

Original Research Article

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) Mollasses 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 Fabricius 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.

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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 than 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

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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 sec-tor (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

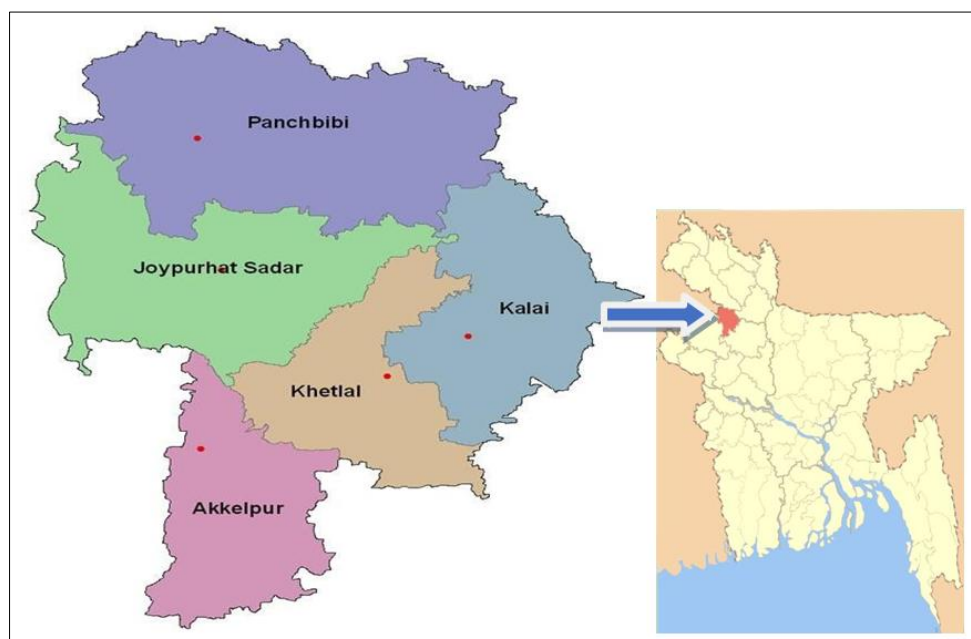
lymphoid organ Bursa of Fabricius and result in immuno- suppression and increase susceptibility of poultry to opportunistic secondary infection such as Marek's disease and Newcastle disease (Lukert, 2003; Islam, 2005; Okwor *et al.*, 2011, Chakma *et al.*, 2015). Biswas *et al.* (2006) reported that 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, Panchibi, 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.



Picture: Location of Study area on Bangladesh Map

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 appetite, 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 proventriculus and gizzard.

Prevalence

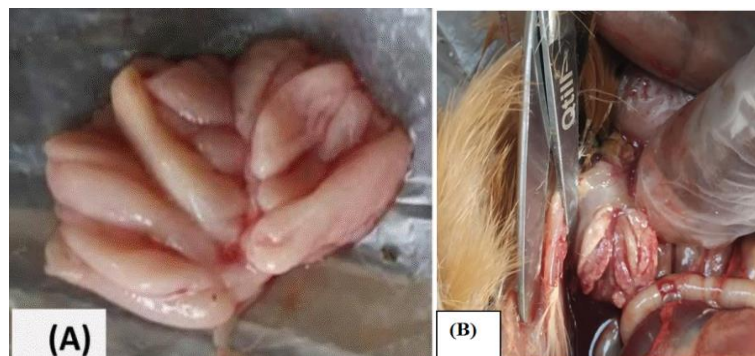
Prevalence was calculated as number of cases of disease divided by population at risk and multiple by 100.

$$\text{Prevalence rate (\%)} = \frac{\text{No of cases of disease}}{\text{Population at risk}} \times 100$$

$$\text{Morality (\%)} = \frac{\text{No of dead birds}}{\text{Affected Population}} \times 100$$

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.



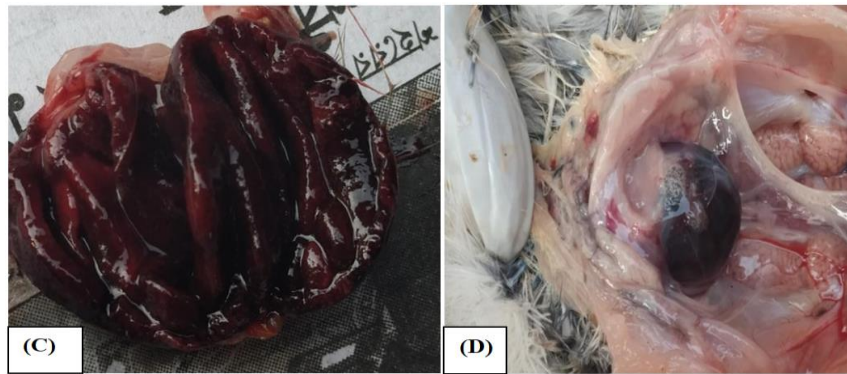


Figure 1: Postmortem signs of bursa

Post-mortem findings of Infectious Bursal Disease (A) normal bursa-no edematous swelling and hemorrhage, (B, C, D) swollen, hemorrhagic and edematous bursa.

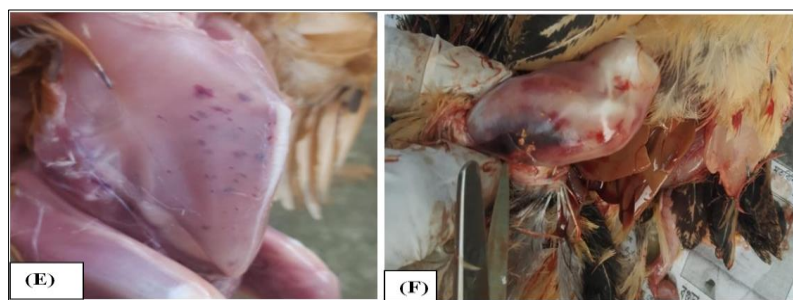


Figure- 6: Postmortem lesion of breast and thigh muscles

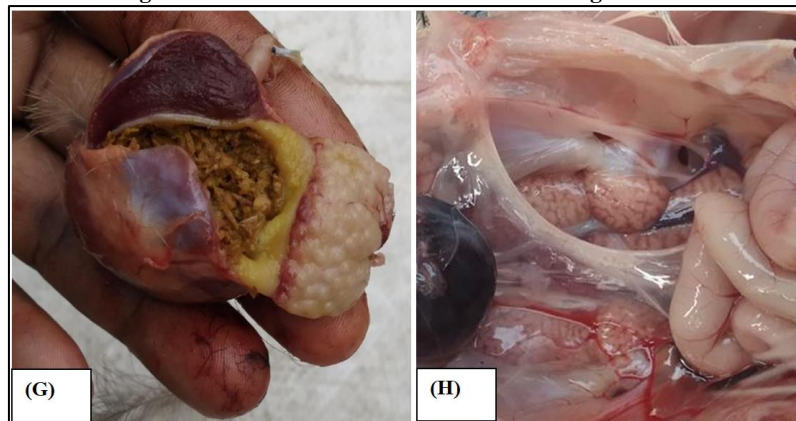


Figure-2: Postmortem lesion gizzard and kidney

Hemorrhage in the thigh and pectoral muscles (E, F), Hemorrhages in the junction of proventriculus 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) where 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	<0.05
Pachbibi	3	4562	639	14.00		143	3.13	
Akkelpur	7	13080	2629	20.09		547	4.18	
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	

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

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 affected 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 placed 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	<0.05	1278	5.77	<0.05
5 to 6 week	10079	1789	17.75		652	6.47	
7 to 8 week	1526	186	12.19		45	2.95	
Total	33735	6772	19.48		1975	5.85	

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 Bhattachajee *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-value					<0.05	<0.05

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	8597	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-value					<0.05	<0.05

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-value					<0.05	<0.05

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, P^H 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) Levofloxacin(10%) b) Vitamin-C (Ascorbic Acid-98%) c) Ph (Formic acid,Lactic acid, Propionic acid & HMTBa) d) Mollasses 5% e) Andopan	a) 1ml/1L drinking water 16hrs daily for 5 days. b) 1gm/3L drinking water 6hrs daily for 3days c) 1ml/3L drinking water 6hrs daily for 5 days d) 20gm/L drinking water 8hrs for 3 days e)1gm/25kg body wt. with drinking water 8hrs daily for 5 days	4±0.75 a	<0.05
Group- B	300	a) Levofloxacin(10%) b) Vitamin-C (Ascorbic Acid-98%) c)Ph(Formic acid,Lactic acid,Propionic acid & HMTBa) d) Mollasses 5%	a) 1ml/1L drinking water 16hrs daily for 5 days. b) 1gm/3L drinking water 6hrs daily for 3days c) 1ml/3L drinking water 6hrs daily for 5 days d)20gm/L drinking water 8hrs for 3 days	7±0.25 b	<0.05
Group- C	300	a) Florfenicol(20%) b) Vitamin-C(Ascorbic Acid-98%) c) Ph(Formic acid, Lactic acid, Propionic acid & HMTBa) d) Mollasses 5% e)Andopan	a) 1ml/1L Drinking water 16hrs daily for 5 days. b) 1gm/3L drinking water 6hrs daily for 3days. c) 1ml/3L drinking water 6hrs daily for 5 days. d) 20gm/L drinking water 8hrs for 3 days. e) 1gm/25kg body wt. with drinking water 8hrs daily for 5 days.	8±0.25 b	<0.05
Group- D	300	a)Ciprofloxacin(10%) b)Vitamin-C(Ascorbic Acid-98%) c)Ph(Formic acid, Lactic acid, Propionic acid & HMTBa)	a) 1ml/1L Drinking water 16hrs daily for 5 days. b) 1gm/3L drinking water 6hrs daily for 3days. c) 1ml/3L drinking water 6hrs daily for 5days	10±0.5 c	<0.05

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. Levofloxacin (10%) b.Vitamin-C (Ascorbic Acid-98%) c. Ph(Formic

acid,Lactic acid,Propionic acid & HMTBa) d. Mollasses 5% e.Andopan) was more effective in controlling IBD than other treatment groups.

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