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Histopathological study of infectious bursal disease and bursal lesion scoring for severity assessment in poultry flocks of Tamil Nadu

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Abstract

A retrospective study on histopathological analysis and bursal lesion scoring of Infectious bursal disease (Gumboro disease) was conducted at Central University Laboratory, TANUVAS, Chennai for the period of 34 months from October 2015 to July 2018. In this study, the samples were received from various parts of Tamil Nadu for histopathological examination. A prevalence of 11.36% (119 cases) was recorded out of 1047 poultry cases. The prevalence of IBD is influenced by age of birds with an increase in the likelihood of IBD occurring within the age range of 4-7 weeks. Based on the history received, most of the affected chicken were anorectic, reluctant to move and showed ruffled feathers with watery diarrhoea and severe prostration. The gross lesions like muscle haemorrhages, haemorrhages in the proventricular gizzard junction and enlargement of the bursa of Fabricius were observed. On histopathological examination, 119 cases showed lesions in the bursa, the lesion scores varying from 1 to 5. Out of 119 cases, six samples had a bursal score of 1, thirty-nine samples had a bursal score of 2, fifty samples had a bursal score of 3, twenty-three samples had a bursal score of 4 and one sample had a bursal score of 5. In this study, most of the affected cases belongs to score 2-4, which caused mortality in affected birds. Among them, the birds with lesion score 3 had a higher mortality rate. This study recommends that poultry farmers should be encouraged to improve farm biosecurity and ensure that their birds are vaccinated.

Keywords: poultry, IBDV, histopathology, lesion score

Introduction

Infectious bursal disease (IBD) or Gumboro disease is an acute ^[1], highly contagious viral infection of poultry and causes heavy mortality and immunosuppression leading to concurrent viral and bacterial infections and also vaccination failures ^[2, 3]. The virus primarily affects bursa of Fabricius, which belongs to Avibirnavirus genus of Birnaviridae family having non-enveloped icosahedral, bi-segmented double-stranded RNA with a diameter of about 55-60 nm in size ^[3, 4]. The virus is ubiquitous in nature, chickens acquire infection by the oral route, under natural conditions. Chicken is the only avian species known to be susceptible to the clinical disease and characteristic lesions caused by IBDV. Turkeys, ducks and ostriches are susceptible to infection with IBDV but are resistant to clinical disease ^[5, 6]. IBDV infects chicks of age between 3-6 weeks ^[3, 7]. The disease by itself usually causes mortality of 5-10% but this rate can reach 30-40% ^[8]. There are two serotypes of IBDV: serotypes 1 and 2. All viruses capable of causing disease in chickens belong to serotype 1; serotype 2 viruses may infect chickens and turkeys and are non-pathogenic for both the species and both these serotypes can be differentiated by Virus Neutralization (VN) test ^[9-11]. Serotype 1 contains the pathogenic strains to chicken and can be grouped into classical, antigenic variant and Very Virulent (vv) strains ^[12]. When this IBDV infection first appeared in chickens in 1962, the disease was designated as "Gumboro disease" after the geographic location of the first recorded outbreaks ^[7]. Since the first report, IBD has been reported in the poultry industries all over the world ^[13, 14].

A retrospective study was carried out at Central University Laboratory, TANUVAS, Chennai with an objective to assess the histopathology of bursal lesion caused by IBD. The study aimed to find the association between the prevalence and severity of IBD with age of the birds.

Materials and Methods

A retrospective study on for the presence of histopathological lesions suggestive of Infectious bursal disease was carried out for the period of 34 months from October 2015 to July 2018. In this study, the tissue samples in 10% formalin, which were received from various parts of Tamil Nadu for histopathological examination were screened. The tissues were processed by using paraffin embedding technique for preparation of sections and stained with haematoxylin and eosin (H&E) for observing microscopic changes [15]. Histopathological examination was carried out for the presence of bursal lesions suggestive of IBD infection and bursal lesion scoring was determined as per the method of on a 0 - 5 scale [16, 17].

Results and Discussion

During the study period, the Central university laboratory had received 1047 poultry cases for histopathological examination. All the 1047 cases were screened for the presence of IBD lesions. Out of 1047 cases, 119 cases (11.36%) showed characteristic IBD lesions and all the affected birds had anorexia, reluctance to move, ruffled feathers with watery white diarrhoea and severe prostration. The morbidity of the birds ranged from 10 to 80% which is in accordance with an earlier report [18]. In this study, the mortality rate ranged from 2 - 67%. Though the disease usually causes mortality of 5-10%, it can reach 30-40% in classical IBD and 50-100% in case of vvIBDV [8], considerable high mortality up to 70% has been reported due to very virulent IBDV outbreak during late 1990s in India [19]. The gross lesions like thigh and breast muscle haemorrhages of varying degrees (petechiae to ecchymosis), haemorrhages in the proventricular gizzard junction and enlargement, oedematous, congestion and haemorrhage in the mucosa, caseous exudate in the lumen and atrophy of the bursa of Fabricius were reported. Dehydration was also reported in almost most of the birds. The gross findings were in accordance with earlier reports [3, 20].

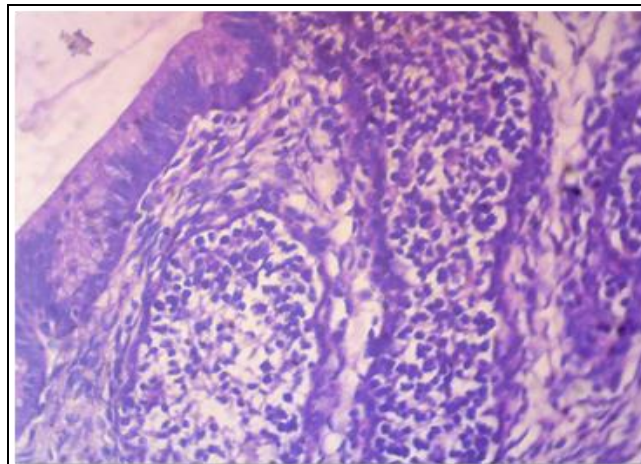
Table 1: No. of cases (Age wise) showed histopathological IBD lesions

Age of the bird (days)	No. of cases showed lesions
11-20	12 (10.08%)
21-30	23 (19.32%)
31-40	16 (13.44%)
41-50	14 (11.76%)
51-60	10 (8.40%)
61-70	8 (6.72%)
71-80	8(6.72%)
81-90	1 (0.84%)
>2 months	6 (5.04%)

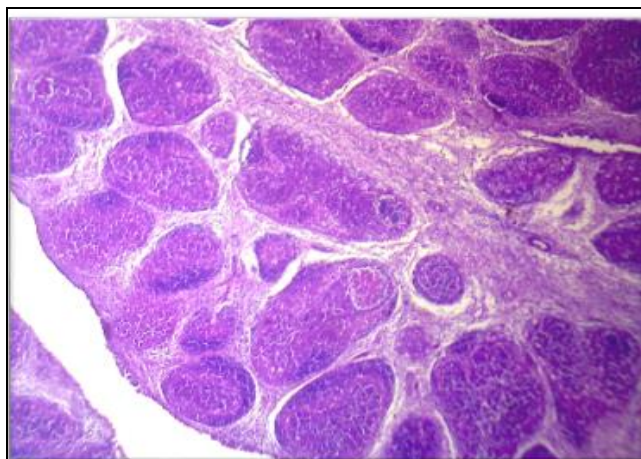
Based on the lesions, chickens affected at the age of 21-30 days showed high mortality rate (23 cases, 19.32%) followed by 31-40 days and 41-50 days of age group with the mortality rate of 13.44% and 11.76% respectively. No chicks are affected which are less than 10 days old (Table. 1). These results were in accordance with the earlier report [21], where they have reported 52.80% cases in 21-30 days age group, 33.13% cases in 30-40 days age group, 3.9% cases in 41-50 days age group and no cases in less than 10 days chicks. The prevalence of IBD is influenced by age of the birds with an increase in the likelihood of IBD occurring within the age range of 20-40 days (3-6 weeks age group) [3, 7].

Table 2: Bursal lesion scoring of IBDV infection in chicken

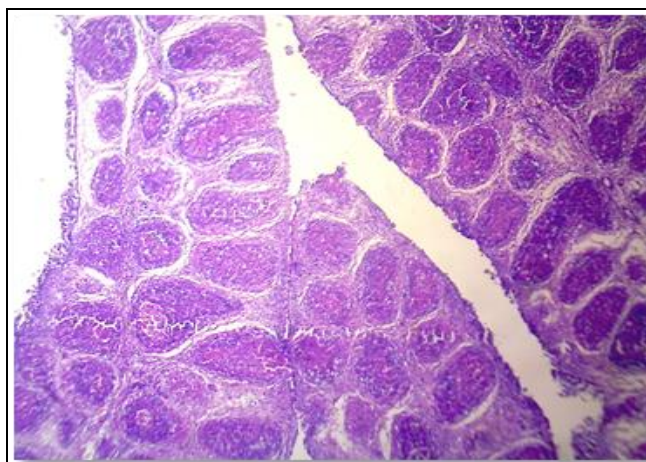
Bursal lesion score	No. of cases showed IBD lesions in Bursa of Fabricius (n=119)
1	6 (5.04%)
2	39 (32.78%)
3	50 (42.01%)
4	23 (19.32%)
5	1 (0.84%)



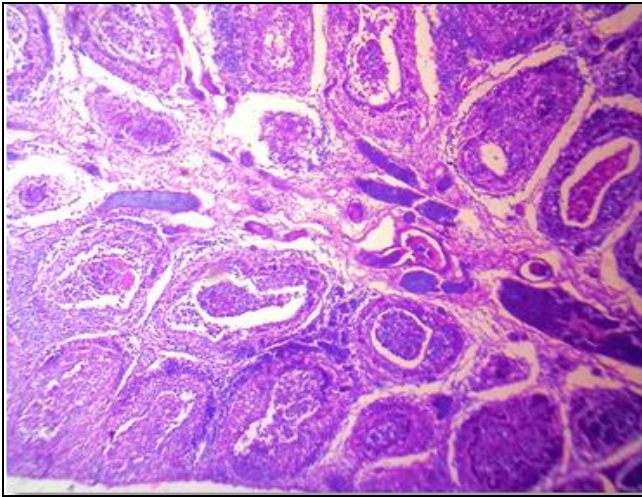
Score 1: Scattered lymphoid necrosis with indistinct cortex and medulla (10µm)



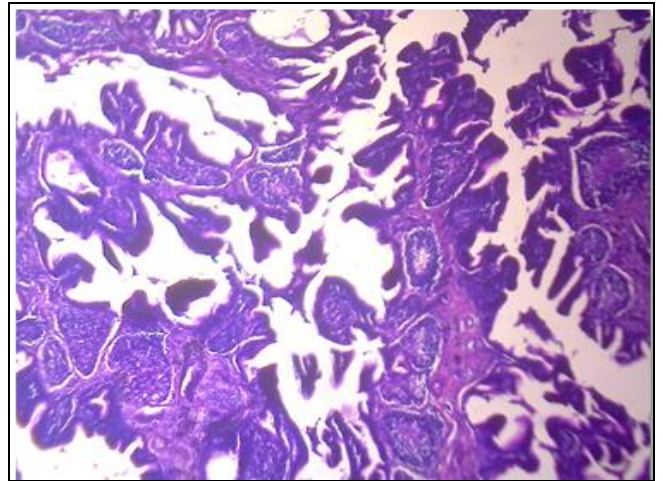
Score 2: The bursal plica revealed moderate to severe lymphoid depletion in most of the bursal follicles (50µm)



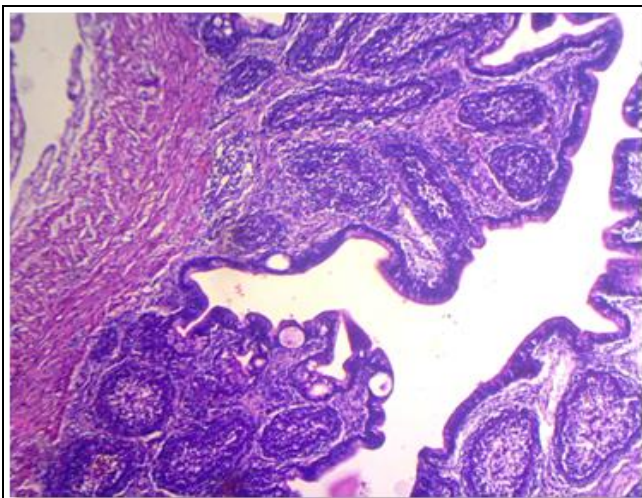
Score 3: The bursa revealed severe lymphoid depletion in almost all the follicles, which appeared pale and vacuolated (50µm)



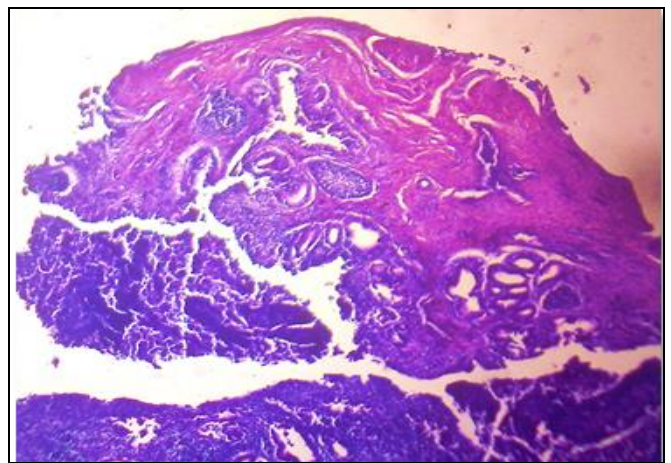
Score 3: Bursal follicles with cellular debris and cystic cavities (50µm)



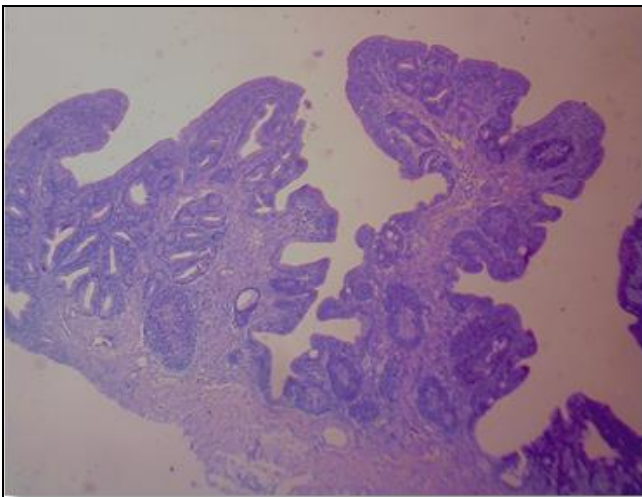
Score 5: Bursa revealed complete loss of architecture. There was no intact lymphoid follicle and the entire area was filled up by fibrous tissue. The lining epithelium was highly corrugated (100µm)



Score 4: Cystic cavities in some follicles plical epithelium. The lining epithelium was corrugated (100µm)



Score 5: Bursa showing loss of architecture, filling up of fibrous tissue (100µm)



Score 4: The bursa revealed loss of lymphoid follicles glandular transformation and increase in inter follicular connective tissue. The lining epithelium was corrugated (100µm)

On histopathological examination, 119 cases showed lesions in the bursa, among them 112 cases were desi chicken and 7 cases were broiler chickens. Out of 119 cases, 6 samples (5.04%) had a bursal score of 1, 39 samples (32.78%) had a bursal score of 2, 50 samples (42.01%) had a bursal score of 3, 23 samples (19.32%) had a bursal score of 4 and only one sample (0.84%) had a bursal score of 5 (Table. 2). In this study, most of the affected cases were having the severity of lesion score 2 to 4. Among them, the birds with lesion score 3 had a higher mortality rate (42.01%). The histopathological lesions were in accordance with earlier reports [16, 17, 20].

Conclusion

Based on the histopathological lesions, it is confirmed that 21-50 days old chicken are most commonly affected by IBD. So, it is recommended that the poultry farmers should be encouraged to improve the biosecurity measures and vaccination against IBDV at two weeks of age to prevent the infection. Further, regular surveillance and characterization of new field strains would help in re-evaluation of control measures time to time.

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