**Original Research Article**

**Epidemiological Investigation of poultry diseases and prescribed antimicrobials in Kishoreganj based on hospital data**

**ABSTRACT**

An epidemiological study was conducted in the District Veterinary Hospital, Kishoreganj from June 2019 up to October 2019 to explore the distribution of different diseases/conditions in chickens (Broiler, Layer, Sonali) and ducks, as well as to know the prescribed antimicrobial patterns at the study area. A total of 805 poultry information of either infected or dead birds were collected and examined to diagnose the diseases based on history, clinical signs, and postmortem findings. The prevalence of Newcastle disease was the highest (16.61%; 95% CI: 13.79-19.75) in chickens among the overall chicken diseases and Duck plague (55.49%) over other duck diseases. IBD percentage (31.78%) was higher followed by visceral gout (16.82%), mycoplasmosis, and omphalitis in the broiler. In layer, the distribution of ND (23.81%) was significantly higher among all diseases during the study period, accompanied by IBD, CRD, Avian tuberculosis, Avian Influenza, heatstress, etc. Coccidiosis was counted as the most frequent disease in sonali and prevalence was 32.69% while, IBD, ND, AI, and concurrent infections of Coccidiosis with ND and IBD were dominant. The present study observed lots of co-infections in poultry and a wide range of unnecessary antimicrobials were prescribed for treating the diseased birds. Among them, a combination of Erythromycin, Sulphadiazine, and Trimethoprim (20.08%) was the most used antibiotic followed by Tiamulin hydrogen fumarate (13.58%). This study depicts the clinical poultry diseases/conditions burden which will be helpful for the authority to prioritize the disease and take preventive or control measures, and findings will be serve as a baseline information for future research in the study area.

*Keywords: Epidemiological, Antimicrobials, Newcastle disease, Duck plague, Baseline*

1. **INTRODUCTION**

In Bangladesh from the beginning of the 21st century, the poultry industry has become unprecedented for quick profit, the generation of local employment, and the production of cheaper animal proteins than any other sector (M. Rahman et al., 2017). There is a long historical record of poultry rearing under traditional backyard farming in Bangladesh. In the beginning, commercial poultry farming started on a small scale, and poor rural women and unemployed youth were involved and thus became employed. It also involved some semi-urban and urban poultry raisers which helped to meet the growing demand for eggs and meat. In the last two decades, many poultry farms have been established in Bangladesh (Hamid et al., 2016a). Government efforts, the involvement of some NGOs and entrepreneurs, and changes in the socioeconomic status of the country recently have favored this greater shift in the Bangladeshi poultry sector (Raha, 2000). In Bangladesh, poultry meat contributes to the total meat products approximately 16.76 % (1.46 million tons), which means around one-fifth of the consumed meat was poultry meat, while total meat production in 2022-23 was 8.71 million metric tons (Department of Livestock Services (DLS), 2024). Like meat, egg production rate also increased over the decade, starting at 1099.52 core numbers (2014-15) to 23.74.97 core numbers in the 2023-24 economic year (Bangladesh Economic Review, 2024; Hamid et al., 2016b). In 2018, the percentage is estimated, around 150,000 poultry farmers in Bangladesh, producing around 570 million tons of meat and 7.34 billion eggs (*PoultryWorld - Bangladesh: Poultry Farming to Benefit from Grant*, 2018). The government of the People’s Republic of Bangladesh has recently given priority to the potential poultry sector. The poultry population in Bangladesh was estimated at 396.03 million in 2024, where the chicken population is about 327.77 million and the duck population is about 68.261 million. The poultry sector shows significant production from 2019 to 2024, at 49.003 million in numbers (Department of Livestock Services (DLS), 2024)   (*Dls Livestock Population of Bangladesh Updated Livestock Economy (2018-2019)*, n.d.). United States Department of Agriculture (USDA) estimates that one million entrepreneurs and eight million people involved in Bangladesh’s poultry sector commercially produce 10.22 billion eggs and 1.46 million tons of poultry meat annually (*USDA: Bangladesh’s Poultry Sector Gearing up for Export in 5-Yr Time | Dhaka Tribune*, n.d.).

In Bangladesh, though poultry farming is a potential field the farmers have to face different challenges to rear them which hinder growth and influence bird mortality (Abdullah et al., 2019; Badruzzaman et al., 2015) Every year, different poultry diseases or conditions are reported and subsequently poultry farmers have to face economic loss due to reducing the optimal production of the flock (S. Islam et al., 2016; Khatun et al., 2018; M. A. Rahman et al., 2019). The occurrences and distribution of poultry diseases depend on various factors like the geo-climatic condition of the area, season, management practices, immune status of the bird, vaccination failure, farm biosecurity, species, production type, breed, and age of the bird, etc.(M. Al Mamun et al., 2019; M. A. Rahman et al., 2019; Uddin, Ahmed, et al., 2010).

Previous studies suggest that Infectious Bursal Disease (IBD), Chronic Respiratory Disease (CRD), Newcastle Disease (ND), Aspergillosis, Salmonellosis, Coccidiosis, Colibacillosis, Ascites, Omphalitis, Necrotic Enteritis, Infectious Coryza, Infectious Bronchitis, DP, DC, etc. are most prevailing poultry diseases in our country (M. Al Mamun et al., 2019; .Giasuddin et al., 2002; Hassan et al., 2016). Moreover, several reports from BD showed that the avian influenza virus was also encountered among the poultry species in their study (Nooruzzaman et al., 2019a; M. A. Rahman et al., 2019).

Poultry farmers choose different kinds of antibiotics to prevent and sometimes to control these diseases and conditions irrespective of prescription from a registered veterinarian (Ur Rahman & Mohsin, 2019). Most of the time the non-therapeutic use of antimicrobials and not maintaining a proper withdrawal period leads to antimicrobial resistance (Oluwasile et al., 2014) which imposes major food safety and public health issues (Akbar & Anal, 2013; M. Islam et al., 2018).

Kishoreganj is a district of Bangladesh with unique geo-climatic conditions and is well known for different poultry rearing. Previous studies reported that different poultry diseases prevail here (M. Al Mamun et al., 2019; Das A, 2018; M. Islam et al., 2021; M. A. Rahman et al., 2019) which is very shocking and alarming for poultry farmers. Though previous studies observed poultry diseases but period was very limited (M. A. Rahman et al., 2019) and did not encounter different age groups of chickens and ducks (M. Al Mamun et al., 2019). So, the current study aimed to estimate the clinical prevalence of different diseases of chickens and ducks to understand the disease burden that came at the District Veterinary Hospital, Kishoreganj, Bangladesh, and also to explore the distribution of prescribed antimicrobials.

1. **MATERIAL AND METHODS**

**2.1 Study area**

The study was conducted at the District Veterinary Hospital of Kishoreganj which is under the Dhaka division of Bangladesh. (Fig. 1)

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| **Fig. 1: Study area (District Veterinary Hospital, Kishoreganj, Bangladesh)** |

**2.2 Study Population and unit**

The population for the study was selected both dead or live chickens (Broiler, Layer and Sonali) and ducks from different poultry farms of different upazillas of Kishoreganj came to be examined at the District Veterinary Hospital of Kishoreganj during the study period. Here, the individual bird represents the study unit.

**2.3 Study design and period**

A cross-sectional study was conducted from June 2019 to October 2019 over five (5) months to determine the clinical prevalence of poultry visiting the hospital.

**2.4 Diagnosis of diseases/conditions**

Diseased birds (lived and dead) were received at the hospital and the tentative diagnosis of chicken (broiler, layer, and Sonali) and duck disease was made based on the history of the flock, age of affected birds, clinical signs and symptoms, postmortem findings for the respective disease, etc.

1. **Disease History:** The history of diseases was collected by asking questions to the farmers who came to the hospital with live or dead chickens and ducks.
2. **Clinical signs:** To determine the specific disease clinical signs were observed in each affected bird and the signs of diseases and conditions told by the farmer and the farm conditions information were also collected from the farmers.
3. **Postmortem Examinations:** Postmortem examination was carried out by the veterinary doctor of the hospital and the identification of diseases was done by the veterinary doctor of District Veterinary Hospital, Kishoreganj. Specific lesions in various organs determine the specific disease. Various internal organs such as the liver, lung, kidney, spleen, heart, intestine, trachea, bone, muscle, etc. were examined properly for the diagnosis and confirmation of disease.

**2.5 Data collection and management**

A total of 805 chickens and duck information were collected for this study. A structured record-keeping sheet was developed for this study and used with the permission of the veterinary doctor. The information was collected from the hospital regarding some important parameters like species and age of the bird, total number of birds reared on a farm, disease history, clinical signs, postmortem findings, the total number of dead birds on the farm, and respective treatment prescribed for the disease, etc. After initial descriptive analysis age of the birds was categorized due to their skewed distribution. Broiler, layer, and Sonali age were categorized into three categories and duck was four categories based on the prior information found in available literature (Rahman et al., 2019).

**2.6 Statistical analysis**

Clinical prevalence was calculated as the proportion of a particular disease/condition (n) among the total number of diseases/conditions (N) in specific birds encountered in the study period (Tipu et al., 2021; Ujjal et al., 2018). Prevalence was presented as a percentage and the precision of these estimates was ensured by calculating a 95% confidence interval. Statistical Analysis System (SAS) version 9.4 was used to perform all statistical analysis. Prevalence with 95% confidence interval was estimated using the Proc SURVEYFREQ command. Differences in prevalence between poultry traits were compared using the Fisher exact test.

1. **RESULTS**

A total of 805 cases were studied from the District Veterinary Hospital, Kishoreganj during the study period. Among them 632 cases were chicken (broiler 107, layer 349, and sonali 176 cases) and 173 cases were duck.

**3.1 Prevalence of overall poultry diseases/conditions**

According to Table 1 and Fig 2, the prevalence of Newcastle disease was the highest (16.61%; 95% CI: 13.79-19.75) in chickens among the overall chicken diseases followed by Infectious bursal disease, coccidiosis and mycoplasmosis. Among the mixed infections (Fig 2), IBD and Coccidiosis were found the most dominating chicken disease followed by ND and Colibacillosis.

**Table 1: Frequency distribution of chicken diseases and conditions in Kishoreganj from June 2019 up to October 2019.**

| Disease name | Prevalence (%) | Confidence Interval (95%) | P-value |
| --- | --- | --- | --- |
| Avian Influenza (AI) | 3.16 | 1.94-4.84 | <.0001 |
| Ascities | 0.79 | 0.26-1.84 |
| Fowl Cholera (FC) | 1.58 | 0.76-2.89 |
| Avian Leukosis | 0.32 | 0.04-1.14 |
| Infectious Bursal Disease (IBD) | 14.4 | 11.75-17.38 |
| Infectious Bronchitis (IB) | 1.58 | 0.76-2.89 |
| Infectious Coryza (IC) | 0.95 | 0.35-2.05 |
| Newcastle Disease (ND) | 16.61 | 13.79-19.75 |
| Coli enteritis | 1.42 | 0.65-2.69 |
| Egg Peritonitis | 1.42 | 0.65-2.69 |
| Avian tuberculosis | 0.32 | 0.04-1.14 |
| Fowl Pox | 0.16 | 00-0.88 |
| Visceral gout | 3.16 | 1.94-4.84 |
| Necrotic Enteritis | 0.95 | 0.35-2.05 |  |
| Omphalitis | 3.01 | 1.82-4.66 |
| Oophoritis | 0.32 | 0.04-1.14 |
| Salmonellosis | 2.22 | 1.22-3.69 |
| Colibacillosis | 3.48 | 2.19-5.22 |
| Aphlatoxicosis | 0.32 | 0.04-1.14 |
| Tape worm | 0.32 | 0.04-1.14 |
| Aspergillosis | 0.16 | 00-0.88 |
| Complicated Chronic Respiratory Disease (CCRD) | 2.53 | 1.45-4.08 |
| Coccidiosis | 8.39 | 6.34-10.83 |
| CRD/mycoplasmosis | 4.59 | 3.09-6.52 |
| Heat stress | 6.33 | 4.56-8.52 |
| Less intake of feed | 0.16 | 00-0.88 |
| Liver cirrhosis | 1.11 | 0.45-2.27 |
| Malnutrition | 0.47 | 0.10-1.38 |
| Beak infection | 0.16 | 00-0.88 |
| Calcium deficiency | 0.32 | 0.04-1.14 |
| Mixed Infections |  |  |

**Fig. 2: Frequency distribution of chicken diseases and conditions (Mixed infection) in Kishoreganj from June 2019 up to October 2019**

In case of Duck, Duck plague (55.49%) and CCRD (14.45%) were found the most common disease over other duck diseases. Besides above mentioned infectious diseases, Duck Cholera, Colibacillosis, CRD, Duck viral hepatitis etc. were also observed in the study period. Some metabolic diseases along with infectious diseases such as malnutrition (4.05%), Indigestion (1.16%) and Vit E deficiency (0.58%) etc. were also observed during study (Table 2).

**Table 2: Frequency distribution of duck diseases and conditions in Kishoreganj from June 2019 up to October 2019.**

|  |  |  |  |
| --- | --- | --- | --- |
| Disease name | Prevalence (%) |  Confidence Interval (95%) | P-value |
| Duck Plague (DP) | 55.49 | 47.76-63.03 | 0.0003 |
| Duck Viral Hepatitis (DVH) | 0.58 | 0.01-3.18 |  |
| Avain tuberculosis | 0.58 | 0.01-3.18 |  |
| CRD/mycoplasmosis | 4.05 | 1.64-8.16 |  |
| ND | 0.58 | 0.01-3.18 |  |
| Oophoritis | 0.58 | 0.01-3.18 |  |
| Aflatoxicosis | 0.58 | 0.01-3.18 |  |
| Anaemia | 1.16 | 0.14-4.11 |  |
| CCRD | 14.45 | 9.58-20.59 |  |
| Colibacillosis | 1.73 | 0.36-4.98 |  |
| Coccidiosis | 0.58 | 0.01-3.18 |  |
| Vit E deficiency | 0.58 | 0.01-3.18 |  |
| Indigestion | 1.16 | 0.14-4.11 |  |
| Malnutrition | 4.05 | 1.64-8.16 |  |
| Heat stress | 1.73 | 0.36-4.98 |  |
| Duck Cholera (DC) | 0.58 | 0.01-3.18 |  |
| DC+DP | 0.58 | 0.01-3.18 |  |
| CCRD+ E. coli | 0.58 | 0.01-3.18 |  |
| DP + Heatstress | 1.73 | 0.36-4.98 |  |
| DP+CCRD | 0.58 | 0.01-3.18 |  |
| DP+ *E.coli* | 1.16 | 0.14-4.11 |  |
| DP+FC+CRD | 1.16 | 0.14-4.11 |  |
| DP+Malnutrition | 0.58 | 0.01-3.18 |  |
| DP+Tape Worm | 1.16 | 0.14-4.11 |  |
| Colibacillosis+Egg Peritonitis | 0.58 | 0.01-3.18 |  |
| Malnutrition+CCRD | 1.73 | 0.36-4.98 |  |
| Heat stress+Perihepatitis | 0.58 | 0.01-3.18 |  |

**3.2 Prevalence of chicken diseases and conditions by production type and age**

The broiler chickens were divided into three groups according to ages such as group A (1-10 days), group B (12-20 days), and group C (1-32 days). Prevalence of IBD (31.78%) was calculated significantly higher among all diseases and followed by visceral gout, Mycoplasmosis, and Omphalitis in broiler bird. Prevalence for Omphalitis (58.82%) was estimated as higher among all diseases found in group A within the study period while, Visceral gout (25.00%) was the most dominant in Group B, followed by IBD (21.15%). In broiler group C, occurrence of the mycoplasmosis was counted highest among the prevailing diseases and all three age groups are susceptible to this infection. One important observation is that 12 to 20 days birds are more prone to different diseases and conditions than chick and mature birds. Some co-infections were also recorded where IBD combined with Coccidiosis, *E. coli*, and CCRD and prevalence (Table 3).

**Table 3: Distribution of diseases and conditions (N = 107) in broiler in Kishoreganj from June 2019 up to October 2019.**

| Disease name | Prevalence (%) | CI (95%) | P-value | 1-10 days | 11-21 days | 22-40 days |
| --- | --- | --- | --- | --- | --- | --- |
| IBD | 31.78 | 23.11-41.48 | <0.001 |   | 21.15 |   |
| Ascities | 1.87 | 0.23-6.59 |  |   | 1.92 | 2.63 |
| Aspergillosis | 0.93 | 0.02-5.10 |  |   | 1.92 |   |
| Coccidiosis | 1.87 | 0.23-6.59 |  |   | 3.85 |   |
| Coli enteritis | 1.87 | 0.23-6.59 |  |   | 3.85 |   |
| CCRD | 3.74 | 1.03-9.30 |  |   | 1.92 |   |
| ND | 3.74 | 1.03-9.30 |  |   | 7.7 | 2.63 |
| Necrotic Enteritis | 1.87 | 0.23-6.59 |  |   | 3.85 |   |
| Colibacillosis | 2.8 | 0.58-7.98 |  |   | 3.85 | 2.63 |
| Omphalitis | 10.28 | 5.24-17.65 |  | 58.82 | 1.92 |   |
| Mycoplasmosis/CRD | 10.28 | 5.24-17.65 |  | 5.88 | 11.54 | 10.53 |
| Less intake of feed | 0.93 | 1.64-8.16 |  |   | 1.92 |   |
| IBD+CCRD | 2.8 | 0.58-7.98 |  |   | 5.77 |   |
| IBD+Coccidiosis | 2.8 | 0.58-7.98 |  |   | 5.77 |   |
| IBD+ *E. coli* | 2.8 | 0.58-7.98 |  |   | 3.85 | 2.63 |
| Visceral gout | 16.82 | 10.29-25.28 |  | 29.41 | 25 |   |
| Visceral gout+CCRD | 0.93 | 1.64-8.16 |  |   | 1.92 |   |
| Visceral gout+IBD | 0.93 | 1.64-8.16 |   | 1.92 |   |  |
| CRD+salmonellosis | 0.93 | 1.64-8.16 | 5.88 |   |   |  |

Layer birds were divided into three groups according to age such as group A (1-56 days), group B (57-140 days), and group C (141-665 days) (Fig. 3). Prevalence of ND (23.21%, 95% CI: 18.88-28.00) was counted as significantly higher among all diseases occurred in the layer during the study period. Besides ND, the prevalence of IBD (5.75%) and CRD (4.30%) were the dominating diseases in the layer. Along with infectious disease, Heatstress was also observed in layer. In Group A, the prevalence of IBD (29.03%) was calculated higher followed by ND and coccidiosis (12.90%) prevalence. In Group B and Group C, highest prevalence was calculated for ND (Table 4).

**Table 4: Distribution of diseases and conditions (N =349) in layer in Kishoreganj from June 2019 up to October 2019.**

| Disease Name | Prevalance (%) | CI (95%) | P-value | 1-56 days | 57- 140 days | 141- 665 days |
| --- | --- | --- | --- | --- | --- | --- |
| Avian Influenza (AI) | 2.58 | 1.19-4.84 | <.0001 | 4.84 |   | 2.69 |
| IBD | 5.75 | 3.54-8.71 |  | 29.03 | 3.13 |   |
| FC | 2.58 | 1.19-4.84 |  |   |   | 4.04 |
| IB | 2.87 | 1.38-5.21 |  | 4.84 | 1.56 | 2.69 |
| IC | 1.15 | 0.31-2.91 |  |   | 3.13 | 0.9 |
| Fowl Pox | 0.29 | 0.01-1.59 |  |   | 1.56 |   |
| Ascities | 0.86 | 0.18-2.49 |  |   | 1.56 | 0.9 |
| Avian tuberculosis | 0.57 | 0.07-2.05 |  |   |   | 0.9 |
| Avian Leukosis | 0.57 | 0.07-2.05 |  |   |   | 0.9 |
| Coccidiosis | 2.29 | 0.99-4.47 |  | 12.9 |   |   |
| Coli enteritis | 2.01 | 0.81-4.09 |  | 1.69 | 3.13 | 1.79 |
| Colibacillosis | 3.72 | 2.00-6.29 |  | 3.23 |   | 4.93 |
| ND | 23.21 | 18.88-28.00 |  | 12.9 | 39.06 | 21.52 |
| CRD/mycoplasmosis | 4.3 | 2.43-6.99 |  |   | 1.56 | 6.28 |
| Salmonellosis | 3.72 | 2.00-6.29 |  | 1.61 | 3.13 | 4.48 |
| Aphlatoxicosis | 0.57 | 0.07-2.05 |  |   |   | 0.9 |
| Necrotic Enteritis(NE) | 0.57 | 0.07-2.05 |  | 1.61 |   | 0.45 |
| Omphalitis | 1.43 | 0.47-3.31 |  | 8.06 |   |   |
| Oophoritis | 0.29 | 0.01-1.59 |  |   |   | 0.45 |
| Tape worm | 0.57 | 0.07-2.05 |  |   | 3.13 |   |
| Beak infection | 0.29 | 0.01-1.59 |  |   | 1.56 |   |
| Calcium deficiency | 0.57 | 0.07-2.05 |  |   |   | 0.9 |
| CCRD | 2.29 | 0.99-4.47 |  |   | 4.69 | 2.24 |
| Liver cirrhosis | 2.01 | 0.81-4.09 |  |   |   | 3.14 |
| Visceral gout | 0.57 | 0.07-2.05 |  | 1.61 |   | 0.45 |
| Heat stress | 11.17 | 8.07-14.96 |  | 3.23 | 4.69 | 15.25 |
| Malnutrition | 0.86 | 0.18-2.49 |  |   | 3.13 | 0.45 |
| Mixed Infections |  |  |  |  |  |  |

**Fig. 3: Frequency distribution of layer diseases and conditions (Mixed infection) in Kishoreganj from June 2019 up to October 2019.**

In the case of Sonali chicken, they were categorized into three groups according to their ages likely group A (1-42 days), group B (43-140) and group C (141-180days). Coccidiosis (24.43%) was counted as the most frequent disease in sonali during the study period. IBD was also observed and the prevalence was 21.02%. Like layer, ND prevalence was also comparatively higher than other diseases and the value was 11.36%. Like other type chicken, mixed infections were also observed in this chicken and co-infection of IBD and Coccidiosis was counted more frequently than others (6.82%). In case Group A, the prevalence of IBD (32.69%) was higher followed by coccidiosis. For Sonali Group B, ND was the most dominant disease (Table 5).

**Table 5: Distribution of diseases and conditions (N =176) in sonali in Kishoreganj from June 2019 up to October 2019.**

| Disease Name | Prevalance (%) | CI (95%) | P-value | 1-42 days | 43-140 days | 141 - 180 days |
| --- | --- | --- | --- | --- | --- | --- |
| Avian Influenza (AI) | 6.25 | 3.16-10.91 | <.0001 |   | 14.93 | 20 |
| FC | 0.57 | 0.01-3.13 |  |   | 1.49 |   |
| Colibacillosis | 3.41 | 1.26-7.27 |  | 4.81 | 1.49 |   |
| IBD | 21.02 | 15.25-27.79 |  | 32.69 | 4.48 |   |
| IC | 1.14 | 0.14-4.04 |  |   | 2.99 |   |
| CRD/mycoplasmosis | 1.7 | 0.35-4.90 |  |   | 4.48 |   |
| ND | 11.36 | 7.08-17.00 |  | 4.81 | 20.9 | 20 |
| NE | 1.14 | 0.14-4.04 |  | 0.96 | 1.49 |   |
| Omphalitis | 1.7 | 0.35-4.90 |  | 2.88 |   |   |
| Oophoritis | 0.57 | 0.01-3.13 |  |   |   | 20 |
| salmonellosis | 0.57 | 0.01-3.13 |  |   | 1.49 |   |
| Coccidiosis | 24.43 | 18.28-31.47 |  | 29.81 | 17.91 |   |
| CCRD | 2.27 | 0.62-5.72 |  |   | 5.97 |   |
| AI+ coccidiosis | 1.14 | 0.14-4.04 |  |   | 2.29 |   |
| Coccidiosis+CCRD | 1.14 | 0.14-4.04 |  | 1.92 |   |   |
| CRD+salmonellosis | 0.57 | 0.01-3.13 |  |   |   | 20 |
| *E. coli* +IBD | 1.14 | 0.14-4.04 |  | 1.92 |   |   |
| *E. coli* +ND | 1.14 | 0.14-4.04 |  |   | 2.99 |   |
| *E. coli* +Tapeworm | 0.57 | 0.01-3.13 |  |   | 1.49 |   |
| IBD+Coccidiosis | 6.82 | 3.57-11.61 |  | 11.54 |   |   |
| ND+NE | 0.57 | 0.01-3.13 |  |   | 1.49 |   |
| IC +ND | 0.57 | 0.01-3.13 |  |   | 1.49 |   |
| Salmonellosis+ Coccidiosis | 0.57 | 0.01-3.13 |  | 0.96 |   |   |
| CRD+ Coccidiosis | 0.57 | 0.01-3.13 |  |   | 1.49 |   |
| ND+AI | 1.14 | 0.14-4.04 |  | 0.96 | 1.49 |   |
| ND+Coccidiosis | 3.98 | 1.61-8.02 |  | 2.88 | 5.97 |   |
| *E. coli* +ND+CRD | 0.57 | 0.01-3.13 |  |   | 1.49 |   |
| Visceral gout + Coccidiosis | 1.14 | 0.14-4.04 |  | 1.92 |   |   |
| Heat stress | 0.57 | 0.01-3.13 |  |   |   | 20 |
| Heat stress+ *E. coli* | 0.57 | 0.01-3.13 |  |   | 1.49 |   |
| Heat stress+NE | 0.57 | 0.01-3.13 |  | 0.96 |   |   |

**3.3 Prevalence of duck diseases and disease conditions by age**

Ducks were divided into four groups following their age and they were group A (4-79 days), group B (90-179 days), group C (180-269 days) and group D (270-730 days). The prevalence of DP in all ages of duck (A=30.26, B=75.68, C=82.00 and D=68.57%) was relatively high among all diseases in the case of duck. (table 6).

**Table 6:**  **Distribution of Duck diseases and conditions by production type (N =173) in Kishoreganj from June 2019 up to October 2019.**

| Disease Name | 4-89 days | 90-179 days | 180-265days | 266-880 days |
| --- | --- | --- | --- | --- |
| DP | 30.26 | 82 | 75.68 | 68.57 |
| DVH | 1.32 |  |  |  |
| Avian tuberculosis | 1.32 |  |  |  |
| CRD | 6.58 |  |  | 5.71 |
| ND | 1.32 |  |  |  |
| Oophoritis |  |  | 2.7 |  |
| Aflatoxicosis |  | 4 |  |  |
| Anaemia | 2.63 |  |  |  |
| CCRD | 31.58 |  |  | 2.86 |
| Colibacillosis | 1.32 |  |  | 5.71 |
| Coccidiosis | 1.32 |  |  |  |
| Vit E defficiency | 1.32 |  |  |  |
| Indigestion | 2.63 |  |  |  |
| Malnutrition | 6.58 | 4 | 2.7 |  |
| Heat stress | 3.95 |  |  |  |
| Duck Cholera | 1.32 |  | 2.7 | 2.86 |
| DC+DP |  |  | 2.7 |  |
| CCRD+ *E. coli* | 1.32 |  |  |  |
| DP + Heatstress |  |  | 2.7 | 5.71 |
| DP+CCRD | 1.32 |  |  |  |
| DP+ *E. coli* |  |  | 2.7 | 2.86 |
| DP+FC+CRD |  |  |  | 5.71 |
| DP+Malnutrition | 1.32 |  |  |  |
| DP+Tape Worm |  | 4 | 2.7 |  |
| *E. coli* +Egg Peritonitis |  |  | 2.7 |  |
| Malnutrition+CCRD | 3.95 |  |  |  |
| Heat stress+Perihepatitis |  |  | 2.7 |  |

**3.4 Prescribed antimicrobial drug frequency**

From Fig-4 we can see that, there were lots of antimicrobial drugs prescribed for the different diseases of chicken and duck during the study period (see the drug code in Appendix). Among them, a mix of Erythromycin, Sulphadiazine, and Trimethoprim (20.08%) were most commonly used drug for treating the illness of birds. The second most common drug used for treating was Tiamulin hydrogen fumarate (13.58%) accompanied by Ciprofloxacin (9.96%), Neomycine sulfate (9.21%), Doxycycline (4.75), Sulphaclozine (4%), levofloxacin (3,89%) etc.

**Fig. 4: Antimicrobial Drug used frequency in Kishoreganj from June 2019 up to October 2019.**

To treat the chickens, a combination of Erythromycin, Sulphadiazine, and Trimethoprim was frequently (23%) prescribed antibiotic during the study period. Beside this, Ciprofloxacin (12%) and Neomycin sulfate (11%) were also used to cure the sick chickens (Fig. 5, Graph 1).

On the other hand, Tiamulin hydrogen fumarate preparation (63%) was the most commonly used antimicrobial for treating sick ducks. Another commonly used drug was the combination of Doxycycline and Trimethoprim (12%) for curing the bird (Fig-5, Graph 2).

**Fig. 5: Drug usage frequency in chicken (Graph 1) and duck (Graph 2) in Kishoreganj from June 2019 up to October 2019.**

1. **DISCUSSION**

In the present study total of 805 cases were studied from District Veterinary Hospital, Kishoreganj during the study period and identified 40 different diseases or conditions among which 6 were specific to duck and the rest of them were found both in chicken and duck. In case of chicken, surprisingly most of the diseases occurred in combined form and near about 18 combinations were noticed in this study (Fig 2). The most dominant diseases in chicken were Newcastle disease (16.61%), Infectious bursal disease (14.40%), Coccidiosis (8.39%), CRD (4.59%), Colibacillosis (3.48%), Visceral gout (3.16%), AI, Omphalitis, Salmonellosis, etc. Among the co-infections, IBD & Coccidiosis, ND & *E. coli*, ND & Coccidiosis were found the most common cases for chicken. Besides the infectious diseases, the effect of heat stress was also noticed in the chicken population in the study areas and the proportion was 6.33%. These findings represent the poultry (chicken) diseases of Bangladesh and are supported by previous studies (Halder et al., 2021; Md. S. Islam et al., 2023; Khalil et al., 2024) (Ahmed, 2010; Khan et al., 2018a; M. Mamun et al., 2019; M. A. Rahman et al., 2018; Uddin, Syed Sayeem Uddin, et al., 2010). Prevalence for mixed infection of IBD and Coccidiosis was similar to the findings of (Uddin, Ahmed, et al., 2010) who reported 2.32% but higher from the (Badruzzaman et al., 2015) who documented 0.71% from Narsingdi and Sylhet, respectively. In Ducks, DP (55.49%) and CCRD (14.45%) prevalence were found comparatively higher than CRD (4.05%), DC (1.73%), Colibacillosis (1.73%), DVH (0.58%), etc. in the study area. Some metabolic diseases were also noticed in duck like malnutrition (4.05%), Indigestion (1.16%), and Vit E deficiency (0.58%) etc. (Table 2). These findings portray the common duck diseases throughout the whole Bangladesh and are congruent with the findings of the previous studies (Khan et al., 2021; Mostari et al., 2022) (Khan et al., 2018b; Munmun & Fakhrul Islam, 2016; Noor et al., 2019; M. A. Rahman et al., 2019; M. A. Rahman & Adhikary, 2016). Mostly occurred DP prevalence of the current study was inclined with the findings of (A. Islam et al., 2009) who recorded 56.7% prevalence in Gaibandha. However, it was lower than the report of (M. A. Rahman et al., 2019) and (Sabuj et al., 2019) who documented 76.2% and 69.6% in Kishoreganj and Ramu, respectively. This discrepancy might be due to the sample size of the duck population. (M. A. Rahman et al., 2019) used to very small size sample (21 ducks) for the study which leads very high prevalence. The current finding aligns with the previous report statement on the endemic nature of DP in Bangladesh (Hoque et al., 2011; S. Islam et al., 2024; Khan et al., 2021). Though vaccines are available, the unawareness of farmers with poor veterinary services and vaccine maintenance might be the reason for the high DP prevalence in the study area.

This study showed that the prevalence of IBD (31.78%), visceral gout (16.82%), mycoplasmosis (10.28%) and Omphalitis (10.28%) were relatively higher in broiler than layer and sonali. These findings agreed with the findings of (Md. S. Islam et al., 2023), (M. Al Mamun et al., 2019), and (Hassan et al., 2016). But disagreed with the findings of (S. S. Islam et al., 2014), who documented a higher prevalence of IBD in sonali (37.5%) than broiler and layer. On the other hand, in the layer birds, the prevalence of ND (23.21%) and Colibacillosis (3.72%) were comparatively higher than both broiler and sonali chicken. These findings are in agreement with the findings of (Hussain et al., 2021) who showed a higher prevalence of colibacillosis (21.25%) in layers than broilers in Pakistan. The prevalence of Salmonellosis (3.72%) and Fowl cholera (2.58%) were higher in layer birds in compared to sonali birds. On the other hand, the prevalence of Coli enteritis (2.01%) was higher in layer than in broiler chicken. These findings were consistent with the findings of (M. Al Mamun et al., 2019),(M. A. Rahman et al., 2019) , (Hassan et al., 2016), (S. S. Islam et al., 2014) from different parts of Bangladesh and Pakistan (Abbas et al., 2015). In case of Sonali, prevalence of Coccidiosis (24.43%) estimated as highest among all three types chicken, followed by IBD and Coccidiosis mixed infection (6.82%). This variation might be due to use of the anticoccidial drug in the feed of case the broiler and layer. Zoonotic AI prevalence was 6.25% in sonali and it was higher than layer (2.58%) (Tables 4 and 5). These findings were consistence with the findings of previous studies ((M. Al Mamun et al., 2019; Hassan et al., 2016). The variation of different disease prevalence among chicken types in the study area might be due to improper vaccine usage, lower vaccination rate, vaccination failure, poor hygienic management, poor bio-security maintenance in the farm, chicken types themselves, farmer unawareness about diseases etc.

Prevalence of IBD (31.78%) was estimated significantly highest among all diseases observed in broiler in the study area. These finding were congruent with the findings of previous studies from Bangladesh (M. Al Mamun et al., 2019; Das A, 2018; M. A. Rahman et al., 2019) and India (Borah et al., 2017). The prevalence for Omphalitis (58.82%) and Visceral gout (25.00%) followed by IBD (21.15%) and CRD (10.53%) were estimated as higher among all diseases found in broiler of 1-10 days, 11-20 days and 21-40 days ages, respectively (Table 3). Higher Omphalitis prevalence in chicks was supported by previous studies (Badruzzaman et al., 2015; Sabuj et al., 2019; Shahjada et al., 2017; Uddin, Ahmed, et al., 2010) and might occur due to yolk sac infections (Rai et al., 2005) and/or poor management of chicks (Shahjada et al., 2017). (Panigrahi Sumitra, 2021) reported occurrence of visceral gout in 1~10 days chicks were more common and it reduces with the advancement of age which support our findings. In current study, higher IBD prevalence was observed in the 11-20 days age group broiler which correlates with the results of (Sabuj et al., 2019) and (M. A. Rahman et al., 2019) and might be due to lack of maternal antibodies against the virus, improper vaccination and incomplete bursal development (Das A, 2018). All ages broilers were susceptible to CRD, and matches with the previous study findings (Hassan et al., 2016; Sabuj et al., 2019) while disagreeing with (M. A. Rahman et al., 2019) who recorded no prevalence for 11-20 days birds.

ND was most prevailing and estimated at 23.21% in the layer which agreed with the findings of (M. A. Rahman et al., 2019), (Das A, 2018) and (Abbas et al., 2015) but did not match with (Hassan et al., 2016) who found the highest prevalence for salmonellosis (38.56%) in the layer. Heatstress condition was observed in all ages layer and the proportion was 11.17% which was supported by the findings of (M. A. Rahman et al., 2019) who recorded 4.7% from the same area which indicates the improper ventilation of poultry shed and management system of farms. In the 1-56 days age group, the prevalence of IBD (29.03%) was higher followed by ND (12.90%) and coccidiosis (12.90%) prevalence. A higher IBD was observed might be due to lack of vaccination or vaccination failure because, after the first 2 weeks, maternal-derived antibodies deployed and unable to protect chicks from IBD (Alam et al., 2002). The ND prevalence was calculated highest for the rest two groups and the values were 39.06% and 21.52%, respectively (Table 4). Though generally commercial layer farmers vaccinated birds against ND but current findings might be due to vaccine failure because of expired /improper storage vaccine usage, stress condition of birds during vaccination, different strain etc. (Munmun & Fakhrul Islam, 2016; Sarkar et al., 2013).

The most important finding in layer was Avain tuberculosis and prevalence was 0.57% which was a relatively unique finding of the study area and supported by the findings of (M. A. Rahman et al., 2019), and (Reza et al., 2015). The presence of zoonotic tuberculosis in layer might be due to inadequate hygienic and biosecurity measurement in the farm. Tuberculosis was observed in older (above 20 weeks) birds which was consistence with the report of previous research (M. Islam et al., 2021; M. A. Rahman et al., 2019; Soler et al., 2009). Another striking observation was a 2.58% prevalence of Avian Influenza in layer which was supported by the findings of (M. S. Rahman et al., 2012) and (Nooruzzaman et al., 2019b) and near the record (1.98%) of (M. Islam et al., 2021) but lower from the prevalence (10.7%) of (Sabuj et al., 2019). This discrepancy might be due to the sample size variation, farm biosecurity practice, etc. in the study area.

Coccidiosis, IBD, ND, zoonotic AI, and concurrent infections of IBD & Coccidiosis, ND & Coccidiosis were more frequently occurring diseases in Sonali during the study period. These results are supported by the previous research findings (Md. S. Islam et al., 2023; Khalil et al., 2024; Tipu et al., 2021) (M. Al Mamun et al., 2019; Hassan et al., 2016; M. Islam et al., 2021; Talukdar et al., 2017). In the current study, Coccidiosis prevalence was significantly higher (24.43%) followed by IBD (21.02%) which differs from the findings of (Talukdar et al., 2017) and (Md. S. Islam et al., 2023), who documented the highest prevalence for IBD (14.72% and 20.42%) followed by coccidiosis (13.95% and 18.31%) in Bogra and Barishal, repectively. The current Observed higher coccidiosis frequency was agreed with the documentation of (Belal, 2017) and (Tipu et al., 2021), and is indicative of poor hygienic management of farms. IBD (32.69%) and coccidiosis (29.81%) were counted most frequently for the age group 1-42 days and ND (20.90%) for the age group 43-143 days (Table 5). Similarly, (Sharma et al., 2013) reported a higher prevalence of coccidiosis in the age group of 31-45 days. Higher IBD and ND might be due to lack of maternal antibodies, inappropriate vaccination, farmer unawareness, faulty storage and administration of vaccine, etc.

The prevalence of DP was relatively high irrespective of age among all diseases observed in this study and 90~179 days ages had higher frequency. These findings were consistence with the findings of (Noor et al., 2019) and (M. A. Rahman et al., 2019) from Sylhet and Kishoreganj. CCRD was prominent in young birds while Avain tuberculosis, DVH, and co-infection of malnutrition & CCRD were only observed in this group. Duck cholera was observed relatively higher in mature ducks (2.86%), similar to a previous Bangladesh study where recorded at 1.48% (Noor et al., 2019). However, this observation was in disagree with the documentation of (Srinivasan et al., 2024) who stated ducks between 4 to 11 weeks older are more susceptible to DC in compare to adult aged ducks. This study's findings conformed with the earlier reports of (M. A. Rahman et al., 2019) and (Noor et al., 2019) who recorded Heat stress and nutritional deficiency, respectively in different aged ducks.

The present study encountered lots of co-infections both in chickens and ducks which is relatively rare documentation; supported by previous research on poultry (Badruzzaman et al., 2015; M. A. Rahman et al., 2019; M. A. Rahman & Adhikary, 2016; Talukdar et al., 2017; Uddin, Ahmed, et al., 2010). Further study is suggested on laboratory diagnosis for confirmation of prevailed combined infections. The variation in the different disease's prevalence in this study might be due to different factors, such as sampling periods, sample size, study design, geo-climatic conditions of the area, the density of the bird population in the flock, available veterinary facilities, farm management, farmer awareness, etc.

The current study observed a wide range of antimicrobials (mostly antibiotics) were prescribed for treating the diseased birds of different flocks in the study area. Using frequency and usage indicates that prescription of antimicrobials basically antibiotics was experienced based instead of standard poultry diseases treatment protocol. Combined and unnecessary antimicrobials were also used for curing sick birds, which is prohibited. Because it will lead to the development of resistant strains of bacteria in poultry, ultimately in the environment and human, which is alarming and threatening to public health (Akbar & Anal, 2013; M. Islam et al., 2018; Oluwasile et al., 2014; M. A. Rahman et al., 2019). Erythromycin, Sulphadiazine, and Trimethoprim combination (20.08%) were estimated higher prescribed frequency for treating the sick chickens whereas, the second most common drug was Tiamulin hydrogen fumarate which was mainly used to cure ducks. Moreover, Ciprofloxacin, Neomycine sulfate, Doxycycline, Sulphaclozine, levofloxacin etc. also prescribed for treatment purposes supported by previous studies by (M. A. Rahman et al., 2019) and (Sabuj et al., 2019) who also recorded Ciprofloxacin, Neomycine, levofloxacin, etc. usage in sick poultry.

1. **CONCLUSION**

The findings presented in this study represent the current relative disease prevalence in the study area for chicken and duck. The prevalence of Newcastle disease (ND) and Duck plague was counted as the highest among all documented diseases in chickens and ducks, respectively in the study period. Prevalence of IBD (31.78%), ND (23.81%), and Coccidiosis (32.69%) were observed higher among prevail diseases in broiler, layer, and Sonali, respectively. Mixed infections of different diseases were more frequent which was the current study's unique findings. Though this study is based on hospital data and it is difficult to have a true picture, we can assume the present disease burden in poultry sectors. Using this information, respective authorities can take necessary actions to mitigate the challenges in poultry sectors from diseases in the study area. These findings may assist researchers in further research or poultry consultants in making a strategy for the control or eradication of specific poultry diseases in Kishoreganj as well as in Bangladesh.

**ETHICAL APPROVAL: NA**

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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**APPENDIX**

**Table A1:**  **Code for Prescribed drug for poultry in Kishoreganj from June 2019 up to October 2019.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Generic name of used Antimicrobes** | Erythromycin+Sulphadiazine+Trimethoprim | Doxycycline | Sulphaclozine | Doxycycline+Neomycine sulfate | Sulphadiazine+Trimethoprim | Tiamulin hydrogen fumarate | Oxytetracycline | Ciprofloxacin | Metronidazole | Sulphachloropyridazine+Trimethoprim | Doxycycline+Trimethoprim | Doxycycline+Tylosin | Pefloxacin | levofloxacin | Neomycine sulfate | Colistin sulphate+Gentamycin | Gentamycin | Amoxacillin | Colistin sulphate+ Trimethoprim | Tylosin | Enrofloxacin | Colistin sulphate | Flumequine | colistin sulphate+ Doxycycline | Amoxicillin trihydrate+ colistin sulphate |
| **Code for****Drug** | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y |