Infectious Bursal Diseases in Sonali Chicken in Joypurhat District of Bangladesh

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Abstract: The study was designed to investigate prevalence and risk factors of Infectious Bursal Disease (IBD) in Sonali chicken in Joypurhat District of Bangladesh. Twenty-five sonali chicken farms with sum of 33,735 birds of various age groups from five different upazila were observed for Infectious Bursal Disease (IBD). The disease was diagnosed on the basis of history, clinical findings and postmortem lesions. The overall prevalence of IBD was 19.48% and mortality 5.85%. The highest prevalence 43.61% was significantly found (P<0.05) in Khetlal upazila and lowest 10.54% in Kalai upazila. Chicken of 3 to 4 weeks age showed higher prevalence 21.68% than other age group. The prevalence was significantly higher in female 20.03% chicken than male 18.66%. Prevalence of IBD in sonali chicken was higher 46.15% in winter season and lowest 12.89% in rainy season. Vaccinated with AviPro® IB Ark (Elanco) significantly (P<0.05) reduces the prevalence and mortality rate of IBD. Prevalence was low in fumigated concrete farm. Treatment with a) Levofloxacin(10%) b) Vitamin-C (Ascorbic Acid-98%) c) Ph (Formic acid, Lactic acid, Propionic acid & HMTBa) d) Molasses 5% e) Andopan significantly recovered the IBD infected chicken within 4±0.75 days. The necropsy findings of infected chicks revealed haemorrhages on thigh and breast muscles; enlarged, edematous, hyperemic and haemorrhagic Bursa of Fabricious followed by atrophy. In some cases, kidneys were found swollen. Therefore, it was concluded that susceptibility of chicks to IBD is influenced by its age, sex, season, vaccination and treatment with appropriate medicine have significant impact on Infectious Bursal Disease (IBD).

Keywords: IBD, Sonali Chicken, Edematous, Hyperemic.

INTRODUCTION

Bangladesh is highly populated country and growth of population is increasing very fast in comparison to its land size, as a result huge pressure is created on people’s basic need. Our national economy mainly depends on agriculture. It has been estimated that in 1961 there were almost 4 billion domestic fowl whereas in 2019 there were almost 26 billion, a more that 6-fold increase in 60 years (Wilson RT, 2021). Livestock plays an important role as the back-bone of agriculture where about 80% people depend on agriculture for their livelihood. Agriculture sector contributes about 20% of the total national economy of Bangladesh (Hossain, 2012). The population growth rate gradually increasing in the world, but do not increasing landing capacity and proper sources of food. Poultry rearing is considered superior to the other agricultural sector in Bangladesh because of the quick economic return in a relatively short period of time. Poultry industry in Bangladesh plays a vital role in the rural socio-economic system by contributing significantly on economic growth and simultaneously creating numerous employment opportunities. Poultry industry plays an important role in Bangladesh in fulfilling the protein demand of human (Islam et al., 2003). The commercial poultry production by the private sector is expanding rapidly in Bangladesh. This industry can provide opportunities for the increase of Gross Domestic Product (GDP) growth rate through ensuring food security and self-employment, and finally reducing poverty. Traditionally in Bangladesh, poultry rearing is one of the most important sources of income for rural women especially for landless and marginal farmers (Badruzzaman et al., 2015). A total of 5 million
people are engaged in this sector (Saleque, 2006). Chicken meat is also relatively cheap and affordable source of animal protein at present chicken contributes 51% of total meat production in Bangladesh and per capita annual consumption of meat is 5.99 kg against the universal standard 80 kg per head (Begum et al., 2011 and Raha, 2007). According to WHO-FAO joint survey, meat consumption per head in Bangladesh is 15.23 kg per year and poultry contributes 35.25% of total meat supply (Akbar et al., 2013). The present population of poultry in Bangladesh is estimated to be 317.70 million including 266.07 million of chicken and 51.62 million of ducks (BBS, 2016). But Diseases are a cause of high economic losses to poultry farmers. In developing countries, poultry diseases are a cause of very large economic losses to poultry industry the high prevalence of diseases creates major constraints in the development of poultry sector (Sharif et al., 2018). High mortality and morbidity of chicken due to various infectious and non-infectious diseases causing economic loss and discouraging poultry rearing (Das et al., 2005).

Among bacterial, viral, parasitic and fungal diseases, the outbreak of viral diseases can cause havoc to the poultry industry causing reduced meat and egg production. One of the important viral diseases is infectious bursal disease (IBD) (Bosha et al., 2012). Infectious bursal disease is an acute, highly contagious, immunosuppressive and economically important poultry disease caused by Birnaviridae RNA virus. The disease damage the humoral immunity producing lymphoid organ Bursa of Fabricius and result in immuno- suppression and increase susceptibility of poultry to opportunistic secondary infection such as Marek’s disease and Newcastle disease (Lukert, 2003; Islam, 2005; Okwor et al., 2011, Chakma et al., 2015). Biswas et al. (2006) reported that about 28% mortality of Sonali chickens in southeastern coast of Bangladesh due to outbreak of several infectious diseases. Therefore, knowledge on infectious bursal disease epidemiology is necessary for to implement a successful prevention-control program at farm and farmer level. So, the present study focuses the prevalence of infectious bursal disease in Joypurhat district of Bangladesh with the following objectives to study the prevalence, mortality rate and risk factors of infectious bursal disease (IBD) in sonali chicken in Joypurhat district of Bangladesh.

**MATERIALS AND METHODS**

The study was carried out at five upazila (Sadar, Panchibibi, Akkelpur, Kalai and Khetlal) in Joypurhat district of Bangladesh. The clinical and postmortem examinations were carried out for diagnosis of infectious bursal disease at farm and Field Disease Investigation Laboratory (FDIL), Joypurhat. Died birds brought by the farmer for diagnosis were examined.

**Study Period**

The study was carried out for a period of 12 months from April 2019 to March 2020.

**Experimental Chicken**

The chickens of different 21 large and small scale commercial sonali poultry farms about 33,735 birds were considered as experimental chickens.
Clinical Examination

a. History: Previous and present history of farms was taken from each farmer. The following data was collected from the farmers: Name of farmer, name of area, total number of birds in farm, age, sex, season, vaccination status, daily mortality.

b. General Examination: The preliminary general examination was carried out to observe any obvious abnormality, general condition of the chicken, condition of vent, feathers and diarrhea.

c. Postmortem examination: The birds were examined and recorded the post-mortem findings as per the method described by Sharon (2002). The live birds were sacrificed according to standard animal care guidelines giving them minimum pain.

Technique

To expose the internal organs, the bird was laid on its back and each leg, in turn drawn outward away from the body while the skin was incised between the leg and abdomen on each side. Both legs were then grasped firmly in the area of the femur and bent forward, downward, and outward, until the heads of both femurs were broken free of the acetabular attachment so that both legs lied flat on the table. The skin was cut between the two previous incisions at a point midway between keel and vent. The cut edge was then forcibly reflected forward, cutting was necessary, until the entire ventral aspect of the body including the neck, was exposed. For exposing of the viscera, knife was used to cut through the abdominal wall transversely midway between the keel and vent, then through the breast muscle on each side. Positioning shears were used to cut first the rib cage, the coracoid and clavicle on both sides. With some care this was done without severing the large blood vessels. Thorough examination of the organs was done. The bursa of fabricious was located by opening the cloaca, laid on its distal side.

Infectious Bursal Disease (IBD)

The observed clinical signs of IBD were severe depression, in appetence, ruffled feather, vent pecking, trembling, limy diarrhea, severe prostration, and rise of body temperature. Whitish diarrhea, less water and feed intake, dehydration.

Gross lesion

Gross morbid lesions of different organs were observed after necropsy examination of the birds. Post mortem findings included hemorrhages in the thigh and pectoral muscles, swollen and enlarged bursa with blood and pus. Kidneys are enlarged and urate deposition in the tubules. Hemorrhage in line of proventiculus and gizzard.

Prevalence

Prevalence was calculated as number of cases of disease divided by population at risk and multiple by 100.

\[
\text{Prevalence rate} = \frac{\text{No of cases of disease}}{\text{Population at risk}} \times 100
\]

\[
\text{Mortality} = \frac{\text{No of dead birds}}{\text{Affected Population}} \times 100
\]

Statistical Analysis

The collected data was analyzed by a statistical software namely, SPSS version 24.0. Associations between explanatory variables (age, sex, breed and season) and prevalence were done by chi-square test. In all analysis, 95% confidence intervals and \( p < 0.05 \) were set to indicate significance.
Figure 1: Postmortem signs of bursa
Post-mortem findings of Infectious Bursal Disease (A) normal bursa-no edematous swelling and hemorrhage, (B, C, D) swollen, hemorrhagic and edematous bursa.

Figure 2: Postmortem lesion gizzard and kidney
Hemorrhage in the thigh and pectoral muscles (E, F), Hemorrhages in the junction of proventiculus and gizzard (G, H).

RESULTS AND DISCUSSION
The suspected chickens of infectious bursal disease (IBD) were subjected to postmortem examinations; the gross lesions were noted on different parts of body, especially on bursa of fabricious for confirmation of IBD. The gross pathological lesions were present on the following body parts. Carcass was dehydrated and darkened in color. Hemorrhages were present on the pectoral, leg and thigh muscles, kidneys and spleen were swollen. The principal lesions were found in the bursa of fabricious, it was swollen (inflamed); appeared edematous and hyperemic and has a gelatinous yellowish transudate. Hemorrhages and areas of necrosis were present in more severe cases. In prolonged cases the bursa of fabricious were atrophied as compared to hemorrhagic and normal bursa of fabricious.

According to the research work conducted in Joypurhat district, the total number of birds in 21 different poultry farms were 33735. The prevalence and mortality rate of IBD were 19.48%, and 5.85% respectively which is similar with the findings of
Rahman et al., (2010) who found 21%. The study is lower than the study of Rahman and Samad (2005) were the prevalence was 30% and it is higher than the study of Ahmed, (2009) who found 10% IBD. The mortality rate is similar with the findings of Lasher and Share (1994) found highest mortality rate 5%. Among five upazila in Joypurhat district the highest prevalence 43.61% was seen in khetlal upazila followed by 20.09% in Akkelpu, 14.0% in Pachbibi, 12.85% in sadar and lowest 10.54% in kalai upazila respectively. The mortality rate was also higher in Khetlal and lower in Pachbibi upazila (Table-1).

### Table 1: Prevalence and mortality rate of sonali chicken in Joypurhat district

| Upazila Name | No. of Farm Visited | Total Birds | Affected Birds | Prevalence (%) | P-value | Dead Birds | Mortality (%) | P-value |
|--------------|---------------------|-------------|----------------|----------------|---------|------------|--------------|---------|
| Sadar        | 5                   | 6032        | 775            | 12.85          | <0.05   | 242        | 4.01         |         |
| Pachbibi     | 3                   | 4562        | 639            | 14.00          |         | 143        | 3.13         |         |
| Akkelpur     | 7                   | 13080       | 2629           | 20.09          |         | 547        | 4.18         | <0.05   |
| Kalai        | 4                   | 5021        | 531            | 10.54          |         | 197        | 3.92         |         |
| Khetlal      | 2                   | 5040        | 2198           | 43.61          |         | 846        | 16.78        |         |
| **Total**    | **21**              | **33735**   | **6772**       | **19.48**      |         | **1975**   | **5.85**     | <0.05   |

P<0.05 means statistically significant at 5% level of significance.

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**Age-Wise Prevalence of IBD in Sonali Chicken**

The prevalence of IBD in sonali chicken was highest 21.68% in 3 to 4 weeks age group, moderate in 5 to 6 weeks age and lowest in 7 to 8 weeks age group. While no case was found in first 1st to 2nd weeks of age, and in above 7th week of age. Rajaonarison et al., (1994) reported that IBD infected birds were 3 to 5 weeks old, the mortality rate ranged from 3.13-16.78%. This finding are similar with present study. Wyeth et al., (2003) carried out studies on IBDV in great britian and examined that IBDV can infect some chicks as young as 15 days old. In recent study no chick was found affected up to 12 days and thus five farms out of total 21 were affected at 15 days of age. Richard and Miles, (2004); Butcher, (2003) and Chettle et al., (1999) examined that sub- clinical form of IBD or immunosuppression in chickens took played in less than 3 weeks of age. We examined no sub- clinical form in two weeks old Sonalis. Das et al., (2014) determined the outbreak of acute clinical IBD in sonali chicken farms in Bangladesh.

### Table 2: Age-wise prevalence and mortality rate of sonali chicken

| Age group | Total Bird | Affected Bird | Prevalence (%) | P-value | Dead Bird | Mortality (%) | P-value |
|-----------|------------|---------------|----------------|---------|-----------|---------------|---------|
| 3 to 4 week | 22130      | 4797          | 21.68          |         | 1278      | 5.77          |         |
| 5 to 6 week | 10079      | 1789          | 17.75          | <0.05   | 652       | 6.47          | <0.05   |
| 7 to 8 week | 1526       | 186           | 12.19          |         | 45        | 2.95          |         |
| **Total** | **33735**  | **6772**      | **19.48**      |         | **1975**  | **5.85**      | <0.05   |

P<0.05 means statistically significant at 5% level of significance.

**Sex Wise Prevalence of IBD in Sonali Chicken**

In the study area we found that male is less susceptible than female birds, the prevalence and mortality were high in case of female birds than male. Male has 18.66% morbidity and mortality 4.30%; for female 20.03% morbidity and 6.91% mortality (Table-3). This observation is closely related with the earlier study of Ahmed et al., (2009) and Bhattachaijee et al., (1996).

### Table 3: Sex-wise prevalence and mortality rate of sonali chicken

| Sex Group | Number of Birds | Affected Birds | Dead Birds | Prevalence (%) | P-value | Dead Birds | Mortality rate (%) | P-value |
|-----------|-----------------|----------------|------------|----------------|---------|------------|-------------------|---------|
| Male      | 13595           | 2537           | 584        | 18.66          | <0.05   | 584        | 4.30              | <0.05   |
| Female    | 20140           | 4035           | 1391       | 20.03          |         | 1391       | 6.91              |         |
| **Total** | **33735**       | **6572**       | **1975**   | **19.48**      |         | **1975**   | **5.85**           |         |

P<0.05 means statistically significant at 5% level of significance.

**Prevalence according to season**

In this study we found that IBD prevalence is higher in winter season (46.15%) and mortality (8.02%)in autumn season (8.02%) and lowest prevalence (12.89%) and mortality rate (4.69%) in rainy season. Farooq et al., (2003) found similar finding in chicken in Kashmir.
Table 4: Season-wise prevalence and mortality rate of sonali chicken

| Season          | Farm Number | Affected Birds | Prevalence (%) | P-value | Dead Birds | Mortality (%) | P-value |
|-----------------|-------------|----------------|----------------|---------|------------|---------------|---------|
| Winter (Dec-Feb)| 08          | 15,570         | 46.15          | <0.05   | 795        | 5.11          | <0.05   |
| Summer (Mar-May)| 04          | 5,630          | 16.78          |         | 319        | 5.66          |         |
| Rainy (Jun-Aug)| 03          | 4,350          | 12.89          |         | 204        | 4.69          |         |
| Autumn (Sep-Nov)| 05          | 8,185          | 24.26          |         | 657        | 8.02          |         |
| Total           | 21          | 33,735         |                |         | 1975       | 5.85          |         |

P<0.05 means statistically significant at 5% level of significance.

Prevalence According to Vaccination Status
Study on vaccination history of the different farm reveals vaccination failure. Among the vaccine, Elanco vaccine was most effective than other vaccine.

Prevalence and mortality of IBD according to vaccination was lowest (3.78%) and (0.89%) in using AviPro® IB Ark (Elanco) vaccine. The result is similar with earlier study of Besseboua et al., (2015) and Islam and Samad, (2003), they found the efficacy of vaccine.

Table 5: Vaccination-wise prevalence and mortality rate of sonali chicken

| Vaccine Name                  | Number of Farm | Number of Birds | Affected Birds No. | Dead Bird No. | Prevalence (%) | Mortality rate (%) |
|-------------------------------|----------------|-----------------|--------------------|---------------|----------------|--------------------|
| GumboMed Plus (Incepta)       | 3              | 3075            | 589                | 113           | 19.15          | 3.67               |
| Cevac IBD (ACI)               | 2              | 2570            | 846                | 376           | 32.92          | 14.63              |
| AviPro® IB Ark (Elanco)       | 5              | 8570            | 324                | 76            | 3.78           | 0.89               |
| BAU 404 (Govt)                | 3              | 5214            | 1559               | 478           | 23.9           | 9.16               |
| Izovac Gumboro (Renata)       | 8              | 14306           | 3254               | 923           | 22.75          | 6.45               |
| Total                         | 21             | 33735           | 6572               | 1975          | 19.48          | 5.85               |

P<0.05 means statistically significant at 5% level of significance.

Prevalence Study According to Constructional Fault
The prevalence of IBD in farm construction with kacha floor are more susceptible to IBD than the concrete floor. The study showed 2.5% prevalence in concrete floor and 3.52% mortality. The prevalence is higher 24.60% and mortality 24.6% in case of kacha floor. Talukdar et al., (2017) also found similar result.

Table 6: Farm construction-wise prevalence and mortality rate of sonali chicken

| Floor type   | Number of Farm | Number of Birds | Affected Birds No. | Dead Bird No. | Prevalence (%) | Mortality (%) |
|--------------|----------------|-----------------|--------------------|---------------|----------------|---------------|
| Concrete     | 4              | 8397            | 389                | 215           | 2.5            | 3.52          |
| Kacha        | 17             | 25138           | 6183               | 1760          | 7.00           | 24.60         |
| Total        | 21             | 33735           | 6572               | 1975          | 5.85           | 19.48         |

P<0.05 means statistically significant at 5% level of significance

Prevalence According to Biosecurity
In this study among 21 farms only 4 farms are fumigated regularly and 17 farms are not fumigated so morbidity and mortality were high in non-fumigated farm. The prevalence of IBD was 7.8% in fumigated and 24.07% in non-fumigated farm and mortality 1.63%, 7.51% respectively fumigated and not fumigated farm similar with the findings of Jindal et al., (2005).

Table 7: Biosecurity-wise prevalence and mortality rate of sonali chicken

| Fumigation | Number of Farm | Number of Birds | Affected Birds No. | Dead Bird No. | Prevalence (%) | Mortality (%) |
|------------|----------------|-----------------|--------------------|---------------|----------------|---------------|
| Fumigated  | 4              | 9512            | 742                | 155           | 7.80           | 1.63          |
| Not Fumigated | 17            | 24223           | 5830               | 1820          | 24.07          | 7.51          |
| Total      | 21             | 33735           | 6572               | 1975          | 19.48          | 5.85          |

P<0.05 means statistically significant at 5% level of significance
Effects of treatment for controlling IBD
During study period we found that treatment group 3 was most responsive than others. Where the affected flock was treated with levofloxacin (10%), Vitamin C, Molasses, P٧ and Andopan, which significantly recovers chicken within 4±0.75 days.

Table 8: Effects of treatment for controlling IBD in sonali chicken

| Name of the group | No. of Birds treated | Name of antibiotic & others Medicine | Dose & route of administration | Range of complete recovery days | P-Value |
|-------------------|-----------------------|--------------------------------------|-------------------------------|---------------------------------|---------|
| Group- A          | 300                   | a) Levofloxacine(10%)                | a) 1ml/1L drinking water 16hrs daily for 5 days. | 4±0.75 a                       | <0.05   |
|                   |                       | b) Vitamin-C (Ascorbic Acid-98%)     | b) 1gm/3L drinking water 6hrs daily for 3 days. |                                |         |
|                   |                       | c) Ph (Formic acid, Lactic acid, Propionic acid & HMTBa) | c) 1ml/3L drinking water 6hrs daily for 5 days. |                                |         |
|                   |                       | d) Molasses 5% e) Andopan            | d) 20gm/L drinking water 8hrs for 3 days  e) 1gm/25kg body wt. with drinking water 8hrs daily for 5 days. |                                |         |
| Group- B          | 300                   | a) Levofloxacine(10%)                | a) 1ml/1L drinking water 16hrs daily for 5 days. | 7±0.25 b                       | <0.05   |
|                   |                       | b) Vitamin-C (Ascorbic Acid-98%)     | b) 1gm/3L drinking water 6hrs daily for 3 days. |                                |         |
|                   |                       | c) Ph (Formic acid, Lactic acid, Propionic acid & HMTBa) | c) 1ml/3L drinking water 6hrs daily for 5 days. |                                |         |
|                   |                       | d) Molasses 5% | d) 20gm/L drinking water 8hrs for 3 days. |                                |         |
| Group- C          | 300                   | a) Florfenicol(20%)                  | a) 1ml/1L Drinking water 16hrs daily for 5 days. | 8±0.25 b                       | <0.05   |
|                   |                       | b) Vitamin-C (Ascorbic Acid-98%)     | b) 1gm/3L Drinking water 6hrs daily for 3 days. |                                |         |
|                   |                       | c) Ph (Formic acid, Lactic acid, Propionic acid & HMTBa) | c) 1ml/3L Drinking water 6hrs daily for 5 days. |                                |         |
|                   |                       | d) Molasses 5% e) Andopan            | d) 20gm/L Drinking water 8hrs for 3 days. e) 1gm/25kg body wt. with drinking water 8hrs daily for 5 days. |                                |         |
| Group- D          | 300                   | a) Ciprofloxacine(10%)               | a) 1ml/1L Drinking water 16hrs daily for 5 days. | 10±0.5 c                       | <0.05   |
|                   |                       | b) Vitamin-C (Ascorbic Acid-98%)     | b) 1gm/3L Drinking water 6hrs daily for 3 days. |                                |         |
|                   |                       | c) Ph (Formic acid, Lactic acid, Propionic acid & HMTBa) | c) 1ml/3L Drinking water 6hrs daily for 5 days. |                                |         |

P<0.05 means statistically significant at 5% level of significance.

CONCLUSION
According to the present study, most prevalence economical important diseases of commercial Sonali chickens at Joypurhat district of Bangladesh is infectious bursal disease (IBD), it was found that the highest prevalence and mortality rate of IBD in sonali chicken was seen in Khetlal upazila (43.61%, 16.78%) and lowest in Khetlal (10.54%) and Panchbibi Upazila (3.13%) in Joypurhat district. It was found that 3 to 4 weeks’ age group female chickens were more susceptible to diseases prevalence but mortality rate was high in 5 to 6 weeks age group. Prevalence was highest in winter and lowest in Rainy season but mortality rate was highest in autumn season. AviPro® IB Ark (Elanco) was more protective than other vaccine. Treatment with (a. Levofloxacine (10%) b. Vitamin-C (Ascorbic Acid-98%) c. Ph (Formic acid, Lactic acid, Propionic acid & HMTBa) d. Molasses 5% e. Andopan) was more effective in controlling IBD than other treatment groups.

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