Research Article

Investigation of Prevalence and Risk Factors of Infectious Bursal Disease in Broiler Chicken at Selective areas of Barishal Region in Bangladesh

Dipa Rani Pal*, Injamamul Haque Rasel, Tarun Chandra Mondal, Mohammed Lalmoddin Mollah and Shampa Rani

Patuakhali Science and Technology University, Bangladesh.

Abstract | The present study was carried out to estimate the prevalence, mortality and pathological changes of infectious bursal disease (IBD) in broiler chicken of Barishal region in Bangladesh. A total of 45 broiler farms of Barishal division were observed for the determination of infectious bursal disease (IBD) during the period of 1st July 2023 to 30th June 2024. Based on history and postmortem pathological lesions the overall prevalence of IBD was 15.10%. The major pathological lesions observed in this study were hemorrhages on thigh and breast muscles, swollen kidneys and principal findings were in the bursa of fabricious which appeared inflamed, edematous, hyperaemic and finally hemorrhagic and atrophied. The prevalence of IBD was 13.28%, 13.33%, 19.48% and 14.30% in Banaripara, Nesarabad, Babugonj and Barishal sadar respectively. The overall mortality was 4.46%. The mortality was 4.29% in Banaripara, 4.93% in Nesarabad, 4.70% in Babugonj and 3.91% in Barishal sadar upazila. The highest prevalence was found in Babugonj upazila and lowest was found in Banaripara upazila. The highest mortality was found in Nesarabad. The study also showed that the broilers of four weeks of old were highly susceptible to IBD (53%) whereas in third weeks 12%, in fifth weeks 28% and in sixth weeks 7% and the broilers of two weeks of age were not affected with IBD. The main risk factors of IBD were season, age of birds, lack of immunization plans, biosecurity measure and inadequate management practices.

Editor | Muhammad Abubakar, National Veterinary Laboratories, Park Road, Islamabad, Pakistan.
Received | August 18, 2024; **Accepted** | October 1, 2024; **Published** | October 16, 2024
***Correspondence** | Dipa Rani Pal, Patuakhali Science and Technology University, Bangladesh; **Email:** dipapal07@pstu.ac.bd
Citation | Pal, D.R., I.H. Rasel, T.C. Mondal, M.L. Mollah. and S. Rani. 2024. Investigation of prevalence and risk factors of infectious bursal disease in broiler chicken at selective areas of barishal region in Bangladesh. Veterinary Sciences: Research and Reviews, 10(2): 82-87.
DOI | https://dx.doi.org/10.17582/journal.vsrr/2024/10.2.82.87
Keywords | Broiler, Infectious bursal disease, Risk factors, Prevalence, Mortality, Barishal

Introduction

Bangladesh is an agriculture based developing country in the world. In agriculture, poultry is one of the important sectors which plays a significant role to promote human health and in poverty alleviations as well as economic upliftment of Bangladesh. The poultry meat alone contributes a substantial 37% of the total meat production in Bangladesh (Begum *et al*., 2011). Among the total livestock population (442.847 million), the poultry population is about 385.704 million (Bangladesh Economic Review, 2022-23). According to WHO-FAO joint survey, meat consumption in Bangladesh is 15.23 kg per

head per year and poultry contributes 35.25% of total meat supply (Akbar *et al*., 2013). More than 89% of rural smallholders rear chickens & 6.8 chickens per household in Bangladesh (Islam and Nisibori, 2009). Traditionally in Bangladesh, poultry rearing is one of the most important sources of income for rural women especially those are landless and marginal farmers (Badruzzaman *et al*., 2015).

In developing countries, poultry diseases are a cause of very large economic losses to poultry industry and the high prevalence of diseases creates major obligations in the development of poultry sector (Sharif *et al*., 2018). Among the viral diseases, Gumboro and Newcastle diseases commonly affect broiler chicken in Bangladesh. Infectious bursal disease (IBD) is a highly contagious acute viral disease of young chickens (3-6 weeks), which causes immunosuppression following damage to the bursa of fabricius, resulting poor growth and significant economic losses (Khan and Dana, 2005; Abed *et al*., 2018; Eterradossi and Saif, 2020). The virus can survive in environmental stress condition (Camilotti *et al*., 2016). Several factors like vaccination status, biosecurity measures, management practices and climatic condition may play an important role in the prevalence of IBD. Infectious bursal disease is also referred to as Gumboro disease. Department of Livestock Service (DLS) of Government of Bangladesh produces vaccine for infectious bursal disease and distributes at a subsidize rate to the farmer for the successful prevention of this disease. Infectious bursal disease was reasonably controlled by successful vaccination (Al-Natour *et al*., 2004). However, in some cases vaccinations have been unsuccessful in protecting birds (Islam *et al*., 2003).

Infectious bursal disease is an important immunosuppressive disease which threatens the poultry production of young chicken (Teshome *et al*., 2015). The IBD problem in Bangladesh begun in the north Bengal, but now it's more severe in all over the country. IBD outbreaks noted in both vaccinated and non-vaccinated flocks of cockerels at Gazipur (Islam and Samad, 2003). Knowledge on the epidemiology of infectious bursal disease is inevitable to implement a successful prevention-control program at farm level. The literature so far available revealed that limited study has been carried on the occurrence of IBD in Broiler chicken at the coastal part of Bangladesh. So, present study was undertaken to determine the prevalence and epidemiology of infectious bursal disease in broiler chicken at some selected areas of Barishal district with the implemention of a successful disease control strategy at farm level.

Materials and Methods

Selection of study area

The cross-sectional study was performed to determine the prevalence and risk factors of infectious bursal disease in broiler chicken at Upazila Livestock Office and Veterinary Hospital, Banaripara, Barishal Sadar, FDIL Barishal, Babugonj and Nesarabad.

Duration of study

The study was carried out for a period of 12 months, starting from July/2023 to June/2024.

Study population

Apparently healthy, sick and dead birds of different ages were examined for the study.

Diagnosis of disease

The clinical history was collected from the farmers and person who were exclusively related with the affected flock. We made a questionnaire to collect the suitable data. The asked questions were easy and simple and technical terms were avoided. The following data were collected from the farmers: Name of farmer, name of area, total number of birds in farm, biosecurity measure, total morbidity, daily mortality and total mortality. Previous and present history of farms were taken from each farmer. Disease history was recorded carefully by asking questions to the owner, farmer or attendant of poultry.

General Examination

The preliminary general examination was carried out to observe any obvious abnormality, general condition of the poultry, condition of vent, feathers and diarrhoea.

Clinical Signs

The clinical symptoms of Infectious Bursal Disease differ significantly throughout farms and the severity of disease is contingent upon the age and breed of the poultry. Clinical indications that were noted in broiler chickens included weariness, sadness, prostration, dehydration, watery diarrhoea, and ruffled feathers. The third day of infection marks the beginning of mortality, which peaks by day four and then quickly declines. After five to seven days, the remaining hens appear healthy again.

Post-Mortem Examination of Birds

The post-mortem examination was performed as early as possible after death of birds. The time was not exceeding 12 hours after death (Samad, 2005). Most of the post-mortem examinations were performed at morning hours, so there was little chance to exceed the time limit that is 12 hours. It was conducted with the help of rubber gloves, a pair of shears, scissors, knife, scalpel and forceps.

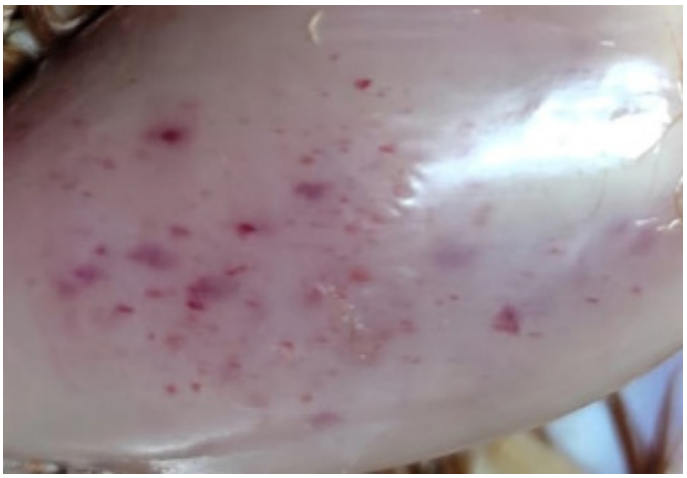

Figure 1: *Hemorrhage in thigh muscle.*

Firstly, external parts were examined before opening the bird, eg. Bone, skin, exudation from natural opening, comb, wattle, beak and eye etc. After that, the bird was placed ventral side upward on the post-mortem tray. Then scissors tore the skin at the junction between the leg and the abdomen. After that, the hip joint was brooked by pressing on tibia- femoral joint. We pulled the skin across the thigh area to check for bleeding or congestion in the thigh muscles (Figure 1). Next, the muscles and skin of the thoracic cage's (posterior side) were severed. The inner organ was then exposed by pushing the entire thoracic cage anteriorly. The organ was then seen in its natural state before each organ was dissected and examined independently. The tracheal bifurcation was reached by cutting the respiratory organ with a scissor, starting from the mouth's lateral commissure. The brain was examined by breaking the bones of head. All organs were examined systematically and thoroughly.

Post-mortem Lesions

The bursa of fabricius were swollen, hemorrhagic, necrosed and sometimes contained yellowish caseous mass. The affected bird exhibited hemorrhages in the thigh and pectoral muscles. Hemorrhage was observed at the junction of the proventriculus and gizzard (Figure 2).

Figure 2: *Swollen of bursa of Fabricius.*

Observation of risk factors

A standardized survey was used to investigate the risk factors associated with the mortality observed. The survey covered the following parameters: flock characteristics, hygiene, vaccination programs, mortality and morbidity rates, age of occurrence, clinical and necropsy lesions, stocking density, season, area and climate.

Statistical Study

In this study the prevalence and mortality rate were calculated by the following statistical formula:

$$\text{Mortality rate \%} = \frac{\text{Number of dead birds during the study period}}{\text{Total number of birds}} \times 100$$

$$\text{Prevalence rate \%} = \frac{\text{Number of affected birds}}{\text{Total number of birds}} \times 100$$

The significant association (p-value< 0.05) between variable was recorded using Chi-square test.

Results and Discussion

We involved four upazilas during the study which were Barishal sadar, Banaripara, Nesarabad and Babugonj upazila. The total number of birds were 36300. The overall prevalence of IBD in Barishal region was 15.10%. The prevalence were 13.28%, 13.33%, 19.48% and 14.30% in Banaripara, Nesarabad, Babugonj and Barishal sadar respectively (Table 1). The overall mortality rate was 4.46%. The mortality was 4.29% in Banaripara, 4.93% in Nesarabad, 4.70% in Babugonj and 3.91% in Barishal sadar upazila respectively. The highest prevalence was found in Babugonj upazila

Table 1: *Prevalence and mortality of IBD in different region of Barishal division.*

Name of the upazila	No. of farmvisited	No. of birds observed	No. of affected birds	No. of death birds	Mortality	Prevalence
Banaripara	10	12050	1600	518	4.29%	13.28%
Nesarabad	10	7500	1000	370	4.93%	13.33%
Babugonj	15	7800	1520	367	4.70%	19.48%
Barishal sadar	10	8950	1280	350	3.91%	14.30%
Total	45	36300	5400	1605	4.46%	15.10%

and lowest was found in Banaripara upazila. The highest mortality was found in Nesarabad upazila.

Broilers of four weeks of old were highly susceptible to IBD (53%) whereas in third week 12%, in fifth week 28% and in sixth week 7% (Table 2) and no case was found in first two weeks of age.

Table 2: *Percentage of IBD according to age.*

Age	No. of infected birds	Total no. of infected birds	Percentage of IBD infection
3 weeks	648	5400	12%
4 weeks	2862		53%
5 weeks	1512		28%
6 weeks	378		7%

Table 3: *prevalence rate of IBD at different districts in Bangladesh.*

Name of district	prevalence
Barishal	15.10%
Dinajpur	10.03%
Mymensingh	21.1%
Sylhet	24.26%

The purpose of the current study was to provide accurate data on the prevalence, mortality and pathological alterations of infectious bursal disease (IBD) in broiler chicken across the Barishal region. The farm history, clinical signs and gross pathological lesions were the basis for the IBD diagnosis in this investigation. According to studies by Kulsum *et al.* (2018); Rahman *et al.* (2010); Okoyo and Dzonkwu (2005); Paul (2004); Richard and Miles (2004), dehydration and alterations in the bursa of fabricious, skeletal muscles, liver, and kidneys were the main pathological lesions at necropsy. The abnormal bursa in all affected birds included swelling, oblong shape changes, changes in color (pink, yellow, red, black) and the development of a gelatinous film surrounding the bursa. The bursa shrank to half its original size or less in a later of days. The postmortem findings were hemorrhages in the thigh/pectoral muscles, enlarged, edematous and hyperemic bursa with bloody or mucoid contents or atrophic in chronic cases and hemorrhage in the junction between gizzard and proventriculus which support the findings of Mera and Sirajo (2019); Islam and Samad (2004); Hasan *et al.* (2010); Mohammed *et al.* (2013); Abed *et al.* (2018). In this study the gross pathological lesions observed on necropsy examination were noted in broiler chickens included bursa of fabricius were swollen, hemorrhagic, necrosed and sometimes contained yellowish caseous mass, hemorrhages in the thigh and pectoral muscles, hemorrhage observed at the junction of the proventriculus and gizzard. Clinically, clinical signs were weariness, sadness, prostration, dehydration, mortality, unsteady gait, ruffled feathers, watery diarrhoea and sudden death which correspond with the findings of Lukert and Saif (2003), Islam and Samad (2004). The overall prevalence of Infectious Bursal Disease was found 15.10% in this study whereas Kulsum *et al.* (2018) found the overall prevalence 10.03% at Dinajpur district, Rahman *et al.* (2010) found the overall prevalence 6.69%, Das *et al.* (2005) revealed that prevalence of IBD in layer and broiler birds as 7.0% and 21.1%, respectively in Mymensingh, Bangladesh. The disease also reported by Islam *et al.* (2003) where they found prevalence rate 24.26% in broiler birds in Sylhet district, Bangladesh. Among different districts of Bangladesh, highest prevalence was found in Sylhet and lowest in Dinajpur district (Table 3). Khan *et al.* (2009) reported that IBD affected birds were four weeks old conclusively. Rajaonarison *et al.* (2006) showed that the birds of three to five weeks of old were most susceptible to IBD. In the present study the most affected birds were four weeks old which is similar to that of Khan (2009). Higher incidence of IBD in broiler has been documented during 4th week of age followed by 5th, 3rd and 6th weeks of age (Jaisankar *et al.*, 2003; Zeleke *et al.*, 2005). Lower level

of IBD in broiler age between 1-10 days is indicative to protective maternal antibody level in broiler chicks whereas occurrence of IBD in broiler >30 days of age indicative to improper IBD vaccination in the broiler farm.

Conclusion and Recommendations

The frequency of IBD infection is increased during winter season and also associated with poultry age. In this study, overall prevalence of Infectious Bursal Disease was found 15.10% and mortality rate 4.46%. This observations of IBD epidemics in broiler farms suggest that these outbreaks are caused by inadequate management practices as well as a lack of immunization plans, which can lead to significant financial losses. This study is noteworthy to encourage farmers to adapt biosecurity tool and vaccinate the broiler regularly and properly to alleviate the further loss. The findings also suggest that risk factors related to biosecurity and farm practices appear to have a significant role in the severity of the disease observed in affected farms. If those factors are prevented, the severity of the IBD problems in farms would be greatly reduced. Clinical symptoms and postmortem findings of affected birds may assist to diagnose a viral disease but laboratory diagnosis is required for the confirmation of diseases. Various diagnostic procedures like enzyme linked immunosorbent assay (ELISA) have been frequently used all over the world to found out viruses from the field samples. Further study needs to be done specially on layer chicken for taking proper laboratory diagnosis of IBD specially in the coastal region of Bangladesh.

Acknowledgments

The author would like to thank all farmers who helped cordially for collecting data related to the report.

Novelty Statement

Recently, there is a lack of information regarding the epidemiology, diagnosis, and treatment of poultry diseases that can aid veterinarians in the successful management of these conditions in resource-poor settings. Infectious bursal disease in poultry is considered as a disease of high economic losses.

Author's Contribution

All authors have contribution to make the experimental design, wrote down and examined the manuscript, and were confirmed liable for any aspect of the manuscript.

Conflict of interest

The authors have declared no conflict of interest.

References

Abed, M., Soubies, S., Courtillon, C., Briand, F.X., Allée, C., Amelot, M. and Kara, R., 2018. Infectious bursal disease virus in Algeria: Detection of highly pathogenic reassortant viruses. Infect.Genet. Evol., 60: 48-57. https://doi.org/10.1016/j.meegid.2018.01.029

Akbar, M.A., Amin, M.R., Ali, M.A., Bhuiyan, M.S.A., Kabir, A.K.M.A. and Siddiki, S.R., 2013. Animal Husbandry- A Business Education for Today and Tomorrow 3rd Annual Conference and Seminar 2013. Bangladesh Society for Animal Production Education and Research (BSAPER), Bangladesh.

Al-Natour, M., Ward, L., Saif, Y., Stewart-Brown, B. and Keck, L., 2004. Effect of different levels of maternally derived antibodies on protection against infectious bursal disease virus. Avian Dis., 48: 177-182. https://doi.org/10.1637/5319

Badruzzaman, A.T., Noor, M., Mamun, M.A., Husna, A., Islam, K.M., Alam, K.J. and Rahman, M.M., 2015. Prevalence of diseases in commercial chickens at Sylhet Division of Bangladesh. Int. Cli. Patho. J., 1(5): 00023. https://doi.org/10.15406/icpjl.2015.01.00023

Begum, I.A., Alam, M.J., Buysse, J., Frija, A. and Van Huylenbroeck, G., 2011. A comparative efficiency analysis of poultry farming systems in Bangladesh.: A Data Envelopment Analysis approach. Appl. Econ., 44: 3737-3747. https://doi.org/10.1080/00036846.2011.581216

Camilotti, E., Moraes, L.B., Furian, T.Q., Borges, K.A., Moraes, H.L.S. and Salle, C.T.P., 2016. Infectious Bursal Disease: Pathogenicity and Immunogenicity of Vaccines. Brazillian J. Poult. Sci., 18(2): 303-308. https://doi.org/10.1590/1806-9061-2015-0148

Das, P.M., Rajib, D.M.M., Noor, M. and Islam, M.R., 2005. Antibody response to Newcastle

disease vaccines in commercial layer chickens. The Bangladesh Vet. J., 23: 1-8.

Eterradossi, N. and Saif, Y. M. (2020). Infectious bursal disease. Dis. Poult., 257-283. https://doi.org/10.1002/9781119371199.ch7

Hasan, R.A.K.M., Ali, M.H., Siddique, M.P., Rahman, M. and Islam, M.A., (2010). Clinical and laboratory diagnoses of Newcastle and infectious bursal diseases of chickens. Bangl. J. Vet. Med., 8(2): 131-140. 12. https://doi.org/10.3329/bjvm.v8i2.11196

Islam, M.R., Das, B.C., Hossain, k., Lucky, N.S. and Mostafa, M.G., 2003. A Study on the occurrence of poultry diseases in Sylhet region of Bangladesh. Int. J. Poult. Sci., 2(5): 354-356. https://doi.org/10.3923/ijps.2003.354.356

Islam, M.A. and Nishibori, M., 2009. Indigenous Naked Neck Chicken: A Valuable Genetic Resource for Bangladesh. World's Poult. Sci. J., 65 (1): 125-138. https://doi.org/10.1017/S0043933909000105

Islam, M.T. and Samad, M.A., 2003. Outbreaks of infectious bursal disease in vaccinated and unvaccinated commercial cockerel farms in Bangladesh. Bang. J. Vet. Med., 1(1): 21-24. https://doi.org/10.3329/bjvm.v1i1.1912

Islam, M.T. and Samad, M.A., 2004. Clinico-pathological studies on natural and experimental infectious bursal disease in broiler chickens. Bang. J. Vet. Med., 2(1): 31-35. https://doi.org/10.3329/bjvm.v2i1.1931

Jaisankar, S.A., Manicavasakadinakaran. and Karunakaran, k., 2003. Retrospective studies on the pattern of viral diseases in poultry in Namakkal. Indian J. Poult. Sci., 38: 142-144.

Khan, C.M., Dana, A., 2005. The Merck Veterinary Manual. 9th ed.; New Jersey, USA: Merck and Co. Inc., p. 2255-2257.

Kulsum, U., Hossain, M.N., Harun-Ur-Rashid, S.M., Islam, M.N. and Salauddin, M., 2018. Pathological investigation of infectious bursal disease (IBD) in broiler at Dinajpur district. IOSR J. Agri. Vet. Sci., 11(10): 73-79.

Khan, R.W., Khan, F.A., Farid, K., Khan, I. and Tariq, M., 2009. Prevalence of Infectious Bursal Disease in Broiler in District Peshawar. ARPN. J. Agri. Bio. sci., 4:1.

Lukert, P.D. and Saif, Y.M., 2003. Infectious bursal disease. Ames, Iowa, Iowa State University Press.

Mera, M.U. and Sirajo, G. 2019. Outbreak of infectious bursal disease in a flock of 14 weeks old ISA brown pullets, Sokoto State, Nigeria. GSC Biol. Pharm. Sci., 9(2): 001-008. https://doi.org/10.30574/gscbps.2019.9.2.0182

Mohammed, M.H., Zahid, A.A.H., Kadhim, L.I. and Hasoon, M.F., 2013. Conventional and Molecular Detection of Newcastle Disease and Infectious Bursal Disease in Chickens J. World's Poult. Res., 3(1): 05-12.

Okoyo, J.O. and Uzoukwu, M., 2005. An outbreak of infectious bursal disease among chickens between 16 and 20 weeks old. Avian Dis., 25(4):1034-1038. https://doi.org/10.2307/1590079

Paul, M.M. 2004. Infectious Bursal Disease- A Pocket guide to poultry health and disease. 34(1): 200-212.

Rahman, M.S., Islam, M.S., Rahman, M.T., Parvez, N.H. and Rahman, M.M., 2010. Analysis of prevalence of infectious Bursal disease in broiler flocks in Dinajpur. Int. J. Sust. Crop Prod., 5: 15-18.

Rajaonarison, J.J., Rakotonindrina, S.M., Rakotondramary, E.K. and Razafimanjary. S., 2006. Gumboro Disease (Infectious bursitis) in Madagascar. Rev. Elev. Med. Vet. Pays Trop. 47(1):15-17 https://doi.org/10.19182/remvt.9125

Richard, and Miles, 2004. Department of Dairy and Poultry Science, Cooperative Extension Service, IFAS, University of Florida, Gainesville-32616.

Samad, M.A., 2005. Poultry Science and medicine. Lyric-Epic Prokasoni, BAU Campus, Mymensingh, 769.

Sharif, A. and Ahmad, T., 2018. Preventing Vaccine Failure in Poultry Flocks. In Immunization-Vaccine Adjuvant Delivery System and Strategies. IntechOpen. United Kingdom, 79-91. https://doi.org/10.5772/intechopen.79330

Teshome, M., Fentahunand, T. and Admassu, B., 2015. Infectious bursal disease (Gumboro disease) in Chickens. Br. J. Poult. Sci., 4(1): 22-28.

Zeleke, A.E., Gelaye, T.S., Ayelet, G., Sirak, A. and Zekarias, B., 2005. Investigation on infectious bursal disease outbreak in Debre Zeit, Ethiop. Int. J. Poult. Sci., 4: 504-506. https://doi.org/10.3923/ijps.2005.504.506