

*Article*

**Incidence of diseases in Japanese quail (*Coturnix coturnix japonica*) with special reference to bacterial and viral diseases in some selected areas of Bangladesh**

Md. Taimur Islam<sup>1\*</sup>, Anup Kumar Talukder<sup>2</sup>, Md. Ataur Rahman<sup>3</sup>, Md. Golam Haider<sup>1</sup> and Abu Nasar Md. Aminoor Rahman<sup>2</sup>

<sup>1</sup>Department of Pathobiology, Faculty of Veterinary Medicine and Animal Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh

<sup>2</sup>Department of Gynecology, Obstetrics and Reproductive Health, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh

<sup>3</sup>Department of Surgery and Radiology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, Bangladesh

\*Corresponding author: Md. Taimur Islam, Department of Pathobiology, Faculty of Veterinary Medicine and Animal Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Salna, Gazipur-1706, Bangladesh. Phone: +88-01712547950, +81-80-3522-2136; E-mail: shiplu\_bau@yahoo.com

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**Abstract:** Quail industry has become a promising sector in livestock of Bangladesh in last decade. This study was aimed to find out the incidence of bacterial and viral diseases in Japanese quail (*Coturnix coturnix japonica*) in Bangladesh. This is the first report about the incidences of diseases in Japanese quail in Bangladesh. The incidences of diseases were investigated by the clinical signs, gross lesions in different organs and histopathological changes of different tissues in bacterial and viral diseases. A total number of 476 birds, either diseased or dead, from 40 quail farms were included in this study. The result showed that the occurrence of viral and bacterial diseases in Japanese quail were 25.21% and 34.45%, respectively where as 15.13% cases were mixed infection. Newcastle disease was found as most prevalent (11.35%) among the viral diseases. On the other hand, colibacillosis was the highest prevalent disease accounting for 15.34% among all bacterial diseases. Moreover, 22.48% cases were other types of infections (mycoplasmosis, coccidiosis, aspergillosis, deficiency disorder and internal parasitic problem) and 2.73% cases were unidentified. The highest numbers of diseases were found in the age group 21 to 30 days (23.53%) whilst the quails aged between 11 to 40 days (59.67) were most vulnerable to various diseases. The highest occurrences of diseases were found in rainy season (39.29%). It can be concluded that Newcastle disease and colibacillosis are the most frequent challenge for the quail farming in Bangladesh. Strict bio-security and proper management system might effectively reduce the incidences of the reported diseases.

**Keywords:** incidence; Japanese quail; histopathology; bacterial and viral diseases

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## 1. Introduction

Now a -days, Poultry in Bangladesh, as an emerging sub-sector of livestock, plays a vital role in her economic development by providing employment of people in different sectors. The number of the poultry farming is increasing for the last few years. In Bangladesh, 153 million fowl and 13 million duck population were estimated which contribute a major domestic income especially egg, meat etc. (Samad, 2005).

Among different types of poultry farming, quail farming is more profitable because Japanese quail (*Coturnix coturnix japonica*) has faster growth, early sexual maturity, high rate of egg production, short generation interval (3-4 generations a year), short incubation period of hatching eggs, less feed cost, small floor space, less feed requirements and less susceptibility to common chicken diseases (Panda, 1990; Panda *et al.*, 1987).

Like other poultry, quail farming development also depends on management, breeding, feeding as well as prevention, control and treatment of diseases. Japanese quail can be affected with various types of viral, bacterial and fungal diseases (Rahman, 2004). The diseases of quail can be classified according to causal agents. Such as viral disease: Quail bronchitis, Newcastle disease (ND), Infectious bursal disease (IBD), Marek's disease, lymphoid leukosis, encephalomyelitis, pox disease etc. Among the bacterial diseases, colisepticemia, fowl cholera, fowl typhoid, salmonellosis are found in Japanese quail. Some fungal diseases (Brooder's pneumonia, candidiasis etc.) and parasitic diseases also occur in Japanese quail (Rahman, 2004).

Diagnosis of disease is very important for proper treatment of a disease. For the diagnosis of a disease clinical signs, gross tissue changes and histopathological examination is very important. However, incidence of quail diseases and histopathological identification of bacterial and viral diseases of quail has not been studied yet in Bangladesh.

It is very important to identify the diseases those are present in commercial quail farms of Bangladesh for sustainable quail farming. This will be helpful for the development of poultry industry and for the ultimate development of the country. Therefore, this study was performed to diagnose the bacterial and viral diseases of quail by observing the clinical signs, necropsy findings and histopathological changes in different tissues. In this Study, the incidence of bacterial, viral diseases and other diseases in Japanese quail in Bangladesh were investigated and the clinical signs, gross lesions in different organs and histopathological changes in different tissues were assessed.

## **2. Materials and Methods**

### **2.1. Study area**

This study was conducted in some selected districts of Bangladesh viz. Khulna, Kushtia, Jessore, Bogra, Shylhet and Netrokona. The quail farmers have been developing Japanese quail farms in the study areas for their livelihoods or for commercial point of view.

### **2.2. Study population**

First of all, forty (40) quail farms were selected. Then dead birds and diseased birds from those farms were brought to the laboratory of Faculty of Veterinary Medicine and Animal Science of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Bangladesh for the necropsy and examination of gross lesions in different organs. Diseased birds were examined to identify the clinical signs and then necropsy was performed. A total number of 476 birds of either diseased or dead were included in this study.

### **2.3. Collection of samples**

At necropsy a systemic dissection was made and gross changes in different tissues were recorded. Following necropsy of both dead and diseased birds, some representative organs (comb, wattle, trachea, lungs, liver, brain, spleen, heart, kidney, caecal tonsils, intestine, proventriculus, gizzard, bursa of fabricius, shanks and egg follicle) were collected (Chauhan and Roy, 2008).

### **2.4. Histopathological examination**

For histopathological studies, all the collected samples were cut into pieces, fixed in the 10% neutral buffered formalin (Gridley, 1960), dehydrated in a series of ascending grades of alcohol, cleared in several changes of xylene and infiltrated with different grades of melted paraffin in the oven at 56° C. The tissues were then embedded in paraffin and finally the sections were cut at 6- $\mu$ m thickness using rotatory microtome. Then the sections were stained with Hematoxylin and Eosin staining method (H&E) (Luna, 1968).

### **2.5. Methods of diagnosis**

The diagnosis of different diseases were based on the history of the flock, age of affected birds, clinical signs, postmortem lesions and histopathology described by Calnek *et al.* (1997).

### **2.6. Statistical analysis**

The data generated from this experiment were entered in Microsoft Excel worksheet, organized and processed for further analysis and descriptive statistical analysis was performed.

### 3. Results and Discussion

#### 3.1. Incidence of diseases

There is, however, dearth of information on the incidence of bacterial and viral diseases in Japanese quail and pathological changes in different tissues caused by these diseases in Bangladesh. In this study, the occurrence of viral and bacterial diseases in Japanese quail was 25.21% and 34.45%, respectively. About 15.13% cases were mixed infection (Table 1). Moreover, 22.48% cases were other types of infection and 2.73% cases were unidentified due to lack of diagnostic facilities and autolysis of the birds (Table 1).

##### 3.1.1. Viral diseases

ND was found as most prevalent (11.35%) among the viral diseases. The frequency of IBD and pox were 7.98% and 5.88%, respectively (Table 1). It has been reported that ND positive cases in chicken in Mymensingh region were 6.73% and 10.24% (Islam *et al.*, 2003; Talha *et al.*, 2001). The present findings would indicate that the incidence of ND in commercial flocks is a big threat to the rising quail industry in Bangladesh in spite of regular use of ND vaccines. It's needed to be investigated if the emergence of ND is due to vaccination failure or any other factor.

##### 3.1.2. Bacterial diseases

Colibacillosis was the highest prevalent disease constituting 15.34% among all bacterial diseases. The frequency of Salmonellosis and necrotic enteritis were 11.97% and 7.14%, respectively (Table 1). In the previous report, Colibacillosis in chicken of Mymensingh region was 13.12% (Talha *et al.*, 2001) which is almost similar to the present findings (15.34%). But these findings are higher than those of Sylhet region (5.17%) and Narsingdi region (5.7%) (Islam *et al.*, 2003; Uddin *et al.*, 2010). It has been reported that the occurrence of Salmonellosis and necrotic enteritis in chicken of Sylhet region was 6.73% and 0.44%, respectively (Islam *et al.*, 2003) and in chicken of Narshingdi region was 7.68% and 0.4%, respectively (Uddin *et al.*, 2010). The present findings of Salmonellosis and necrotic enteritis were elevated than those of Sylhet and Narsingdi region (Islam *et al.*, 2003; Uddin *et al.*, 2010). These results indicated that the increase of bacterial diseases might be due to poor management of the farm.

##### 3.1.3. Mixed infections

The prevalence of mixed infections in Japanese quail was IBD+Coccidiosis (2.73%), IBD+ND (5.04%), IBD+ND+Coccidiosis (1.26%) and Salmonellosis+ Colibacillosis (6.09%) (Table 1).

##### 3.1.4. Miscellaneous infections

Along with bacterial and viral diseases, other diseases were also found in Japanese quail such as Chronic respiratory disease (CRD)/ Mycoplasmosis (5.05%), Aspergillosis (3.99%), Coccidiosis (5.25%), Deficiency disorder (3.57%), internal parasitic problem (4.62%) and 2.73% cases were unidentified (Table 1). Islam *et al.* (2003) reported 5.32% of Mycoplasmosis in chicken which is similar to the present findings in quail. In the present study, we found 3.99% of cases of Aspergillosis in quail which is very close to the findings of 4.20% positive cases in chicken in Mymensingh region (Talha *et al.*, 2001). In the present study, Coccidiosis in Japanese quail constituted 5.25% of the total cases which correlates with the previous results in chicken (Talha *et al.*, 2001; Kutubuddin, 1973; Sarker, 1976).

#### 3.2. Age related occurrence of diseases in Japanese quail

The prevalence of diseases in Japanese quails in relation to age is presented in Table 2. The highest number of cases were recorded in the age group of 21-30 days (23.53%), followed by 11-20 days age group (19.33%), 31-40 days age group (16.81%), over 60 days age group (12.61%), 41-50 days age group (11.55%), 0-10 days age group (9.66%) and 51-60 days age group (6.51%) of quail. Conclusively, it could be mentioned that quails aged between 11 to 40 days (59.67%) were most vulnerable to various diseases. Lack of proper brooding system, sanitation, hygiene specially poor bio-security may be the main cause and the most prevalent diseases like IBD, ND, colibacillosis, salmonellosis, aspergillosis, coccidiosis and mycoplasmosis demand immediate attention for prevention and control.

**Table 1. Incidence of diseases in Japanese quail.**

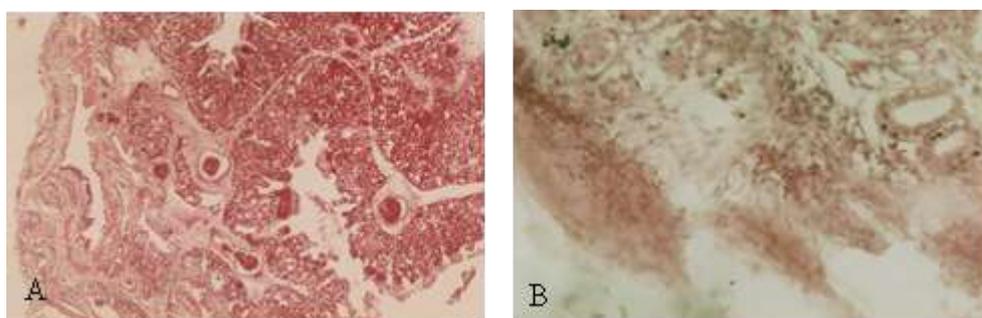
Diseases	No. of cases	Percentage (%)	
IBD	38	7.98	
ND	54	11.35	Viral diseases
Pox	28	5.88	
<b>Total</b>	<b>120</b>	<b>25.21</b>	
Salmonellosis	57	11.97	
Colibacillosis	73	15.34	Bacterial diseases
Necrotic Enteritis	34	7.14	
<b>Total</b>	<b>164</b>	<b>34.45</b>	
IBD+Coccidiosis	13	2.73	
IBD+ND	24	5.04	Mixed infections
IBD+ND+Coccidiosis	06	1.26	
Salmonellosis+ Colibacillosis	29	6.10	
<b>Total</b>	<b>72</b>	<b>15.13</b>	
CRD/Mycoplasmosis	24	5.04	
Coccidiosis	25	5.25	
Aspergillosis	19	3.99	Miscellaneous infections
Deficiency disorder	17	3.58	
Internal parasitic problem	22	4.62	
<b>Total</b>	<b>107</b>	<b>22.48</b>	
Unidentified cases	13	4.83	

**Table 2. Incidence of diseases in Japanese quail in relation to age.**

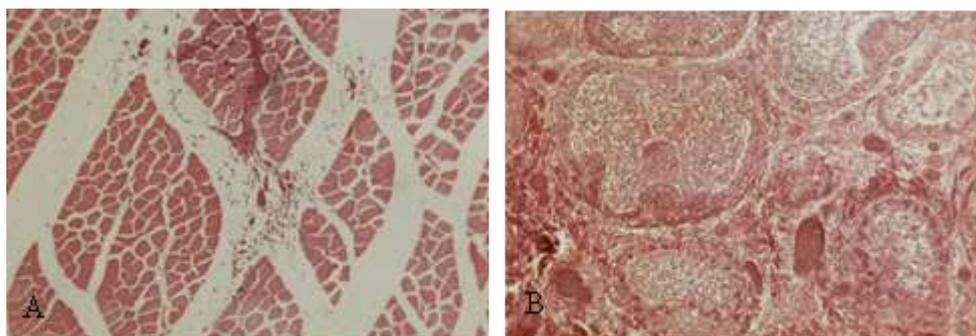
Diseases	Age of the bird (days)						
	0-10	11-20	21-30	31-40	41-50	51-60	Over 60
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
IBD	-	03 (0.63%)	17 (3.57%)	13 (2.73%)	05 (1.05%)	-	-
ND	-	07 (1.47%)	12 (2.52%)	04 (0.84%)	03 (0.63%)	06 (1.26%)	22 (4.62%)
Pox	-	-	03 (0.63%)	06 (1.26%)	02 (0.42%)	03 (0.63%)	14 (2.94%)
Salmonellosis	08 (1.68%)	23 (4.83%)	16 (3.36%)	5 (1.05%)	04 (0.84%)	01 (0.21%)	-
Colibacillosis	26 (5.46%)	20 (4.20%)	12 (2.52%)	03 (0.63%)	04 (0.84%)	04 (0.84%)	04 (0.84%)
Necrotic Enteritis	-	-	-	05 (1.05%)	14 (2.94%)	08 (1.68%)	07 (1.47%)
Aspergillosis	08 (1.68%)	11 (2.31%)	-	-	-	-	-
CRD/Mycoplasmosis	-	02 (0.42%)	06 (1.26%)	06 (1.26%)	08 (1.68%)	02 (0.42%)	-
Coccidiosis	-	-	12 (2.52%)	10 (2.10%)	02 (0.42%)	01 (0.21%)	-
IBD+Coccidiosis	-	01 (0.21%)	08 (1.68%)	04 (0.84%)	-	-	-
IBD+ND	-	-	08 (1.68%)	12 (2.52%)	04 (0.84%)	-	-
IBD+ND+Coccidiosis	-	-	02 (0.42%)	02 (0.42%)	02 (0.42%)	-	-
Salmonellosis+ Colibacillosis	03 (0.63%)	14 (2.94%)	08 (1.68%)	03 (0.63%)	1 (0.21%)	-	-
Deficiency disorder	-	05 (1.05%)	04 (0.84%)	03 (0.63%)	02 (0.42%)	02 (0.42%)	01 (0.21%)
Internal parasitic problem	-	-	03 (0.63%)	02 (0.42%)	01 (0.21%)	04 (0.84%)	12 (2.52%)
Unidentified cases	01 (0.21%)	06 (1.26%)	01 (0.21%)	02 (0.42%)	03 (0.63%)	-	-
<b>Total</b>	<b>46 (9.66%)</b>	<b>92 (19.33%)</b>	<b>112 (23.53%)</b>	<b>80 (16.81%)</b>	<b>55 (11.55%)</b>	<b>31 (6.51%)</b>	<b>60 (12.61%)</b>

**Table 3. Seasonal occurrence of diseases in Japanese quail.**

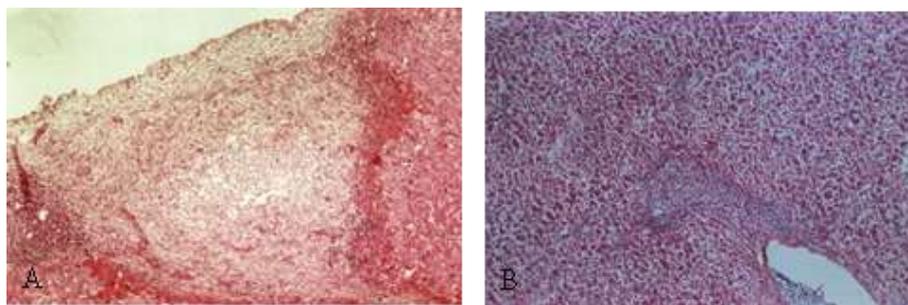
Diseases	Seasons			Number of cases encountered
	Rainy	Winter	Summer	
IBD	19 (3.99%)	7 (1.47%)	12 (2.52%)	38 (7.98%)
ND	18 (3.78%)	24 (5.04%)	12 (2.52%)	54 (11.35%)
Pox	3 (0.63%)	2 (0.42%)	23 (4.83%)	28 (5.88%)
Salmonellosis	32 (6.72%)	8 (1.68%)	17 (3.57%)	57 (11.97%)
Colibacillosis	22 (4.62%)	40 (8.40%)	11 (2.31%)	73 (15.34)
Necrotic Enteritis	16 (3.36%)	4 (0.84%)	14 (2.94%)	34 (7.14%)
Aspergillosis	10 (2.10%)	8 (1.68%)	1 (0.21%)	19 (3.99%)
CRD/Mycoplasmosis	9 (1.89%)	13 (2.73%)	2 (0.42%)	24 (5.04%)
Coccidiosis	9 (1.89%)	10 (2.10%)	6 (1.26%)	25 (5.25%)
IBD+Coccidiosis	4 (0.84%)	8 (1.68%)	1 (0.21%)	13 (2.73%)
IBD+ND	14(2.94%)	3 (0.63%)	7 (1.47%)	24 (5.04%)
IBD+ND+Coccidiosis	4 (0.84%)	1 (0.21%)	1 (0.21%)	06 (1.26%)
Salmonellosis+ Colibacillosis	11(2.31%)	13 (2.73%)	5 (1.05%)	29 (6.09)
Deficiency disorder	5 (1.05%)	7 (1.47%)	5 (1.05%)	17 (3.57%)
Internal parasitic problem	8 (1.68%)	8 (1.68%)	6 (1.26%)	22 (4.62)
Unidentified cases	3 (0.63%)	4 (0.84%)	6 (1.26%)	13 (2.73%)
Total	187 (39.29%)	160 (33.61%)	129 (27.10%)	476 (100.00%)



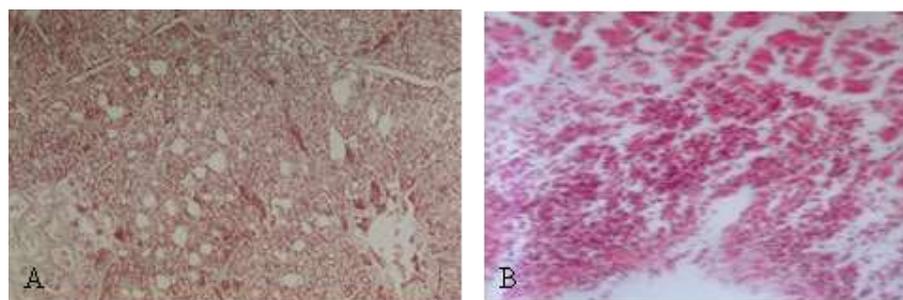
**Figure 1. Histopathological findings of ND in quail. (A) Severe congestion on lungs tissue. (H & E: 83X). (B) Presence of hemorrhage and huge infiltration of mononuclear cells in the proventriculus. (H& E: 83X).**



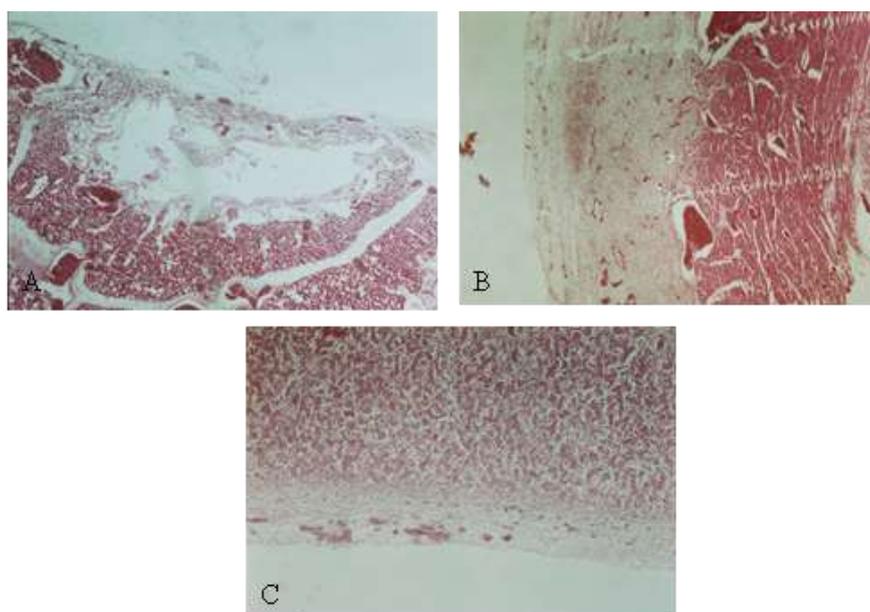
**Figure 2. Histopathological findings of IBD in quail. (A) Severe hemorrhage on muscle septa. (H & E: 83X). (B) Severe hemorrhage on follicles of bursa & moderate depletion of lymphoid follicular cells. (H & E: 83X).**



**Figure 3. Histopathological findings of Salmonellosis in quail. (A) Presence of hemorrhage and focal area of necrosis in liver. (H & E: 83X). (B) Focal necrosis with infiltration of mononuclear cell around the central vein. (H & E: 83X).**



**Figure 4. Histopathological changes due to Colibacillosis in quail. (A) Presence of congestion and fibrinous exudation with reactive cell in interstitial space in Lung. (H & E: 83X). (B) Huge infiltration of mononuclear cells in portal area of liver. (H & E: 330X).**



**Figure 5. Histopathological changes due to mycoplasmosis in quail. (A) Presence of congestion & accumulation of fibrin in lung parenchyma. (H & E: 83X). (B) Presence of fibrin layer, congestion, thickening of the pericardium & infiltration of inflammatory cell in Heart. (H & E: 83X). (C) Presence of fibrin layer and congestion in liver. (H & E: 83X).**

### 3.3. Seasonal occurrence of diseases in Japanese quail

A total of 476 quail were examined throughout the year. The highest occurrence of diseases were found in rainy season (39.29%) followed by winter (33.61%) and summer (27.10%) season (Table 3). Three types of bacterial diseases were observed in quail such as salmonellosis, necrotic enteritis and colibacillosis. Among these diseases the occurrence of colibacillosis was the highest (15.34%) and the most occurrence of colibacillosis was observed in winter season (8.40%) compared to other two seasons. This finding did not match with Mushi *et al.* (2008) and Nicole *et al.* (2000) who found the highest occurrence of the diseases in chicken during the rainy season. There are some factors which make the birds more susceptible such as presence of ammonia, dust in poultry house, over-stocking, poor hygienic management, high temperature of the shed, poor ventilation etc. (Barnes and Gross, 1997). These factors are more prominent during the winter seasons compared to other two seasons in our country. Due to these reasons, the result might be varied with others. Highest occurrence of salmonellosis (6.72%) was observed in rainy season. The observed viral diseases were ND, IBD and pox. The highest occurrence of IBD was observed in rainy (3.99%) season. This result was similar with that of Islam *et al.* (2003) who reported the highest occurrence of IBD in chicken was found in rainy season in Sylhet region of Bangladesh. Occurrence of ND was highest in winter season (5.04%).

### 3.4. Pathological study

#### 3.4.1. Newcastle disease (ND)

Necropsy examination of quails, died of ND showed Hemorrhages on the tip of the glands of the proventriculus. Dark red or purple red button shaped hemorrhagic lesions associated with necrosis in the intestinal wall were noticed. Severe inflammation of the trachea and air sacs were also observed. The necropsy lesions observed in this study of ND are in conformity with the earlier reports in chicken (Bhattacharjee *et al.*, 1996a; Talha *et al.*, 2001; Rahman and Samad, 2005).

Microscopically, severe congestion on lungs tissue was found (Figure 1A). Presence of hemorrhage and huge infiltration of mononuclear cells were found in the proventriculus (Figure 1B). These findings are similar with the findings in chicken (Calnek *et al.*, 1997; Chauhan and Roy, 2008).

#### 3.4.2. Infectious bursal disease (IBD)

Necropsy examination of dead quails, caused by IBD, showed severe hemorrhages on thigh and pectoral muscles and serous, catarrhal or caseous exudation in the trachea. Swollen and hemorrhagic bursa of febricius was found. Pale and swollen kidneys were found in some cases. The necropsy lesions observed in this study of IBD are in conformity with the previous reports in chicken (Bhattacharjee *et al.*, 1996b; Talha *et al.*, 2001; Rahman and Samad, 2005).

Microscopically, severe hemorrhages were seen on inter-muscular septa (Figure 2A). Severe hemorrhages were also found on follicles of bursa and moderate depletion of lymphoid follicular cells (Figure 2B) were observed as previously reported (Calnek *et al.*, 1997; Chauhan and Roy, 2008).

#### 3.4.3. Pox

Gross examination of sick birds and necropsy examination of dead birds caused by fowl pox, showed typical skin lesions which included rough, gray or dark brown or necrotic nodular lesions on the lip, wattle, fingers and eyelid as reported by Calnek *et al.* (1997) in chicken.

#### 3.4.4. Salmonellosis

Grossly, the livers were enlarged and congested. In some cases, necrotic foci were present in the liver. Petechial hemorrhages were seen in the spleen, base of the heart and kidneys. In some cases, pneumonic and fibrotic lungs were found. There was catarrhal inflammation in the intestine. Unabsorbed yolk sacs were also found in some cases.

Microscopically, the section of the liver showed congestion, hemorrhages, focal degeneration, focal necrosis with infiltration of mononuclear cells and congestion of the central veins (Figure 3). The pulmonary lesions consisted of diffuse congestion and hemorrhage. The intestinal mucosa exhibited congestion, hemorrhages and infiltration of inflammatory cells. In many instances sloughing of mucosa epithelia were recorded as well.

#### 3.4.5. Colibacillosis

The birds were found lethargic, dehydrated and depressed with poor growth performance. Gross lesions included thickening of the air sacs, caseous exudation on the respiratory surfaces and congestion in the liver and spleen.

Microscopically, section of the lungs showed infiltration of heterophils, fibrinous exudation and pink colored fluid around the blood vessels (Figure 4A). In some cases, there was severe diffuse congestion in liver. Section of the liver showed infiltration of heterophils, lymphocytes and macrophages mainly in portal areas (Figure 4B). All the parameters used for diagnosis of salmonellosis and colibacillosis corresponded with the findings of many authors (Chisti *et al.*, 1985; Jordan and Pattison, 1996; Calnek *et al.*, 1997; Talha *et al.*, 2001; Pikipinyo *et al.*, 2002; Shome *et al.*, 2002; Wilkins *et al.*, 2002; Saleque *et al.*, 2003; Haider *et al.*, 2004; Chauhan and Roy, 2008).

#### 3.4.6. Necrotic enteritis

The small intestine was often distended with gases and the necrotic mucosa was visible through the wall. Sometimes, hemorrhages were seen through the intestinal wall. Sometimes, small intestine was filled with foul-smelling, brownish fluid, mixed with gas bubbles. Similar findings were observed as previously reported (Calnek *et al.*, 1997; Chauhan and Roy, 2008).

#### 3.4.7. Mycoplasmosis

Grossly, the birds were diagnosed with mycoplasmosis, showed fibrinous perihepatitis, fibrinous pericarditis and fibrinous pleuritis. Cheesy materials were found in the air sacs. In most of the cases, trachea was found congested.

Microscopically, in some cases, there were presence of fibrin layer and congestion in liver (Figure 5C). In some cases, presence of fibrin layer, congestion, thickening of the pericardium and infiltration of inflammatory cell in Heart (Figure 5B). Congestion and accumulation of fibrin in lung parenchyma were found (Figure 5A). These Necropsy findings and histopathological findings of mycoplasmosis in quail correlate with the previous findings in chicken (Calnek *et al.*, 1997; Chauhan and Roy, 2008).

#### 3.4.8. Aspergillosis

White color nodules were found in lungs and air sacs.

#### 3.4.9. Coccidiosis

Clotted blood was found in the cecum. The necropsy findings of aspergillosis and coccidiosis in Japanese quail were very similar to the published report on chicken (Calnek *et al.*, 1997; Chauhan and Roy, 2008).

### 4. Conclusions

There has been no report on the incidence of quail diseases in Bangladesh. This is the first study to diagnose the infectious diseases endemic in quail farms in Bangladesh. Among the quail diseases, infectious bursal diseases, Newcastle disease, salmonellosis, colibacillosis, necrotic enteritis, mycoplasmosis, coccidiosis etc. were more frequent in the study area. They were highly contagious diseases, worldwide distributed and cause higher proportional mortality in Japanese quail. We know that quail industry is a developing sector in Bangladesh. But these diseases are still endemic even in the well managed commercial flocks in different districts in Bangladesh in spite of intensive vaccination efforts. These diseases are constraint for the development of the quail industry. So, further investigation is necessary to clarify the various reasons of mortality in quail and to control its diseases.

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### Conflict of interest

None to declare.

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