicillin (15.6%)

and streptopenicillin (25%) (Table 6). Among the supportive therapy, pheniramine maleate ,promethazine, meloxicam, ketoprofen ,vitamin , autohaemotherapy, virutex and povidon iodine, respectively, were used in 78.1%, 21.8%, 75%, 25%, 37.5%, 71.8%, 28.1% and 93.7 of different treatment regimens recommended by the field veterinarians.

Table 6 : Patterns of drugs prescribed to treat LSD cases (N=32)

Variable	Categories	LSD, n	%(95% CI)
Antibiotics	Amoxycillin	12	37.5(21.10-56.31)
	Oxytetracycline	7	21.8(9.28-39.97)
	Streptomycin and penicillin	8	25(11.46-43.40)
	Procaine and benzyl Penicillin	5	15.6(5.27-32.79)
Others	Pheniramine maleate	25	78.1(60.03-90.72)
	Promethazine	7	21.8(9.28-39.97)
	Meloxicam	24	75(56.59-88.54)
	Ketoprofen	8	25(11.46-43.40)
	Vitamin supplement	12	37.5(21.10-56.31)
	Furosemide	6	18.7(7.21-36.44)
	Autohaemotherapy	23	71.8(53.25-86.25)
	Normal saline	2	6.25(0.77-20.80)
	Dexamethasone	8	25(11.46-43.40)
	Virutex	9	28.1(13.74-46.75)
	Povidone iodine	30	93.7(79.19-99.23)

Furthermore, furosemide (18.7%), normal saline (6.25%) and dexamethasone (25%) were also used in some cases depending on the severity of complications.

Chapter 4: Discussion

LSD is a devastating, acute or inapparent pox viral disease of cattle with major socio-economic impact by production losses, adding treatment costs, chronic debilitation and death of the animals. The present study endeavored to explore the prevalence of LSD and describe the clinico-epidemiological, haematological, therapeutic management parameters by closely examining the clinical cases of LSD affecting cattle population in Chattogram district.

The results revealed that the prevalence of LSD could be very high in Karnafully (11.66%), Shatkania(10.88%) Sitakund (8.95%) and Anwara(4.07%) upazilas of Chattogram district. The presence of high densities of biting insects, poor drainage system, improper management condition, difference in husbandry practices and less awareness of the farmers could be some probable reasons of seeing such high prevalence of the disease in these upazilas mentioned.

LSD disease was significantly higher in cattle that were reared on smallholdings .The reason for this is that farmers kept their cattle in open grazing area which potentially allows biting flies to easily transmit the virus. On the other hand, cattle which reared in particular on organized farms are less susceptible to LSD infection due to their zero grazing management system that kept them away from arthropod vectors. This finding is supported by a previous study (Ochwo *et al.,* 2019). Female animals had a significantly increased risk to LSD than male animals. It may be due to the physiological conditions of female cattle (lactation, pregnancy etc.). This result is corroborated with a similar observation of a previous study (Ochwo *et al.,* 2019).

Analysis of the association of the factor age with LSD revealed that adult animals had a significantly higher prevalence of LSD and this could be related to weaning of maternally derived immunity level and more duration of exposure to the virus. Contrarily, younger cattle didn't show higher susceptibility to LSD due to existence of passive maternal immunity, lower frequency of explosure and restricted rearing in a better protected environment, away from the access of flies and other vectors. This finding is similar to findings of many other studies (Abera *et al.,* 2015; Ochwo *et al.,* 2019), but also have disagreement with some others (Jameel *et al*., 2016; Ayelet *et al*., 2014).

In this study, Cross-bred animals were found to be significantly higher risk for LSD as compared to local breeds which is in agreement with many previous studies (Davies, 1991; Jameel *et al*., 2016; Abera *et al.,* 2015; Ochwo *et al.,* 2019; Salib and Osman, 2011). The local or native breeds may have the stronger immune response, well adaptability to the environment and also the genetic differences between the breeds could influence the susceptibility of the disease (Salib and Osman, 2011).

The frequent clinical features of LSD were characteristics skin nodules, fever, enlargement of lymph node, anorexia and salivation are in agreement with many previous studies (Coetzer., 2004; Gari *et al*., 2010; Salib and Osman, 2011; Tuppurainen and Oura, 2011;Body *et al*., 2012). The first noticeable sign of LSD is fever that can take a course of 4 to 14 days and more prolonged fever indicates secondary bacterial reaction (Jalali *et al*., 2017). The complications of LSD involving cutaneous edema, sloughing off of lumps, cellulitis, pneumonia, recumbency and diarrhoea were observed in this study and these findings are supported by (Jameel *et al*.,2016). These complications resulted from persistent fever, immunosuppression, damage of the skin or mucous membrane which were further aggravated by secondary bacterial invasions (Salib and Osman, 2011). Recumbency resulted from severe debilitation and cachexia needs longer time to recover. Presence of LSD nodules in intestinal mucosa invaded later by bacteria may result in diarrhoea and bacterial invasion on eroded areas in bronchial and tracheal mucosa could result in pneumonia (Davies, 1991).

Haematological assessment of blood samples obtained from LSD affected cattle revealed that total leukocyte count (WBC), differential leukocyte count, mean corpuscular volume (MCV) remained in normal reference ranges. But such findings are in disagreement with (Abutarbush *et al*., 2016) where leukocytosis in some animals and leukopenia in others were reported. Besides, total erythrocyte count (TEC), haemoglobin level (Hb), haematocrit value (HCT) and red blood cell distribution width (RDW) were found to be decreased in the present study, supported by (Jalali *et al*., 2017).This type of reduction may be considered as anemia of inflammation that is caused by inflammatory cytokines, including TNF, IL-1α, IL1β, and IF-γ, lower bone marrow responsiveness to erythropoietin, anorexia, reduction of serum iron (Jalali *et al*., 2017; Morceau *et al*., 2009).

As a viral disease, LSD has no specific treatment and only symptomatic therapy is applicable by using combination of antimicrobials and anti-inflammatory drugs. Most common antibiotics that were used to treat animals under the present study were amoxycilin, oxytetracyclin, streptopenicillin and penicillin. These systemic antibiotics were seemingly important to cure skin infection, fever, pneumonia and cellulitis (Davies, 1991). The outcome of treatment was comparatively better when amoxycilin and oxytetracyclin were administered, according to the follow up feedback received from the owners of the affected animals. Anti-inflammatory drugs (pheniramine maleate, promethazine ketoprofen and meloxicam) were used to reduce generalized inflammation and vitamin supplement was used to stimulate immunity (Al-Salihi, 2014). Antiseptic solutions were used for wound dressings and intravenous fluid therapy was used for maintenance of hydration and preventing debilitation during diarrhoea and recumbency (Kumar, 2011; Salib and Osman, 2011). Furosemide was used along with dexamethasone for treating cutaneous edema to prevent the body from absorbing too much salts. Dexamethasone was sometimes used to inhibit the inflammatory response, fibrin deposition, deposition of collagen, scar formation, fibroblast and capillary proliferation (Jameel *et al*., 2016).

Limitations

The study was conducted with a small sample size and in short period of time available for the internship rotation.

LSD cases enrolled for the study were diagnosed mainly based on history and clinical signs by the duty veterinarians at the work place, and there was no facilities available at the UVH to confirm a case of LSD by applying valid laboratory testing. Despite the limitations mentioned, this study provides some valuable information on clinical, haematological and epidemiological pictures of LSD affecting cattle in Chattogram district.

Conclusion and recommendations

In Bangladesh, LSD was for the first time reported in cattle in Chattogram division, in 2019. Sporadic incidences of the disease were reported from almost all unions of the upazilas of Chattogram district with variable intensities. The prevalence of the disease could be higher in cattle on smallholdings compared with on organized farms. Female animals are seemingly more susceptible to LSD compared with male and indigenous cattle are comparatively less susceptible to the disease compared with exotic breeds or cross-bread cattle. Clinically, the classical presentation is the development of nodules or lumps covering the major parts of the body, and other commonalities include fever, lymphadenitis, dehydration and sometimes salivation and debilitation due to inability to feed properly. RBC, haematocrit, red blood cell distribution width, haemoglobin level might decrease in cattle suffering from LSD. As complications, in addition to sloughing off the lumps, cellulitis, edema, pneumonia and diarrhoea might develop. There are different antimicrobials are on the choice list for the field veterinarians to stop lesion aggravation due to secondary bacterial infections, but the routinely used antimicrobials are seemingly amoxicillin and oxytetracycline.

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Biograpy

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