

GENETIC AND NON-GENETIC FACTORS ASSOCIATED WITH DISEASE PREVALENCE OF GOATS

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ABSTRACT

The purpose of the study was to ascertain the prevalence of diseases of the goats at the Central Veterinary Hospital, Dhaka, Bangladesh. The diseases were identified by laboratory results, clinical indicators, and complaints from the patients' owners. The risk factors of the disease prevalence were associated with breed, varieties or type, age, and sex of the animals. Overall disease prevalence of goats was found around PPR (40%), Pneumonia (11%), Mastitis (6%), Worm infestation (14%), Bloat (17%), Urolithiasis (8%) and Miscellaneous (4%). The prevalence was relatively higher in Black Bengal (56.92%), followed by Jamunapari (23.07%) and Jamunapari and Black Bengal crosses (20%). The study revealed that PPR prevalence was significantly ($P<0.05$) influenced by breed. Disease occurrence in morphological variant groups has no significant effect. The infection rate of goats was highly variable in 7-24 months of age (50.76%) followed by 0-6 months (27.69%) and over 24 months (21.53%). It was found that bloat disease has significant ($P<0.05$) effects on the age of the animals. Male goats have higher (7.69%) Urolithiasis cases compared to female goats. The results of this study is important to understand the prevalence of goat diseases in this region concerning different genetic and non-genetic risk factors which will facilitate the implementation of appropriate preventative measures against those diseases.

Keywords: Prevalence, disease, goat, breed, age.

INTRODUCTION

Goat is one of the most indispensable small ruminants in Bangladesh due to their high rates of prolificacy, short generation intervals, and the ease with which the goats and their products can be marketed. According to the Food and Agricultural Organization (FAO), goat meat and skin makeup roughly 38% and 28% of all livestock meat and skin output in Bangladesh (Sarker and Islam, 2011). To enhance national health, goat supplies the primary dietary animal protein in the form of meat. In Bangladesh, Black Bengal goat (BBG) accounts for around 90% of the country's total goat population. Other goat breeds include Jamunapari, and crosses between BBG and Jamunapari, according to Amin *et al.*, (2001) and Husain, (1993). Goats play a significant role in Bangladesh's rural economic development and poverty reduction. Goats are known as "poor man's cows" because they may be raised with relatively minimal capital input by impoverished farmers, laborers, and miserable women who cannot afford to raise cattle. Moreover, there are varieties of coat color variants in the BBG. Husain, (1993) reported that about 80% of BBG is black in color and others being solid white, solid brown, mixed grey or spotted. Chowdhury, (2002) also reported BBG to be mostly black comprising 69% of the total goat population and the rest being white stripe on black (13%), brown (5%), solid white (4%), black with white patches or brown with white or brown with black (9%). About 90% of all goats in Bangladesh are BBGs, which are raised for their high fertility rate, propensity for procreation, early sexual maturity, ability to adapt quickly to hot environments, and superior quality meat and skin (Hussain, 1993; Amin *et al.*, 2001). Currently, there are about 26.7 million goats (DLS, 2023) in Bangladesh. However, numerous infectious and non-infectious diseases are commonly occurring in goats which is considered as a severe threat to existing animals in Bangladesh. In this country, urolithiasis, parasitism, and infectious diseases such as PPR, goat pox, pneumonia, etc. are prevalent ailments that can kill young or adult goats. Diseases are the main obstacle to goat production. According to Hussain, (1993), infectious diseases can negatively impact Bangladesh's national

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economy in addition to causing farmers to suffer significant losses. Unhealthy management practices and unfavorable environmental conditions contribute to the incidence of many diseases in Bangladesh (Ndegwa *et al.*, 2001). Considering the above fact, the present study was conducted to find out the incidence, frequencies, as well as some common genetic and non-genetic risk factors associated with goat diseases and disorders at Central Veterinary Hospital (CVH), Dhaka, Bangladesh.

MATERIALS AND METHODS

Study region and period

The study was conducted at Central Veterinary Hospital (CVH), Dhaka district, Bangladesh during the period from July to August 2022. The necessary information and data were collected directly from the goat owner and the registered record book of the veterinary hospital where all diseased goats were brought for treatment.

Sample size and data collection

During this study period, a total of 77 goats were recorded to visit this hospital. Among those, 65 goats were diagnosed with the disease. The prevalence was measured according to the breed, variety, age, and sex of the goats which were studied. Data were collected by face-to-face interaction with the responded goat owner, repeated questioning, and observation of goat and recorded based on the basic information about owner's, number of animals, breed, age, sex, source of purchase, body weight, disease condition, vaccination, anthelmintic, purchase ready feed, supplied amount, feed supplement, frequency of feeding, feeding routine, favorite feed, housing system, rearing system, watering system, amount of water per day, problems and suggestions.

Clinical evaluation and determination

Following a visual examination of the patient, palpation, percussion, auscultation, needle puncture, and an analysis of the animals' stride and posture were used to check various body parts and systems of each sick animal. Based on the merits of each case, the general clinical examination was carried out taking into account the owner's complaint, the disease history, the symptoms, and common laboratory procedures such as microscopic inspection (Rosenberger, 1979). Thus, each of these ill animals had their temperature, pulse, and respiration rate noted. For viral disease diagnosis, close inspection were performed properly followed by the protocol of Raquib *et al.*, (2020). Presenting signs of abnormalities were observed such as a sharp rise of temperature 104°F–106°F, oculonasal discharge, diarrhea and respiratory distress. Rectal temperature was recorded with the thermometer in every case. Respiratory distress was identified with the help of stethoscope and the lung and tracheal sounds were observed and recorded. When it comes to parasite disorders, some were presumed to be diagnosed based on the patient's medical history, clinical signs and symptoms, and study of their feces (Blood and Radostits, 1989). A thorough inspection of the feces was done to identify any live or dead worms as well as tapeworm segments. Any discernible ectoparasites were looked for on the animal's body. The keys and descriptions provided by Wall and Shearer, (1997) were used to identify ectoparasites. Percentages of the prevalence of disease was calculated by using the formula of Raquib *et al.*, (2020). Briefly referring to the number of cases of a disease that are present in a particular population at a given time.

Statistical analysis

Each patient's data was gathered and entered into Microsoft Excel (Microsoft Office Excel-2013, USA). Using the Minitab19 software (Minitab Ltd., UK), the Pearson's Chi-square test was used to evaluate all of the study's data. A significance level of $p < 0.05$ was assigned to differences.

RESULTS AND DISCUSSION

Overall occurrence of diseases in goat

The highest prevalence was found in PPR which was almost (40%), followed by bloat (17%), worm infestation (14%), pneumonia (11%), urolithiasis (8%), mastitis (6%) and miscellaneous (4%) respectively. The prevalence of the different diseases in goat are presented in Fig. 1. Numerous species,

including bacteria, fungi, parasites, protozoa, rickettsia, and viruses, are thought to be the cause of goat diseases. Poor management practices and low-quality diets can also increase the risk of metabolic disorders, which can result in lower productivity and even mortality (Unigwe *et al.*, 2016). The current study found 40% incidence of PPR in goats among the viral illnesses, which is greater than previous investigations that found 13.72% and 13.74% prevalence of PPR in goats (Poddar *et al.*, 2018, Raquib *et al.*, 2020). However, Balamurugan *et al.*, (2014) found the prevalence of PPR was almost 45.2% in northeastern India. The resemblance could stem from comparable animal husbandry practices and regional distribution.

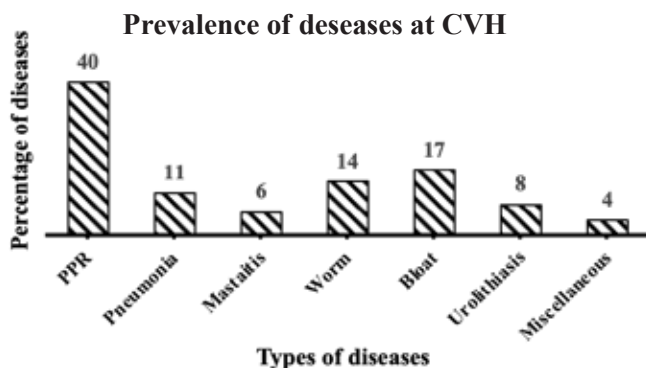


Fig. 1: Overall disease prevalence of goat studied at CVH.

In this study, among the bacterial diseases, pneumonia was recorded to be prevalent in around 11% of goats whereas it was observed 17.11% in Ethiopia (Mekibib *et al.*, 2019). Other studies reported a slightly lower prevalence 9.6% and 8.28% pneumonia in goats in Magura and Sylhet respectively (Karim *et al.*, 2014). It was reported that, the highest prevalence rate of pneumonia was recorded during winter (3.62%) (Sarder *et al.*, 2006). Since seasonal variation was not considered in this study; hence, the increased pneumonia rate in this study might be due to poor husbandry practices, infection of the lungs and a small sample number with diseased conditions.

Mastitis refers to an inflammation of the mammary glands due to a bacterial infection. Udder damage, often caused by mastitis, is one of the leading causes of culling in goat operations (Scharko, 2008). The findings of the present study showed 6% prevalence of Mastitis in goats. Hoque and Samad, (1997) stated that 10.14% mastitis cases in goats in the central Veterinary Hospital, Dhaka out of 1243 clinical cases. Other studies reported 1.6% mastitis in goat (Karim *et al.*, 2014), but in Eastern Algeria the prevalence of mastitis in goat was 3.55% which was Lower than the present study (Gabli *et al.*, 2019). Seasonal variation and breed types influence the mastitis prevalence in goats. The data variation of mastitis in this study is possible to influence by the breed and seasonal variation and geographic location along with scientific management of rearing systems.

Worm parasites pose a significant threat to the health of small ruminants. Parasites can damage the gastrointestinal tract, and result in reduced reproductive performance, reduced growth rates; less productive animals in terms of meat, fiber, and milk; and even death (Kate *et al.*, 2006). The present study showed that the prevalence of worm infestation was recorded almost 14% in goat. Proper deworming practices is recommended to maintain the animal health. The patient records considered in this study found lack of deworming practices regular interval hence animals become sick and come for treatment in the CVH.

Bloat is mainly a dietary in origin and occurs most frequently in ruminants in Bangladesh (Sutradhar *et al.*, 2000). The present study recorded almost 17% prevalence of bloat which was higher than earlier studies of Karim *et al.*, (2014) found 2.6% bloat case in goats at Upazila Veterinary Hospital, Mohammadpur, Magura. Location, availability of feed with its component and frequency of offering is highly related to bloat disease. The location of the present study is city area and the availability of feed

is rare. The highest prevalence rate of bloat in this study was seems to be considered due to improper feed management.

The overall prevalence of urolithiasis in goats was 8%. Hossain *et al.*, (1986) reported urolithiasis (5.3%) at the Veterinary Teaching Hospital of the Bangladesh Agricultural University from 1980 to 1984, which was little higher to this study. McIntosh, (1978) recorded urolithiasis as a disease where dietary factors played a significant role. Rahman *et al.*, (1975) reported 8.6% urolithiasis in goats. The present study support the previous statement of the similar results regarding urolithiasis of goats.

Breed and variety wise disease prevalence of goat

The highest disease prevalence was observed in BBG (56.92%) and the least in crossbred (20%) as shown in Table 1. PPR prevalence has significant variation among the breeds ($P<0.05$). The morphological variants of BBG were solid black, Black with toggenberg, Black with dutch belt spotting, silver bezoar and brown bezoar. Morphological variants of BBG did not show any differences of disease prevalence. In BBG, the highest prevalence was found in PPR (26.15%). The breed and variety-wise disease prevalence of goats are presented in Table 1 and 2. Results shows that among the

Table 1. Breed-wise prevalence of clinical diseases of goat

Breed Disease	Jamunapari No. (%)	Black Bengal No. (%)	Crossbred No. (%)	<i>P value</i>
PPR	6 (9.23)	17 (26.15)	3 (4.61)	0.002*
Pneumonia	1 (1.53)	3 (4.61)	3 (4.61)	0.565
Mastitis	-	3 (4.61)	1 (1.53)	0.223
Worm	2 (3.07)	5 (7.69)	2 (3.07)	0.368
Bloat	2 (3.07)	7 (10.76)	2 (3.07)	0.103
Urolithiasis	2 (3.07)	1 (1.53)	2 (3.07)	0.819
Others	2 (3.07)	1 (1.53)	-	0.368
Total	15 (23.07)	37 (56.92)	13 (20)	
Overall	65 (100%)			

*Statistically significant ($P<0.05$)

Table 2. Coat colour variants and disease prevalence of Black Bengal goat

Variety Disease	Solid black No. (%)	Black with Toggenberg pattern No. (%)	Black with Dutch belt spotting No. (%)	Silver bezoar No. (%)	Brown bezoar No. (%)	<i>P value</i>
PPR	6 (9.23)	3 (4.61)	5 (7.69)	-	3 (4.61)	0.070
Pneumonia	2 (3.07)	-	-	-	1 (1.53)	0.255
Mastitis	1 (1.53)	1 (1.53)	-	-	1 (1.53)	0.736
Worm	3 (4.61)	-	1 (1.53)	-	1 (1.53)	0.199
Bloat	4 (6.15)	1 (1.53)	-	-	2 (3.07)	0.092
Urolithiasis	-	-	-	1 (1.53)	-	ND
Other	-	-	-	-	1 (1.53)	ND
Total (n=37)	16 (24.61)	5 (7.69)	6 (9.23)	1 (1.53)	9 (13.84)	

*Statistically significant ($P<0.05$)

ND: Not done

bacterial diseases, pneumonia are a common and serious disease in goats. The prevalence of pneumonia was considerably higher in BBG and crossbred (4.61%). Moreover, the prevalence of worm infestation was considerably higher in BBG (7.69%), Jamunapari (3.07%) and crossbred (3.07%). In North east India, the prevalence of PPR was detected as 45.2% which is higher than this study. This variation may be due to different geographical location and management system (Balamurugan *et al.*,

2014). Previous study showed that the prevalence of PPR was highest in winter (20.00%) and lowest in summer (8.40%) season (Raquib *et al.*, 2020). In this study the breed wise variation of PPR might be due to age factor, location and management issues.

Age-wise occurrence of diseases in goats

The no. of 65 goats was observed in which 18 were in 0-6 months, 33 were in 7-24 months and 14 were in over 24 months of age (Table 3). The most percentage was detected in 7-24 months (50.76%), and the least in over 24 months (21.53%). Bloat was significantly differ ($P<0.05$) among the age group of goats. This study illustrated that adult goats were more susceptible to disease prevalence than the young. Other studies represented that the young was more susceptible PPR than adult goat (Raquib *et al.*, 2020; Nath *et al.*, 2014; Sarker and Islam, 2011). However, a non-significant difference was observed among the other diseases of different age groups. The young animals might be more susceptible because of undernourishment, lack of immunity and poor husbandry. In this study, improper feeding management might be caused the metabolic disorder of adult animals.

Table 3. Age-wise prevalence of clinical diseases of goat

Age Disease	0-6 Month No. (%)	7-24 Month No. (%)	>24 Month No. (%)	<i>P value</i>
PPR	8 (12.3)	14 (21.53)	4 (6.15)	0.054
Pneumonia	3 (4.61)	4 (6.15)	-	0.156
Mastitis	-	2 (3.07)	2 (3.07)	0.368
Worm	5 (7.69)	3 (4.61)	1 (1.53)	0.264
Bloat	1 (1.53)	8 (12.3)	2 (3.07)	0.020*
Urolithiasis	-	1 (1.53)	4 (6.15)	0.074
Other	1 (1.53)	1 (1.53)	1 (1.53)	1
Total	18 (27.69)	33 (50.76)	14 (21.53)	
Overall	65 (100%)			

*Statistically significant ($P<0.05$)

ND: Not done

Sex-wise occurrence of diseases in goats

In this study, goats were classified in male and female categories to find out sex sex-wise disease occurrence of goats. Among observed samples, 26 were male and 39 were female (Table 4). The highest percentage of disease occurrence was observed in females (60%) compared to male goats (40%). In males, the highest disease occurrence rate was PPR (13.84%), and the lowest in pneumonia (1.53%). In female, the highest occurrence rate was in PPR (26.15%). Male goats have higher (7.69%)

Table 4. Sex-wise prevalence of clinical diseases of goat

Disease	Sex	Male No. (%)	Female No. (%)	<i>P value</i>
PPR		9 (13.84)	17 (26.15)	0.117
Pneumonia		1 (1.53)	6 (9.23)	0.059
Worm		3 (4.61)	6 (9.23)	0.317
Bloat		5 (7.69)	6 (9.23)	0.763
Urolithiasis		5 (7.69)	-	ND
Others		3 (4.61)	-	ND
Total		26 (40)	39 (60)	
Overall		65 (100%)		

*Statistically significant ($P<0.05$)

ND: Not done

urolithiasis cases compared to female goats in the study area. Seasonal variation was observed in the prevalence of urolithiasis of goat by Raquib *et al.*, (2020) where it was estimated 3.82% in summer season followed by rainy (3.80%) and winter season (2.31%). Raquib *et al.*, (2020) also reported, earlier stage of age group (0-12 months) was found to be more (3.89%) susceptible than 13-24 months (1.85%) and above 24 months (3.39%) age group. Alternatively, other study reported higher prevalence of urolithiasis in goat (44.4%) in Magura, Bangladesh (Karim *et al.*, 2014). In this study, males patient have higher prevalence of urolithiasis seems supplied feed was not appropriate for the male animals. However, urolithiasis is a disease in which small calculi (often called 'stones' or 'crystals') form in the urinary tract and is likely linked to or certainly effected by diet. Urinary calculi or stones are caused by the precipitation of minerals. In goats, phosphate salts, often apatite (calcium phosphate) or more frequently struvite (magnesium ammonium phosphate hexahydrate), make up the calculi (Gutierrez *et al.*, 2000). Moreover, wethers are particularly vulnerable because their urethras the tubes that empty the bladder are often smaller than those of bucks. Although bladder stones can occur in does as well, they typically fit through the short, straight female urethra with ease. In this study the higher urinary stones in male goats support the previous statement for wethers and buck in the study area.

CONCLUSION

It was observed that goats came for treatment at veterinary hospital were mostly infected by viral, bacterial, worm infestation, and nutritional diseases. PPR, bloat, and urolithiasis is mostly found in the Dhaka city area. Disease prevalence also varied with some genetic and non-genetic factors such as breed, variety, age, and sex of the animals. It has been observed that the experimental study's duration and sample size are insufficient to fully examine the spectrum of illnesses and disorders. Therefore, more thorough research should be done to accurately ascertain the prevalence of diseases and abnormalities in goats in the studied area. However, these findings will assist to know about breed-wise, sex-wise, age-wise, and varieties-wise diseases of goat and will assist to application suitable way of prevention procedure against goat disease.

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Compliance with ethical statements

Conflict of interest: The authors declare that they have no conflict of interest.

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