



Seroprevalence of Infectious Bursal Disease (IBD) in Layers at Karachi During 2017-2019

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Abstract | Infectious bursal disease (IBD) is a severe, highly contagious immunosuppressive disease that has become impediment for poultry production. To know the seroprevalence of IBD, a total of 1162 blood samples such as 257, 431 and 474 during 2017, 2018 and 2019 respectively, were collected from suspected layers and analyzed through agar gel precipitation (AGP) test. Results revealed that the overall seroprevalence of IBD was 38.29% which was nonsignificantly different ($p>0.05$) in different seasons during 2017 (38.13%), 2018 (35.73%) and 2019 (40.71%) respectively. The seroprevalence of IBD was significantly reduced ($p<0.05$) in vaccinated birds (14.31%) than non-vaccinated birds (26.03%) and birds having treatment (23.12%) compared to untreated birds (31.53%); whereas the seroprevalence was found nonsignificantly different ($p>0.05$) with age, sex, and type of treatment. These results demonstrated that the seroprevalence of IBD is not different in different seasons during 2017, 2018 and 2019 but have significant association with vaccine and treatment used.

Keywords | Seroprevalence, Infectious bursal disease, Layers, Seasons, Karachi

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INTRODUCTION

Poultry is a second largest and rapidly growing sector of agriculture in Pakistan (Hussain et al., 2019). Infectious bursal disease (IBD) is a considered as a major viral disease which damaged the poultry industry. IBD is a severe immunosuppressive and highly contagious disease of wild birds and poultry, caused by *Birna* virus of family *Birnaviridae* (Ferrero et al., 2015). There are two stereotypes of IBD, such as stereotype I and II. Only stereotype I caused clinical disease in poultry (Muller et al., 2003). Serotypes I was further classified into four subtypes as classical, very virulent (vvIBD), variant and artificially

attenuated (Vakharia et al., 1994).

Infectious bursal disease (IBD) is the most important disease in which B lymphocytes were affected and the birds become less defensive (Fan et al., 2019). It became a constraint for poultry production, most devastating and ill-defined in Pakistan (Hussain et al., 2020). It was first time isolated from poultry in 1962 from Gumboro, Delaware, USA so it is called as Gumboro (Cosgrove, 1962). It was initially isolated in 1971 from northern areas of Pakistan (Qureshi, 1999) afterwards it was not given importance for 15 years and then reported as a major problem of layers in 1987 in Peshawar (Siddique et al., 1987). The incidences

Table 1: The seroprevalence of Infectious bursal disease (IBD) in different seasons during 2017 to 2019.

Seasons	Total samples	No. of +ve samples	Seroprevalence of IBD n (%)			Prevalence	P-value
			2017	2018	2019		
Winter	244	106	25/66 (37.87)	41/90 (45.55)	40/88 (45.45)	43.44	0.277
Summer	396	145	23/61 (37.70)	24/80 (30.00)	98/255 (38.43)	36.61	
Spring	303	114	24/60 (40.00)	46/137 (33.57)	44/106 (41.50)	37.62	
Autumn	219	80	26/70 (37.14)	43/124 (34.67)	11/25 (44.00)	36.52	
Total	1162	445	98/257 (38.13)	154/431 (35.73)	193/474 (40.71)	38.29	

Table 2: Factors affecting the seroprevalence of infectious bursal disease (IBD).

Factors affecting	Levels	No. of samples	Mortality rate (%)	IBD positive n (%)	X ²	P-value
Age	<30 weeks	581	25	181(31)	0.47	0.48
	>30 weeks	581	22	192(33)		
Sex	Male	580	15	154(26.55)	0.72	0.39
	Female	582	19	167(28.69)		
Vaccine	Vaccinated	440	12	63(14.31)	22.17	0.0001
	Non-vaccinated	722	16	188(26.03)		
Treatment	Yes	588	21	136(23.12)	10.34	0.0013
	No	574	24	181(31.53)		
Medication type	Antibiotics	652	17	157(24.07)	0.86	0.352
	Antibiotics +vitamin	510	11	111(21.76)		

of IBD in poultry in Pakistan were increased which caused morbidity 70% and mortality 15% in affected birds (Khan et al., 1988b). Initially the farmers were unaware, but later diagnosed by clinical signs (Siddique et al., 1987, Farooq et al., 2000). After that, the prevalence of IBD was found 60% compared to other diseases (Farooq., 2003). IBD caused major losses in brooding (50.4 %) and laying age (18.3%) (Farooq et al., 2002). The outbreaks of IBD has been increased in poultry at Pakistan which has become an impediment in the poultry production and has now become endemic (Khan et al., 2017).

Due to increased incidences of infectious bursal disease and major loss in poultry production; this study was designed to know the seroprevalence and factors affecting the incidences of infectious bursal disease in poultry at Karachi.

MATERIALS AND METHODS

SELECTION OF LAYER FARMS AND COLLECTION OF SAMPLES

The study was conducted on 192-layer farms located in Karachi. A total of 1162 blood samples were collected for this study including 257, 431 and 474 during 2017, 2018 and 2019 respectively. The samples were taken from suspected layers with clinical signs such as whitish diarrhea, leg paralysis and hemorrhagic bursa. The sample collection was

done in four seasons including Winter (December-February) Spring (March-May), Summer (June-August) and Autumn (September-November). The blood samples were collected through sterilized 5cc syringes from wing vein and sifted to new Eppendorf (1.5ml). The samples were properly labeled and transported to Research and Development Laboratory, Sindh Institute of Animal Health, Karachi. After that the samples were centrifuged at 3000 rpm for 5 minutes. The sera were collected into a sterilized Eppendorf's, labeled carefully, and stored at -20°C for further analysis.

AGAR GEL PRECIPITATION TEST (AGPT)

Agar Gel Precipitation was performed by making noble agar (Sigma Aldrich, Germany). Briefly, prepare noble agar (1%) in borate buffer comprising borate buffer (boric acid 1.2g and sodium tetraborate 3.841g per liter). After that the agar was dispensed in sterile petri plates for 15minutes at room temperature. The plates were inverted and placed at 4°C for further use. A central well was prepared surrounding six wells. The standard IBDV (25µl) was dispensed at central well and sera (25µl) were placed in surrounding wells. The petri plates were placed at 4°C and results were observed after every 12 hours till 72hours. The arc line formed between sera and standard antigen was noted.

STATISTICAL ANALYSIS

The data obtained was tabulated on Microsoft Excel sheet and the prevalence percentage was calculated. Furthermore, the significance level ($p \leq 0.05$) was calculated through Chi square test by using Graph Pad Prism-5.

RESULTS

Results of current study revealed that the overall seroprevalence of infectious bursal disease (IBD) was 38.29% which was nonsignificantly different ($p > 0.05$) during 2017 (38.13%), 2018 (35.73%) and 2019 (40.71%) respectively. Furthermore, the seasonal seroprevalence of IBD during 2017 was found slightly higher in spring (40%), compared to winter (37.87%), summer (37.70%) and autumn (37.14%) respectively. Correspondingly, the seroprevalence of IBD during 2018 was found higher in winter (45.55%) whereas lower in summer (30%) while moderate in spring (33.57%) and autumn (34.67%), the seroprevalence of IBD during 2019 was higher in winter (45.45%), followed by autumn (44.0%), spring (41.50%) and summer (36.61%) respectively (Table 1).

The results further revealed that the seroprevalence of IBD was influenced by various factors specially age, sex, vaccination, treatment, and type of medication. The seroprevalence of IBD was found non-significantly different ($p > 0.05$) in birds of age greater than 30 weeks (33%) than birds of age less than thirty (31%); female (28.69%) and male (26.55%), treated with antibiotics (24.07%) and antibiotics along with vitamins (21.76%); whereas significantly reduced ($p < 0.05$) in vaccinated birds (14.31%) than non-vaccinated birds (26.03%) and birds having treatment (23.12%) compared to untreated birds (31.53%) respectively (Table 2).

DISCUSSION

Infectious bursal disease is an acute, highly contagious, and immunosuppressive disease of birds caused by *Birnavirus* of family *Birnaviridae*; it has become a major constraint for the poultry production. The incidences of IBD in layers was increased at Karachi which affects the layer production either in brooding or in laying stage since last five decades. The disease is responsible for severe economic losses in the poultry industry throughout the world. IBD virus (IBDV) is a double-stranded RNA virus which has two serotypes but only serotype 1 is known for causing the infection in young chickens. The virus mainly infects the bursa of Fabricius; particularly the actively dividing and differentiating lymphocytes of the B-cells lineage in immature chickens which leads the morbidity, mortality, and immunosuppression (Dey et al., 2019). IBD has now become endemic in poultry therefore, it is necessary to screen the seroprevalence of IBD in layer flocks located in Karachi.

Results of present study revealed that the seroprevalence of infectious bursal disease (IBD) was non significantly different in all seasons during 2017, 2018 and 2019. The findings of current study are in correspondence with (Asame-new et al., 2016); who have found the average prevalence of IBD was 38.3% (69/180), the highest prevalence was 58.6% and the lowest was 9.4 % in the Koche and Tefki. Correspondingly, the prevalence of IBDV was 40.8% in Wolmera (Hailu et al., 2010) and 38.39% in Bahrdar (Sinidu et al., 2015). Likewise, the IBD was relatively higher in the monsoon as 36.73% (Choudhary et al., 2012). The mortality was comparatively high in winter than summer and autumn (Rashid et al., 2013). The seroprevalence of IBD in backyard chickens in Ethiopia was detected 82.2% through indirect ELISA. The higher prevalence might be due to method of detection and environmental conditions. Interestingly, the seroprevalence of IBD in 2018 was 41.41% which was non-significantly different ($p \leq 0.05$) in various seasons including winter, summer, spring, and autumn respectively. The results of present study are contrary to (Kassa and Molla, 2012) has found the prevalence of IBD as 85.4% in the Addis Ababa. Likewise, 72.7% in the Gondor (Thrusfield, 2005), 89.78% in the Woliso (Hailu et al., 2010), 90.3% in the Mekele (Shiferaw et al., 2012). However, Lawal et al. (2014) have found the prevalence of IBD (84.4%) in the rainy season and (40.3%) in dry season. The lower prevalence of IBD in current study may be due to the area of study, rain fall, environmental conditions and scavenger that carry viral agents from farm to farm.

Furthermore, the results showed that the seroprevalence infectious bursal disease (IBD) in 2019 was 40.6% which was comparatively similar ($p > 0.05$) in winter, summer, spring and autumn respectively. The findings of current study are in agreement with (Yuguda and Baba, 2002) who have found the prevalence of IBD (45.7%) in the summer in Borno State. Furthermore, Khan et al. (2009) have found that the prevalence of IBD was 7.75%. The higher prevalence was due to environment conditions, poor management, and less skilled persons at poultry farms.

Interestingly, the seroprevalence of IBD was significantly reduced ($p \leq 0.05$) in vaccinated birds compared to non-vaccinated birds and birds having treatment than birds having no treatment. Although, the seroprevalence does not differ with age, sex, and type of treatment. The results are in agreement with (Zeryehun and Fekadu, 2012) who have found that the prevalence of IBD was significantly influenced by site of study, age of birds, sex and vaccination program. However, Lawal et al. (2014) have found the prevalence of IBD (84.4%) in the rainy season and (40.3%) in dry season. Males chickens associated with higher prevalence (59.9%) than female chickens (52.2%). It would be interesting to know that whether vaccine reduce the rate

of infection and shedding of the virus or only reduce the signs of the disease, though the vaccine of IBD is frequently used in birds but still the rate of infection is high.

CONCLUSION

It is concluded that the seroprevalence of IBD was not significantly different in different seasons from 2017 to 2019. Moreover, it is significantly associated with vaccination program and the treatment but does not associated with age, sex and type of treatment used.

CONFLICT OF INTEREST

There is no conflict of interest.

AUTHORS CONTRIBUTION

All authors contributed equally.

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