Study on the Prevalence and Risk Factors of Lumphy Skin Disease of Cattle at Chakaria Upazila, Cox's Bazar

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The Author

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List of Abbreviation

Abbreviation and Symbol	Elaboration
LSD	Lumphy Skin Disease
LSDV	Lumphy Skin Disease Virus
DNA	De-oxy Ribo Nucleic Acid
GDP	Gross Domestic Product
et al.	And his associates
%	Percent
UVH	Upazilla Veterinary Hospital
ULO	Upazilla Livestock Officer
VS	Veterinary Surgeon
B. wt	Body weight
SAQ	Shahedul Alam Quadery

Abstract

This study investigates the prevalence and impact of LSD among cattle in the Chakaria Upazila of Cox's Bazar. Livestock plays a crucial role in Bangladesh's food security, balanced nutrition, and solving unemployment issues through creating self-employment, earning foreign exchange, increasing the fertility of agricultural land, and empowering women. LSD, a contagious ailment, presents a substantial threat to this sector. The research, conducted from April to June 2023 at the Chakaria Upazila Veterinary Hospital, involved a comprehensive examination of 274 cattle cases. Out of these, 171 were diagnosed with LSD, revealing a high prevalence rate of 62.4%. The mortality rate stood at 4.34%, with a case fatality rate of 7.02%, underscoring the severity of the disease. Gender and age emerged as significant factors in disease susceptibility. Male cattle were more prone to infection and mortality compared to females, with the 0–6-month age group showing the highest incidence. Furthermore, the study indicated that indigenous cattle exhibited milder symptoms compared to crossbreeds, pointing to varying disease resistance capabilities. The study highlighted limited use of vector control measures, mainly relying on natural controls or mosquito nets, likely due to resource constraints and awareness gaps. While the study offers valuable insights into LSD's prevalence and impact, it states that several limitations, such as the focus solely on Chakaria Upazila, the short study period, and the use of completely hospital-based data, which may limit the generalizability of the findings. In conclusion, this research emphasizes the urgent need for targeted interventions to mitigate the impact of LSD on cattle populations in the Chakaria Upazila. Addressing this issue is crucial to safeguarding the livestock industry, which plays a vital role in sustaining Bangladesh's economy.

Key words: Case Fatality Rate**,** LSD, Mortality Rate, Prevalence.

Chapter 1

Introduction

Bangladesh relies heavily on agriculture, with a dense population to feed. Livestock farming has a long history in the country and plays a crucial role. Livestock, such as oxen, provide essential power for farming and transportation and contribute to meat, milk, and other industries. They also produce manure for crops and fuel for rural households. The livestock sector accounts for a substantial 3.23% of Bangladesh's GDP, highlighting its economic significance in the nation (BBS, 2022-23). Therefore, the livestock industry is vital to Bangladesh's economy. The country has sizable populations of cattle, goats, and buffalo, with approximately 24.86 million, 26.9 million, and 3.82 million of these animals, respectively (BBS, 2022-23).

Lumpy skin disease (LSD) is a contagious ailment found in cattle, resulting from an infection with a virus belonging to the Poxviridae family, commonly referred to as the Neethling virus (Davies, 1991). Poxviruses are double-stranded DNA viruses characterized by terminal hairpin loops at the genome ends. They can be identified by their unique brick-shaped appearance when viewed under an electron microscope (Curry et al., 2006). LSDV's genome consists of double-stranded DNA and encodes 30 pox viral proteins, both structural and nonstructural. This virus shares a high degree of genetic and antigenic similarity with sheep pox virus (SPPV) and goat pox virus (GTPV), with nucleotide sequences showing a 96% identity across these species (Tulman et al., 2001)

In mid-2019, the veterinary authorities in Bangladesh identified an outbreak of an unfamiliar syndrome characterized by the presence of nodular skin lesions. This outbreak occurred among both commercial and backyard cattle populations in specific areas of the Chattogram district, including Anwara, Karnaphuli, and Patiya Upazila (Hasib et al., 2021). The identical clinical onset pattern was later observed in diverse districts throughout the nation (Giasuddin et al., 2019; Khalil et al., 2021).

LSD is year-round but worse in hot, humid climates. The virus is robust, surviving in dried scabs, posing contamination risks. Severity depends on virus virulence and host factors like immunity, cattle breed, and age. While cattle are the main hosts, LSD can infect buffalo and sheep with milder symptoms (Elhaig et al., 2017). LSDV transmission through direct contact is inefficient, requiring parenteral inoculation. Generalized disease may result from arthropod-mediated, Stomoxys spread, especially through intravenous feeding. Additionally, insects and ticks like *Aedes aegypti calcitrans*, and *Rhipicephalus appendiculatus* have been identified as effective mechanical vectors for the virus (Chihota et al.,2001; Lubinga et al., 2015; Rouby et al., 2017; Carn et al., 1995).

Clinical signs of LSD include fever, skin nodules, leg swelling, edema, lymph node enlargement, lameness, and cellulitis etc. Common symptoms include anorexia, reduced milk production, and varying degrees of decreased body weight. Some animals may also experience complications like mastitis and myiasis (Al-Salihi et al., 2014; Abutarbush et al., 2015). Bulls can experience either permanent or temporary infertility, and the virus can be present in their sperm for prolonged durations (Irons et al., 2005).

Additionally, the occurrence of LSD varies widely, ranging from 2% to 85% in various regions. In endemic areas, the typical morbidity rate stands at around 10%. Additionally, LSDV affects cattle of all sexes and ages, while research suggests that young animals are particularly vulnerable to this fatal disease. The mortality rate typically falls between 1% and 3%, but in extreme cases, it can reach 40% (Al-Salihi et al., 2014; Tuppurainen et al., 2013).

As a viral disease, LSD lacks a specific treatment. Supportive care can involve antibiotics to prevent secondary bacterial infections, anti-inflammatories to reduce fever, and antihistamines to minimize tissue damage. Effective strategies for combating the disease include widespread cattle vaccination, along with measures like disinfection, farm bio-security, stamping-out, and movement controls. However, the approach to eradication and control may vary among countries due to factors like climate and local farming practices.

The Chakaria Upazila Veterinary Hospital serves as a valuable resource for the information of animal diseases, their prevention, and treatment. People from distant regions rely on this facility for assistance with their animals. Assessing this report can contribute to forming a strategy for addressing LSDV in the upazila.

Specific Objectives:

1. To understand the prevalence of LSD in cattle.
2. To Figure out the risk factors of LSD.

Chapter 2

Materials and Methods

2.1. Study area & Study period:

The study was conducted at the Upazila Veterinary Hospital (UVH) in Chakaria, Cox's Bazar as part of my internship program during the period of 16th April to 8th June, 2023.

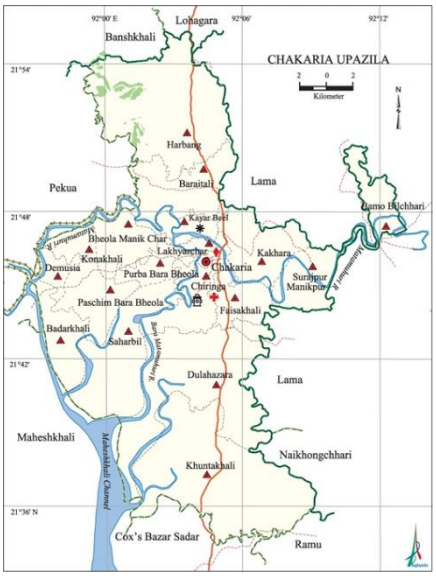

Fig. 1: Map of Chakaria Upazila

2.2. Data collection and questionnaire design:

A total of 274 clinical cases of cattle were documented throughout the reporting or study period at the UVH in Chakaria. Initially, cattle owners brought their animals to the hospital and completed a registration process. Subsequently, the requisite patients and owner's information were collected through a standardized questionnaire. Following the disease diagnosis, appropriate treatment was administered, and regular follow-up assessments were conducted to monitor the disease's progression over the course of several days.

Questionnaire for Data Collection

Case Number: Date:

Name of the owner:

Address: Mobile No:

Patients History:

Breed: Age: Sex: M / F B. wt:

Type of Animal: Lactating cow/ Dry cow/ Pregnant/ Calf/ Bull

Farm Size: Affected: Death: De-worming: Yes/ No

Clinical Symptoms:

Temp: M/M: Pink/Pale Dehydration: Mild/ Moderate/ Severe

Skin Nodule: Mild/ Moderate/ Severe L/N Swollen: Yes/ No

Brisket Swollen: Yes/ No Swelling in Leg: Yes/ No

Lameness: Present/Absent Resp. Sign: Present/ Absent

Management History:

- Herd Size: Small (1-3)/ Medium (4-6)/ Large (7 or above)
- Presence of tick on the affected cattle: Yes/ No
- Use of insecticide: Yes/ No
- Segregate infected one from the herd: Yes/ No
- Farming System: Intensive/ Semi-intensive
- Housing System: Group/ Individual pan
- Induce an infected animal with LSD to the herd: Yes/ No

2.3. Clinical findings to diagnose LSD:

Following a visual assessment of the patient, a comprehensive clinical examination was carried out, tailored to the specifics of each case. This examination took into account factors such as the disease history, the owner's complaints, and the exhibited symptoms. The diagnosis of LSD cases relied entirely on the observed clinical signs and the patient's clinical history. Prominent clinical signs of LSD include high body temperature (105–106°F), skin nodules, leg and brisket swelling, and occasional respiratory distress during critical disease stages.

Fig. 2: Taking Clinical history

Fig. 3: Taking Rectal Temperature

Fig. 4: Checking Lymph node

Fig. 5: Multiple nodules in body

Fig. 6: Respiratory distress

Fig. 7: Swollen of leg

Fig. 8: Eruption of Skin

2.4. Rate of prevalence, mortality and case fatality:

- **Prevalence**: It is the percentage of individuals in a population who, at a particular point in time, are affected by a disease or health condition, representing the total number of cases in relation to the population. Prevalence is determined by the following equation-

  Prevalence (%) = (Number of existing cases of a disease at a specific time / Total population at risk at that time) × 100

- **Mortality:** It refers to the number of deaths due to a specific cause in a given population during a defined period.

  Mortality Rate (%) = (Number of Deaths due to a Specific Cause / Total Population) x 100

- **Case Fatality:** It refers to the percentage of individuals with a particular disease or condition who succumb to the disease within a defined period.

  Case Fatality Rate (%) = (Number of deaths due to the disease / Number of diagnosed cases of the disease) x 100

2.5. Data management and statistical analysis:

Data has been collected from UVH, arranged, and stored in a spreadsheet in Microsoft Office. The data was arranged based on numerous factors. STATA-14 was then applied to evaluate the data. After assessing the data, I constructed several tables and figures to demonstrate the relationship between disease distribution and other factors such as age, sex, breed, herd size, and control measures. Probability values that were less than 0.05 were regarded as statistically significant.

Chapter 3

Result and Discussion

3.1. General Description:

During the study, 274 cattle were hospitalized, with 171 found to have LSD. Data were collected on the affected cattle, and it was discovered how different risk factors are connected to the disease. This information helped create a specific treatment plan. The infected cattle were then closely watched during follow-up for several days.

- Table- 01: Descriptive information on the distribution of cases of LSD in Chakaria Upazila (N=171)

Variable	Category		No. of Animals infected	Prevalence (%)
Age	0-6 months		109	63.74
	6-12 months		36	21.05
	>12 months		26	15.20
Breed	Indigenous		81	47.37
	Cross		90	52.63
Sex	Male		95	55.55
	Female		76	44.45
Herd size	Small (less than 4)		120	70.18
	Large (greater than 4)		51	29.82
Clinical signs	Limb swelling		35	20.46
	Nodule	Mild	54	31.58
		Moderate	61	35.67
		Severe	56	32.75
	Respiratory Distress		25	14.62
	Brisket swelling		29	16.96

3.2. Prevalence, mortality and case fatality rate:

- Prevalence = (171/ 274) × 100 = 62.4%
- Mortality = (12/ 274) × 100 = 4.34%
- Case fatality rate = (12/ 171) × 100 = 7.02%

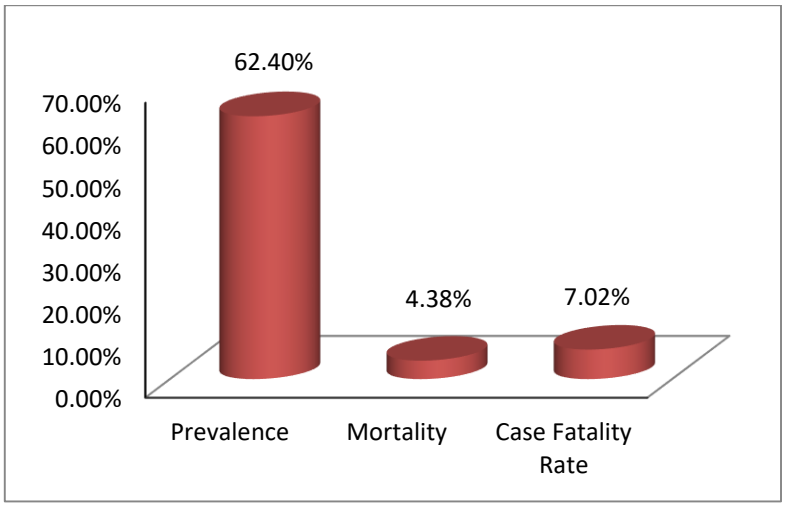

Fig. 9: Prevalence, mortality and case fatality rate of LSD

Approximately 62.4% of the cattle in the study were infected with LSD, indicating a relatively high prevalence of the disease among the sampled population. The prevalence of LSD can vary widely, ranging from as low as 2% to exceeding 85% or even higher (Tuppurainen et al., 2012). In contrast, Natore Sadar and Baraigram Upazilas recorded significantly higher prevalence rates of LSD, affecting approximately 64.70% and 83.02% of cattle, respectively (Haque et al., 2021). Biswas et al., conducted a 2020 study, which revealed that Monirampur and Avoynagor Upazilas had rates of 63.33% and 52.38% affected cattle, respectively (Biswas et al., 2020). Additionally, Haque and Gofur in their research conducted in Badalgachi, Naogaon, observed an incidence rate of 49% (Haque & Gofur, 2020). Another study in Dinajpur, Bangladesh, conducted by Sarkar et al., reported a prevalence of 41.06% (Sarkar et al., 2020).

The study revealed a 4.34% mortality rate among the studied population, indicating some deaths among the infected animals which relevant to other research work. Mortality rate was slightly higher in Turkey during LSD outbreak (Sevik & Dogan,

2017). In Natore Sadar, the mortality rate stood at 2.94%, whereas in Baraigram, it was slightly higher at 3.77% (Haque et al., 2021). Biswas et al., in their study, reported a mortality rate of 1.59% in Abhaynagar and 3.33% in Monirampur Upazila (Biswas et al., 2020). Haque and Gofur found a lower rate of 0.5%, while earlier research indicated mortality rates ranging from 0.99% to 2.12% (Haque & Gofur, 2020) (GARI et al., 2010).

The survey reported a significant 7.02% case fatality rate, emphasizing the severity of the disease, as 7.02% of infected cattle didn't recover. Similar findings were observed in other research. In Natore Sadar and Baraigram, case fatality rates were around 4.53% and 4.55%, respectively (Haque et al., 2021). Biswas et al.'s study indicated rates of 5.26% in Monirampur and 3.03% in Avoynagor, while Haque and Gofur's research reported a lower rate of 1% (Biswas et al., 2020; Haque & Gofur, 2020).

3.3. Relation between age & sex of the LSD affected animal (Table- 02):

Gender	Age (Months)	No. of Animals infected	No. of Animals death	X^2 value	P- value
Male	0-6m	55	5	7.3786	0.02499
	6-12m	25	2		
	>12m	15	0		
Female	0-6m	56	4		
	6-12m	15	1		
	>12m	5	0		

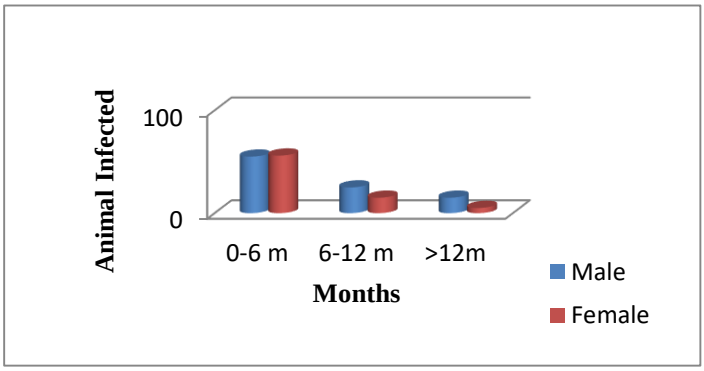

Fig. 10:

Relation between age & sex of the LSD affected animal.

The obtained p-value of 0.02499 from the chi-squared test signifies a statistically significant link between gender, age group, and animal infection or mortality. In essence, this suggests that gender and age are influential factors in determining the likelihood of animals getting infected and perishing due to the infection. The above table indicates that males have a higher incidence of LSD infection and mortality compared to females. Additionally, the 0-6months age group shows the highest number of infections and deaths in both male and female animals. A similar result was reported in other studies. In comparison to female animals, male animals had a higher rate of infection. Male animals' elevated infection rate may result from physical fatigue rather than biological factors (Abera et al., 2015; GARI et al., 2010). (Badhy et al., 2021) and (Elmohsen et al., 2019) noted higher rates in males. (Ochwo et al., 2019) observed sex as significant in Uganda. In contrast, (Sarkar et al., 2020; Elhaig et al., 2017 and Molla et al., 2018) found no significant sex association with LSD.

3.4. ***Limb swelling according to different age category of infected cattle in the affected area (Table- 03):***

Age (months)	**Total animal examined**	**Limb swelling (%)**	**X^2 value**	**p-value**
0-6 m	109	21 (19.27)	1.6911	0.4293
6-12 m	36	10 (27.78)		
>12 m	26	4 (15.34)		

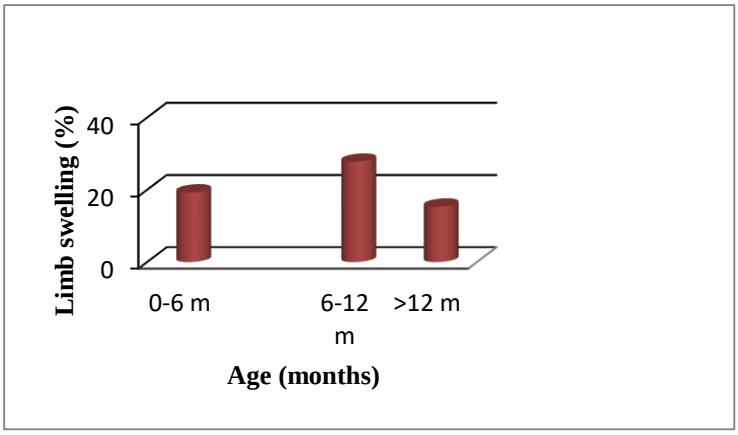

Fig. 11:

Age vs Limb swelling

According to Table_03 the p-value is greater than the typical significance level of 0.05, suggesting that there is no significant association between age and limb swelling of the LSD infected cattle. Here, also noticed that the 6-12 months' age group has the highest percentage of animals with limb swelling (27.78%). Other study found significantly different of limb swelling from other age groups and highest (12.02%) limb swelling was observed in young cattle aged between 1-3 years (Biswas et al., 2020). Limb swelling and lameness are common clinical manifestations in cattle infected with LSD (Gelaye et al., 2015; Tassew et al., 2018). Lameness is caused by the development of ulcerative skin nodules that extend into tendons and sheaths (Tuppurainen et al., 2018). Additionally, Joint swelling, cellulitis, or phlegmon can lead to arthritis and lameness in cattle (Salib & Osman, 2011). Nevertheless, certain cases of limb swelling might result from age-related factors.

3.5. Severity of skin nodule based on breed of LSD infected Cattle (Table- 04) (N=171)

Breed	Severity	No of animal infected	X^2 value	p-value
Cross (90)	Mild	26	3.960	0.138
	Moderate	29		
	Severe	35		
Indigenous (81)	Mild	28		
	Moderate	33		
	Severe	20		

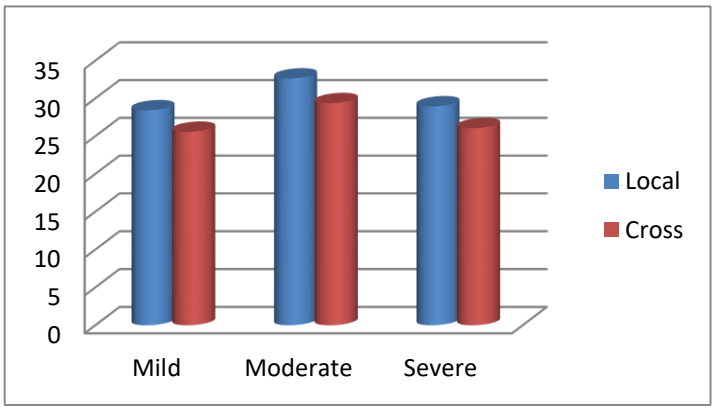

Fig. 12:

Severity of skin nodule based on breed.

Study results reveal lower disease risk in herds with indigenous cattle than crossbreeds, possibly due to varied management practices. Though some confounding factors exist, numerous reports support indigenous cattle's reduced risk and milder symptoms compared to crossbreds (Rammahi et al., 2015; Kiplagat et al., 2020; Tuppurainen et al., 2018). This aligns with the observations of (AI et at., 1993) who noted more severe clinical signs of LSD in cross breed cattle in Sudan. The heightened susceptibility of crossbred cattle could be attributed to their lower disease resistance capability when compared to indigenous breeds (Tageldin et al., 2014).

3.6. Use of Vector Controlling Tools:

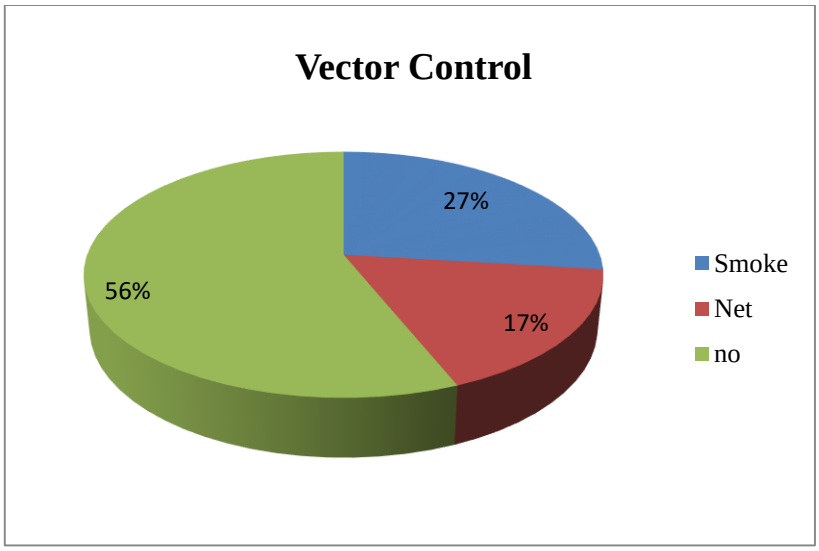

Fig. 13: Use of Vector Controlling Tools

The data shows the distribution of vector control methods used to combat the spread of LSD. The most notable observation is that a majority (56.14%) of vector control relies on the "no" control method. This may be due to resource constraints, awareness gaps, or reliance on natural controls. There are a small group of farmers who consciously use mosquito nets or use fumes in cowsheds to repel mosquitoes or flies. Other studies also showed about the less use of mosquito net (Biswas et al., 2020; Haque et al., 2021)

Limitations

Limitations of the study include short period of study, only hospital-based data which may not fully represent the entire cattle population in the region. Focusing solely on Chakaria Upazila restricts the applicability of findings to other regions. Moreover, the use of hospital based-data may introduce biases and inaccuracies when assessing LSD prevalence and risk factors.

Conclusion

In conclusion, the study found a high prevalence of LSD among cattle in the Chakaria Upazila, with a significant impact on mortality and case fatality rates. Gender and age were identified as influential factors, with males and younger animals being more susceptible. Indigenous cattle showed milder symptoms than crossbreeds. The study also revealed limited use of vector control measures, likely due to resource constraints and awareness issues. Further research and targeted interventions are needed to mitigate LSD's impact on cattle populations in the region. .

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BIOGRAPHY

I am **Shiful Islam**, born to Md. Osman Goni and Hasina Begum. My educational journey began at Chakaria Grammar School, Cox's Bazar, with my Secondary School Certificate (SSC) achieved in 2015. I obtained my Higher Secondary Certificate (HSC) from Govt. Haji Mohammad Mohsin College, Chittagong, in 2017.

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