Preventive Veterinary Medicine 109 (2013) 354–358

Contents lists available at SciVerse ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

Short communication

A longitudinal study on the incidence of mortality of infectious diseases of commercial layer birds in Bangladesh

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ARTICLE INFO

Article history:
Received 1 December 2011
Received in revised form 16 October 2012
Accepted 21 October 2012

Keywords:
Chickens
Disease
Incidence rate
Longitudinal study
Proportional mortality rate
Newcastle disease
Marek's disease
Infectious bursal disease
Salmonellosis
Infectious bronchitis

ABSTRACT

A 20-month longitudinal field study was undertaken during the period from January 2010 to August 2011 to determine the incidence of mortality due to infectious diseases affecting commercial layer birds in 8 upazilas (an administrative unit) of 5 different districts in Bangladesh. Diagnosis of different diseases was made based on the flock history, age of birds, clinical signs, characteristic gross and microscopic lesions, and isolation and identification of the organisms. During the study period, 4710 birds were found dead as a result of disease occurrence. The incidence rate (true incidence rate) of mortality for the study period was 0.0171 per bird-months at risk. The incidences of mortality of almost all the infectious diseases were significantly higher in rainy followed by summer seasons. Particularly, mortality rate of ND and FC was significantly higher in rainy and summer seasons compared to winter and autumn seasons. And higher mortality rate of IBD, salmonellosis, IB, colibacillosis and MD was found in rainy than other three seasons. The highest mortality was recorded in birds below 8 weeks of age followed by birds aged 21 weeks and above. The mortality due to IBD was significantly higher (0.006) in the young birds (<8 weeks of age) than older birds. On the other hand, mortality rate of ND was significantly higher (0.003) in older birds (>8 weeks of age). Statistically no significant difference ($p > 0.05$) was observed in the mortality rate of colibacillosis between different age groups. The proportional mortality due to infectious diseases was 54.2% (including single or mixed infections). Of the overall mortality, 13.4% was attributed to ND, 9.53% to IBD, 6.69% to MD, 4.33% to IB, 4.23% to salmonellosis, 3.23% to FC, 3.31% to colibacillosis, 1.1% to aspergillosis and 45.8% to non-infectious causes. The findings indicated that infectious diseases appear to be a major constraint of commercial layer birds in Bangladesh.

1. Introduction

In Bangladesh, commercial poultry farming has been developed from the last few years, where high yielding strains of chickens are reared in an intensive system. Despite existing favorable agro-climatic conditions, the blooming poultry industry is witnessing a series of problems due to outbreaks of infectious and noninfectious diseases, resulting in mortality which brings high economic losses. The following infectious diseases have previously

Abbreviations: Asp, aspergillosis; Coli, colibacillosis; ELISA, enzyme-linked immunosorbent assay; FC, fowl cholera; HA, haemagglutination; HI, haemagglutination inhibition; IB, infectious bronchitis; IBD, infectious bursal diseases; MD, Marek's disease; ND, Newcastle diseases; Sal, salmonellosis; SPF, specific-pathogen-free.

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http://dx.doi.org/10.1016/j.prevetmed.2012.10.012

been diagnosed in Bangladesh and were considered in this study. Infectious bursal disease (IBD) is a highly contagious, world wide occurring viral poultry disease. It suppresses the immune system of affected birds by damaging organs of primarily the humoral cell defense, particularly from the bursa of Fabricius (Homer et al., 1992).

Newcastle disease (ND) is a common fatal viral disease. Infectious bronchitis (IB) is an acute highly contagious respiratory disease of chickens characterized by tracheal rales, coughing, and sneezing. Marek's disease (MD) is a lymphoproliferative disease of chicken characterized by lymphoma of gonads, iris, various visceral organs, muscle and skin, and lymphocytic inflammation of the peripheral nerves. Avian salmonellosis (Sal), a bacterial disease, occurs in acute or chronic forms and is caused by various members of the genus Salmonella, under the family Enterobacteriaceae. Fowl cholera (FC) (avian hemorrhagic septicemia) is a contagious disease caused by *Pasteurella multocida.* Avian colibacillosis (Coli) (*Escherichia coli* infection) is a major infectious disease of all ages of chickens. Aspergillosis (Asp) is encountered in commercial chickens in two forms: acute, with high morbidity and mortality, particularly in young birds; and chronic, found in adults. A good epidemiological understanding of infectious diseases is needed to facilitate their prevention, control and eradication. Therefore, the present study was undertaken to determine the incidence of mortality due to infectious diseases affecting commercial layer birds in the study area.

2. Materials and methods

2.1. Study areas, period and population

A longitudinal study was performed over a 20-month period between January 2010 and August 2011. Active surveillance was restricted to 306 flocks of 8 upazilas (an administrative unit of Bangladesh): Bera, Santhia, Shahjadpur, Sirajgonj sadar, Narayangonj sadar, Gazipur sadar, Balaganj, Sylhet sadar. As several upazilas are governed under a district, firstly, we have randomly selected five districts out of 64 and then 8 upazilas having at least one from each selected district. The list of poultry farms was collected from Upazila Livestock Offices and then 306 farms having at least 35 from each upazila were randomly selected.

2.2. Calculation of mortality rate of diseases

The incidence rate of mortality (true incidence rate), cumulative mortality and proportional mortality were measured. To calculate the season-specific incidence rates of mortality, all birds found dead during the study period were included in the numerator and the total number of bird-months at risk in the denominator. The number of birds for the denominator for a particular month was the arithmetic mean of the populations at the beginning and end of the month. Age- and flock-wise cumulative mortality was calculated by taking the number of dead birds due to a specific disease as the numerator and the number of birds at risk at the beginning in a flock as denominator. Proportional mortalities were calculated by using the number of deaths due to a specific disease as numerator divided by the number of total dead birds as denominator during the study period.

2.3. Collection of information and tissues

For collection of epidemiological data and tissues from dead birds, 8 field technicians were recruited, one for each upazila, and their performances were monitored monthly by a veterinarian from the Sylhet Agricultural University. Before sending the technicians to the farm investigation, they were trained for the work. Every technician visited at least thrice a week to the farmers' houses and collected information as well as dead birds which had died due to clinical illness. However, if any bird died other than the day of visit, farmers informed the technicians over mobile phone and then technicians collected the dead birds. The technician had a financial enticement at the rate of 50 taka (taka is the currency of Bangladesh; US$ 1 = 74.0 taka) for collecting each dead bird. The farmers were also compensated 30 taka per dead bird submitted. A total of 4710 birds died over the 20 months, of which 2553 (54.2%) were collected for further investigation (tissues from the bursa of Fabricius, liver, spleen, heart, lung, trachea and the gastrointestinal tract were collected from them).

2.4. Diagnosis of diseases

The diseases were diagnosed by following the criteria in the OIE Manual (OIE, 2009) with necessary modifications (Biswas et al., 2006) suitable for field conditions and laboratory facilities. In short, ND was diagnosed by propagating Newcastle disease virus (NDV) inoculums (collected from oro-nasal swabs; lung, kidneys, intestine, spleen, brain, liver and heart tissues, separately or as a pool) in 9–11-day-old specific-pathogen-free (SPF) chick embryos. Identification of the isolated virus was done by haemagglutination (HA) followed by haemagglutination inhibition (HI) test. Infectious bursal disease was diagnosed tentatively by observing pathological changes in the bursa of Fabricius and hemorrhage in the thigh or pectoral muscles. The agar gel precipitation test was used for confirmation of the infectious bursal disease virus (IBDV). Fowl cholera was diagnosed by observing the characteristic bi-polar organism in liver imprints stained by Giemsa. Salmonellosis and colibacillosis were diagnosed on the basis of isolation of the causative agent onto McConkey agar followed by typical biochemical characteristics shown by the organism. Aspergillosis was diagnosed by finding the characteristic colony produced on Sabouraud's dextrose agar. Marek's disease was diagnosed by observation of gross tumors in chickens, ocular or skin leucosis and nerve involvement. Histopathologically, small to medium lymphocytes comprised tumors, and lymphoid cells occurred in peripheral nerves. Infectious bronchitis was diagnosed by propagating inoculums prepared from the pooled organ tissues (trachea, lungs, kidneys, caecal tonsils and cloaca) through allantoic sac route of 10–11 days' old chicken embryo. The growth of the infectious bronchitis virus (IBV) was determined by finding characteristic changes in the embryos-curling and dwarfing at