Research Article

Prevalence and Associated Risk Factors of Lumpy Skin Disease in Cattle in Barishal District of Bangladesh

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Abstract | A study was conducted at Babugonj upazila under the district of Barishal during the period from January, 2022 to October, 2022. In this study, the prevalence and risk factors of lumpy skin disease in cattle population in the study area was determined. A total number of 1390 diseases cases were recorded randomly irrespective of age, sex, breed and season over the study period, among them 325 case were clinically diagnosed as Lumpy Skin Disease. The overall prevalence of Lumpy Skin Disease in cattle was 23.38%. The prevalence of Lumpy Skin Disease was maximum 33.84% at age of 0-6 months, in compared with 20.00%, 32.30%, 13.84% at age category 6-18 months, 18-36 months, > 36 months respectively. The prevalence of Lumpy Skin Disease in the study area in summer (73.84%) season is higher than rainy (26.15%) season. In the field, systemic antibiotics, such as amoxicillin, oxytetracycline and anti-inflammatory, antihistaminic drugs were commonly used as supportive treatment for the disease. Lumpy Skin Disease causes higher morbidity and heavy economic losses in recent years which may be reduced substantially by vaccination, proper surveillance and monitoring, restricted movement of infected and exposed animals.

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Introduction

Bangladesh is one of the world's most densely populated countries in south Asia. In this region, livestock is a significant sub-sector that is considered the backbone of agriculture. Livestock is an integrated part of farming system in Bangladesh, where it accounts about 16.52% of the agricultural Gross Domestic Product (GDP) as well as contributes about 1.90% of total of GDP (DLS, 2021-2022). The current estimated cattle population in Bangladesh is 25 million that plays a key role in employment generation, supply of meat and milk, leather and good source of income for farmers. Aside from that, the most essential raw resource for the leather industry is cattle hides. Bangladesh has 113 tanneries that generate 180 million square feet of hides and skins every year, valued $75 billion in commerce. Lumpy Skin Disease (LSD) is a serious viral disease that affects cattle health and cattle's hide. Currently, this

disease has a significant impact on cattle farming, especially small-scale farming, where economic losses are putting farmers' livelihoods at risk and discouraging them from continuing to farm in our nation.

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. 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). Three countries in Asia have reported the first occurrence of the disease to OIE (2019): Bangladesh (outbreak start date 14/07/2019), China (outbreak start date 03/08/2019) and India (outbreak start date 12/08/2019).

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 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).

In Bangladesh, an outbreak of an unknown syndrome with nodular skin lesions was reported by local veterinary services authority in mid 2019 in commercial and backyard cattle population in some locations (Anwara, Karnaphuli and Patiya) of Chattogram district (Anonymous, 2019). Same pattern of clinical onset was reported later in different districts of the country (Giasuddin *et al*., 2020; Khalil *et al*., 2021). The outbreak report was preliminary confirmed based on clinical signs and later using the reverse transcription polymerase chain reaction (RT-PCR) test by the Department of Livestock Services (DLS), Bangladesh and notified the disease as LSD to OIE in August, 2019 (Anonymous, 2019). LSD is highly host-specific, causing disease in cattle only and it is not zoonotic.

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. Although LSD affects cattle of all ages and breeds, *Bos taurus* are particularly more susceptible than zebu cattle (Hailu *et al*., 2015).

Direct transmission: Direct transmission can occur when the animals share the same feeding and drinking trough due to contamination by nasal and salivary discharges 9 from infected animals or ingestion of the already contaminated food or by iatrogenic agents (Lefèvre and Gourreau, 2010). LSDV can be transmitted by intrauterine transmission, as well as from mother to calf through skin lesions on the udder and teats or through contaminated milk (Tuppurainen *et al*., 2017). Transmission of LSDV through semen has been experimentally demonstrated.

Indirect transmission: LSDV can be mechanically transmitted by different blood feeding vectors (Sprygin *et al*., 2019). LSDV is mainly transmitted by arthropod vectors like biting flies, ticks (Lubinga *et al*., 2014). The virus can be transmitted through contaminated mouth parts of vectors without real replication of the virus inside arthropod cells or tissues (Sprygin *et al*., 2019). Tuppurainen *et al*. (2013), showed the association of male ticks in LSDV transmission. The prevalence of (*Rhipicephalus appendiculatus)* ticks in 65.45% cattle of Chittagong hilly area in Bangladesh, and it is noteworthy to mention that the first outbreak of LSDV infection was reported in Chittagong area of Bangladesh (OIE World Animal Health Information Database, 2019).

Stomoxys calcitrans (Stable fly) was reported as the most important vector for LSDV transmission during LSD outbreaks in Israel (Kahana-Sutin *et al*., 2017). A recent study demonstrated *Stomoxys calcitrans* as the most efficient vector for LSDV transmission, where *Aedes aegypti* was found as an efficient vector (Gubbins, 2019). Sohier *et al*. (2019) showed that both *Stomoxys calcitrans* and *Haematopota* spp. Can support mechanical transmission of LSDV. In a recent study, (Sprygin *et al*., 2018b) demonstrated that the common house fly (*Musca domestica*) could be involved in the LSD transmission. Although further work is required to conform the role of *M. domestica* in the transmission of LSDV (Sprygin *et al*., 2018) but it is speculated that houseflies may play an important role in the seasonal transmission of LSD in Bangladesh.

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). With this background the present study was conducted to achieve the overall prevalence of LSD in cattle at study area as well as to estimate the proportional prevalence of LSD of cattle relation to breed, age, sex and the risk factors of LSD in cattle in study area and evaluate of symptomatic treatment for LSD affected cattle.

Materials and Methods

Study area and duration

The study was conducted at Barishal district of Bangladesh. The study was carried out in Barishal district during the period from January, 2022 to October, 2022.

Sample and sample size

The study was conducted on naturally LSD suspected brought to the various veterinary hospital during the study period. In study periods about 1390 cattle were treated in Veterinary Hospital due to different diseased condition. Among them total lumpy skin disease affected cattle were 325.

Data collection

Firstly, a total number of cattle were recorded through preset questionnaire survey and the number of data of clinically suspected lumpy skin diseased were recorded. The data were directly collected from the owner and record book of the Veterinary Hospital, Barishal. Data were based on, client/owners, anamnesis of patient, clinical history, physical examination data (inspection, temperature, auscultation, respiration) and clinical sign of suspected cattle.

Clinical and physical examination

All the studied cattle presented at the Veterinary Hospital, undergone through physical examination by using the methods of inspection and palpation. Diagnosis of a LSD case was performed considering the general and specific signs of a 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.

Diagnosis of LSD cases

Among all diseased cases of cattle brought to the veterinary hospitals for treatment, presumptive diagnosis of LSD in cattle were made on the basis of owners complains, clinical history, clinical signs.

Vaccination history of LSD

Each owner was asked about previous vaccination history of his/her cattle sufferings from LSD virus.

Treatment

Antimicrobials of different combination and symptomatic therapy were provided to treat animals suffering from LSD. The antibiotics commonly prescribed were amoxycillin, oxytetracycline, procaine and benzyl penicillin. Among the supportive therapy, pheniramine maleate, promethazine, meloxicam, ketoprofen, autohaemotherapy, virutex and povidon iodine, respectively, were used in different treatment regimens in the Veterinary Hospital.

Statistical analysis

The prevalence was calculated by considering total number of samples screened for LSD and number of samples detected positive as per formula. LSD (%) = Number of positive cases/Total number of screened sample x 100. Data also analyzed by Chi-square test to observe the significant influence of parameters.

Results and Discussion

The study was conducted of Barishal District from January to October, 2022. Total 1390 animals were examined where 325 animals were clinically positive for Lumpy Skin Disease. The prevalence of LSD in cattle and therapy used to control also taken into consideration for determining the therapeutic efficacy of LSD infected cattle in veterinary hospital to observe in this study. The prevalence and associated results of this study are summarized.

Overall prevalence of LSD

In the present study the overall prevalence of LSD was 23.38% (Table 1). But other authors reported the dissimilar prevalence of LSD such as, Khalil *et al.* (2021), 21% in Barishal, Bangladesh; Elhaig *et al.* (2017) 17.4% in Egypt, Ochwo *et al.* (2019) 8.7% in Uganda and Molla *et al.* (2018) 26.5% in Ethiopia. The author Sarkar *et al.* (2020) found 41.06% in Dinajpur, Bangladesh; Haque and Gofur (2020) 49% in Naogon, Bangladesh. Body *et al.* (2012) observed the prevalence (27.9%) in cattle of Oman. In fact, the prevalence may differ from region to region. The higher or lower prevalence of disease might have been influenced by many factors such as age, sex, breed, geography, farm management and biosecurity, seasons, availability of arthropods vectors, importation of animal from infected areas, disposal of the dead animals.

Prevalence of LSD in different breeds of cattle

A total of 325 cattle were found affected with LSD in which prevalence of LSD in local (indigenous) cattle is 78.46% and in cross breed is 21.54% as shown in Table 1. In the present study, a significant variation in breed susceptibility was observed affecting mostly 24 indigenous cattle (78.46%). The risk of getting LSD cases in indigenous cattle was 3.64 times higher than cross breed in the study area. The farmers are mostly reared indigenous cattle rather than crossbreed; for this reason the prevalence of LSD in indigenous cattle is high. A study was conducted at Sylhet Sadar of Sylhet District from January to December, 2020 also reported that prevalence of LSD in local breed is 15.34% and the risk of getting LSD cases in indigenous cattle was 2 times higher than cross breed. Although the indigenous breeds cattle are in lower risk to diseases (Kiplagat *et al.*, 2020). Higher susceptibility of crossbred cattle might be due to lower disease resistance capability in comparison to indigenous breeds (Tageldin *et al.*, 2014). On the other hand, the prevalence of the disease was mostly associated with the presence of insect vectors, livestock grazing, watering points, husbandry systems, wet seasons and market conditions etc.

Table 1: *The prevalence of LSD in cattle of different breeds, age, sex and seasons in Barishal District of Bangladesh.*

Total cases	No. of infected cattle	Prevalence (%)
1390	325	23.38
Name of breed		
Local	255	78.46
Cross	70	21.54
Age (months)		
0-6	110	33.84
6-18	65	20.00
18-36	105	32.30
>36	45	13.84
Sex		
Male	140	43.07
Female	185	56.92
Season		
Summer	240	73.84
Rainy	85	26.15

Figure 1: *LSD diagnosed in a showing typical large circumscribed lumps of variable size covered all over the skin.*

Prevalence of LSD in different ages of cattle

The prevalence of LSD was maximum 33.84% at age of 0-6 months, in compare with 20.00%, 3230%, 13.84% at age category 6-18 months, 18-36 months, > 36 months, respectively. Analysis of the age (Table 1) prevalence of LSD revealed that the highest prevalence was observed in ages of 0-6 months (33.84%). This was followed by 18-36 months (32.30%), 6-18 months (20.00%) and > 36 months (13.84%) with statistically significant differences in

the study area. In this area calves are mostly affected because poor hygienic management, practicing poor bio-security practices, farm waste management, high density of biting fly around the shed. The authors' Sarkar *et al.* (2020), and Abera *et al.* (2015) reported the LSD prevalence was higher in young cattle in comparison with adult. In considering the age of animals, the prevalence was higher in adult animal when compared to young having similarities with the findings of the authors Haque and Gofur (2020). There was statistically significant difference between animal age and prevalence rate in this study. This dissimilar report to this study was probably due to variation in study place and time.

Figure 2: *Sloughing of lumps due to LSD.*

Prevalence of LSD in different sex of cattle

The variable sex of cattle, females (56.92%) were more susceptible than male (43.07%) to LSD disease. The prevalence of LSD in different sex of cattle is shown in Table 1. In this study female are more susceptible than male. Females were more prone to LSD compared to males which was consistent with previous research (Ayelet *et al.*, 2013; Magori-cohen *et al.*, 2012; Salib and Osman, 2011). Higher frequency of LSD in female cattle could be due to their exposure to many stress conditions, e.g., pregnancy, parturition and sometimes less amount of feed supplied compared to their actual requirement (Kasem *et al.*, 2018).

Prevalence of LSD in different season cattle

The prevalence of LSD in the study area in Summer (73.84%) season is higher than Rainy (26.15%) season. The prevalence of LSD in different season (Table 1), in this study show that in summer season is higher than rainy season. LSD is associated with increased number of insects which are mechanical vectors (Magori-cohen, 2012). It is more prevalent during the wet and warmer condition of summer months and occurs particularly in low lying agro-climate zone and along watercourses (OIE, 2010). The warm and humid climate in midland and lowland agro-climates has been considered as more favorable environment for the occurrence of large populations of biting flies than the cool temperature in the highlands (Tuppurainen *et al.*, 2012).

Efficacy of therapeutic response of LSD in cattle at different therapeutic methods

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, and penicillin (Table 2). These systemic antibiotics were seemingly important to cure skin infection, fever, pneumonia and cellulitis. 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).

The present investigation summaries the clinical outbreaks of LSD in cattle population at Barishal District. 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

Table 2: *Efficacy of therapeutic response of LSD in cattle with different therapeutic drugs.*

Therapy	Total no. of animals treated	No. of cured animals	Prevalence of cured animals (%)
Penicillin + Pheniramine maleate + Antiseptic solutions + Fluid and electrolyte therapy	325	322	99.07
Amoxicillin + Pheniramine maleate + Antiseptic solutions + Fluid and electrolyte therapy	325	320	98.46
Oxytetracyclin + Pheniramine maleate + Antiseptic solutions + Fluid and electrolyte therapy	325	317	97.53

present study endeavored to explore the prevalence of LSD by examining the clinical cases of LSD affecting cattle population in Barishal District of Bangladesh.

Conclusions and Recommendations

In performed study, it has been observed that young are more susceptible than old animal, local breeds are more prone to LSD. Here male was more resistant to LSD infection than female. Summer season prevalence are higher than rainy season. Overall, LSD is considered as a disease of high economic pressure because of its ability to compromise food security through protein loss, draft power, reduced output of animal production, increased production costs due to increased costs of disease control strategy, disrupt livestock and their product trade, result of reduced milk yield, weight loss, abortion, infertility in cows, mastitis and infertility in lactating cows, infertility in bull. A Veterinary Hospital is the best source of information about animal diseases and their prevention and treatment.

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Novelty Statement

LSD is considered as a disease of high economic Pressure. result of reduced milk yield, weight loss, abortion, infertility in cows, mastitis and infertility in lactating cows, infertility in bull.

Author's Contribution

All authors contributed to the experimental design, wrote down and examined the manuscript, and were confirmed liable for any aspect of the manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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