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Transverse study of infectious bursal disease in chicken of Kashmir valley

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Abstract
The present work was conducted for the assessment of occurrence of infectious bursal disease in chicken of various poultry farms operating in district Srinagar, Ganderbal, Budgam and Shopain of Kashmir valley. Samples comprised of dead chicken from various poultry farms of Kashmir valley as well as that were brought to Division of Veterinary Pathology, FVSc & A.H, SKUAST-K Shuhama, for postmortem examination. The outbreaks suspected for IBD in broiler chicken were identified based on the history, clinical signs and lesions following a thorough post mortem examination. A total of 32 outbreaks were recorded during the study period from four districts namely Srinagar (8), Ganderbal (15), Budgam (7) and Shopain (2). The highest mortality was recorded in district Ganderbal (75.0%), followed by Srinagar (42.4%), Budgam (41.4%) and Shopain (33.8%). Age-wise proportionate mortality due to infectious bursal disease was 19.2%, 53.3%, 22.0, 10.3%, in age group of 15-20 days, 21-30 days, 31-40 days and in case of layers respectively. The highest mortality associated with infectious bursal disease was recorded in the age group of 21-30 days. The overall mortality in the flock was 34.7% and among the affected flock mortality ranged between 10.3-53.3 % respectively.

Keywords: Birnaviridae, chicken, infectious bursal disease, mortality, occurrence

Introduction
Infectious bursal disease (IBD) also known as Gumboro disease is a highly contagious acute viral disease of young chicken characterized by massive damage to bursa of fabricius and leading to immunosuppression (Okwor *et al*., 2012) [12]. The etiological agent of infectious bursal disease is a single, non-enveloped icosahedral virus which targets immunoglobulin M bearing lymphocytes which are primarly produced in bursa (Sharma *et al*., 2000) [15]. IBDV virus is a bi-segmented, double stranded RNA genome (Ye *et al*., 2018) [23] belonging to genus Avibirna virus of the family Birnaviridae (Delmas *et al*., 2019) [4].
The IBDV genome is divided into segments A (3.4kb) and B (2.8kb). The large segment A encodes 4 viral proteins, the two capsid proteins VP2 (48kDa) is the major capsid protein which are vital for inducing neutralizing antibodies against IBDV (Vakharia *et al*., 1994) [20] and VP3 (32–35kDa), the viral protease VP4 (24kDa), and a nonstructural protein VP5 (17–21kDa) (Mosley *et al*., 2017) [10] while the smaller segment B encodes VP1 (90kDa), an RNA-dependent RNA polymerase (Ursula *et al*., 2004) [19]. Two serotypes of IBDV (serotype 1 and serotype 2) have been recognized and only serotype 1 is known to be pathogenic (Van de berg *et al*., 2004) [21] and serotype 2 is nonpathogenic. Recently virus has been divided into 7 genotypes on the basis of phylogenetic analysis of hypervariable region (Michel and Jackwood, 2017) [9].
Following IBDV infection, the virus primarly replicates in cloacal bursa. However, the virus has also been shown to replicate in other lymphoid organs including spleen, thymus, harderian gland, and caecal tonsils (Snyder, 1990) [16]. Within these lymphoid organs, the virus preferentially replicates in proliferating and differentiating B lymphocytes, resulting in bursal lymphocytolysis. The disease causes high mortality in 3-6 weeks of birds and chickens less than 1 week of age suffer from severe and permanent B-cell immunosuppression and significant mortality.

The disease is characterized by severe inflammation of bursa resulting in lymphocytic depletion and bursal atrophy and ultimately immunosuppression (Atif *et al*., 2014) [1].The acute phase of disease lasts for 6-10 days and represents severe form of disease (Uddin *et al*., 2012) [18]. Immunosuppression occurs in clinical and subclinical forms where both humoral and cellular immune responses are compromised and thus making birds more vulnerable to other secondary infections and reduced response to vaccination (Musa *et al*., 2010) [11].

The variation in pathogenicity has led to classification of IBDV into different pathotypes viz; mild, intermediate, variant virulent, classical virulent and very virulent or hyper virulent (Lukert and Saif, 2003) [7]. The molecular basis for this difference is due to antigenic domains of the VP2 protein. This protein is the major protective antigen of IBDV that contains specific epitopes responsible for inducing neutralized antibody responses. Different nucleotide and amino acid changes occurring within variable region of VP2 of field strains leads to the emergence of variant strains (Yamaguchi *et al*., 1996) [22].

Poultry farmers of J&K are witnessing frequent outbreaks of IBD even in vaccinated flocks causing heavy mortality. As there is a lack of comprehensive information on the IBDV strains in the commercial and backyard poultry so, farmers often vaccinate their flocks using different strains of vaccines available from commercial suppliers. The IBDV shows rapid mutation in the hypervariable region of VP2 gene and thus resulting in the evolution of more virulent antigenic variant or mutants in the viral population.

Although, in the presence of strict biosecurity measures and intensive immunization programs, still IBD outbreaks occur globally as there is no clear data available on the IBDV surveillance and clustering of IBD outbreak patterns in poultry, making it more difficult to implement certain preventive and control measures (Spackman *et al*., 2018) [17]. Besides biosecurity, vaccination is the most important measure to control IBDV in the field. Classical and variant strains have been used for many years, but extensive usage of live vaccines in the field favors the emergence of new strains resulting in severe outbreaks of IBD. Thus keeping in view the above situation the present work was carried out to find the occurrence of infectious bursal disease in chicken of Kashmir valley.

Material and Methods

Technical program:

The proposed research work was conducted in the Division of Veterinary Pathology, FVSc and A.H at Shuhama campus, SKUAST-K.

Study Area & Material

The study area included the broiler farms operating in Central Kashmir including Srinagar, Ganderbal, Budgam, Shopain and the ones brought to the Division of Veterinary pathology, SKUAST-K constituted the study material.

Investigation approach

This involves systematic approach including clinical examination of diseased birds, postmortem examination of dead birds and laboratory investigation of the samples.

Result

Occurrence of Infectious bursal disease

The present work was conducted for the assessment of occurrence of infectious bursal disease in chicken of various poultry farms operating in district Srinagar, Ganderbal, Budgam and Shopain of Kashmir valley.

A total of 32 outbreaks of infectious bursal disease in chicken were recorded from four districts, namely Srinagar (8), Ganderbal (15), Budgam (7) and Shopain (2). The highest mortality of 75.0% was recorded in district Ganderbal, followed by Srinagar 42.4% as compared to other districts. The case fatality rate was highest in Ganderbal about 89.2% followed by Srinagar 67.5%. The overall pattern of infectious bursal disease is given in table 1.

Table 1: Overall pattern of infectious bursal disease (IBD) outbreaks

District	Outbreak	No. of Susceptible/ Flock Size	No. of Affected	No. of Death	Morbidity Rate (%)	Mortality Rate (%)	Case Fatality Rate (%)
Srinagar	8	17000	10681	7210	62.8	42.4	67.5
Ganderbal	15	41201	34632	30911	84.0	75.0	89.2
Budgam	7	27867	17871	11560	64.1	41.4	64.5
Shopain	2	35412	19814	12001	55.9	33.8	60.4
Total	32	121480	82998	61682	68.3	50.7	74.2

x^2= 1.998, P-value = 0.158

In age-wise proportionate mortality due to infectious bursal disease, the overall mortality in the flock was 34.7% with maximum mortality observed in 21-30 days (53.3%) followed by 31-40 days (22.0%) and minimum mortality observed in case of layers (10.3%). Among the affected flock mortality ranged between 10.3-53.3 % (Table 2).

Table 2: Overall mortality and occurrence of infectious bursal disease among broiler and layers

Age group	Total No. of birds in the flock	Mortality associated with infectious bursal disease	
		No. of chicken died	%
15-20 days	8332	1600	19.2
21-30 days	29816	15901	53.3
31-40 days	13519	2984	22.0
Layers	10021	968	10.3
Total	61688	21453	34.7

x^2 = 2.938, P-value = 0.086

Discussion

Infectious bursal disease (IBD) also known as Gumboro disease is a highly contagious acute viral disease of young chickens characterized by massive damage to bursa of fabricius and leading to immunosuppression (Okwor *et al*., 2012) [12]. IBDV virus is a bi-segmented, double stranded RNA genome (Ye *et al*., 2018) [23] belonging to genus Avibirna virus of the family Birnaviridae (Delmas *et al*., 2019) [4].

Following IBDV infection, the virus primarly replicates in cloacal bursa. However, the virus has also been shown to replicate in other lymphoid organs including spleen, thymus, harderian gland, and caecal tonsils (Snyder, 1990) [16]. Within these lymphoid organs, the virus preferentially replicates in proliferating and differentiating B lymphocytes, resulting in bursal lymphocytolysis.

In the present study, 34.7% of the total mortality in broiler and layers was due to IBDV; strengthening the fact that IBDV is one of the principal cause of morbidity and mortality in the poultry industry. IBDV has also been reported as a principal cause of mortality in broilers by Zeleke *et al*., (2005) [24] who reported overall mortality of 49.89% in chickens. Mazengia *et al*., (2009) [8] reported incidence of IBDV as 17.40-38.39%. Oluwayelu *et al*., (2014) [13] reported 57.1% prevalence of IBD virus. Chakma (2015) [3] reported highest prevalence in Comilla district (10.4%) followed by Feni district (10.3%) and Chittagong district (10.0%), while the highest mortality was recorded in the same Comilla district (8.3%) followed by Chittagong district (8.1%) and Feni district (7.0%). Belaly and Rahman (2022) [2] reported that the overall prevalence of IBD observed was 19.48% and mortality 5.85%. The case fatality rate during our study was highest 89.2%. These findings were in accordance with Mazengia *et al*., (2009) [8] showing case fatality rate of 77.73-98.56%. Kulsum *et al*., (2018) [5] observed the prevalence of IBD as 11.11%, 10.4%, 9.06% and 9.11% in Sadar, Birol, Birgonj and Kaharol upazila respectively, with an overall prevalence of 10.03% at Dinajpur District. Kundu *et al*., (2018) [6] conducted a study during which 1368 outbreaks of IBD occurred with overall morbidity, mortality and case fatality rate of 4.19%, 2.61% and 62.34% respectively. Preeti *et al*., (2018) [14] reported that the overall morbidity, cumulative mortality and case fatality rate due to IBD were 4.38%, 2.62% and 59.68%, respectively. The present investigation revealed outbreaks in chickens of different age groups with highest mortality of 53.3% recorded in the age group of 21-30 days, followed by 22.0% in the age group of 31-40 days, 19.2% in the age group of 15-20 days and 10.3% in case of layers. These findings were in accordance with Zeleke *et al*., (2005) [24] who reported an outbreak in 20-45 day old broilers. Chakma (2015) [3] reported that broiler with age between 21-30 days was significantly reported with high prevalence rate and high mortality rate. Belaly and Rahman (2022) [2] reported that chicken of 3 to 4 weeks age showed higher prevalence 21.68% than other age group. The prevalence of IBD in broiler chickens was the highest (13.13%) at 4th week of age and the lowest (5.6%) at 6th week of age Kulsum *et al*., (2018) [5]. Kundu *et al*., (2018) [6] reported that maximum number of 734 (53.7%) IBD outbreaks were reported in 21-30 days of age followed by 349 (25.5%) in 11-20 days of age, 259 (18.9%) in 31-40 days of age and 26 (1.9%) outbreaks in 41-50 days of age. This indicates an increase in number of IBD outbreaks in 11-20 days of age cases as compared to earlier reports. Preeti *et al*., (2018) [14] reported that the birds of age group of 21-30 days were more affected with IBD as compared to other age groups. The highest occurrence of IBDV in the age group of 22-28 days might be associated with the immunosuppression occurring in the particular age group of birds. The variation in the mortality and morbidity could be due to difference in age, size of organs managemental practices, concurrent infection, weather conditions and degree of virulence of IBDVs.

Conclusion

Infectious bursal disease (IBD) is a highly contagious disease that emerges as constant threat to poultry industry worldwide causing severe economic losses. The present study recorded highest mortality in district Ganderbal (75.0%), followed by Srinagar (42.2%), Budgam (41.4%) and Shopain (33.8%). The highest mortality associated with infectious bursal disease was recorded in the age group of 21-30 days. The overall mortality in the flock was 34.7%. Thus, we concluded that careful IBDV monitoring and clustering of IBDV outbreak pattern in the chicken of Kashmir valley is very important to implement certain preventive and control measures in combating the disease.

Conflict of Interest

The authors declare that they have no competing interest.

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