Journal of Environmental Science 12 (2025) 17-26

IES University of Rajshahi

Journal of Environmental Science
https://jenvos ci.com

Livestock Scenario and Its Health Challenges in Char Majherdiar of Rajshahi, Bangladesh

Md. Anisur Rahman1, Md. Abul Kalam Azad [2*], Tashfia Tashnim Dia[3]

[1&2] Institute of Environmental Science (IES), University of Rajshahi, Rajshahi-6205, Bangladesh
[3] Department of Zoology, University of Rajshahi, Rajshahi-6205, Bangladesh

ARTICLE INFO

Keywords:
Ownership, Ingredients, Vaccination, Disease infestation, Deaths.

ABSTRACT

The Chars of the Padma River are rich in livestock resources for many grazing lands. This study revealed the livestock management and health challenges among the people of Char Majherdiar, Rajshahi, Bangladesh. Both primary and secondary data were collected during the study. Primary data was collected from 316 households with structured questionnaires, two focus group discussions (FGD) were held and six key informants were interviewed (KII) during January-June, 2025.The secondary data were collected from published and unpublished sources. The majority 52.53% households have 1-5 cattle and 8.86% have more than 20 cattle. More than half (53.16%) households have 1-5 goats and 0.95% households have more than 20 goats. Feeding practices revealed that 48.10% households used farm-made feeds, 30.38% depend on open field grazing, and 21.52% used both farm-made feeds and open field grazing. Mineral supplements, grains and straw represent 25% of the total diet composition. This combination provides a more balanced diet, with grains mixture of broken rice (*kud*), flour (*ata*), salt (*labon*), and rice bran (*dhaner gura*) adding extra energy and protein, which are crucial for the growth and productivity of livestock. Vaccination coverage of livestock is very poor (10.44%) in Char Majherdiar. Major livestock diseases are FMD (cattle 24.23% and buffalo 22.22%), HS (cattle 10.74% and buffalo 17.78%), seasonal diarrhea (cattle 11.20%, buffalo 11.11%, sheep 22.42% and goat 19.41%), PPR (sheep 47.08% and goat 37.70%), LSD (cattle 13.95% and buffalo 4.44%), buffalo pox (17.77%), sheep pox (15.25%) and goat pox (9.14%) etc. This research recommends the improvement of communication, infrastructure development, veterinary services and vaccination coverage in Char Majherdiar of Rajshahi, Bangladesh.

1. Introduction

Bangladesh is an agricultural country. Approximately 74.5% people living in rural areas and participating in agricultural activities, either directly or indirectly (World Bank, 2012). Livestock farming boosts both rural employment and the country's economy. The livestock sub-sector provides about 20% of rural employment and contributes 12% of the agricultural GDP overall (Rahman et al., 2014; Mehrabi et al., 2020). Ruminants, especially cattle, goats, sheep, and buffaloes are crucial of livestock sector. With 23.64 million cattle, 16.96 million goats, 1.5 million buffaloes and 1.2-1.5 million sheep, Bangladesh is sanctuary to a sizable livestock population. Despite a 6.95 million metric tons yearly demand of meat, 5.68 million metric tons of meat is produced every year (DLS, 2022). Over 10 million people (16%) of Bangladesh directly or indirectly rely on livestock for their livelihoods (Moller et al., 2023).The production of cattle, goats, buffaloes

Corresponding author.
E-mail address: akazad-ies@ru.ac.bd (Md. Abul Kalam Azad)
Receive 04 May 2025; Revised Received 04 December 2025; Accepted 07 December 2025;
Available Online 21 December 2025;
Published by Institute of Environmental Science, University of Rajshahi.

and other agricultural operations are vital to the livelihoods of the people living in river basin areas. The northern part of Bangladesh is shelter to an abundance of charlands (Ahmed et al., 2016). In char areas, raising livestock is popular for plenty of grazing land or fodder and good marketing option (ISPAN, 1995).

The Padma is a meandering river, which creates a vast region of charland due to erosion and accretion of sediment. Char Majherdiar is a permanent char, the char, which is relatively stable and located along rivers, includes infrastructure such as permanent and semi permanent houses, building, roads, vegetation, trees, markets, schools etc. is known as permanent char and characterized by its geographic locations. Agriculture practices are the main occupation of this char area's people. So, livestock including to providing income generation through sale are also exploited as major power for cultivation, food (meat and milk), organic substance, and as well as fuel. Cattle, buffaloes, goats and sheep are the most important animals play a vital role in this region. Livestock in the study area are mainly feed on natural grasses, crop residues, and forage.

The major challenges faced by livestock farmers in Char Majherdiar include limited access to quality feeds, inadequate veterinary services, vulnerability to natural disasters, and lack of good marketing facility. There is limited research on livestock population, feeding practices, vaccination coverage and diseases infestation in Char Majherdiar, Rajshahi, Bangladesh. So, the present study was carried out to fill up the gap by collecting livestock population, feeds type, feeds ingredients and healthcare challenges in the study area.

2. Materials and Methods

2.1 Study Site Description

Char Majherdiar is a permanent char in the southern part of Padma River. The location of this char is in Ward Number 1 of Haripur Union under Paba Upazila of Rajshahi District. This char is bounded on 3 sides (east, west and south) by the Murshidabad District in India, only on the north by the Padma River in Bangladesh. The total population of this char is 5613. Among them male number is 2946, and the female number is 2627. It is located just 7.3 km south of Rajshahi City isolated by the Padma River. Only boats are used to cross the 4 km-wide Padma River, while motorcycle or votvati is used to access the 1,148-hectare char (Rahman et al., 2025). The geographical location of Char Majherdiar is bounded between latitude 24°17'30"N to 24020'30"N and longitude 88°31'30"E to 88034'30"E (Figure 1).

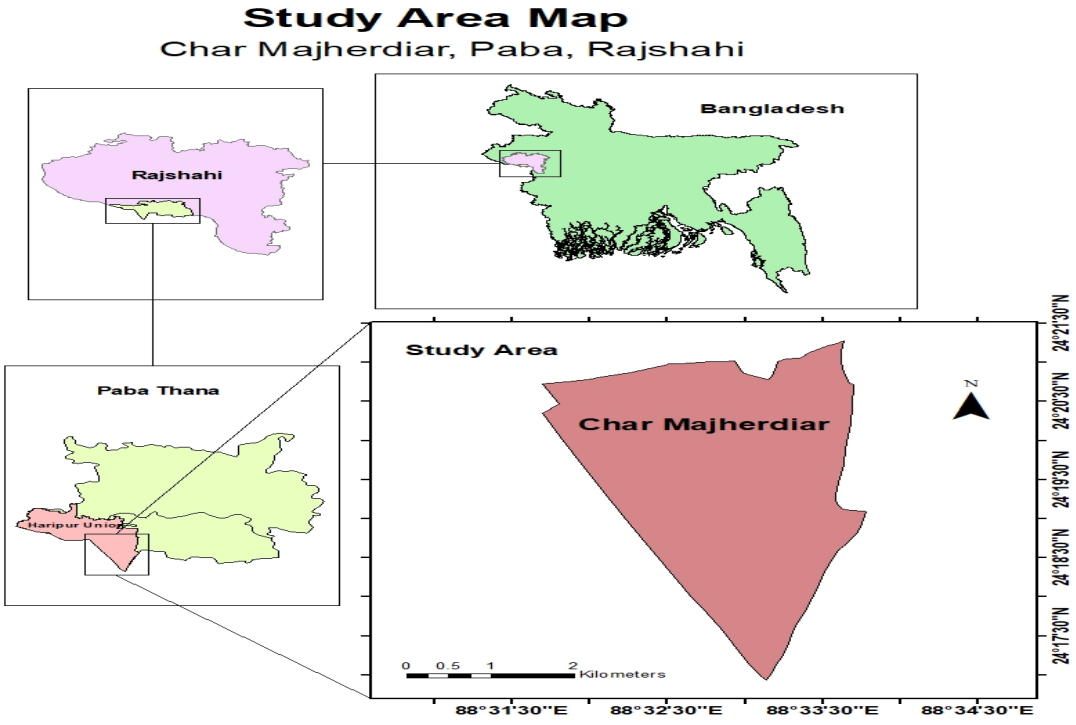

Figure: 1. Location of the study site.

Source: Produced as of ArcGIS 10.1 Model

2.2. Data Collection

Both primary and secondary data were collected for this study. A standard data collection procedure was followed to collect information from the respondents. Due to time and budget limitation, it is unable to interview all 1500 households of the study area. Therefore, the sample size was determined with the help of Toro Yamane's mathematical formula (1967): $n=\frac{N}{1+N(e)2}$; Where, n = sample size,

N= total household, and e =level of significance (0.05);

So, the sample size, $n=\frac{1500}{1+1500\times (0.05)^2} = 316$

A total of 316 respondents were selected using random sampling along with 2 focus group discussion (FGD) and 6 key informant interviewee (KII). The data were collected from the respondents on different kinds of animals during on January-June, 2025. The main data are livestock population, feeds type, feeding ingredients, diet supplement, major diseases, death conditions and vaccination coverage etc.

2.3. Data Analysis

The collected information was accumulated, grouped, and interpreted according to the objectives as well as the parameters of interest. The data were then presented in tables, and graphs. For data processing and analysis purposes, frequency distribution has been used. Collected data were processed and analyzed by Statistical Package for Social Science (SPSS) version 26.0 and descriptive statistics (frequency distribution) was used to find out the result. At last, the analyzed data were compiled and presented in the paper using tables, graphs, and pie diagrams.

3. Results and Discussion

3.1 Cattle and Buffalo Ownership

Table 1 represents the ownership of cattle and buffalo in Char Majherdiar. The majority of the households (52.53%) have 1-5 cattle, which reflects the subsistence-level of farming, animals used for agricultural work and income generation. However, a quarter (25%) households have 6-10 cattle typically represent middle-income farming. Approximately 4.43% households have between 11-15 cattle represents more commercially involved in livestock farming compared to those with smaller herds. While, 5.38% households have 16-20 cattle; farmers of this group engaged in livestock farming at a commercial or semi-commercial scale. Only 8.86% households have more than 20 cattle, representing larger-scale operations. This could indicate a more commercial or industrial level of cattle farming, where the focus is likely on significant production for market purpose and rest of the 3.80% households have no cattle.

The study in Lakhsmitari and Kaunia Balapara Unions of Teesta flood prone area in Rangpur District have average 5+ cattle only 2.22% households, and average 48.23% family have no cattle (Rumana, 2017). In Bangladesh total cattle (Cow & Bulls) 23.64 millions and average per household have 1-3 cattle in rural areas. Based on commercial dairy farmers or larger farms may have more than 10 cattle. However in Rajshahi District total cattle 1.5-2 million and in Paba Upazila have average 1-3 cattle per household (DLS, 2022).

Table 1. Ownership of cattle and buffalo in Char Majherdiar

Livestock population group	Number of respondents (%)			
	Cattle		Buffalo	
	Households (N)	Percentages (%)	Households (N)	Percentages (%)
0	12	3.80	237	75.0
1-5	166	52.53	48	15.19
6-10	79	25	14	4.43
11-15	14	4.43	8	2.53
16-20	17	5.38	6	1.90
20+	28	8.86	3	0.95
Total	316	100	316	100

On the basis of Table 1 the majority of households (75%) did not have any buffalo, followed by (15.19%) have 1- 5 buffaloes, (4.43%) households have 6 -10 buffaloes, 2.53% have 11-15 buffaloes, another 1.90% have 16-20 buffaloes, and rest of the 0.95% have 20+ buffaloes. In Bangladesh total buffalo population is 1.5 million, and average per household have 1-2 buffaloes in regions like coastal or char areas. However in Rajshahi District total fewer than 50,000 buffaloes and Paba Upazila average per household have 1-2 buffaloes, and mostly in areas near river of chars, where buffaloes are reared for milk and draft purposes (DLS, 2022).

Overall result suggests that Char Majherdiar area is very rich in cattle farming. So, this area may be a good source for cow's milk and animal protein production.

3.2 Goat and Sheep Ownership

Table 2 indicates that 53.16% households have a small number of goat, suggesting that goat ownership is between 1- 5 goats, followed by 35.76% households have 6-10 goats, 2.85% have between 11-15 goats and 3.80% have 16-20 goats, and a few individuals are engaged in large - scale goat farming (0.95%), implying that it is not predominant economic activity for most households. The research of Lakhsmitari and Kaunia Balapara Unions of Teesta flood prone area in Rangpur District have average 5+ goats only 0 .55%, and average 52.35% family have no goat (Rumana, 2017). In Bangladesh total goats 26-27 millions and average per household have 2-5 goats in rural areas, while commercial goat farms have larger herds. However, in Rajshahi District total goats 1.2-1.5 million and Paba Upazila have average 2-4 goats for per household (DLS, 2022).

Table 2. Ownership of goat and sheep in Char Majherdiar

Livestock population group	Number of respondents (%)			
	Goat		Sheep	
	Households (N)	Percentages (%)	Households(N)	Percentages (%)
0	11	3.48	285	90.19
1-5	168	53.16	14	4.43
6-10	113	35.76	6	1.90
11-15	9	2.85	2	0.63
16-20	12	3.80	5	1.58
20+	1	0.95	4	1.27
Total	316	100	316	100

Table 2 depicts that a vast majority (90.19%) of households do not have any sheep. Small percentages (4.43%) have 1-5 sheep, while even fewer has 6-10 sheep (1.90%). Ownership of larger flocks is rare; with 0.63% has 11-15 sheep, 1.58% have16-20 sheep, and 1.27% has more than 20 sheep. This figure suggests that sheep ownership is limited, with only a small segment of the people engaged in sheep farming in a small scale. In Bangladesh total sheep is approximately 1.2-1.5 million and average per household have1-3 sheep in rural areas. However, in Rajshahi District total 50,000-60,000 sheep and Paba Upazila have average 1-3 sheep per household, mainly for meat and wool in certain rural areas (DLS, 2022).

Overall, the data suggests that goat and sheep farming is predominantly small-scale, with very few owners having large herds. This could indicate that goats are mainly kept for subsistence, small-scale commerce, or supplementary income rather than as a primary source of livelihood.

3.3 Livestock Feeds

This study found that livestock feeding practices vary significantly in Char Majherdiar (Figure 2). Nearly half (48.10%) of households used farm-made feeds for their livestock. This indicates a strong preference for controlled feeding using locally available ingredients, which could be cost effective and nutritionally balanced based on KAP (Knowledge, Attitude, and Practice) model. While 30.38% households depend on open field grazing as the primary method for feeding their livestock. This suggests that access to pasture land is available and utilized which may reduce feeding costs but can be influenced by seasonal variations in forage availability. However, 21.52% households rely on combination of farm-made feeds and grazing. This approach likely aims to balance the benefits of methods, ensuring a steady food supply while minimizing costs and utilizing available resources efficiently.

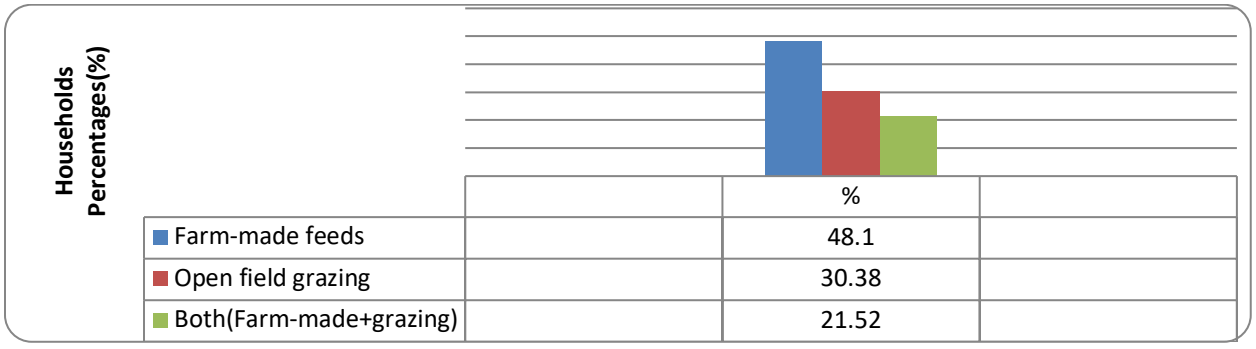

Figure:2. Livestock feeds type

3.4 Livestock Feeds Ingredients

Table 3 indicates that livestock feeds ingredients in the study area are the combination of natural and farm-made feed resources. The highest portion of feed comes from open field natural pastures (30.38%), indicating the high dependence on open grazing. Mineral supplements, grains and straw represent 25% of the total feed. This combination provides a more balanced diet, with grains mixture of broken rice (kud), flour (ata), salt (labon), and rice bran (dhaner gura) adding extra energy and protein, which are crucial for the growth and productivity of livestock. Crop residue (straw) constitutes 23.10% of the total feed. Straw is common roughage used for feeding livestock, providing fiber but lower nutritional value. Fresh green grasses represent 12.66% of total feed, likely in order to seasonal or land availability. Napier grass and other cultivated fodders represent the lowest share (8.86%), reflecting that improved fodder cultivation has not yet greatly adopted.

Overall, the above distribution highlights that most livestock feed comes from open field grazing and crop by-products, running the system highly responsible for seasonal availability and vulnerable to climatic variation, which can result in feed scarcity and loss of productivity.

Table 3. Livestock feeds ingredients in Char Majherdiar

Ingredients Type	Households(N-316)	Percentages (%)
Crop residue (straw)	73	23.10
Fresh green grass	40	12.66
Napier grass & other cultivated fodder	28	8.86
Mineral supplements, grains and straw	79	25
Open fields natural pastures (grass)	96	30.38
Total	316	100

3.5 KAP (Knowledge, Attitude & Practice) and K-P (Knowledge-Practice) Gap Based on Livestock Feeds Ingredients

The KAP (Knowledge, Attitude & Practice) result revealed that farmers in the study area possess moderate to high knowledge regarding various feed resources, but their real feeding practices are comparatively low. Knowledge was highest for Napier grass and other cultivated fodders (73.86%), followed by green grass (67.25%), straw (crop residue) (51.70%), grains (47.9%), mineral supplements (46.65%), natural pastures (38.51%) and no knowledge for urea and molasses (0%), indicating that farmers are well conscious of the importance of developed forages. However, only 8.93% farmers practiced Napier grass and other cultivated fodders, focusing in the highest knowledge-practice gap (64.93%) (Table 4). It is shown that though farmers are well known of Napier grass and other cultivated fodders but they are unable to adopt it widely, most likely on account of land scarcity, high cost of establishment, and limited access to extension services.

Fresh green grasses also focused a high gap (54.75%), indicating that seasonal unavailability and overdependence on natural grazing fields constraints its use. In case, open field grazing had the lowest gap (8.15%), suggesting that knowledge almost matches practice and farmers depend greatly on free grazing, which is general phenomena in char areas (Table 4).

Table 4. Knowledge, Attitude and Practice (KAP) Regarding Feed Ingredients

Feed Ingredients	Knowledge (%)	Attitude (%)	Practice (%)	K-P Gap (%) and Comments
Straw (crop residue)	51.70	25.09	23.21	28.49 (Moderate gap)
Fresh green grass	67.25	20.25	12.5	54.75 (Moderate gap)
Napier grass and other cultivated fodders	73.86	17.21	8.93	64.93 (Highest gap)
Natural pastures (open fields)	38.51	31.13	30.36	8.15 (Lowest gap)
Mineral supplements (salt)	46.65	28.35	25	21.65 (Moderate gap)
Grains	47.9	27.10	25	22.90 (Moderate gap)
Molasses or urea	0	0	0	0 (No knowledge or practice)

K-P Gap= Knowledge-Practice Gap

Mineral supplements (salt) and grains indicated moderate gaps (21.65% and 22.90%), indicating that they are used occasionally but not on a regular or balanced basis. Molasses and urea indicated zero

knowledge and practice, pointing to a complete unawareness or exposure to feed supplementation technologies (Table 4).

Overall, these findings highlight that the major challenge is not lack of knowledge but the lack of adaptation and availability of improved feeding resources. Targeted intervention like training, input support, and demonstration of Napier and other fodders cultivation, may help bridge the gap and develop livestock nutrition in the study area.

3.6 Vaccination Coverage of Livestock

Figure 3 reflects that only 10.44% farmers vaccinated their livestock while significant majorities of 89.56% were not to use any vaccine. This indicates a major gap in vaccination coverage, which could be due to various factors such as lack of awareness, lack of access to vaccine, or financial constraints.

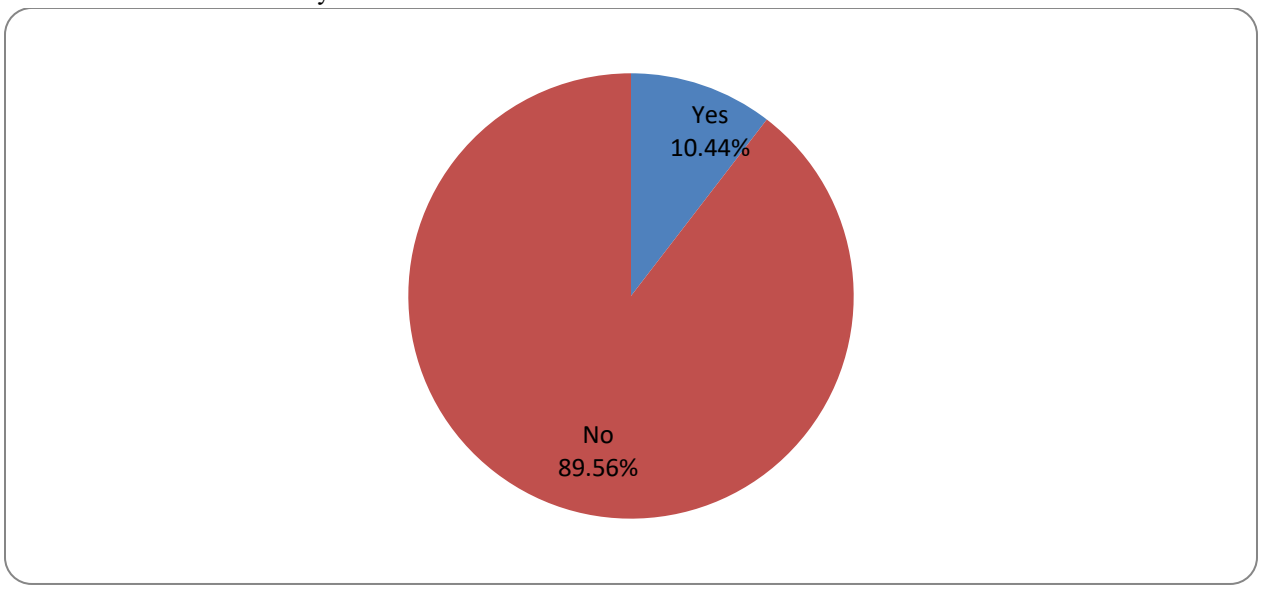

Figure: 3.Vaccination coverage of livestock

The low vaccination rate puts the livestock at high risk of diseases outbreaks, leading to potential economic losses and threats to food security. So, overall result suggests that enhancing vaccination awareness and accessibility is crucial for improving animal health and productivity.

3.7 Disease Infestation of Livestock

Table 5 indicates the disease infestation of cattle, buffalo, sheep and goat in Char Majherdiar, Rajshahi, Bangladesh. In cattle, Foot-and-Mouth Disease (FMD) is the leading 24.23% affected, followed by lumpy skin disease (LSD)13.95%, hemorrhagic septicemia (HS) 10.74%, black quarter (BQ) 12.12%, bloat/ acidosis 10.89%, seasonal diarrhea 11.20%, bovine ephemeral fever (Three-Day- Sickness) 8.28%, anthrax 6.90%, and rest of ticks 1.69%. The FMD prevalence of present study is 24.23%, which is lower than the stated prevalence 38.62% (Lucky et al., 2016) and higher than the findings 14.44% (Alam et al., 2018). Bloat/Acidosis found in cattle 10.89%, which is greater than the findings1.88% (Alam et al., 2018).

Table 5. Major diseases of livestock in Char Majherdiar

Diseases	Affected of livestock (%)			
	Cattle (%)	Buffalo (%)	Sheep (%)	Goat (%)
FMD	24.23	22.22	-	-
HS	10.74	17.78	-	-
BQ	12.12	-	-	-
BEF	8.28	-	-	-

Bloat/Acidosis	10.89	4.44		
Diarrhea	11.20	11.11	22.42	19.41
Anthrax	6.90	8.89	-	-
Ticks	1.69	4.45	-	-
LSD	13.95	4.44	-	-
Brucellosis	-	8.90	-	-
Buffalo pox	-	17.77	-	-
PPR	-	-	47.08	37.70
Sheep/Goat pox	-	-	15.25	9.14
Bluetongue	-	-	8.97	8.30
Enterotoxaemia	-	-	-	8.15
Foot Rot	-	-	6.28	5.05
Pneumonia	-	-	-	12.25
Total	100	100	100	100

In case of buffalo, Foot-and- Mouth Disease (FMD) is the highest affected (22.22%), followed by hemorrhagic septicemia (HS) 17.78%, buffalo pox 17.77%, diarrhea 11.11% , anthrax 8.89%, bloat/acidosis and LSD both 4.44%, ticks 4.45%, and brucellosis 8.90% (Table 5).

Overall result suggests that FMD infested rate in cattle comparison to buffalo (24.23% vs. 22.22%) shows species-specific vulnerability. Moreover, buffaloes overall mortality rate is less than cattle (4.18% vs. 10.27%)(Figure 4). Buffaloes in flood-prone areas are more sustain to pathogenic organisms in order to prolonged standing water and unhygienic environments.

In case of sheep, Peste des Petits Ruminants (PPR) has the highest affected (47.08%), followed by diarrhea 22.42%, sheep pox 15.25%, bluetongue 8.97%, and rest of 6.28% by Foot Rot (Table 5).The table highlights that PPR and diarrhea are major threat to sheep in the surveyed area, reflecting the need for preventive measures like vaccination and as early as possible veterinary care management.

For goats, Peste des Petits Ruminants (PPR) is the highest prevalent disease in the study area, representing 37.70% of cases (Table 5).This study harmonizes with result from past studies, which insights PPR as a very contagious viral disease in goats, particularly in winter season in order to weakened immunity and as well as expanded bio congregation (Alam, et al., 2022). Goat pox, which is 9.14% prevalence, suggests ensured vaccination coverage and bio-security managements. Bluetongue 8.30% and Enterotoxaemia 8.15%, occurring with the monsoon and post monsoon periods then environmental situations favor vector-borne and bacterial infections. Bluetongue is a one kind of viral disease transported by Culicoides midges, remains a concern on account of its economic impact on small ruminants like goats. Enterotoxaemia, created by Clostridium perfringens, has a very short duration of disease (12-48hrs), relying on the significance of preventive cares like nutritional balance and enhance vaccination coverage. Foot Rot is prevalent 5.05%, spreading this bacterial disease in wet and humid weather, during grazing goats uncovered to muddy or wet (humid) environments. Diarrhea (19.41%) is a very vital issue particularly in the rainy and summer seasons (Table 5).The high prevalence during above both seasons reflects a strong connection with waterborne infections, heat stress, and nutritional shifts, requesting adequate hydration and nutritional care (Haque and Rahman, 2024). Pneumonia (12.25%) is a major issue caused by pathogenic bacteria like Pasteurella Multocida and Mannheimia haemolytica due to extreme weather, restricted ventilation, over accumulation and malnutrition, generates coughing, fever and respiratory disorders. The study by Momin et al., (2011) provided valuable insights into the bacterial pathogenic organisms caused by pneumonia in goats. They observed that Pasteurella Multocida and Staphylococcus aureus are significant responsible to the disease, with Pasteurella Multocida most prevalent isolate. Safe shelter, vaccination, and initial antibiotic therapy are essential for mitigation and management.

3.8. Livestock Mortality by Diseases

Char Majherdiar is prone to livestock diseases. River erosion and flood are the major natural disasters in this reason. Every year this area is flooded in the rainy season. During and after flood livestock diseases are epidemic in this area. So, inhabitants of this area are faced very trouble for livestock.

The highest mortality rate 25.86% was found to sheep vulnerable to illness and environmental stressors. The mortality rate of goats was 17.75%, followed by cattle at 10.27%. The lowest mortality rate 4.18% was found in buffaloes, which may indicate greater resistance or fewer health problems. So, the high rate of death among sheep and goat points to the necessity of better nutrition and disease control practices. Moreover, high cattle mortality was 10.27% in the study area is a result of the harsh environment and limited access to veterinary care and low coverage of vaccination practices (Figure 4).

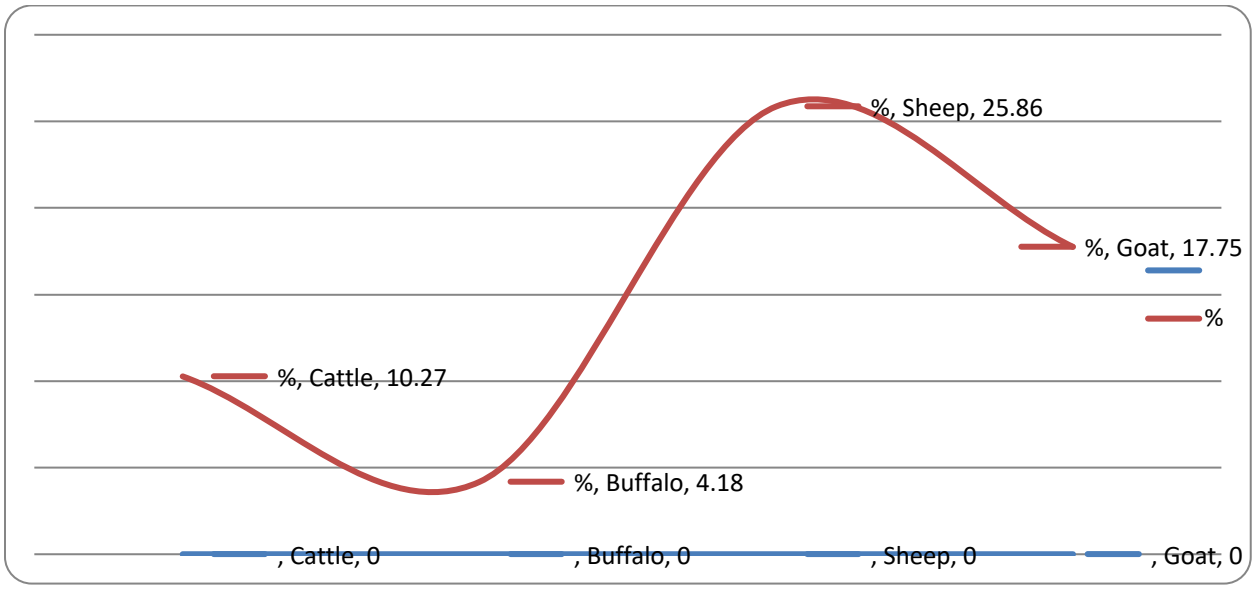

Figure: 4. Mortality rate of domestic animals

3.9 Analysis of Chi-square Test of Livestock Diseases

Chi-square analysis (Table 6) revealed significant differences ($p<0.05$) in disease prevalence across livestock species for all of recorded diseases. The high statistical significance for PPR, sheep pox, diarrhea, and pneumonia suggest that these diseases pose the most serious threats to livestock health in the study area. Overall, the findings highlight the urgent need for developed disease surveillance, vaccination coverage, farmer's awareness and ensure veterinary cares in the charland ecosystem.

Table 6. Analysis of Chi-square ($\chi 2$) test of different diseases

Sl No.	Disease	$\chi 2$-value	p-value	Significance
01	FMD	133.49	9.57×10-29	Significant
02	HS	57.55	1.96×10-12	Significant
03	BQ	75.14	3.39 × 10-16	Significant
04	BEF	51.12	3.39 × 10-11	Significant
05	Bloat/Acidosis	62.49	1.73 × 10-13	Significant
06	Diarrhea	110.82	7.29 × 10-24	Significant
07	Anthrax	36.57	5.68 × 10-8	Significant
08	Ticks	9.94	0.019	Significant
09	LSD	81.58	1.40 × 10-17	Significant
10	PPR	616.50	2.67 × 10-133	Significant
11	Foot Rot	77.33	1.15 × 10-16	Significant
12	Sheep pox	413.91	2.14 × 10-89	Significant
13	Goat pox	125.28	5.61×10-27	Significant
14	Bluetongue	117.00	3.41×10-25	Significant
15	Pneumonia	168.39	2.83×10-36	Significant
16	Brucellosis	59.53	7.40×10-13	Significant
17	Buffalo pox	119.15	1.17×10-25	Significant

18	Enterotoxaemia	111.64	4.86×10-24	Significant

4. Conclusions

The findings of this study indicate that a significant portion of households have small numbers of livestock. Feeding practices mostly on homemade feeds and grazing fields. Limited vaccination coverage and poor access to veterinary services are responsible for the high rate of disease infestation of livestock in Char Majherdiar. To improve livestock productivity, it is an important to implement vaccination programs, veterinary services, dietary practices, and address communication in Char Majherdiar of Rajshahi.

References

Ahmed JU, Raha SK, and Rahman MH. 2016. Dairy Farming in a Selected Char Area of Northern Bangladesh: Prospect of Profitability and Contribution to Livelihood Improvement. Journal of Dairy Science and Technology, 5(2):1-20. www.stmjournals.com

Alam MR, Jalil MA, Sarker BK, and Mussa T. 2022. Prevalence of Peste des Petits Ruminants in the Chuadanga District of Bangladesh. Journal of the Sylhet Agricultural University, 9(2): 137-141.

Alam MB, Tareq Mahmud TM, Khan SA, Ariful Islam AI, Hai MA, and Hasan MM. 2018. Occurrence of diseases and disease conditions in cattle and goats at the Upazila Veterinery Hospital, Debidwar, Comilla. Journal of Advanced Veterinery and Animal Research, 5(2):117-122 https://doi.org/10.5455/javar.2018.e254

DLS (Department of Livestock Services). 2022. Annual Report on Livestock, Division of Livestock Statistics, Ministry of Fisheries and Livestock, Farmgate, Dhaka, Bangladesh.

http://www.dls.gov.bd

Livestock and dairy development project. 2022. Department of Livestock, Ministry of Fisheries and Livestock, Farmgate, Dhaka, Bangladesh. website:iddp.portal.gov.bd

Lucky NS, Hossain MK, Roy AC, Haque MM, Uddin AM, Islam MM, and Howlader, MMR. 2016. A Longitudinal study on clinical diseases and disorders of cattle and goats in Sylhet. Bangladesh Journal of Advanced Veterinary and Animal Research, 3: 24-37. https://doi.org/10.5455/javar.2016.c128

FAP 16. 1995. Bangladesh Flood Action Plan (Charland Socio-Economic Summary Report), Dhaka: Flood Plan Coordination Organization, Ministry of Water Resources, Report prepared by Irrigation Support Project for Asia and the Near East (ISPAN).

Haque MN and Rahman MH. 2024. Incidence of Common goat diseases and disorders in Bangladesh. Journal of Research in Veterinary Sciences, 3(2):37-47. https://doi.org/10.5455/JRVS.20240523011347

Moller K, Easwaran R, Nejadhashemi AP, Hermandez-S uarez JS. 2023. Livestock and aquaculture farming in Bangladesh: Current and future challenges and opportunities. Cogent Food and Agriculture, 9 (2241274).https://doi.org/10.1080/23311932.2023.2241274.

Mehrabi Z, Gill M, Wijk MV, Herrero M, and Ramankutty N. 2020. Livestock policy for sustainable development. Nature Food, 1(3) :160-165. https://doi.org/10.1038/s43016-020-0042-9.

Momin MA, Islam MA, Khatun MM, Rahman MM, and Islam MA. 2011. Characterization of Bacteria Associated with Pneumonia in Black Bengal Goats. Bangladesh Journal of Veterinary Medicine , 9(1): 67-71.Doi= http://doi.org/10.3329/bjvm.v9i1.11215

Rahman MA, Azad MAK, and Nahar MK. 2025. Socio-economic Condition of People of Char Majherdiar in Rajshahi, Bangladesh. International Journal of Science and Development, 1(3), 33-43. https://doi.org/10.5281/zenodo.15101101or https://ijsdev.com

Rahman S, Begum IA, and Alam MJ. 2014. Livestock in Bangladesh: distribution, growth, performance and potential. Livestock Research for Rural Development, 26(10):233-238.

Rumana SM. 2017. Impact of Flood on Livelihood and Its Adaptation Strategy on Teesta Flood Prone area in Rangpur District. An unpublished PhD dissertation, Institute of Environmental Science, University of Rajshahi :96-99.

Yamane T. 1967. Statistics: An Introductory Analysis, 2nd Edition. New York: Harper and Row.

WB (World Bank). 2012. The World Bank Report. World Bank Indicator-Bangladesh-density and urbanization. Washington DC, USA.