Infectious and Non-Infectious Diseases of Farm Animals in Natore District of Bangladesh

Afroja Yasmin[1], Fahima Khatun[1], Sheikh Arafatur Rahman[1], Zahid Hasan Anik[2] and Mahmudul Hasan[2,3,*]

[1]Department of Pathobiology, Faculty of Veterinary Medicine and Animal Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh; [2]Evolution and Diversity Research Laboratory, Bangamata Sheikh Fojilatunnesa Mujib Science and Technology University, Jamalpur-2012, Bangladesh; [3]Department of Fisheries, Bangamata Sheikh Fojilatunnesa Mujib Science and Technology University, Jamalpur-2012, Bangladesh.

*Corresponding author: Mahmudul Hasan; E-mail: mhasan@bsfmstu.ac.bd

ARTICLE INFO

ABSTRACT

Farm animals in Bangladesh play a crucial role in providing nutrition and are a vital component of the rural economy. This study aimed to evaluate the frequency of prevalent infectious and non-infectious diseases among farm animals in the Natore district of Bangladesh. Six Upazila Veterinary Hospitals in the Natore district of Bangladesh participated in the research from January 2023 to December 2023. We identified 76,040 clinical cases by considering the owner's statement, conducting a general examination, observing clinical indicators, and performing laboratory diagnostics. The incidence of endoparasitic infection was the highest (47.73%), while bacterial disease infection was less frequent (1.94%). Among farm animals (cattle, buffalo, goats, sheep, and pigs) goats had the highest prevalence (54.55%) while buffaloes (3.592%) and pigs (0.068%) had the lowest prevalence. The prevalence of both infectious and non-infectious diseases was highest during the rainy season (44.37%), followed by the winter (30.48%) and summer season (25.14%). Although pig farming is uncommon in Bangladesh, we have observed the raising of pigs in the Natore district. Regrettably, parasitic infestation, specifically lice and roundworms, affects a significant number of these piglets. The frequency of lice and roundworm infestation in pigs is 0.02%. These findings suggest a significant prevalence of both infectious and non-infectious disorders. Our research reveals significant insights for prioritizing research on specific diseases and implementing efficient control strategies against them. Therefore, it is imperative for veterinarians and development partners to act to prevent and mitigate the impact of both infectious and non-infectious diseases in farm animals in Bangladesh.

INTRODUCTION

In 2020, the agricultural sector made a substantial contribution to the gross domestic product (GDP) of low-income and lower-middle-income nations which accounted for 28% and 16% of the Gross Domestic Product GDP, respectively (Chakrabortty et al., 2023; Das et al., 2020). The livestock sector in Bangladesh plays a crucial role in the agricultural economy, as the country aims to attain self-sufficiency in the production of cattle products. The agricultural sector plays a crucial role in fulfilling the country's protein needs, accounting for around 36% of the protein supply (ADB, 2023). According to Mia (2013), the livestock subsector accounts for 12% of the agricultural sector's GDP and contributes 3% to the overall national economy. Moreover, the cattle industry plays a central role in generating employment opportunities, supporting the livelihoods of more than 50% of the labor force. Approximately 20% of the population relies directly on livestock, while an additional 50% has a partial dependence on this sector (Bangladesh Economic Review, 2009). Bangladesh possesses a substantial livestock population, with over 22.87 million cattle, 20.75 million goats, 2.63 million sheep, 116.5 million poultry, and 13.47 million ducks (DLS, 2017). These animals possess the capacity to fulfill the increasing need for dairy, meat, and poultry products. Nevertheless, traditional smallholder management techniques dominate livestock rearing in rural Bangladesh, and they face several challenges. Factors contributing to the problem are insufficient grazing land, limited technical knowledge, and poor access to vaccines, insufficient epidemiological research, and a shortage of government staff at the field level. Additionally, there are many animal diseases affecting the situation.

In Bangladesh, farmers typically raise agricultural animals, particularly ruminants, in either free-range or semi-intensive settings. The necessity for economically efficient feeding alternatives year-round drives these systems, resulting in animals frequently wandering unrestricted in streets and communities with minimal or no additional food. Animals that graze on pastures and forages are vulnerable to environmental hazards like theft and mortality (Lawal-Adebowale, 2012). The confluence of animal husbandry practices and the geo-climatic conditions in Bangladesh heightens the vulnerability of cattle to a multitude of diseases. Jabbar et al. (1995) observed that the implementation of intensive and semi-intensive management practices can impose a greater burden on farm animals, resulting in an increased occurrence of diseases and parasites. This, in turn, leads to reduced production and limited contributions to household income. Tropical illnesses pose significant challenges to cattle production, leading to significant social, economic, and environmental impacts. These disorders can also endanger human health in certain instances (Mostari et al., 2020). Illnesses provide a significant obstacle to the progress of cattle farming, as they diminish productivity and result in death (Mostari et al., 2020). According to Ali et al. (2011), almost 10% of livestock perish each year as a result of diseases. Moreover, diseases play a role in causing dietary deficits and hindering fertility. Both viral and non-infectious diseases continue to be significant obstacles to the progress of cattle development in Bangladesh (Alam et al., 2018).

In order to establish an efficient and economical livestock management program, it is crucial to have a comprehensive understanding of the occurrence, frequency, spread, and contributing factors of illnesses in certain regions. Almost every Upazila (sub-district) in Bangladesh houses government-operated animal healthcare facilities. These institutions possess efficiently structured disease record systems that can offer useful insights into local and national disease patterns. Veterinary hospitals are dependable repositories of knowledge on animal diseases and their remedies, as they frequently receive sick or depressed animals brought by livestock owners from nearby regions. Veterinary clinics can enhance their awareness of illness patterns and trends by meticulously documenting and evaluating patient data from various places. Researchers have carried out numerous prevalence studies and surveys across various regions of Bangladesh (Ali et al., 2011; Kabir et al., 2011; Pallab et al., 2012; Rahman et al., 2012, 2017, 2020; Sarker et al., 2013; Parvez et al., 2014; Karim et al., 2014; Sarker et al., 2015; Badruzzaman et al., 2015; Islam et al.,

328

Res. Agric. Livest. Fish.   Vol. 11, No. 3, December 2024: 327-341.

2015a, b, 2019). All these studies focused on single or two species in various districts of Bangladesh. However, this information is scarce in the Natore district of Bangladesh and is primarily focused on five types of common farm animals, namely cattle, buffalo, goat, sheep, and pig. The Natore district has not yet completed a study involving these diverse farms animal types. Hence, the aim of this research is to determine the predominant diseases that impact livestock of various species of farm animals in the Natore district. The research was carried out at the all (six) Upazila Veterinary Hospitals of Natore district. This research seeks to enhance the current body of knowledge on farm animal illnesses in Natore district of Bangladesh, with a specific emphasis on food animals. These animals are of great importance since there is a potential for zoonotic diseases to be transmitted through their intake.

MATERIALS AND METHODS

Study Area and Time

The study was conducted at six Upazila Veterinary Hospitals in the Natore district of Bangladesh from January 2023 to December 2023. We identified the disorders based on the owner's statement, clinical indicators, general examination, and laboratory diagnosis.

Sample Size

Six Upazilas Veterinary Hospitals in the Natore district documented a total of 76,040 animals affected by the disease during the designated study period. This comprehensive data set enabled the assessment of the disease's overall prevalence. We observed a total of 23,177 animals during the winter, in the summer (19,123) and the rainy season (33,740). Goats accounted for the highest number of cases, with 41,482 reported followed by cattle with 30,200 cases, buffaloes with 2,731 cases, sheep with 1,575 cases, and pigs with 52 cases.

Physical Examination

Disease diagnosis relied on a comprehensive assessment of the patient's physical condition, medical background, observable symptoms, macroscopic examination, and laboratory analyses. During the physical examination, the veterinarian observed and recorded the animal's body condition, behaviour, posture, locomotion, pulse, respiration, temperature, and digestive functions. The veterinarian evaluated various anatomical structures and physiological systems using methods such as palpation, auscultation, percussion, needle puncture, and walking tests. We also considered the owner's grievances. The main clinical observations consisted of assessing the body condition score, temperature, faecal consistency, and any notable indications like lameness, crepitation, udder enlargement, wounds, or swelling. This study was conducted an examination to assess lameness in the thigh muscles and hindquarters, and to palpate the udder for signs of redness or soreness. We conducted an examination on the animal's body surface to identify any swellings, wounds, hernias, or outgrowths. We also scrutinized the feet and mouth for vesicles or excessive salivation. We conducted an assessment to evaluate the preputial mucosa and glanspenis for abnormal discharges or ulcerations, and to palpate the joints for any signs of swelling or soreness. We identified abnormal respiratory sounds using a stethoscope.

Disease Diagnosis

The present study diagnosed the viral, bacterial, fungal, protozoal, and mixed illnesses by considering the owner's complaints and the specific clinical signs provided by Khan (2000) and Jones et al. (1996). We determined preliminary diagnoses based on symptomatic indicators, carefully considering environmental conditions and the herd's historical records, both long-term and short-term. We evaluated the respiratory rate and character of the animal before restricting it, and then measured the temperature and pulse. We assessed

the hue of mucous membranes in the conjunctiva or vulva, and examined the thickness and flexibility of the skin for indications of localized inflammation. We manually checked the enlarged lymph nodes and assessed the head for any signs of asymmetry. We assessed breathing difficulties, coughing, and respiratory distress using the methodologies outlined by Jackson and Cockcroft (2002). We identified parasitic infestations by examining faecal samples under a microscope, adhering to Soulsby's (1986) method. We verified haemoprotozoan infections by producing and analyzing blood smears stained with Giemsa, adhering to the procedures outlined by Hendrix & Robinson (2006).

RESULTS

The study undertaken in the Natore district of Bangladesh unveils the incidence of diverse infectious and non-infectious diseases among domesticated livestock, encompassing cattle, buffaloes, goats, sheep, and pigs (Table 1). According to the data, goats were the most afflicted among the 76,040 cases reported in six Upazila Veterinary Hospitals, accounting for 54.55% of the cases. Cattle were the second most affected species, accounting for 39.72% of the cases, followed by buffaloes (3.592%), sheep (2.071%), and pigs (0.068%).

Parasitic infestations had the highest occurrence, with roundworms being the most prevalent infection (22.42%), followed by fluke (15.23%) and tapeworms (10.08%). This emphasizes the substantial weight of endoparasitic infections in animals. Peste des Petits Ruminants (PPR) was a highly prevalent viral disease in goats, accounting for 4.967% of all reported viral cases. Additional noteworthy diseases affecting cattle and buffalo include FMD (foot-and-mouth disease), ephemeral fever, and lumpy skin disease (LSD). Additionally, there were notable cases of ectoparasitic illnesses, such as ticks, mites, and lice, with ticks infecting 8.214% of the animals. Sexually transmitted infections and disorders related to metabolism constituted a lesser proportion of the overall cases, amounting to 2.111% and 5.857%, respectively. The results emphasize the urgent requirement for efficient disease control strategies, specifically in goats, which saw a higher impact from parasite and viral infections. The report recommends implementing better veterinary care, immunization programs, and improved management techniques to decrease the occurrence of diseases, prevent financial losses, and safeguard the livelihoods of farmers in the region.

Analysis and Implications

Roundworms caused the maximum amount of endoparasitic infestation (22.42%), while tapeworms caused the minimum amount (10.08%). Roundworm primarily affected cattle (9.388%), followed by goats (11.84%), and buffalo, sheep, and pigs affected less than 1%. The prevalence rate of Fluke infestation was 15.23%, with the highest rate in cattle (7.088%), followed by goats (6.753%), and a rate of 1.009% in buffaloes. In sheep and pigs, the frequency was less than 1%. The prevalence rate of tapeworm infestation was highest in goats (7.529%) and then in cattle (1.589%), in buffalo, sheep, and pigs it was ≤0.5%. In the case of ectoparasitic infestation, the most infestation was observed by lice (9.507%) and the least by mites (5.075%), in which the highest number of goats (5.43%) was infected by lice followed by cattle (3.197%), buffalo (0.647%) sheep (0.209%) and pig (0.024%). The prevalence of tick infestation was recorded at 8.214% and highest in cattle (4.709%) and lowest in pigs (0.008%). PPR prevalence was 5.101% and was the most common viral infection in goats (4.967%), while bovine ephemeral fever (2.349%) was the most common in cattle (2.282%). We recorded the prevalence of lumpy skin disease at 1.624%, with the highest prevalence in cattle (1.57%) and the lowest in buffalo (0.054%). Rabies recorded the lowest viral disease prevalence (0.007%) and was at the same rate (0.003%) in cattle and goats (0.003%), and in sheep, it was 0.001%. Only goats (0.045%) recorded a pox prevalence of 0.046%. Foot and Mouth Disease accounted for 1.362% of the total diseases, with the highest prevalence rates in cattle (0.978%), goats (0.313%), and sheep (0.014%), respectively. Mastitis (1.399%) had the highest prevalence among bacterial diseases and the frequency was

in cattle (0.788%), goats (0.539%), buffaloes (0.059%), and sheep (0.013%), while tuberculosis had the lowest prevalence (0.003%). Tetanus (0.397%) recorded the second highest prevalence among bacterial diseases and the frequency was in goats (0.37%), cattle (0.026%), and sheep (0.001%) respectively.

Table 1. Prevalence of infectious and non-infectious diseases of farm animals (cattle, buffaloes, goats, sheep and pigs) in the Natore district, Bangladesh

Diseases	N= 76040					Total
	Cattle	**Buffaloes**	**Goats**	**Sheep**	**Pigs**	
Viral Disease						
FMD	744 (0.978)§	43 (0.057)	238 (0.313)	11 (0.014)	0 (0)	1036 (1.362)
Rabies	2 (0.003)	0 (0)	2 (0.003)	1 (0.001)	0 (0)	5 (0.007)
PPR	0 (0)	0 (0)	3777 (4.967)	102 (0.134)	0 (0)	3879 (5.101)
Ephemeral Fever	1735 (2.282)	17 (0.022)	31 (0.041)	3 (0.004)	0 (0)	1786 (2.349)
Pox	0 (0)	0 (0)	34 (0.045)	1 (0.001)	0 (0)	35 (0.046)
LSD	1194 (1.57)	41 (0.054)	0 (0)	0 (0)	0 (0)	1235 (1.624)
Bacterial Disease						
Anthrax	10 (0.013)	0 (0)	0 (0)	0 (0)	0 (0)	10 (0.013)
Black Quarter	40 (0.053)	2 (0.003)	0 (0)	0 (0)	0 (0)	42 (0.055)
Hemorrhagic Septicemia	34 (0.047)	21 (0.028)	0 (0)	0 (0)	0 (0)	57 (0.075)
Tetanus	20 (0.026)	0 (0)	281 (0.37)	1 (0.001)	0 (0)	302 (0.397)
Tuberculosis	0 (0)	0 (0)	1 (0.001)	1 (0.001)	0 (0)	2 (0.003)
Mastitis	599 (0.788)	45 (0.059)	410 (0.539)	10 (0.013)	0 (0)	1064 (1.399)
Protozoan disease						
Babesiosis	164 (0.216)	3 (0.004)	52 (0.068)	0 (0)	0 (0)	219 (0.288)
Theileriosis	10 (0.013)	0 (0)	0 (0)	0 (0)	0 (0)	10 (0.013)
Anaplasmosis	23 (0.03)	0 (0)	197 (0.259)	0 (0)	0 (0)	220 (0.289)
Coccidiosis	2335 (3.071)	36 (0.047)	4068 (5.35)	14 (0.018)	1 (0.001)	6454 (8.488)
Endoparasite						
Roundworm	7139 (9.388)	572 (0.752)	9006 (11.84)	313 (0.412)	15 (0.02)	17045 (22.42)
Fluke	5390 (7.088)	767 (1.009)	5135 (6.753)	284 (0.373)	8 (0.011)	11584 (15.23)
Tapeworm	1208 (1.589)	338 (0.445)	5725 (7.529)	387 (0.509)	4 (0.005)	7662 (10.08)
Ectoparasite						
Tick	3581 (4.709)	132 (0.174)	2400 (3.156)	127 (0.167)	6 (0.008)	6246 (8.214)
Mite	1391 (1.829)	111 (0.146)	2282 (3.001)	75 (0.099)	0 (0)	3859 (5.075)
Lice	2431 (3.197)	492 (0.647)	4129 (5.43)	159 (0.209)	18 (0.024)	7229 (9.507)
Others						
Sexual disease	580 (0.763)	43 (0.057)	941 (1.238)	41 (0.054)	0 (0)	1605 (2.111)
Metabolic disease	1568 (2.062)	68 (0.089)	2773 (3.647)	45 (0.059)	0 (0)	4454 (5.857)
Grand Total=	30200 (39.72)	2731 (3.592)	41482 (54.55)	1575 (2.071)	52 (0.068)	76040 (100.0)

§Number in the parenthesis indicates percent prevalence, FMD = Foot and Mouth Disease, LSD = Lumpy skin Disease

331

Res. Agric. Livest. Fish.   Vol. 11, No. 3, December 2024: 327-341.

In terms of protozoan disease infestation, goats had the highest prevalence of Coccidiosis (5.35%), while cattle, buffalo, sheep, and pigs recorded the highest prevalence at 3.071%, 0.047%, 0.018%, and 0.001%, respectively.In other diseases (metabolic and sexual diseases), goats had the highest prevalence rate among all species; metabolic disease (3.647%) and sexual disease (1.238%), while pigs had the lowest rate (0.00%). We found the prevalence of metabolic disease in cattle, buffalo, and sheep to be 2.062%, 0.089%, and 0.059%, respectively. The sexual disease had a prevalence of 2.111%. Prevalence of sexual disease was highest in goats (1.238%), lowest in pigs (0.00%), and was followed by cattle (0.763%). buffaloes (0.057%) and sheep (0.054%), respectively.

This dataset emphasizes notable patterns in the incidence of cattle diseases, including the overwhelming presence of parasitic infections. Poor grazing management and inadequate deworming procedures contribute to the high incidence of roundworm and Fluke infestations. Goats appear particularly vulnerable because of their free-range rearing techniques, which increase their susceptibility to parasites.

The high incidence of viral infections such as PPR in goats and FMD in cattle highlights the necessity for focused vaccination campaigns to manage these extremely contagious diseases. Moreover, the rise of LSD and other viral illnesses underscores the significance of ongoing surveillance and the adoption of preventive strategies. The study also indicates that ectoparasitic illnesses, namely ticks, remain a substantial obstacle in cattle management. The significant occurrence of these illnesses suggests a lack of adequate cleanliness and treatment procedures in animal husbandry.

The study provides useful insights into the disease burden that cattle in the Natore district face. It emphasizes the need for collaborative efforts from both the government and commercial sectors to enhance animal health services, reinforce disease surveillance, and encourage sustainable livestock farming techniques.

The highest prevalence was recorded for endoparasitic infestation (47.73%) and the lowest prevalence for bacterial diseases (1.94%). Occurrence of ectoparasitic infestation, viral disease, others and protozoan diseases was documented 22.79%, 10.49%, 7.96% and 9.08% respectively (Figure 1).
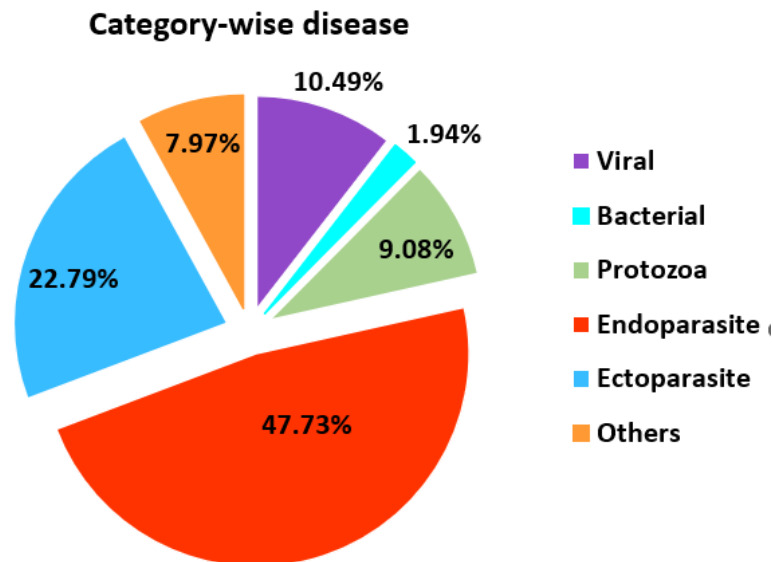

Figure 1. Prevalence of different types of diseases in farm animals of Natore district

Analysis (Figure 1)

The data presented reflects the prevalence of various diseases among animals in the Natore district in 2023. This analysis highlights the significant disparities in the types of diseases affecting the animals, with a particular emphasis on parasitic infestations and the relatively lower occurrence of bacterial and viral diseases.

Endoparasitic Infestation

Endoparasitic infection had the greatest prevalence rate of 47.73%. These findings indicate that internal parasites pose a significant threat to animal health in the Natore district. Endoparasites, including roundworms, flukes, and tapeworms, can flourish in circumstances where animals come into contact with contaminated food or water supplies. Inadequate hygiene measures, congested living situations, and absence of regular deworming techniques frequently play a substantial role in causing these infestations. The elevated prevalence of endoparasitic infestations highlights the necessity for more effective deworming initiatives, enhanced pasture supervision, and improved hygiene protocols.

Ectoparasitic Infestation

The second largest occurrence was ectoparasitic infestation, with a prevalence rate of 22.79%. This issue significantly impacts animal wellbeing. Ectoparasites, such as ticks, mites, and lice, can cause considerable discomfort, irritation, and secondary diseases in animals. These parasites frequently flourish in environments that are both warm and humid, which may be typical of the region. Possible causes for the relatively high occurrence of ectoparasitic infestations may include a lack of regular veterinarian care, failure to use preventive medicines such pesticides, and inadequate living conditions.

Protozoan Diseases

The prevalence of protozoan illnesses was documented at 9.08%, suggesting that although not as extensive as parasitic infestations, they nonetheless present a significant risk. Protozoan diseases, such as coccidiosis and babesiosis, can significantly impair animal health and production. These diseases can be transmitted through polluted water or through vectors such as ticks. Therefore, it is important to prioritize control methods that focus on water hygiene and vector management.

Viral Diseases

The prevalence of viral illnesses was 10.49%, which, although lower than parasitic infestations, is nevertheless noteworthy. Virulent illnesses have the ability to propagate swiftly within populations and can prove challenging to contain once an outbreak ensues. Viral infections may arise due to low vaccination coverage or inadequate biosecurity measures. This highlights the necessity for more robust vaccination campaigns, improved animal handling methods, and enhanced biosecurity protocols in order to minimize the transmission of viral infections.

Other Diseases

The "other diseases" category represented 7.97% of the overall cases. This comprehensive classification encompasses a range of ailments, including metabolic disorders, dietary deficiencies, and non-specific illnesses. This highlights the necessity of adopting a holistic strategy for managing animal health, which considers many aspects such as nutrition, environmental stress, and genetic predisposition.

333

Res. Agric. Livest. Fish.   **Vol. 11, No. 3, December 2024: 327-341.**

Bacterial Diseases

Notably, the bacterial infections had the lowest occurrence rate, at 1.94%. The limited occurrence of this phenomenon may indicate the efficacy of current management strategies, such as the administration of antibiotics, adherence to cleanliness protocols, or the implementation of vaccination campaigns specifically aimed against bacterial pathogens. Although the incidence is infrequent, bacterial illnesses can nonetheless result in serious consequences when they do manifest. The low prevalence may also indicate the possibility of underreporting or misdiagnosis, as bacterial infections are frequently subsequent to underlying disorders such parasitic infestations.

Implications for Animal Health Management

According to the data, parasitic infections, both internal (endoparasitic) and external (ectoparasitic), are the most significant risk to animal health in the Natore district. This necessitates specific interventions such as implementing regular deworming schedules, establishing vector control programs, and enhancing hygiene and sanitation practices. In addition, although bacterial illnesses may seem less common, it is crucial to be vigilant by ensuring accurate diagnosis and implementing preventive measures such as immunization and biosecurity. Priority should be given to techniques such as vector control, water hygiene management, and intensified immunization efforts in dealing with protozoan and viral infections. Tackling these diseases necessitates a comprehensive approach that considers the interplay between the environment, management techniques, and veterinary care. The data indicates that parasite infestations are the main issue affecting animal health in Natore district, while other types of diseases have a lesser but still substantial influence. An integrated strategy, emphasizing both proactive measures and therapeutic interventions, is crucial for enhancing animal well-being and mitigating the spread of diseases. Overall infectious and non-infectious diseases are highest in rainy season (44.37%), followed by winter season (30.48%) and summer season (25.14%) (Figure 2).
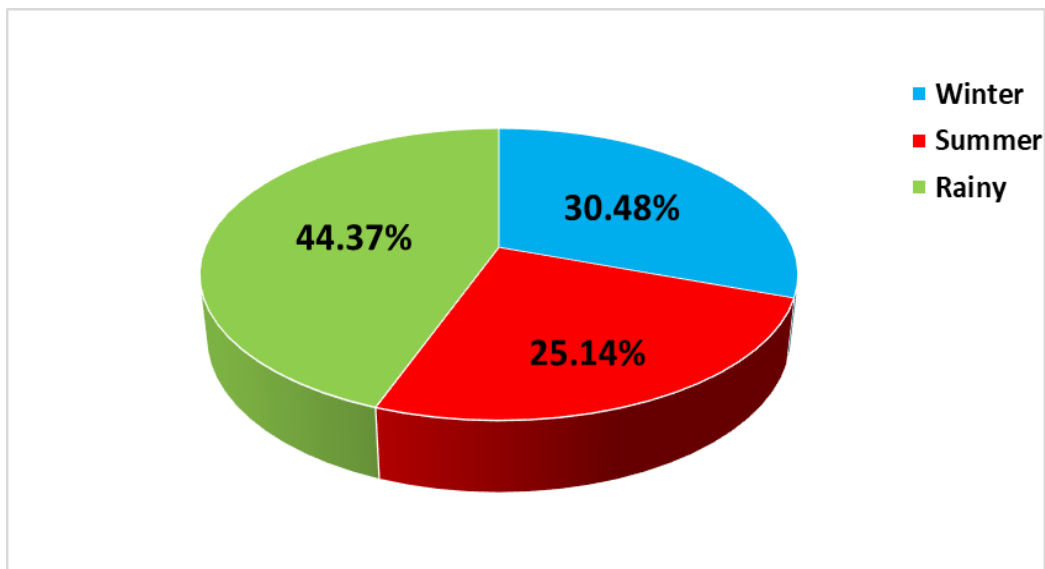

Figure 2. Season-wise disease percentage

334

Res. Agric. Livest. Fish.   Vol. 11, No. 3, December 2024: 327-341.

Analysis (Figure 2)

The data offers valuable information regarding the fluctuation of infectious and non-infectious diseases among animals over the seasons. The largest occurrence is observed during the rainy season (44.37%), followed by winter (30.48%) and summer (25.14%). This pattern emphasizes the impact of seasonal influences on animal health, emphasizing the necessity for disease management techniques tailored to each season.

Rainy Season (44.37%)

It is not unexpected that infections are most common during the rainy season, as this time of year usually provides optimal circumstances for the rapid growth and spread of disease-causing microorganisms and parasites. The combination of elevated humidity, stagnant water, and a higher abundance of disease-carrying organisms such as mosquitoes, flies, and ticks facilitate the transmission of various infectious (e.g., viral, bacterial, protozoan) and parasitic diseases (e.g., endoparasites and ectoparasites).The rainy season increases the likelihood of food and water supplies becoming contaminated with disease-causing substances, resulting in a higher occurrence of internal parasite infestations and diseases transmitted by water. Inadequate drainage systems and flooding can worsen these problems by heightening the animals' exposure to polluted habitats. The increased incidence of diseases during this time period indicates the necessity for proactive measures, such as enhanced sanitation, water management, and vector control, to reduce the occurrence of disease outbreaks during the rainy season.

Winter Season (30.48%)

Diseases had the second greatest occurrence rate throughout the winter season. Animals may undergo stress in colder climates as a result of temperature variations, leading to a weakened immune system and increased vulnerability to both infectious and non-infectious illnesses. The close proximity of animals during this season promotes the transmission of infections, leading to an increase in viral diseases, respiratory infections, and ectoparasitic infestations. In addition, during winter, there may be an increased occurrence of non-infectious ailments, such as nutritional deficiencies or metabolic abnormalities, due to animals struggling to acquire enough nutrients and energy to sustain their body heat. Ensuring adequate nourishment, providing well-heated housing, and practicing good cleanliness in confined areas are essential measures to prevent the transmission of diseases in the winter season.

Summer Season (25.14%)

Despite having the lowest illness prevalence (25.14%), the summer season nevertheless presents considerable health hazards to animals, primarily due to heat stress, dehydration, and certain infections. Elevated temperatures can result in compromised immunological responses in animals, rendering them more susceptible to diseases. Moreover, the combination of water scarcity and the pollution of existing water sources during this period might exacerbate the transmission of infectious diseases and parasites. The decreased incidence of diseases during the summer season can be attributed to increased outdoor activity among animals, resulting in less proximity and transmission of contagious infections. Nevertheless, it is crucial to pay close attention throughout this season to guarantee adequate hydration, seek shade, and regularly monitor for indications of heat stress or other health problems associated with summer.

335

Res. Agric. Livest. Fish.   Vol. 11, No. 3, December 2024: 327-341.

Implications for Disease Management

The notable disparity in illness frequency over different seasons underscores the necessity of implementing animal health management methods that are tailored to each unique season. During the rainy season, it is crucial to manage vector populations, uphold hygienic living conditions, and guarantee access to uncontaminated food and water in order to prevent the spread of infectious and parasitic diseases. During the winter season, it is crucial to ensure sufficient shelter, proper nutrition, and regular surveillance to effectively control the prevalence of respiratory or viral diseases. In the summer, it is important to focus on reducing heat stress and providing access to clean water in order to decrease the chances of disease epidemics.

According to the data, the rainy season is identified as the most difficult period for animal health, with almost 50% of the ailments occurring during this time. Both winter and summer seasons pose distinct challenges that necessitate specific health management approaches. Implementing a strategy that is specifically designed for each season to prevent and control diseases is crucial for enhancing animal health and reducing the occurrence of disease outbreaks throughout the year. Occurrence of endoparasitic infestation was found highest in all season and highest was in rainy season (19.37%) followed by winter (16.34%) and summer (12.01%). Except bacterial disease all diseases (viral, ectoparasitic, protozoan and other) are highest in rainy season. Bacterial disease occurrence was recorded highest (1.60%) in winter followed by rainy (1.54%) and summer (1.44%) respectively (Figure 3).
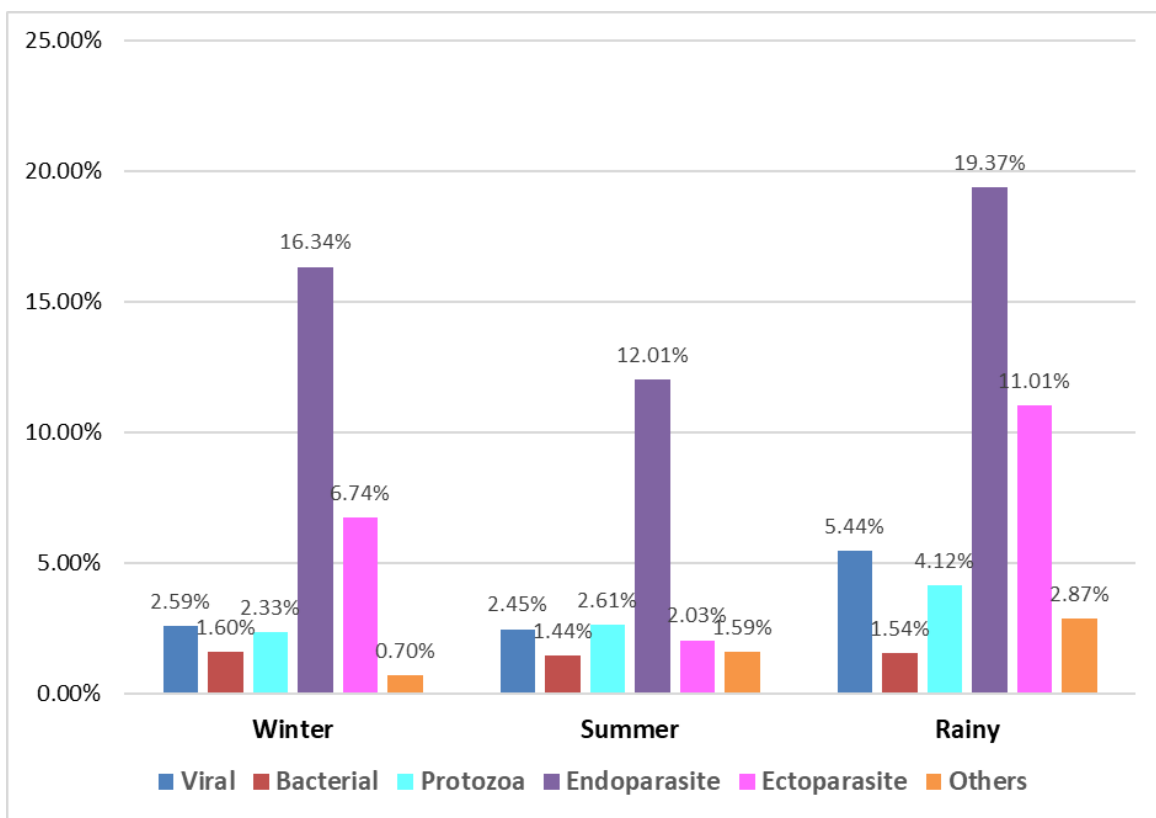

Figure 3. Disease prevalence in Winter, Summer and rainy seasons of farm animals

Analysis

The data emphasizes the fluctuation in the occurrence of many forms of diseases among animals throughout the seasons, specifically focusing on infestations caused by internal parasites and bacterial infections. It is evident that although the majority of diseases are more common during the wet season, bacterial infections reach their highest point during winter. The seasonal pattern highlights the impact of environmental factors on the dynamics of disease in animals.

Endoparasitic Infestations

The most common kind of disease throughout all seasons was endoparasitic infestations, with the highest prevalence observed during the rainy season (19.37%), and followed by winter (16.34%) and summer (12.01%). The higher occurrence of endoparasitic infections during the rainy season can be ascribed to the environmental circumstances that promote the proliferation and dissemination of parasites. Optimal circumstances for the survival and transmission of endoparasites, such as worms and protozoa, are created by high humidity, moist soil, and water stagnation.

Animals frequently encounter polluted water and food sources during the rainy season, which heightens their susceptibility to consuming parasite eggs or larvae. The elevated levels of endoparasitic infections during both winter and summer suggest that while the rainy season is the peak, parasite infestations pose a persistent burden throughout the year. These findings emphasize the necessity of regularly administering deworming treatments and implementing better water and feeding practices in order to decrease the prevalence of internal parasites throughout different seasons.

Other Diseases

Except for bacterial diseases, all other types of diseases-viral, ectoparasitic, protozoan, and others showed the highest occurrence during the rainy season. This trend is consistent with the general observation that the rainy season fosters favorable conditions for the spread of infectious diseases and parasites due to increased moisture, which supports the survival of pathogens and vectors.

- Viral Diseases: The increased occurrence of viral diseases during the rainy season could be due to the higher concentration of animals in shelter during heavy rains, which facilitates the spread of airborne viral pathogens.
- Ectoparasitic Infestations: The higher incidence of ectoparasitic infestations in the rainy season can be attributed to the breeding of external parasites, such as ticks and mites, which thrive in warm and humid conditions. The presence of water and mud also increases the likelihood of ectoparasites attaching to animals.
- Protozoan Diseases: Protozoan diseases, often transmitted through vectors or contaminated water, also peak during the rainy season when such conditions are most common.
- Sexual and metabolic diseases: Sexual and metabolic diseases are also higher in amount during the rainy season could be due to the wet, cold, damp environment, slower metabolism, increased humidity and increased water-borne diseases.

The rise in illness prevalence during the rainy season underscores the necessity for preventative measures such as vaccination, vector control, and maintaining cleanliness to limit the risks.

Bacterial Diseases

Bacterial infections exhibited the highest incidence during the winter season (1.60%), followed closely by the rainy season (1.54%) and summer (1.44%), in contrast to other illness types. The increased prevalence of bacterial illnesses during winter can be attributed to various factors:

337

Res. Agric. Livest. Fish.   **Vol. 11, No. 3, December 2024: 327-341.**

Cold stress can lead to immune suppression. Animals are prone to stress in colder weather due to temperature variations, which can compromise their immune systems and increase their vulnerability to bacterial illnesses, especially respiratory disorders.

Close Confinement: In winter, animals are frequently kept in close proximity to shield them from the cold. However, this can heighten the likelihood of bacterial illnesses spreading through direct touch or shared living quarters.

Moisture and inadequate ventilation: Although moisture and humidity are typically linked to the rainy season, insufficient ventilation and condensation in winter housing can also create small-scale conditions that promote the proliferation of bacterial infections. This pattern suggests that bacterial diseases are less affected by moisture levels compared to parasitic and viral infections. However, they are strongly associated with animal management methods during the colder months. To decrease the occurrence of bacterial diseases, it is advisable to enhance ventilation, uphold good hygiene practices, and prevent overcrowding of animals in winter housing.

Implications for Disease Management

The cyclical pattern of illness occurrence highlights the necessity for customized therapies that are informed by the distinct hazards associated with each season. During the rainy season, it is important to prioritize the management of parasite infestations, minimize exposure to disease-carrying organisms, and ensure the availability of uncontaminated water and food sources. In contrast, winter necessitates a concentration on reducing the impact of cold stress, enhancing living conditions, and averting bacterial infections by means of appropriate cleanliness and ventilation.

Furthermore, although bacterial diseases are less common than parasitic and viral diseases, it is crucial to stay alert during winter and rainy seasons when the danger is higher. Consistent veterinary surveillance, immunization, and proactive healthcare throughout the year are essential for preserving animal well-being. Endoparasitic infestations pose the greatest illness burden throughout the year, especially during the rainy season, when viral, ectoparasitic, and protozoan diseases also become more prevalent. Bacterial illnesses, on the other hand, reach their highest point during the winter season as a result of cold-induced stress and environmental factors linked to indoor living conditions. This data emphasizes the significance of implementing disease control strategies that are appropriate to each season in order to decrease the overall occurrence and consequences of both infectious and non-infectious diseases in animals.

DISCUSSION

The findings of this investigation provide pivotal insights into the prevalence and seasonal distribution of infectious and non-infectious diseases in farm animals in the Natore district of Bangladesh. The high prevalence of diseases mostly endoparasitic infestations highlights the susceptibility of farm animals to parasitic infections. The 47.73% incidence rate of parasitic infestations detected in this study predominantly among goats, aligns with previous research such as Chakrabortty et al. (2023) where the prevalence of Gastrointestinal (GI) parasites in Black Bengal Goats (BBGs) was 65.4% and Dey et al. (2020) where 62.1% goats were found to be infected with one or more species of Gastrointestinal Nematodes (GINs), that identifies parasitism as a major concern in tropical and subtropical areas like Bangladesh, where favorable climatic environments boost the life cycles of parasites. This causes a major threat to the productivity and overall health of livestock and controlling parasitic infestation in the region. Among species goats had a peak prevalence of disease mostly parasitic infections compared to other species, which may be related to their grazing habits and environmental exposure. Goats in Bangladesh are often grazed in communal areas which increase their contact with contaminated soil, water and pasture. On the other hand, buffaloes and pigs

338

Res. Agric. Livest. Fish.   **Vol. 11, No. 3, December 2024: 327-341.**

exhibited the lowest prevalence, which could be associated with their smaller populations or different management practices. In the case of pigs, despite the small population, parasitic infestation particularly lice and roundworms were observed. These findings suggest that personalized preventive measures should be familiarized for each species based on their specific management practices and risk factors.

In the case of viral diseases, the highest prevalence was observed for Peste des Petits Ruminants (PPR) in goats, which may be attributed to the natural occurrence of PPR in goats and sheep, as supported by Kumar et al. (2014) that Peste des Petits Ruminants virus (PPR virus) causes an acute fatal disease in its natural host (sheep/goats). Another viral disease, lumpy skin disease, was recorded exclusively in cattle and buffalo, as supported by Eom et al. (2023) in which the host-specific LSD virus affected large ruminants, such as cattle and domestic water buffalo. In bacterial disease, the infection rate was comparatively low (1.942%), which could be attributed to better vaccination coverage or the better use of antibiotics in veterinary practices. However, this finding also raises concerns about the potential overuse of antibiotics, leading to antimicrobial resistance which is a growing problem globally.

The seasonal distribution of diseases with the highest prevalence rate during the rainy season (44.37%) and lowest during the summer (25.14%), as supported by Das et al. (2020) in which the overall disease prevalence was higher in the rainy season (43.80%) and in lower in summer (9.50%). The maximum prevalence rate during the rainy season can be described by the increased humidity and temperature which are helpful to the growth and spread of many pathogens and parasites. Rainy season conditions can also decrease the overall health status of animals due to poor nutrition as grazing becomes inadequate, and animals are often exposed to flooded or contaminated environments. This highlights the need for heightened veterinary involvement and disease surveillance during the rainy season to prevent outbreaks. Our findings emphasize the significance of strategic disease prevention and control measures focusing on parasitic management, seasonal disease monitoring, and antibiotic stewardship. The high prevalence rate of parasitic infestations demands routine deworming programs, better-quality farm hygiene and improved livestock management practices to decrease the burden of parasitic disease. It is also vital to raise awareness among farmers about the importance of vaccination, biosecurity and proper veterinary care to improve the health and productivity of their livestock.

Ultimately, this investigation provides important baseline data on the prevalence of infectious and non-infectious diseases in farm animals in the Natore district which can guide veterinarians and policymakers in prioritizing intercessions. By focusing on prevention strategies and disease control specific to species and seasons livestock productivity and welfare can be improved. This research also emphasizes the necessity for continued disease surveillance particularly for emerging parasitic infestations in non-traditional livestock species like pigs to confirm the sustainability of animal farming in Bangladesh.

CONCLUSION

Infectious and non-infectious diseases pose a significant global challenge, specifically affecting livestock health and production, with agricultural animals being particularly susceptible. This study emphasizes the concerning frequency of these diseases in farm animals in the Natore region of Bangladesh, where they have a significant negative effect on livestock productivity. Farmers are particularly concerned about the high prevalence of infectious diseases, since it poses a threat to both animal well-being and economic stability. To address this problem, veterinary services must increase their monitoring efforts for all farm animals in order to rapidly detect and control disease outbreaks. It is imperative for the government and private sectors to work together in order to create and execute comprehensive disease control programs that aim to reduce the negative impacts of both infectious and non-infectious diseases. These efforts will not only ensure the well-being of animals, but also preserve farmers' economic means. This study offers significant insights into the current disease scenario in Bangladesh's livestock industry and provides a basis for well-informed

339

Res. Agric. Livest. Fish.   **Vol. 11, No. 3, December 2024: 327-341.**

interventions. Nevertheless, additional investigation is required to have a more comprehensive understanding of the origins and spread patterns of these illnesses. Conducting such investigations is crucial for developing improved prevention and control strategies to ensure the long-term sustainability and productivity of the livestock industry.

Authors' contributions

Afroja Yasmin: Design the research, collect data, analyze data, write the manuscript, and finalize the manuscript. Fahima Khatun and Sheikh Arafatur Rahman: Write the Introduction and review the manuscript. Zahid Hasan Anik: Partly wrote the manuscript and Mahmudul Hasan: Overall proofread the manuscript and supervised it.

Funding

Conflict of interest

The authors declare no conflict of interest.

Data availability

The data supporting the findings of this study are available on request from the corresponding author.

Acknowledgment

REFERENCES

1. Alam MB, T Mahmud, SA Khan, A Islam, MA Hai and MM Hassan, 2018.Occurrence of diseases and disease conditions in cattle and goats at the Upazilla Veterinary Hospital, Debidwar, Comilla. Journal of Advance Veterinary and Animal Research, 5: 117–122.
2. Ali MH, MKJ Bhuiyan, MM Alam, 2011. Retrospective epidemiologic study of diseases in ruminants in Khagrachari hill tract district of Bangladesh. Bangladesh Journal of Veterinary Medicine, 9: 145-153.
3. Asian Development Bank, MARCH, 2023. Bangladesh's agriculture, natural resources, and rural development (ANR) sector assessment and strategy.
4. Badruzzaman ATM, MSI Siddiqui, MO Faruk, NS Lucky, MA Zinnah, FMA Hossain and MM Rahman, 2015. Prevalence of infectious and non-infectious diseases in cattle population in Chittagong district of Bangladesh. International Journal of Biological Research, 3: 1-4.
5. Chakrabortty M, NN Shohana, N Begum, AR Dey, SA Rony, S Akter and MZ Alam, 2023. Diversity and prevalence of gastrointestinal parasites of Black Bengal goats in Natore, Bangladesh. Journal of Advanced Veterinary and Animal Research, 10(1): 80–87.
6. Das M, B Sharma, MI Ahsan and S Akter, 2020. Prevalence of Diseases and Disorders of Large Ruminant in MoulvibazarSadarUpazila, Bangladesh. Bangladesh Journal of Veterinary and Animal Sciences, 8(2): 20-28.
7. Dey AR, N Begum, MA Alim, S Malakar, MT Islam and MZ Alam, 2020. Gastro-intestinal nematodes in goats in Bangladesh: A large-scale epidemiological study on the prevalence and risk factors. Parasite Epidemiology and Control, 9.
8. DLS, 2017. Department of Livestock services: Annual Report Fisheries and Livestock, 2016- 2017.
9. Eom HJ, ES Lee and HS Yoo, 2023. Lumpy skin disease as an emerging infectious disease. Journal of Veterinary Science, 24(3).

10. Hendrix CM and E Robinson, 2006 Diagnostic Parasitology for Veterinary Technicians, third edition, Mosby Inc. and affiliated of Elsevier Inc, China, pp: 246-247.

11. Islam MN, JA Begum, YA Sarker, S Aktar and MH Sikder, 2015. Retrospective study of diseases of cattle at Adamdighi Veterinary Hospital, Bogra. The Bangladesh Veterinarian, 32: 7–12.

12. Islam O, MM Hossain, S Khatun, M Famous and MM Uddin, 2019. Observational study on clinical diseases and disorders in cattle recorded through one year at Daksh in Surma upazilla under Sylhet district of Bangladesh. Research Journal of Veterinary Practitioners, 7: 58- 62.

13. Islam S, SP Moni, SR Barua, and MA Parvez, 2015b. Clinical manifestations and diseases of cattle and goats in Gopalganj, Bangladesh Journal of Eco-Friendly Agriculture, 8: 81–85.

14. Jabbar MA, L Reynolds and PA Francis, 1995. Sedentarisation of cattle farmers in the derived savanna region southwest Nigeria: results of a survey. Tropical Animal Health Production, 27: 55 – 64

15. Jones TC, RD Hunt and NW Kimg, 1996. Veterinary Pathology, Sixth edition, Williams & Wilkins, A Waverly Company, pp: 1024-1041.

16. Kabir MH, MA Reza, KMA Razi, MM Parvez, MAS Bagand, SU Mahfuz, 2011. A report on clinical prevalence of diseases and disorders in cattle and goat at the Upazilla Veterinary Hospital, Ulipur, Kurigram. International Journal of Biological Research, 2: 17-23.

17. Khan CM 2000.The Merck Veterinary Manual. Tenth edition, Merck Sharp & Dohme Corporation. USA, pp: 501-524

18. Kumar N, S Maherchandani, SK Kashyap, SV Singh, S Sharma, KK Chaubey, and H Ly, 2014. Peste des petits ruminant's virus infection of small ruminants: a comprehensive review. Viruses, 6(6): 2287–2327.

19. Lawal-Adebowale OA, 2012. Dynamics of Ruminant Livestock Management in the Context of the Nigerian Agricultural System. In: Livestock Production (Eds. Khalid Javed). Intech. USA. ISBN978- 953-51-0814-6.

20. Mia MAR, 2013. Final Draft National Livestock Extension Policy.

21. Mostari KD, KMA Noman, SMH Rashid, MA Haque, and MG Azam 2020. Study on status of cattle diseases in relation to age, sex and season at Debidwar, Bangladesh. IOSR Journal of Agriculture and Veterinary Science, 13: 55-65.

22. Pallab MS, SM Ullah, MM Uddin, and OF Miazi 2012. A cross sectional study of several diseases in cattle at ChandanaishUpazilla of Chittagong district, Bangladesh. Scientific Journal of Veterinary Advances, 1: 28-32.

23. Parvez MA, MR Faruque, BC Sutradhar, MM Rahman, A Mannan, and R Khatun, 2014. Clinical diseases and manifestations of goats and cattle recorded at teaching veterinary hospital in Chittagong Veterinary and Animal Sciences University. Bangladesh Journal of Veterinary Medicine, 12(1): 73-81.

24. Rahman M, S Chowdhury, MR Adnan, MU Rahman, D Sathi, M Ahmed, and MM Rahman, 2017. Status of diseases and disorders of ruminants in Sylhet, Bangladesh. International Journal of Developmental Research, 7: 15366-15372

25. Rahman MA, MA Islam, MA Rahman, AK Talukder, MS Parvin, and MT Islam, 2012. Clinical diseases of ruminants recorded at the Patuakhali Science and Technology University Veterinary Clinic. Bangladesh Journal of Veterinary Medicine, 10(1 & 2): 63- 73.

26. Rahman MT, MS Islam, SHMF Siddiki, AK Talukder, MT Islam, MG Haider, ANMA Rahman, and MA Rahman, 2020. Prevalence of common diseases of livestock and pets at Veterinary Teaching Hospital, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur. International Journal of Natural Science, 10: 21-29.

27. Sarker MAS, M Aktaruzzaman, AKMA Rahman, and MS Rahman 2013. Retrospective study of clinical diseases and disorders of cattle in Sirajganj district in Bangladesh. Bangladesh Journal of Veterinary Medicine, 11: 137-144.

28. Sarker YA, AH Miah, N Sharif, MH Himel, S Islam, RC Ray, TK Paul, MT Islam, and MH Sikder 2015. A retrospective study of common diseases at veterinary teaching hospital, Bangladesh Agricultural University, Mymensingh. Bangladesh Journal Veterinary Medicine, 13: 55-61.

29. Siddiki SHMF, MG Morshed, MS Parvin, and L Naher, 2015. Clinical prevalence of diseases and disorders of cattle at the Upazilla Veterinary Hospital, Chauhali, Sirajganj. Research in Agriculture Livestock and Fisheries, 2: 465–474.

30. Soulsby EJL, 1986. Helminths, Arthropods and Protozoa of Domesticated Animals, Seventh edition, The ELBS and Baillier Tindall, London, UK, pp: 40-52.

341