

ORIGINAL ARTICLE

A Case of Newcastle disease from an outbreak in a commercial broiler farm in Mymensingh city, Bangladesh

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Abstract

Background

Newcastle disease (ND) is a contagious and often deadly viral disease caused by the Newcastle disease virus (NDV), affecting a wide variety of domestic and wild birds. The outbreak of this fatal disease is one of the greatest constraints to the expansion of poultry farms, resulting in significant financial losses. Here we report the clinical and pathological features of a ND case from an outbreak in a commercial broiler farm.

Materials and Methods

A broiler farm with a population of 850 birds aged 27 days reported the death of 100 chickens within 4 days of the onset of the disease in 2019. For investigation, one dead chicken was brought to the department of pathology, Bangladesh Agricultural University, Mymensingh. The case history was recorded, and an autopsy was performed. Portion of the samples were kept in 10% neutral buffered formalin for histopathological study.

Results

The morbidity and mortality rates were reported to be 17.65% and 11.47%, respectively. Recorded clinical history were depression, off-feed, huddling, gasping, ruffled feathers, greenish diarrhea, soiled vent and the birds were unvaccinated. On external examination, the birds appeared dehydrated, dyspneic and had nasal exudates, ruffled feathers, and soiled vents. Autopsy exhibited prominent gross lesions in the trachea, lungs, proventriculus, gizzard, intestine, cecal tonsil, liver, spleen and cloacal bursa. Grossly, tracheal hemorrhage, severe congestion in the lungs, pin point hemorrhages on the tip of the proventricular glands, hemorrhage in the cecal tonsil, button-like ulceration in the intestine and mottled spleen were suggestive of ND. Histopathologically, severe enteritis, necrotic mass in the cecal tonsil and proventriculus, lymphoid depletion in the spleen supported the infection of NDV. The clinicopathological findings of the ND outbreak in broiler farm confirmed that it was velogenic viscerotropic in nature.

Conclusion

ND in commercial flocks remains a threat to the poultry industry in Bangladesh. Implementation of strict biosecurity, husbandry practice and effective vaccination are required to prevent diseases and improve economic stability.

Keywords: Morbidity, mortality, pathology and velogenic viscerotropic.

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Introduction

Newcastle disease (ND) is a contagious and often deadly viral disease caused by the Newcastle disease virus (NDV), affecting a wide variety of domestic and wild birds. The outbreak of this fatal disease is one of the greatest constraints to the expansion of poultry farms, resulting in significant financial losses (Khatun *et al.*, 2018).

NDV is a non-segmented, single-stranded, negative sense RNA virus under the sub-family *Paramyxovirinae* and family *Paramyxoviridae*. Based on pathogenicity, NDV is classified into 4 pathotypes, namely velogenic, mesogenic, lentogenic and asymptomatic enteric. Again, velogenic pathotypes are classified as viscerotropic (visceral lesions) or neurotropic (nervous lesions) (Alexander and Senne, 2008). In Bangladesh, the velogenic viscerotropic NDV is endemic and causes substantial economic loss (Nooruzzaman *et al.*, 2015). In addition to viral strains, age and immune status of the bird, dose, route of entry and environmental factors are accountable for the pathogenicity of NDV. Nasal, oral and ocular are natural routes of infection and the respiratory system is said to be the primary predilection site for NDV. During naturally occurring infections, birds liberate the virus through small or large droplets and feces. So, susceptible birds become sick by inhalation of virus-containing droplets or by ingesting feces contaminated by feed (Alexander and Senne, 2008).

In young chicks, infection with a virulent strain produces sudden death without notable clinical indications. However, in older chickens, the disease may be more prolonged and show distinct clinical signs in the digestive tract, including respiratory distress and nervous signs (Ewies *et al.*, 2017).

The control of ND relies on the administration of a safe and effective vaccine on a regular basis. Livestock Research Institute of Bangladesh produces two vaccines: a baby chick rani khet disease vaccine and a ranikhet disease vaccine using lentogenic F strain and mesogenic muktेशwar strain of NDV. Virulent ND strains can still infect, replicate, and be excreted from

vaccinated birds. Virulent NDV can be found in the tissues and organs of both vaccinated and unvaccinated birds. Although all NDVs belong to the same serotype, multiple investigations have found antigenic and genetic variability among NDV isolates. NDV genotyping is a useful method because genotyping heterologous vaccines is less efficient in limiting virus proliferation and shedding following experimental exposure. By developing ND vaccines containing viruses that are similar to the most likely outbreak viruses, it may be possible to elicit an immune response that protects against not only morbidity and mortality, but also the spread of the virulent virus (Miller *et al.*, 2007).

The poultry industry contributes to a great extent to the agro-based economy of Bangladesh. ND is one of the prime fatal threats to the poultry sector not only in Bangladesh but also all over the world. A study reported that the average economic loss owing to the ND outbreak was calculated at BDT 2561 and an average of eight poultry birds per household per annum (Khatun *et al.*, 2018). Here, we have reported the clinicopathological findings of an outbreak of ND in a commercial broiler farm.

Materials and methods

A broiler farm with a population of 850 birds aged 27 days reported the death of 100 chickens within 4 days of the onset of the disease in 2019. For investigation, one dead chicken was brought to the department of pathology, Bangladesh Agricultural University, Mymensingh. The case history was recorded, and an autopsy was performed. Portion of the samples were kept in 10% neutral buffered formalin (NBF) for histopathological study. NBF fixed tissues were processed, embedded in paraffin, sectioned with 3-6 μm in thickness and then stained with Hematoxylin & eosin (H & E) according to Luna, 1968. The stained tissue sections were then mounted and examined under light microscope (ZIESS primo star) and the images were captured electronically.

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Results and Discussion

In Bangladesh, at the field level, poultry disease diagnosis is made mostly by reviewing the clinical histories, clinical signs and by pathognomonic pathological lesions during autopsy. Although, molecular techniques have proven to be more reliable, sensitive and specific methods for confirmatory diagnosis, but not available at the field level in our country. In this study, we also made the diagnosis based on clinical histories, clinical signs and pathological findings.

The owner reported that 100 birds died within four days and the birds were unvaccinated and kept in an intensive house. Recorded clinical signs were depression, off-feed, huddling, gasping, ruffled feathers, and greenish diarrhea and soiled vent (Eze *et al.*, 2014). An autopsy was performed to examine and record gross

findings. Upon opening the carcass, edematous fluid was found in the neck region. In the respiratory system, observed gross lesions were severe hemorrhagic trachea and congested, consolidated lungs. The liver showed mild congestion and hemorrhages. Hemorrhagic spots were found on the tips of proventricular glands, under the cornified layer of the gizzard as well (Figure 1). In addition, thickened hemorrhagic cecal tonsils and button-like ulceration in the intestine were present. Gradual examination revealed grey necrotic foci on the spleen and a severely hemorrhagic, edematous bursa along with a congested, enlarged kidney. These lesions are considered pathognomonic for ND in poultry and are consistent with previous findings (Etriwati *et al.*, 2017).

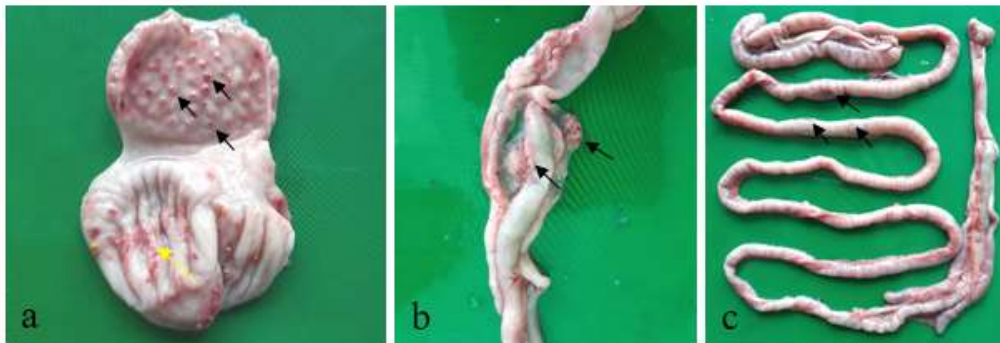


Figure 1. Gross pathological changes of naturally New Castle disease infected broiler. Lesions in the proventriculus and gizzard showed hemorrhages on the tip of the proventricular glands (a, black arrows) and under the cornified layer of gizzard (a, yellow arrow). Cecal tonsils showed hemorrhages (arrows). Lesions in the intestine showed button-like ulcers (arrows).

Histopathologically, lesions in the lungs revealed severe congestion and hemorrhages. In the trachea, hemorrhages were noticed. In the alimentary canal, severe enteritis characterized by infiltrates of mononuclear cells was observed. In addition, necrotic mass was seen in the proventriculus and cecal tonsil (Figure 2) consistent with the previous

findings of (Kabiraj *et al.*, 2020). The liver showed chronic perihepatitis at advanced stages.

Initially, NDV attacks respiratory epithelium cells by binding its surface glycoprotein with host cell receptors containing sialic acid that causes respiratory impairment (Ganar *et al.*, 2014). In the present case, which is evidenced

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by respiratory distress, nasal discharge, and congested trachea with exudates. A study of NDV tissue tropism and pathogenesis revealed that from the respiratory tract, the virus invades the intestine, cecal tonsil, and bursa of Fabricius either via direct contact within the intestinal lumen or primary viremia.

Later, the causative agent enters the proventriculus, liver, spleen, thymus, and kidney (Hussein *et al.*, 2019). Tracheitis,

congested lungs, enteritis, typhlitis, proventriculitis, bursitis were found in the present study that agrees with tissue tropism and pathogenesis of NDV. The clinicopathological findings of the outbreak of ND in broiler farm confirm that it is velogenic viscerotropic in nature. Examining the pathology of naturally infected chickens and assessing the distribution pattern of NDV led to a similar conclusion (Etriwati *et al.*, 2017).

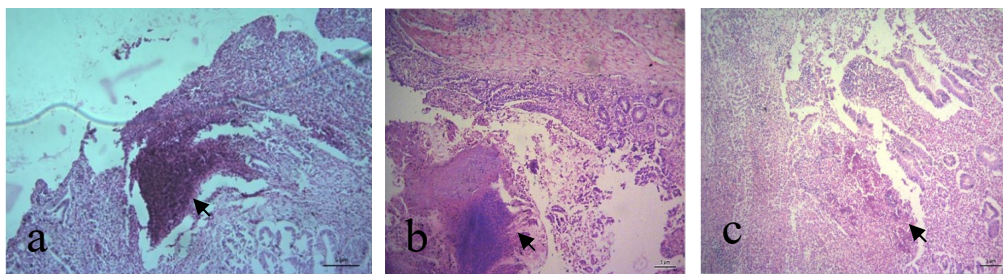


Figure 2. Histopathological changes of naturally New Castle disease infected broiler. Hematoxylin & Eosin stain, 10x. Lesions in the proventriculus showed formation of necrotic masses (a, arrow). Cecal tonsils also showed formation of necrotic masses (arrow). Lesions in the intestine showed severe enteritis which is characterized by infiltrates of mononuclear cells (arrow).

Conclusion

Despite the availability of ND vaccinations, ND in commercial flocks remains a threat to the poultry industry in Bangladesh. Implementation of strict biosecurity, husbandry practice and effective vaccination are required to prevent diseases and improve economic stability.

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Competing interest

The authors declare that they have no potential competing interests.

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