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Retrospective Investigation of Duck Diseases and Their Temporal Distribution in Sylhet: Passive Surveillance

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ABSTRACT

A cross-sectional retrospective study was performed from September 2020 to December 2024 at Field disease investigation Laboratory (FDIL), Sylhet in Bangladesh to determine the prevalence of different duck diseases and to explore the temporal distribution of important duck diseases in Sylhet. Data were collected passively from the registers of FDIL, Sylhet and a total of 472 pieces of duck information about either infected or dead ducks were collected. The prevalence of duck plague was significantly higher (45.3%; 95% CI: 40.78-49.95) among all duck diseases documented during the study period. Duck cholera was the second most prevailing disease (28%) followed by AI, salmonellosis, DVH, NE, Colibacillosis, Mycoplasmosis, etc. The current study observed a relatively high percentage of DP in mature ducks (66.20%; 95% CI: 53.99-77.00%) compared to the younger birds and in the summer compared to the rest of the seasons. On the other hand, the young-aged group of ducks had a comparatively high frequency (33.96%; 95% CI: 27.62- 40.76%) of duck cholera compared to mature birds, and no prevalence was observed for birds aged above 269 days. This study revealed the duck disease burden from a clinical aspect, which will be beneficial for the concerned authority to take preventive measures against the diseases. Additionally, further research on duck diseases with temporal distribution will be facilitated by the current study findings.

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Introduction

Rearing livestock specially poultry is an integral part of rural farming communities in Bangladesh which plays a significant impact in socio-economic development of farmer, national economy by means of contributing in GDP (1.8%) as well as providing major protein source (Bangladesh Economic Review, 2024; Mostafizur et al., 2020). Duck ranks second just after chicken among poultry population and comprises approximately 68.261 million in number; important contributor in table eggs production (2374.97 Crore) in Bangladesh (Department of Livestock Services (DLS), 2024). According to DLS, the duck production rate has experienced an exponential growth over the decade starting from 50.522 million in 2014-15 economic year. In Bangladesh, duck farming is increasing day by day might be due to favorable geo-climatic environment, relative disease resistant nature compared to chickens, exceptional foraging skills, easy rearing and management system (Ahamed et al., 2015; Islam et al., 2016; Islam et al., 2024). Ducks are not only considered as valuable asset and income source besides chicken for rural women but also decreases the poverty rate. Duck farming creates a potential source of self-employment and occupation opportunities for small, marginal and landless poor farmers (Islam et al., 2024). However, farmers encountered constrains in duck rearing, of which major constrain is prevailing of infectious diseases. Almost every year, diseases devastate in duck namely, duck plague, duck cholera, duck viral hepatitis, Salmonellosis in BD (Khan et al., 2018; Noor et al., 2019).

Duck plague (DP) or duck virus enteritis (DVE) which is caused by Duck Viral Enteritis Virus (DVEV), is one of the major highly contagious and lethal disease in domestic and wild ducks, swans, geese, and other Anseriformes (Liang et al., 2022). DP is an acute and, causes morbidity and mortality which may ranges from 5-100% (Ahamed et al., 2015; Khan et al., 2021). Another fatal disease of duck is Duck cholera, which is one of the earliest reported diseases caused by the *Pasteurella multocida*. The disease may be acute septicemic or chronic with localized infection with high morbidity and mortality rate as 63% and 50%, respectively in duck flocks (Eldin & Lamyaa M., 2016). Avian influenza (AI) is another important infectious disease of poultry caused by the Type A influenza virus (Duvauchelle et al., 2013). Ducks and other waterfowl are acts as a natural reservoir for this virus which may result in asymptomatic, subclinical, or clinical infections where asymptomatic ducks often shed the viruses through feces and respiratory droplets (Dutta et al., 2022). Natural water bodies like marshy lands, haors, rivers, ponds and canals are favorable for duck rearing due to availability of natural feed, sustainable temperature and plentiful water for roaming around (Hoque et al., 2011). Sylhet, the north eastern part of Bangladesh, is internationally recognized for its unique wetland ecosystem and is called the *Haor* basin. Sunamganj, Habiganj, and Moulvibazar district and Sylhet Sadar Upazila of Sylhet division form the core *Haor* area where duck rearing is considered an important means of livelihood besides agriculture and fishing for impoverished people (Khan et al., 2018). Previous studies suggest that like other parts of country, different duck diseases also present in Sylhet (Hassan et al., 2020; Noor et al., 2019; Rahman & Adhikary, 2016), which leads to significant economic loss of the farmer. But no systemic work has been documented till date on duck diseases and their management in Sylhet. Moreover, epidemiological scenario of duck diseases in this region has not been fully analyzed which might be valuable for realizing the economic importance as well as epidemiology of predominant diseases. Acknowledging that, the aim of the current study was to estimate the clinical prevalence of different duck diseases and to determine the temporal distribution of important Duck diseases in Sylhet.

Materials and Methods

The study was conducted at Field disease investigation Laboratory (FDIL), Sylhet, in Bangladesh during five years from 20th September, 2020 to 24th December, 2024.The population for the study were selected both dead or live ducks from farms/households of different areas of Sylhet came to be examined at FDIL of Sylhet district during the study period. Here, the individual duck was counted as the study unit.

To obtain the information, a retrospective cross-sectional study scheme was followed and data were collected passively from the registers of FDIL, Sylhet with the permission of the respective veterinary doctor. The register books enlisted only few information of each case like date of sample collection, age, owners complain/clinical sign, types of specimens, lab findings and diagnosis. After collection of data, a descriptive analysis was performed. Some variables like age of duck and date of diagnosis/reporting were categorized for convenient. Age was categorized on accordance of prior information found in available literature into four groups such as Group 1 (0-89 days), Group 2 (90-179 days), Group 3 (180-269 days) and Group 4 (270-720 days). On aligns with the climatic condition of BD, the year was divided into three seasons namely winter (November to February), summer (March to June) and rainy (July to October) season.

As the study population did not represents the true duck population of Sylhet, so the calculated prevalence might be overestimated and it will be representing clinical prevalence. Prevalence was calculated as the proportion of a particular disease (n) among the total number of diseases (N) observed in duck during study period. Prevalence was presented as percentage and the precision of these estimates was ensured by calculating a 95% confidence interval. Variations of prevalence of two important duck diseases among different age groups and seasons were assessed by chi-square ($\chi 2$) test and statistical significances of these variations were evaluated. Variations obtained p value <0.05 were considered as cut off value for this test. SPSS (Statistical Package for the Social Sciences) version 30 was used to perform all statistical analysis**.**

For assessing the overall temporal trend of DP and DC in the study area, epidemic curves were constructed by plotting the total recorded number of specific cases in a month against that particular month of the year.

Results

A total 472 duck were studied during the study period of which, 156 in winter, 103 in summer and 213 in rainy season were studied. The prevalence of Duck plague was significantly higher (45.3%; 95% CI: 40.78-49.95) among all duck diseases documented in FDIL, Sylhet from September, 2020 to December, 2024. Total seventeen (17) infectious diseases were observed in duck during this period while, Duck cholera was the second most recorded disease (28%) followed by AI, salmonellosis, DVH, NE, Colibacillosis, Mycoplasmosis, etc. The study observed some co-infections in ducks throughout the study period such as DC + DP, Botulism with DC and DP, Salmonellosis + *E. coli*, etc. (Table 1).

According to Table 2, the DP prevalence was significantly higher in the group 4 birds (66.20%, 95% CI: 53.99-77.00 %) accompanied by Group 1, Group 2 and Group 3, respectively. Whereas, current study estimated high percentage of DP in summer in compare the rest two seasons. Temporal trend of DP showed fluctuation over the study period with a peak from August to September in 2023 (Figure 1).

Duck cholera was higher in Group 1 ducks in comparison to Groups 2 and 3, though the variation was statistically insignificant. One important finding was the absence of DC in most aged groups of ducks. In the winter season, a higher percentage of DC was counted (Table 3), and the epidemic curve noted two peaks with fluctuations in the whole study period (Figure 2).

Table 1. Distribution of Duck diseases (N=472) in Sylhet from September, 2020 to December, 2024

Disease Name	Prevalence (%)	Confidence Interval (CI) 95%	P- value
Duck Plague (DP)	45.3	40.78-49.95	<.001
Duck cholera (DC)	28	23.96-32.25	
Avain Influenza (AI)	5.3	3.46-7.72	
Salmonellosis	3.8	2.28-5.96	
Duck viral hepatitis (DVH)	3.2	1.79-5.19	
Necrotic Enteritis (NE)	2.8	1.47-4.66	
Colibacillosis	2.5	1.32-4.40	
Mycoplasmosis	1.1	0.34-2.45	
Botulism	1.1	0.34-2.45	
Omphalitis	1.1	0.34-2.45	
Aspergillosis	0.8	0.23-2.16	
Enterotoximia	0.2	0.01-1.17	
Non specific diarrhoea	0.2	0.01-1.17	
kidney infection	0.2	0.01-1.17	
IBD	0.2	0.01-1.17	
Mycotoxicosis	0.2	0.01-1.17	
Pneumonia	0.2	0.01-1.17	
DC + DP	0.6	0.13-1.85	
DC + *E. coli*	0.6	0.13-1.85	
DC + worm	0.2	0.01-1.17	
DP + *E. coli*	0.2	0.01-1.17	
DP + fungal infection	0.2	0.01-1.17	
Salmonellosis + *E. coli*	0.6	0.13-1.85	
Mycoplasma + worm + Salmonellosis + *E. coli*	0.4	0.05-1.52	
Salmonellosis + Enteritis	0.2	0.01-1.17	
Botulism + Worm	0.2	0.01-1.17	
Botulism + DC	0.2	0.01-1.17	
Botulism + DP	0.2	0.01-1.17	

Table 2. Duck Plague distribution (N=214) in Duck in Sylhet from September, 2020 to December, 2024

Criteria	Prevalence (%)	95% CI	P- value
Age Group			
0-89 days	50.47	43.54-57.39	<.001
90-179 days	32.14	23.63-41.63	
180-269 days	31.17	21.09-42.74	
270-720 days	66.20	53.99-77.00	
Season			
Winter (Nov-Feb)	46.41	38.32-54.64	0.02
Summer (Mar-June)	55.66	45.69-65.31	
Rainy (July-Oct)	39.44	32.83-46.34	

Table 3. Duck Cholera distribution (N=132) in Duck in Sylhet from September, 2020 to December, 2024

Criteria	Prevalence (%)	95% CI	P- value
Age Group			
0-89 days	33.96	27.62- 40.76	0.88
90-179 days	31.25	22.82-40.70	
180-269 days	32.47	22.23-44.10	
Season			
Winter (Nov-Feb)	36.60	28.97-44.76	0.01
Summer (Mar-June)	27.36	19.15-36.87	
Rainy (July-Oct)	22.54	17.11-28.74	

Discussion

Estimated prevalence of various diseases indicates the prevailing disease burden of the duck population in Bangladesh and are supported by the previous studies ((Ahamed et al., 2015; Hassan et al., 2020; Islam et al., 2024; Khan et al., 2018; Noor et al., 2019; Rahman & Adhikary, 2016) (Table 1). The current highest DP frequency was congruent with the findings of previous studies from Bangladesh (Hoque et al., 2011; Islam et al., 2024) while, (Rahman & Adhikary, 2016), (Noor et al., 2019) (Ahamed et al., 2015) and (Mostari et al., 2022) reported relatively lower prevalence from current prevalence and the value was 9.16%, 15.48%, 18.1% and 19.81%, respectively. At the same time, (Khan et al., 2021) showed a 60% frequency for DP from Haor districts which are higher from the present study. Though the vaccines are available, the unawareness of farmer with poor veterinay services and vaccine maintenance, vaccine resistance, rearing system of duck, lack of preventive measures, chances of mixing with infected wild and migratory birds, etc. might be the reason of occurance high DP in the study area.

DC was the second most prevailing disease and estimated 28% in ducks which conform with the findings of (Islam et al., 2024) who documented 26.67% prevalence in Nageswari and 33.33% prevalence in Rupali Duck but did not match with the findings of (Eldin and Lamyaa M., 2016) and (Islam et al., 2017) who found comparatively higher prevalence (60%) and lower percentage (11.39%) for DC in duck, respectively. This discrepancy might be due to the sample size variation, farm biosecurity practice, duck management practice, available vaccination facilities, etc. in the Sylhet region.

The present study encountered a relatively high percentage of DP in mature ducks in comparison to the young birds (Table 2). DP can occur in all aged group from 7 days ducklings to mature breeder ducks (OIE, 2018). This observation was supported by the findings of (Khan et al., 2018), (Noor et al., 2019), and (Rahman et al., 2019) who also recorded a higher prevalence for adult birds than younger ducks from Sylhet, Kishoreganj, and Haor districts of Bangladesh.

By proper analysis of temporal distribution, it could be seen that DP occurs around the year, which represents the endemic nature of the disease. (Khan et al., 2021) stated that the duck population of Bangladesh frequently suffered from this fatal disease either in an endemic or epidemic form every year. Although the epidemic curves showed fluctuation, no clear peaks were observed until 2023. A peak was observed from August to September 2023 during the study period (Figure 1). The present study calculated a higher frequency of DP in the summer season which agreed with the report of (Rahman and Adhikary, 2016). However, it disagreed with the findings of (Noor et al., 2019) who recorded higher frequency in winter (13.24%) than in summer from Sylhet.

Group 1 that is to say, the young aged-group duck had comparatively highest frequency of DC than mature birds, and no prevalence was observed for ducks aged above 269 days (Table 3). (Srinivasan et al., 2024) documented that 4 to 11 weeks older ducks are more susceptible to DC in compare to adult-aged ducks. However, (Noor et al., 2019) showed highest occurrence of DC in mature birds (above 16 weeks) (1.48%).

Analysis of the epidemiological data reveals that the DC frequency prevailed year-round from September 2020 to December 2024. A notable fluctuation was observed throughout the whole period indicative of endemic distribution of DC in the study area. A peak was noted in March 2022 and then again in November 2023 which was relatively higher (Figure 2). A high percentage of DC was estimated for the winter season in the current study. This was supported by the previous reports (Noor et al., 2019; Rahman and Adhikary, 2016).

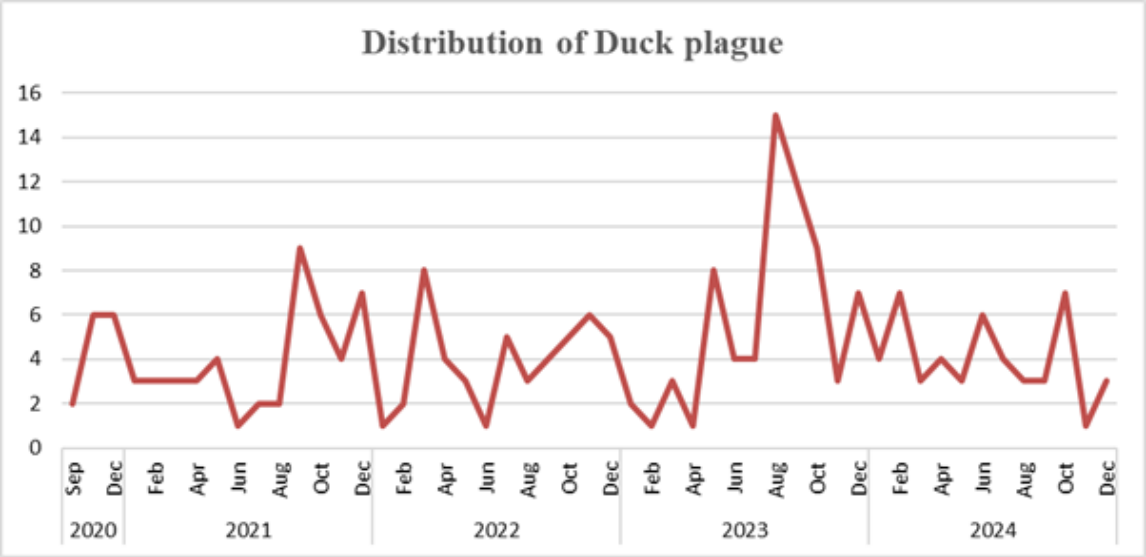

Figure 1. Epidemic curve constructed from monthly occurrence of Duck plague cases recorded in FDIL, Sylhet from September, 2020 to December, 2024

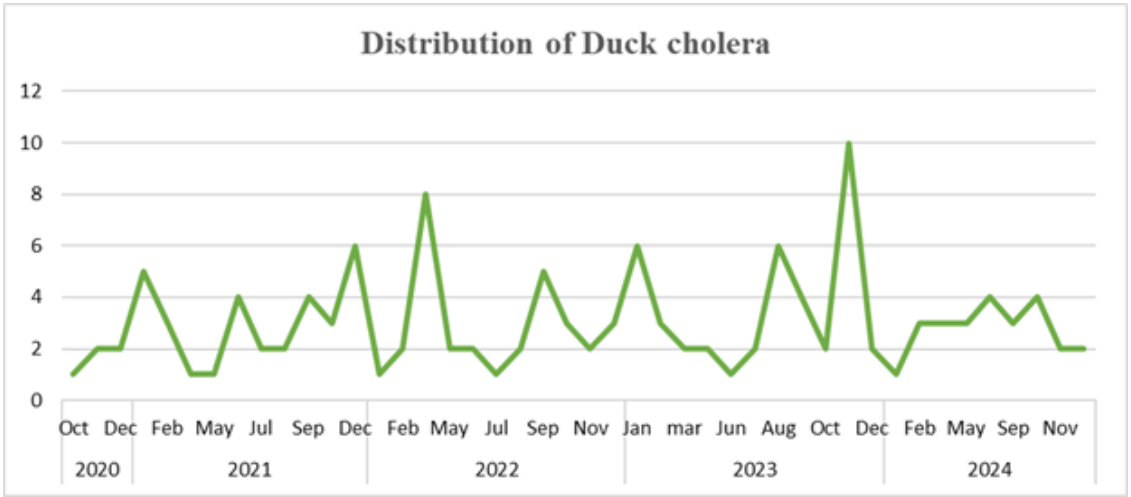

Figure 2. Epidemic curve constructed from monthly occurrence of Duck cholera cases recorded in FDIL, Sylhet from September, 2020 to December, 2024

Conclusions

The present study provided important epidemiological data about the prevalence for prevailing duck diseases in Sylhet region for nearly five years period based on passive surveillance. Duck plague was most significant (45.3%; 95% CI: 40.78-49.95) among all duck diseases followed by Duck cholera, AI, salmonellosis, DVH, NE, Colibacillosis, Mycoplasmosis etc. during study period. The DP prevalence was higher in summer season and mature duck while DC was relatively higher in winter season and in younger aged duck. As it is based on clinical data, don't represent generalize information but can be used to take initiative for preventive and control measures for diseases. It is recommended that campaign should be arranged to encourage the duck farmers to vaccinate their duck properly against fatal DP and DC. Furthermore, research on duck diseases and temporal distribution will have baseline information from current observations.

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Competing Interests

The authors declare that they have no competing interest.

Authors' Contributions

This research was a collaborative work. Author SA designed the study, performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript, review the script and supervised the work. Author MKI, MANS, MHI did the field work, compile raw data and managed the literature searches. All authors read and approved the final manuscript.

Ethical Approval

As this study dealt with poultry, there was no existence of animal ethical issue.

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