Chapter-I

Introduction

Bangladesh is predominantly an agricultural country where the agriculture sector plays a vital role in accelerating economic growth. Bangladesh is a densely populated crop growing country in the world and livestock has been an important component mixed farming system practiced in Bangladesh for centuries. About 60% of draught power for crop production, a substantial amount of power for transportation of goods, meat & milk for human consumption, hides, bones, horns as raw materials for industry and export manure for crop fields and fuel for domestic used all derived from the livestock for the country. The magnitude of the contribution of the livestock sector to the GDP is 3.47 in Bangladesh (BBS 2019). It generates 13% of the total foreign exchange earnings and provides full-time employment to about 20% of the rural population. Despite its substantial importance, much less attention is given in development plans by policymakers to the livestock sector compared to the crop sector primarily because of the poor state of knowledge about methods and problems of production and utilization of the livestock in the country. Livestock disease is one of the most important barriers to livestock development in this country. As a result, there is an acute shortage of livestock products like milk, meat, and eggs. The domestic production of milk, meat, and eggs account for 13.58%, 10.50%, and 22.78% of the minimum requirements respectively and per capita availability of milk 33.95 ml/day, meat 12.61 gm/day, and eggs 0.455/week are highly deficits against the per capita requirements of milk 250ml/day, meat 120gm/day and egg 2/week (GOB, 2008). Similarly, there is also acute storage of animal power of tillage operation and the extent of storage appears to be 7.5% in terms of the number of draught cattle herds, but the production raises to 40.90% when a estimation is made based on the power unit. There are about 25.07 million cattle in our country (BBS, 2019).Bangladesh earns foreign currency every year about 2.32 million square m leather area produced.

Livestock is an integrated component of the farming system plays a crucial role in the traditional economy of Bangladesh. Ruminants, especially large (cattle and buffaloes) ruminants constitute the major portion of the Livestock. Most of these animals reared in rural areas under smallholder traditional management systems. The large ruminants are used for draught power, meat, and milk production. These ruminants are not only important for draught power, meat and milk but also important for good quality leather and a source of income to farmers but various types of diseases are responsible for discomfort, loss of market value, weight, milk production, draught power of the animal, and small to marginal farmers

and landless laborers. It is estimated that an economic loss of BDT4168.4 thousand for 475 FMD affected cattle due to calf mortality, reduced milk yield, and plow loss. Annual financial loss amounting to BDT 8118 cores (the US $221 million) estimated to be downgrading and rejection of leathers associated with the defects caused by skin disease lesions and post mortem and industrial defects. It is an estimation that about 10% of animals die annually due to diseases and the cost-benefit ratio had shown to be 1:8 for vaccination and 10:25 for deworming (Rahman *et. al.,* 1993). Analyze the case records the clinical incidence of diseases in cattle was 12%, (Rahman and Ahmed, 1994).In Bangladesh, the population of cattle is about 25.7 million. Among the total6 million milking cows (85-90) %of them are indigenous and (10-15) % of them are crossbred (BBS 2019).

In Bangladesh, recently LSD outbreak was known to start in Karnafully Upazila (sub-district) of Chattogram district on 14thJuly 2019 although confirmed as lumpy skin disease through real-time PCR on 27thAugust 2019.The initial attack rate was 18% with no mortality (DLS, 2019). Within a short time, the disease has surged to all parts of the country. According to the situation, report published by the department of livestock services, total cases reached to 553528 among the 25 million cattle population and recorded total death of 97 since 3rd December 2019 (DLS, 2019). In April 2019, the first case had seen in Bangladesh. The outbreak of LSD occurs in the summer and autumn season due to moist weather is favorable for the breeding of flies and usually ceased in the winter. A study in Ethiopia stated the introduction of new animals to the herd and the presence of water bodies act as risk factors. Although this virus could infect all breeds of cattle irrespective of age and sex, *Bos taurus* is found more susceptible than *Bos indicus* (Calistri et al. 2020). In 2019, the LSD outbreak was reported for the first time in Bangladesh as well as in India and China and re-emerged in Israel. To my mind, still no research investigation has conducted in Bangladesh to reveal the disease risk factors, transmission, and role of vectors. In Bangladesh, the onset of disease in Karnafully was first on the week of April; 2019. A total of 450 cattle were affected including 43 farms (CDIL). In June 2019, the second spread was detected in Patiya with an infection of 300 cattle including 11 farms. The Third spread was in Anwara Upazila on 1July, in 2019 and 350 cattle were affected andin9farms (CDIL). The First LSD case was seen in Rangunia from 18 April 2019 (UVH) but confirmed officially on15 September 2019 through real-Time PCR (CDIL).

Taking all these factors in account, we have taken this study in hand to assess the distribution pattern of lumpy skin disease and the management approach to cure the lumpy skin disease affected cases at Rangunia.

Objectives of the study:

1) To investigate the frequency of LSD in Rangunia upazila

2) To determine the risk factors of LSD

4) To know the drugs used for LSD in RUVH

Chapter: II

Review of literature

2.1. Lumpy skin disease (LSD):

Lumpy skin disease (LSD) is a contagious, devastating viral disease of all aged cattle. It is a vector-borne disease. Lumpy skin disease (LSD) caused by lumpy skin disease virus (LSDV), a virus from the family Pox viridae the genus Capripoxvirus. Sheeppox virus and the Goatpox virus are the two other virus species in this genus.

2.2. Epidemiology and vector:

It mainly spreads through arthropods like mosquitoes, flies, and ticks but variations appeared in region to region. *Stomoxys calcitrans* and *Haematopota sp* are primary vectors for mechanical transmission of LSD in Europe. Where as in sub-Saharan Africa three species of hard ticks and *Aedes aegypti* mosquito plays a crucial role along with *Stomoxys calcitrans* flies (OIE, 2017). Mosquitoes carry the virus from infected animals to a new one through biting. Animals can be infected through the consumption of contaminated feed, water, and semen from the infected bull. The result of experimental research has shown that direct transmission from infected to a susceptible animal is very rare (Karalliu et al.2017). In Bangladesh, the primary vectors did not detect yet and it assumed that a rapid transmission has occurred through malpractice by non-vets using contaminated needles, equipment, and vehicle. A study in India recognized LSD virus in higher proportion in scabs (79.16%) compared to blood 77(31.81%) and frozen bull semen (20.45%) (Sudhakar et al.2019). Another study explored that LSDV genes possess an average 65% structural relationship with other known mammalian poxvirus-suipoxvirus, yatapoxvirus, and leporipoxviruses. (Tulman et al.2001).LSD manifested mainly with fever and skin lesions as well as a sudden fall in milk production.

2.3. History:

In 1929, LSD first Identified in Zambia, and from 1929-1988 the disease was confined in Africa. A focus of LSD was identified in Israel in 1989.The virus entered the Middle East in 2012.The disease spread out from the Middle East to Turkey and South-East Europe and Russia within 2012-2013.An outbreak in Greece occurred in the 2015-2017 and Bulgaria and Balkan Region. On 21st July 2019 LSD was reported in Chattogram, Bangladesh. On 25thAugust 2019, LSD like symptoms were found in Odisha, India (ProMEDMail), and on26thAugust 2019 LSD found in China near the border of Kazakhstan (Rahman, 2016).

2.4. Taxonomy of Lumpy Skin Disease Virus (LSDV):

Poxviridae is divided into two subfamilies: poxviruses affecting insects (Entomopoxvirinae) and vertebrates (Chordopoxvirinae) and several genera. Within the *Chordopox*virinae, the genus *Capripoxvirus* comprises lumpy skin disease virus (LSDV), sheep pox virus (SPPV), and goat pox virus (GTPV). The prototype of lumpy skin disease virus (LSDV) is known as the Neethling strain which was first isolated in South Africa (Alexander et al.,1957). LSDV belongs to the family Poxviridae which is under the sub-family *Chordopox*virinae, genus Capripoxvirus (International Committee on Taxonomy of Viruses, ICTV, 2013)

2.5. Resistance to physical and chemical action:

LSD virus is the susceptible to temperature of 55°C/2 hours or 65°C/30 minutes. It can recover from skin nodules kept at - 80°C for 10 years and infected tissue culture fluid stored at 4°C for 6 months. It is Susceptible to alkaline or acid pH. No significant reduction in titer when held at pH 6.6–8.6 for 5 days at 37°C. LSD virus is susceptible to ether (20%), chloroform, formalin (1%) and some detergents, e.g. sodium dodecyl sulphate, phenol (2%/15 minutes), sodium hypochlorite (2–3%), iodine compounds (1:33 dilution), Virkon® (2%), quaternary ammonium compounds (0.5%).

2.6. Survival:

LSDV is remarkably stable, surviving for long periods at ambient temperature, especially in dried scabs. LSDV is very resistant to inactivation, surviving in necrotic skin nodules for up to 33 days or longer in desiccated crusts for up to 35days, and at least 18 days in air-dried hides. It can remain viable for long periods in the environment. The virus is susceptible to sunlight and detergents containing lipid solvents, but in dark environmental conditions, such as contaminated animal sheds, it can persist for many months.

2.7. Host:

LSDV is highly host-specific and causes. These diseases only in cattle*(Bos indicus* and *B. Taurus*) and water buffalo (*Bubalus bubalis*)is evidence from a study in Ethiopia of differential breed susceptibility to LSD, with Holstein Friesian or crossbred cattle exhibiting higher morbidity and mortality due to LSD when compared with local zebu cattle. Extensive serological surveys of wild ruminant species in Africa have not identified a wildlife reservoir of LSDV. The virus appears to highly host specific and LSDV is not a zoonotic disease.

2.8. Transmission:

The principal means of transmission is by an arthropod vector. Mosquitoes like (*Culex mirificens* and *Aedes natrionus*), Biting flies like (*Stomoxys calcitrans* and *Biomyia fasciata),*and Male ticks like (*Riphicephalus appendiculatus* and *Amblyomma hebraeum*) could play a role in the transmission of the virus. Infected bulls can excrete the virus in the semen; however, the transmission of LSD via infected semen has not demonstrated. It is not known if the transmission can occur via fomites, like, ingestion of feed and water contaminated with infected saliva (Rahman, 2016). Animals can be infected experimentally by inoculation with material from cutaneous nodules or blood. Direct contact plays a minor role in the transmission of the virus.

2.9. Sources of virus:

Skin nodules, scabs, and crusts contain relatively high amounts of LSDV. The virus can be isolated from this material for up to 35 days and likely for longer.LSDV can be isolated from blood, saliva, ocular and nasal discharge, and semen. LSDV could find in the blood intermittently from approximately 7to 21 days post-infection at lower levels than present in skin nodule. Virus Shedding in semen may be prolonged.LSDV has been isolated from the semen of an experimentally infected bull 42 days post-inoculation. There has been one reported of placental transmission of LSD. LSD does not cause chronic disease. It does not exhibit latency and the recrudescence of disease does not occur (OIE, 2017).

2.10. Diagnosis:

Under the experimental conditions, following the virus inoculation, the incubation period is between 4 and 14 days. LSD signs range from inapparent to severe disease. There is no current evidence of variation in virulence regarding the different LSDV strains. The major signs are Fever that may exceed 41°C,Marked reduction in milk yield in lactating cattle, anorexia, depression and emaciation, rhinitis, conjunctivitis and excessive salivation, enlarged superficial lymph nodes, cutaneous nodules of 2–5 cm in diameter develop, particularly on the head, neck, limbs, udder, genitalia, and perineum within 48 hours of the onset of the febrile reaction. The nodules are circumscribed, firm, round, and raised, and involve the skin, subcutaneous tissue, and sometimes even the underlying muscles. Large nodules may become necrotic and eventually fibrotic and persist for several months (“sit-fasts”); the scars may remain in definitely. Small nodules may resolve spontaneously without consequences, myiasis of the nodules may occur too. Vesicles, erosions, and ulcers may develop in the mucous membranes of the mouth and alimentary tract and the trachea and

lungs. Limbs and other ventral parts of the body such as the dewlap, brisket, scrotum and vulva may be edematous, causing the animal to be reluctant to move, Bulls may become permanently or temporarily infertile, pregnant cows may abort and be in anestrus for several months. Recovery from severe infection is slow due to emaciation, secondary pneumonia, mastitis, and necrotic skin plugs, which are subject to fly strike and shed leaving deep holes in the hide. LSD can be diagnosed by Polymerase chain reaction (PCR). It is the least expensive and quickest method for the detection of LSDV. Skin nodules and scabs, saliva, nasal secretions and blood are suitable samples for PCR detection of LSDV. Electron microscopy can be used to identify the classic poxvirus vision but cannot differentiate to genus or species level (OIE 2017) *Capripox*virus antibody enzyme-linked immune sorbent assay is the new commercial kits for the detection of *Capri poxvirus* antibodies are currently being developed and released on to the market.

2.11. Treatment of Lumpy Skin Disease:

Unfortunately, there are no specific antiviral drugs available for the treatment of lumpy skin disease. The only treatment available is supportive care of cattle. This can include the treatment of skin lesions using wound care sprays and the use of antibiotics to prevent secondary infections and pneumonia. Anti-inflammatory painkillers can use to keep up the appetite of affected animals. Intravenous fluid administration may be of benefit; however, this may not be practical in the field. The lack of treatment options for lumpy skin disease virus emphasizes the need for using effective vaccination for preventing disease.

Chapter: III

Materials and Method

3.1. Site selection:

The study had done in Rangunia upazila veterinary hospital (RUVH).Many village areas are under Rangunia upazila rearing livestock treated in RUVH. Rangunia upazila is one of the important sites for the livestock population. The cattle are treated in RUVH and most of the common livestock diseases are frequently found in this area. Almost 70-80 % of patients from different village areas come in RUVH to be treated. It was quite easy to collect data from the owners by questionnaire and by observing the animal condition. As it was easy for me to collect data and I had plenty of LSD patients that is why I selected Rangunia for my study area.

3.2. Target population:

All suspected domestic cattle including young and adult were the target population. Mainly patients visit the RUVH and patients from visiting the village area were the study population. We found a total of 116 cases of lumpy skin disease which include 38 number of calves, 55 females and 23 males. They were selected for the study population. We have diagnosed LSD mainly by observing clinical signs and symptoms.

3.4. Duration of the study:

I had an opportunity to work in Rangunia UVH as an intern student. When I was working at UVH, that time LSD outbreak occurred in Rangunia upazila. We used to treat many LSD patients with the help of veterinary surgeon (VS) of Rangunia upazila and LSD drastically spread out at Rangunia at that time. It was quite easy to collect data from the owners by questionnaire and by observing the animal condition. The duration of the study is 12 months. The duration of the study mainly from April 2019 to March 2020

3.5. Types of the study:

The study was carried out on the hospital data and patient from the village area and it is a cross-sectional study.

3.6. Techniques and tools used for data collection:

A total of 38 young calves, 55 cow &23 bulls, at different age infected with LSD registered from different villages and Upazila Veterinary Hospital of Rangunia under Chattagram

district during the part of the internship period. There were two ways of the gathered patient, one was a hospital where farmers willingly came with the patient, and another way was field visit with the veterinary surgeon for treatment of diseased animals. A prepared questionnaire had used for collecting various types of information regarding age, sex, owner's complaint, management, previous treatment, and preventive measures during the animal examination. The general clinical examination inspection, palpation, percussion, auscultation, method were applied to examine the animals. Clinical history was collected from the owners themselves.

3.7. Process of clinical examination to diagnose the diseases or disorders in cattle:

At first, I took the clinical history from the owners and recorded them as case number, date of administration, species, breed, age, sex, class, physiological state, temperament, and body weight, owner's name, address, etc. Then we took disease history, like epidemiological history such as herd size, morbidity, mortality and so on. We examined individual animals by distant inspection and direct auscultation, like demeanor, physical condition, posture, gait, eating, defecation, urination, voice, respiratory, ruminal, and other sounds, etc. Rumination, respiratory character, abdomen size, skin and coat, head (eyes, ear, horn, face, nose, tongue, etc.) tail, digit, mammary gland, testes, vulva, prepuce, brisket and lymph node etc also examined. We mainly observed the animals' signs and symptoms to detect disease. For most of the LSD cases, we found some common major signs like fever (103-107 deg F), nodules in the skin (generalized and local), brisket swelling, leg pain, leg swelling, myiasis. A few patients were found with a history like reluctant to move, anorexia, emaciation, lameness, and unable to walk.

3.8. Data analysis:

We have collected data from RUVH and visiting by the village area .We have found 116 cases of LSD. After collecting data like the season of infection, breed, age, sex, signs, and symptoms, herd size, treatment strategy, etc, We have stored them in Microsoft office excel sheet and sorted them. I had categorized them according to different parameters. Then the data was analyzed in STATA-14. I had worked and tried to found the association of disease distribution with some factors like season, breed, age, sex, herd size, etc and after analyzing the data, I have organized them in different tables.

Chapter: IV

Result and Discussion

4.1. General Description:

We have worked on total 116 cases of LSD and have identified some risk factors which have statistical relationship with the outbreak of LSD. We have found from (Tab.1) that, among 116 cases of LSD, about 13.8% of cases had seen in the summer season (March to August). About 26% of cases had seen in the winter (December to February) season but about 63.8% cases had seen in fall (September to November).

Table.1: Descriptive information on the distribution of cases of LSD in Rangunia (N= 116)

Traits	Category	Frequency (%)	95% Confidence Interval
Season	Summer	16 (13.8)	8- 21
	Fall	74 (63.8)	54.3- 72.5
	Winter	26 (22.4)	15.2- 31.1
Breed	Cross	8 (6.9)	30.2- 13.1
	Indigenous	108 (93.1)	87- 97
Age	Less than 1 year	36 (31)	22.8- 40.3
	Less than 2.5 years	37 (32)	23.5- 41.2
	More than 2.5 years	43 (37)	28.3- 46.5
Sex	Calf (Less than 1 year)	38 (32.8)	24.3- 42.1
	Female	55 (47.4)	39.1- 57
	Male	23 (19.8)	13- 28.2
Herd	Small (Less than 5 animals)	76 (65.5)	56.1- 74.1
	Large (More than 5 animals)	40 (34.5)	26- 43.9
Farm owner	Female	13 (11.2)	6.1- 18.4
	Male	103 (88.8)	81.6- 94
Distance from UVH	≤ 1 Km	38 (32.8)	24.3- 42.1
	>1 km	78 (67.2)	58- 75.7

The frequency have increased in fall because the vectors like fly and mosquitoes increased in fall season associated with rainfall and spread LSD in most of the animals. A study in Ethiopia found that the seasonality in the numbers of outbreaks is apparent, which tend to be higher in the months following the long rainy season compared to other seasons (W. Molla 2017).

About 93.1 % of cases noticed in indigenous cattle and 6.9% of cases have found in crossbred cattle. It may the reason for rearing indigenous cattle more than crossbred cattle in the Village area (Tab.1)

The almost same frequency of LSD has found in all ages of cattle but about 37% of cases found in the animal of ages more than 2.5 years old. Most of the cases have seen in the female which about 47.4%.A similar study carried out in Ethiopia, they also found that the sero prevalence between female and male animals studied and out of animals sampled, the majority or 64.0 % were females while about 36.0 % of them were males. There was a statistically significant difference ($p = 0.384$) among the age groups (adult, young, and calf) in the sero prevalence of LSD. The average sero prevalence according to age groups was 8.78 %, 5 %, and 2.74 % in adults, young and calves, respectively and this shows the prevalence was very low in calves (Zelalem Abera et al. 2015). It may be the cause of rearing female animals for milk production for long years in farm and small-scale farmer's house.

We also can see that in small herd infections were more than the large herd. In the small herd, the infections were about 65.5 % and in large it was 34.5%. In the small herd cases are more because people in rural area rear more animal in backyard system than large farm or maybe in the large farm the disease controlling system is good enough and nutritional condition also good in animals that is why LSD infections are less in the large farm than small.

From the study, we found that Male farm owners are (about 88.8 %) more than female (about 11.2%) owners. Naturally, in a rural area, female farmers are less than male.

The distribution of cases is seen about 32.8 % from the distance of 1 km area and 67.2 % cases are from the distance of more than 1 km area from RUVH. Therefore, it is clear that patients come from far to RUVH for the treatment and need to be maintained.

4.2. Relationship between age and herd size:

We tried to find out the relationship between the age of the animals and herd size from the data collected from the UVH of Rangunia. We have categorized the age in three groups, a group ages less than 1 year, 2nd group ages less than 2.5 years but more than 1 year, another group ages more than 2.5 years. Then, all information is sorted and analyzed them and found relationship.

Tab.2. Relationship between age of the animal and herd size (Chi-Square Test) (N= 116)

Age	Herd size		P-value
	≤ 5 animals	> 5 animals	
< 1 year	7	29	0.03
<2.5 years	18	19	
> 2.5 years	15	28	

From table 2, we can see that the relationship between age and herd size for the LSD cases in Rangunia is significant. Calf less than 1 year old and cow more than 2.5 years old more affected in the large herd than small herd (Tab.2). As the large dairy farm rear, more cows for milk production for years (Tab.1) and there are more calf rearing at a time. Therefore, it is somewhat difficult to take care of more calf at a time or may be the calf got the infection from their mother. A study in Kenya also stated that large herds were 3.5 times more likely to experience LSD outbreaks compared to the small herds (Tuppurainen and Golan, 2019).

4.3. Distributions of symptoms in LSD patient:

We have found 116 LSD cases in Rangunia during our study. We have found some common major signs and symptoms in those cases. Different symptoms were showing in a different animal, so we have sorted the symptoms according to cases and analyzed them to have the descriptive data on the symptoms showed in LSD at Rangunia.

Tab.3. Descriptive data on the symptoms showed in LSD at Rangunia UVH (N=116)

Symptoms	Category	Frequency (%)	95% Confidence Interval
Fever	Present	88 (75.9)	67- 83.3
	Absent	28 (24.1)	16.7- 33
Skin Nodule	Present	80 (69)	60- 77.2
	Absent	36 (31)	22.8- 40.3
Swelling in leg	Present	33 (28.4)	20.4- 37.6
	Absent	83 (71.6)	62.4- 79.5
Pain in leg	Present	38 (32.8)	24.3- 42.1
	Absent	78 (67.2)	58- 75.7
Swelling in Brisket	Present	21 (18.1)	11.6- 26.3
	Absent	95 (81.9)	73.7- 88.4

From table 3, we can see that the frequency of different symptoms found indifferent diseased animal where fever found on about 75.9 % cases, skin nodule found in 69% cases, swelling in the leg found in 28.4% cases, pain in the leg found in 32.8% cases and swelling in brisket found in 18.1 % cases at Rangunia. The sign and symptoms mentioned in the review and literature part also seen in the study table. A study in Albania conducted on lumpy skin disease; they found fever in 100% cases, skin nodules in 41% cases, leg pain in 60.7 % cases, brisket swelling in 10.7% cases (Karalliu et al. 2017).

4.4. The treatment protocol used in LSD cases at Rangunia:

After the diagnosis of LSD, we had treated those cases. We mainly treated with supportive treatment like NSAID, Antihistaminic, Antibiotics, diuretics, vitamins and mineral supplements. Then, the drugs were used according to the signs and symptoms they had. So, different drugs used in different cases. We have categorized the drug into groups and found the frequency of using them in LSD cases at Rangunia.

Tab.4. Descriptive data on the treatment protocol used in LSD cases at Rangunia UVH (N=116

Drugs	Category	Frequency (%)	95% Confidence Interval
NSAID	Not used	42 (36.2)	27.5- 45.6
	Used	74 (63.8)	54.3- 72.5
Antihistaminic	Not used	79 (68.1)	58.8- 76.4
	Used	37 (31.9)	23.5- 41.2
Antiviral	Not used	51 (44)	34.8- 53.5
	Used	65 (56)	46.5- 65.2
Antibiotic	Not used	36 (31)	22.8- 40.3
	Used	80 (69)	59.7- 77.2
Topical ointment	Not used	113 (97.4)	92.6- 99.5
	Used	3 (2.6)	0.5- 7.4
Diuretics	Not used	80 (69)	59.7- 77.2
	Used	36 (31)	22.8- 40.3
Fluid Therapy	Not used	100 (86.2)	78.6- 92
	Used	16 (13.8)	8- 21.4
Oral zinc therapy	Not used	58 (50)	40.6- 59.4
	Used	58 (50)	40.6- 59.4
Vitamin C	Not used	51 (54)	34.8- 53.5
	Used	65 (56)	45.6- 64.4
Soda water and Sugar	Not used	106 (91.4)	84.7- 95.8
	Used	10 (8.6)	4.2- 15.3
Turpentine spray	Not used	85 (73.3)	64.3- 81.1
	Used	31 (26.7)	19- 35.7
Dressing	Not performed	98 (84.5)	76.6- 90.5
	Performed	18 (15.5)	9.5- 23.4

From table 4, we can see that NSAID (Non-steroidal anti-inflammatory drug) was used in 63.8% of cases of LSD at Rangunia. As, LSD is a viral disease and inflammation, fever, pain are common phenomenon occurs here, that is why NSAID used to reduce the inflammatory action. In table 5, we can see that from all types of NSAID, we have chosen mostly Flunixin, which used in 33.8 % cases, followed by ketoprofen in 31.2 % cases and least used

Meloxicam in 1.3 % cases at Rangunia. Antihistaminic used to check histamine release and to reduce inflammation. As LSD is a viral disease here different types of cytokine releases and we used antibiotics of different kinds in LSD cases which can cause the allergic condition in animals and causes inflammation, that's why we used antihistaminic in LSD cases at Rangunia to check the inflammatory reaction.

Tab.5. Distribution of drug of choice in the treatment regimen for LSD cases:

Drugs	Category	Frequency (%)	95% Confidence Interval
NSAID (N=77)	Ketoprofen	24 (31.2)	21.1- 42.7
	Flunixin	26 (33.8)	23.4- 45.4
	Aminopyrine and Suplyrine	15 (19.5)	11.3- 30.1
	Tolfenamic acid	7 (9.1)	3.7-17.8
	Paracetamol	4 (5.2)	1.4- 12.8
	Meloxicam	1 (1.3)	0.03- 7
Antibiotics (N=79)	Combined	31 (39.2)	28.4- 50.9
	Single	48 (60.8)	49.1- 71.6
	Beta lactams	67 (57.8)	75- 92
	Aminoglycosides	32 (27.6)	29.6- 52.1
	Sulfonamides	12 (10.3)	8.1- 25
	Tetracyclines	8 (6.9)	4.5- 19
Antihistaminic (N= 37)	Chlorpheniramine Maleate	15 (40.5)	24.7- 58
	Pheniramine Maleate	7 (19)	8- 35.1
	Promethazine hydrochloride	15 (40.5)	24.7- 58

In table 4, we can see that we used antihistaminic in 31.9 % cases, and from table 5, we can see that, mostly used antihistaminic are Chlorpheniramine Maleate and Promethazine hydrochloride and used in the same number of cases, which is about 40.5%. Pheniramine Maleate was used in 19% of total cases.

Antibiotics were used against bacterial infection in the body. Here, antibiotics were used to check secondary bacterial infection associated with LSD. In table 4, we can see that Antibiotics used in 56% cases. Among antibiotics, we used single antibiotics in about 60.8 % cases and combined antibiotics in about 39.2 % cases (Tab.5). Mostly used antibiotics are from the Beta Lactams group and in about 58% cases (Tab.5)

Antiviral drugs kill and reduce viral infection.LSD is a viral disease, so antiviral used in those LSD case. The antiviral drugs were used in 56% of cases (Tab.4). Topical ointments were used in 3% cases for the nodules which became rupture to check bacterial infection and dressing performed in 15.5 % cases where ruptured nodules present (Tab.4). Diuretics used in 31% cases to remove excess fluid accumulation in the leg and brisket area (Tab.4) as supportive treatment. Fluid therapy was used in 13.8 % cases and vitamin C was used in 56% cases to boost up immunity (Tab.4). Soda water and Sugar were used in 10% cases to check viral load (Tab.4). Turpentine spray was used in 31 % cases to remove vectors like fly and mosquitoes from the farm area (Tab.4).

4.5. Association between fever and drug choice:

In total of 116 cases of LSD, fever was common in 75.9 % cases (Tab.3). We have used different drugs according to the symptoms they had. In fever having cases, we used some drugs. I tried to find out the association between fever and drug of choice and we analyzed the data and found a significant relationship between them (Tab.6)

Table.6. Association between fever and drug of choice (Chi-Square Test) (N= 116)

Drugs	Category	Fever		P-value
		Present	Absent	
Zinc	Used	49	9	0.03
	Not used	39	19	
Vita-C	Used	54	11	0.04
	Not used	34	17	
Fluid Therapy	Used	2	3	0.02
	Not used	80	20	

From table 6, we can see the association between fever and drug of choice. The association between zinc and fever is significant (p=0.03). Zinc was used more in those cases had a fever. About in 49 cases, we used Zinc and those had a fever. Zinc was mainly used to reduce the mineral imbalance. We also can see the relationship between Vita-C and fever is significant (p =0.04). Vita-C was used more in cases that had a fever. About in 54 cases, vita-C is used

to reduce stress by its antioxidant property. Fluid therapy used when there was no fever and not used in cases with fever. In the total of 80 cases, fluid therapy was not used and those cases had a fever.

4.6. Factors related to the antibiotic of choice:

We used antibiotics in 69% of cases to check secondary bacterial infection. We have chosen two types of antibiotics, one is broad-spectrum and another is a narrow spectrum. A broad-spectrum antibiotic is an antibiotic that acts on the two major bacterial groups, gram-positive and gram-negative, or any antibiotic that acts against a wide range of disease-causing bacteria. A narrow-spectrum antibiotic is an antibiotic that is only able to kill or inhibit limited species of bacteria. We used those two types of antibiotics according to their age group. We found a significant relationship between them (Tab.7).

Table.7. Factors related to antibiotic of choice (Chi-Square Test) (N= 116)

Traits	Category	Antibiotic Type		P-value
		Broad spectrum	Narrow Spectrum	
Age	< 1 Year	16	9	0.01
	< 2.5 year	15	10	
	> 2.5 year	8	23	
Flunixin	Prescribed	6	15	0.04
	Not prescribed	33	27	

In table.7, we can see that we used two types of antibiotics in LSD cases; we used broad-spectrum antibiotics in the 16 calf patients and used a narrow spectrum in only nine cases whose ages are less than 1 year. On the other hand, in the adult whose ages were more than 2.5 years, there we used a narrow spectrum in 23 cases and a broad-spectrum in only eight cases. Therefore, we can see the relationship of using antibiotics according to age. Narrow spectrum antibiotics were used more in adult cases and broad spectrum used in young cases. It may be because of having less immunity in the calves than adults. As they had less immunity, broad-spectrum used in advance to save the calves lives from secondary bacterial infection.

In table 7, we can also see another relationship between Flunixin and antibiotics choices and it is significant (p =0.04). Flunixin is an antihistaminic, which less used when we used broad-spectrum antibiotics and used more when we used narrow-spectrum antibiotics. In 33 cases, we did not prescribe Flunixin, which was treated with a broad-spectrum antibiotic.

4.7. The relationship between the presence of nodules in skin and treatment strategy:

In total 69 % of cases, we found generalized nodules in the skin (Tab.3), in such cases we treated them with antibiotics and dressing also done in few cases. We tried to see the significant relationship with the treatment strategy and the presence of nodule in table 8.

Table.8. Association among the presence of nodule in skin and treatment strategy (Chi-Square Test) (N= 116)

Drugs	Category	Nodule		P-value
		Present	Absent	
Combined antibiotic	Prescribed	26	5	0.04
	Not prescribed	54	31	
Dressing with Povidone-iodine	Done	17	0	0.003
	Not done	63	36	

We already have mentioned in the review literature that nodule in the skin all over the body is a major sign of LSD. In table 8, we can see that the relationship between combined antibiotics and nodules in the skin is highly significant. We prescribed more combined antibiotics in those cases who had generalized nodules in the skin. We prescribed combined antibiotics in 26 cases of having nodules in the skin. Combined antibiotics used more in nodules having cases because nodules are present in the outer surface of the body and could get any type of infections from both gram-positive and gram-negative bacteria.

In table 8, we can also see another relationship between povidone-iodine and nodules in the skin and it is significant. Povidone Iodine dressing was prescribed in those cases in which cases had nodules in the skin. In the 63 cases, povidone-iodine was not prescribed although they also had nodules. Here, povidone-iodine dressing was not prescribed as the nodules did not rupture and in 17 cases povidone-iodine dressing prescribed because the nodules ruptured in those cases.

4.8. Association between drugs used in the treatment of LSD at Rangunia:

We prescribed antibiotics, antihistaminic, antiviral drugs to treat the LSD cases at Rangunia. We prescribed different types of drugs and they had an association between them. we tried to find out them in table 9.

Table.9. Association between drugs used in the treatment of LSD cases at Rangunia (Chi-Square Test)

Drugs	Category	Antihistaminic		P-value
		Prescribed	Not prescribed	
Antibiotic Type	Broad spectrum	21	18	0.02
	Narrow spectrum	12	30	
Antiviral Drug	Acyclovir	15	50	0.02
	Not prescribed	22	29	
Flunixin	Prescribed	1	25	0.00
	Not prescribed	36	54	

At first, the relationship between antibiotics types and antihistaminic, we can see that, we used antihistaminic more in those cases in which we used broad-spectrum antibiotics. Antihistaminic is used more in such cases so that they can check anaphylactic shock associated with broad-spectrum antibiotics. In about 21 broad-spectrum antibiotics having cases, we prescribed antihistaminic and in only 12 narrow-spectrum having cases, we prescribed antihistaminic (Tab.9).

Secondly, (Tab.9), we can see the relationship between antiviral drugs (Acyclovir) and antihistaminic. When we prescribed Acyclovir in 50 cases, there we did not prescribe any antihistaminic. Antihistaminic was used less in acyclovir having cases than the cases in which acyclovir was absent. This relationship is also highly significant (p=0.02)

Thirdly, the relationship between Flunixin and antihistaminic is significant. When we did not prescribe Flunixin, there we prescribed antihistaminic. In the 36 cases of the total, Antihistaminic prescribed where Flunixin was absent.

Chapter: V

Conclusion

After the analysis of LSD cases from Rangunia UVH, We determined the risk factors and the rationale of the treatment of lumpy skin disease. We did this study on the total of 116 LSD patients at Rangunia UVH where calves were 38, Adult females were 55 and 23 male patients in number. In this study, we found some association of occurring LSD with some risk factors like season, breed, age, sex, herd size, farm owners' sex, etc. In the fall season, the disease occurrences were more. We found more cases in indigenous cattle because in the village area people rear more indigenous cattle than the crossbred cattle. We found more cases in females than males and in those females whose ages are of more than 2.5 years, more cases in the large herd than the small herd. In this study, we found the symptoms like fever (75.9%), skin nodules (69%),leg swelling (28.4%),brisket swelling (18.1%),etc. in LSD cases. We tried to treat the patients with NSAID, antihistaminic, antibiotics, diuretics, Vitamin and mineral supplements etc as symptomatic treatment and used an antiviral drug as a specific treatment. We found an association between fever and drug choice. In patients with fever, we prescribed vitamin C (54 cases) and Zinc (49 cases) to reduce stress. We used more broad-spectrum antibiotics in calves less than one year and a narrow spectrum in adults' ages above 2.5 years. Patients having nodules on the skin treated with more combined antibiotics (26) than single antibiotics to check both gram-positive and negative bacterial infection. We also found a different association between antibiotics and antihistaminic use.

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Problems and limitations

During my study period at Rangunia UVH, I had felt some limitations like, some of the owners of the cattle farm initially did not want to co-operate with the researcher. Due to the pandemic of the Covid-19 outbreak, data collection became difficult at the ending of the study and due to lockdown; it was quite difficult for patients to come to UVH for treatment. If the sample size of the animal population in which I conducted my study would large, then the result might become more accurate. It would be better if we could diagnose the disease (LSD) with laboratory diagnostic facilities and in some of the causes, signs and symptoms were less.

Biography

Intern Doctor of Veterinary Medicine

Chattogram Veterinary and Animal Sciences University

E-mail:ayshahabiba2036@gmail.com

Personal Profile:

Name: Umme Aysha Habiba

Father's Name: Faridul Islam

Mother's Name: Jaynab Begum

Permanent Address: Pomra, **Upazila**; Rangunia **District**; Chattogram

Birth Date: 29th December 1996

Nationality: Bangladeshi

Religion: Islam

Blood group: O (+ ve)

Academic Qualification

Name of the Examination/Course	Name of the Institutions	Board	Passing year	Grade
SSC	Rangunia Public School And College	Chattogram	2012	4.75
HSC	CUET School And College	Chattogram	2014	5
DVM	Chattogram Veterinary And Animal Science University	-------	--------	--------

My Goal

As a human being, I have a long-cherished dream to serve my nation through my knowledge, creativity, and profession. As a veterinarian, I think I have a great opportunity to fulfill my dream by developing my career in the field as a veterinary practitioner. By dealing as a veterinary surgeon, I would be able to expand and spread my knowledge. I have also a high interest in Medical Research, Wildlife Conservation and Eco health approach.