Epidemiology of Important Poultry Diseases in Nepal

T. R. Gompo*,[1], U. Pokhrel[2], B. R. Shah[3],D. D. Bhatta[1]

[1] Department of Livestock Services, Central Veterinary Laboratory, Kathmandu, Nepal
[2] Agriculture and Forestry University, Chitwan, Nepal
[3]Institute of Agriculture and Animal Science, Tribhuvan University

*Corresponding author: tulsigompo@gmail.com

ASBTRACT

Despite the rapidly growing poultry industry throughout Nepal, the periodic outbreaks of diseases and infections in poultry birds led to huge production loss. The aim of this study was to identify the top ten poultry diseases in Nepal and an analysis of their seasonal distributions. A cross-sectional study was performed to describe the distributions of major poultry diseases diagnosed from April 2018 to April 2019 at Central Veterinary Laboratory, Nepal. Out of 2358 observations recorded at the CVL registry at that period, only 2271 observations qualified for the final analysis. Among 2271, removing the missing values, only 1915 observations were used to describe bird characteristics such as median age and mean flock sizes. Descriptive analysis and graphical representation was performed in R studio (Version 1.0.143) and MS excel 2010 respectively. The top ten diseases identified with highest to lowest incidence were: colibacillosis 26% (584/2271), mycotoxicosis 13% (301/2271), ascites 10% (232/2271), complicated chronic respiratory disease (cCRD) 9% (196/2271), infectious bursal disease (IBD) 7% (155/2271), Newcastle disease (ND) 7% (148/2271), avian influenza (AI) 3% (76/2271), salmonellosis 2% (40/2271), infectious bronchitis 1% (33/2271), coccidiosis 1% (25/2271) and non-specific diseases accounts for 21% (481/2271). Cases of colibacillosis were predominant all year round. Mycotoxicosis was seen mostly during pre-monsoon and monsoon season. Ascites and IBD were common during spring and winter seasons. cCRD was most common during summer and winter months. AI kept changing the disease outbreak pattern but it was most common during spring and summer. The number of cases of Salmonella, IB and coccidiosis were not sufficient to provide the seasonal trend. Identification of common poultry disease and their seasonal distributions is useful in taking preventive measures such as vaccination and good management practices to minimize their incidence in the future.

Keywords: Outbreaks, Poultry indusrty, Seasonal distributions

INTRODUCTION

In Nepal, the poultry sector contributes around 4% of GDP. The poultry industry is spreading rapidly throughout the nation; the commercial poultry farming has been practiced in 64 districts out of 77 districts of Nepal (NCPS, 2017). Of the total 70,007,151 poultry birds in Nepal (MoALD, 2018) there are around 93.29% broiler farms, 6.09% layer farms, 0.58% parent farms and 0.04% of giriraja/kuroiler farms in Nepal (NCPS, 2017). The total person employed in poultry sector is about 55,871 and among which 31,330 were male and 24,541 were female. Despite rapid turnover on the poultry business, adoption of an intensive production system, the introduction of new breeds, application of enhanced biosecurity and preventive health measures

are limited in developing countries like Nepal (Biswas *et.al.,* 2009; Permin and Pedersen, 2002). Despite the booming poultry business in Nepal, there is a periodic outbreak of common poultry diseases such as colibacillosis, Newcastle disease (ND), infectious bursal disease (IBD), avian influenza (AI), chronic respiratory disease (CRD), infectious bronchitis (IB) in different parts of Nepal that created a great loss to poultry industry (DLS, 2018). The aim of this study was to perform the descriptive analysis to identify the top ten poultry diseases of Nepal and report their seasonal incidences. Central Veterinary Laboratory (CVL), Kathmandu, Nepal was chosen for the study site because CVL is a national reference laboratory for animal disease investigation in Nepal.

MATERIALS AND METHODS

Study design

A cross-sectional study was performed to analyze the case data recorded in the registry book of postmortem unit, Central Veterinary Laboratory (CVL) from mid-April, 2018 to mid-April, 2019 (Baisakh to Chaitra 2075). All the data in the registry book were entered manually in the excel spreadsheet and the preliminary data cleaning was performed manually. There was a total of 2358 observations in the data with ten variables: age, bird type, flock size, mortality per day, total mortality, source of chicks (name of hatcheries), and source of birds (name of feed company), location of the farm, the date on birds brought for necropsy and tentative disease diagnosed. However, after removing observations with incomplete pieces of information, the total number of cases included in the final study was 2271. The diagnosis of disease in the postmortem units was mostly based on, clinical history, pathological lesions observed at the time of necropsies and the rapid antigen detection tests available for AI, ND, IBD, IB at CVL.

Statistical analysis:

All the data entered in the spreadsheet were first analyzed by Pivot Table in excel to check its consistency. Any discrepancies in the values of the variables were corrected by writing R script and final descriptive analysis was performed in R studio (Version 1.0.143). And, MS excel 2010 was applied to generate the graphical presentation of a monthly and seasonal trend of the cases.

RESULTS

Bird Characteristics:

Of the total 2271 observations, after removing incomplete information, only 1995 observations were used to classify poultry types in calculating their median ages and flock sizes. Among them, the birds were categorized under commercial broilers, commercial layers, commercial parents, kuroilers, giriraja, local chicken, turkey and their median ages (in days) were 26, 89, 80, 52, 59, 65, 105 and 60 respectively. The different bird categories and their average flock sizes along with the proportions of the cases for each category are depicted in Table 1.

Table 1: Different poultry bird categories and their median ages with mean flock sizes.

Bird categories	Median ages	Mean flock size (95% CI)	No of cases	cases (%)
Commercial broilers	26	1708 (1639.4, 1776.6)	1346	70.29
Commercial layers	89	2121 (1938.8, 2303.2)	329	17.18
Commercial parents	80	5629 (1913.9, 9344.2)	27	1.41
Kuroilers	52	748 (506.2, 989.9)	97	5.07
Giriraj	59	690 (425.6, 954.4)	47	2.45
Local chicken	65	965 (581.1, 1348.9)	24	1.25
Turkey	105	124 (41.9,206.1)	11	0.57
Duck	60	299 (197.1, 400.9)	9	0.47
Others (crow, parrot etc.)			25	1.31
Total			1915	100.00

Classification of Top Ten Poultry Diseases:

Of the total 2271 cases, the top ten diseases diagnosed at CVL in the year 2018-19 is shown in Fig 1. Colibacillosis accounts for 26% (584/2271) of all cases, myotoxicity 13% (301/2271), ascites 10% (232/2271), cCRD 9% (196/2271), IBD 7% (155/2271), ND 7% (148/2271), AI 3% (76/2271), salmonellosis 2% (40/2271), IB 1% (33/2271), coccidiosis 1% (25/2271) and non-specific diseases comprise of 21% (481/2271) of all cases.

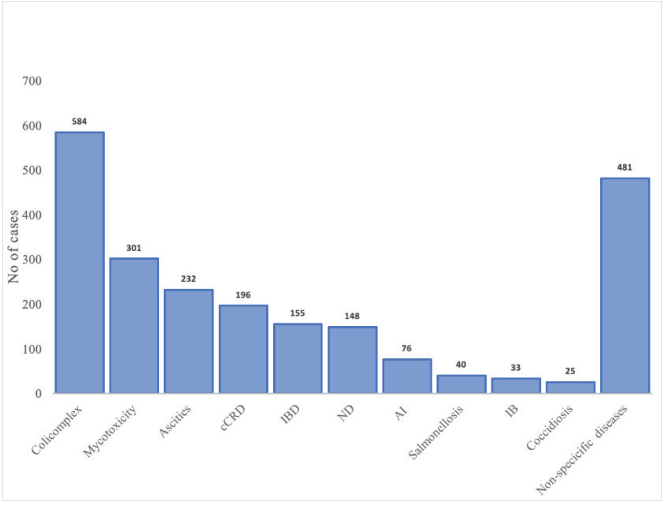

Fig 1. Graphical representation of major poultry diseases diagnosed at CVL, 2018-19.

The Seasonal Trend of Poultry Disease Diagnosed at CVL

Colibacillosis is a predominant disease throughout the year. Myotoxicity is seen mostly during pre-monsoon (Baisakh-Jestha) and continue throughout monsoon season (Ashad to Bhadra). Again, in winter season (Mangsir to Magh) there is a significant rise in cases of mycotoxicosis. Ascities are seen mostly during winter months (Mangsir-Poush) but there is significant number of cases even in spring (Chaitra and Baisakh) too. cCRD is most common during summer (Jestha-Sharawan) followed by winter season (Mangsir to Magh). The cases of IBD are more common during spring (Chaitra-Jestha) and summer (Ashad-Shrawan) which ultimately decline at fall season (Ashoj-Mangsir) and in winter (Poush-Magh). The outbreak time of avian influenza, though keeps changing, is most common during the spring (Falgun-Baisakh) and summer (Jestha-Ashad) (Table 2, Fig 2). The number of cases of salmonellosis, IB and coccidiosis were not sufficient to describe the seasonal trend in this study.

Table 2: Monthly distributions of major poultry diseases diagnosed at CVL from mid April 2018

Months/ Diseases	Colibaci llosis	Mycoto xicosis	Ascites	cCRD	IBD	ND	AI	Salmo nellosis	IB	Cocci diosis
Baisakh	75	30	40	9	32	25	5	4	3	0
Jestha	49	21	13	19	31	31	18	8	1	6
Ashad	43	42	10	17	20	3	7	2	0	6
Shrawan	36	22	11	18	20	19	1	10	5	3
Bhadra	59	29	4	9	6	7	0	4	8	2
Ashoj	37	14	18	9	1	2	0	0	1	3
Kartik	53	23	19	3	6	2	2	0	3	0
Mangsir	73	36	22	20	5	1	4	3	2	1
Poush	25	30	38	40	5	6	3	1	4	0
Magh	43	15	14	32	6	17	3	4	2	1
Falgun	42	17	15	17	4	11	12	4	1	2
Chaitra	49	22	28	3	19	24	21	0	3	1

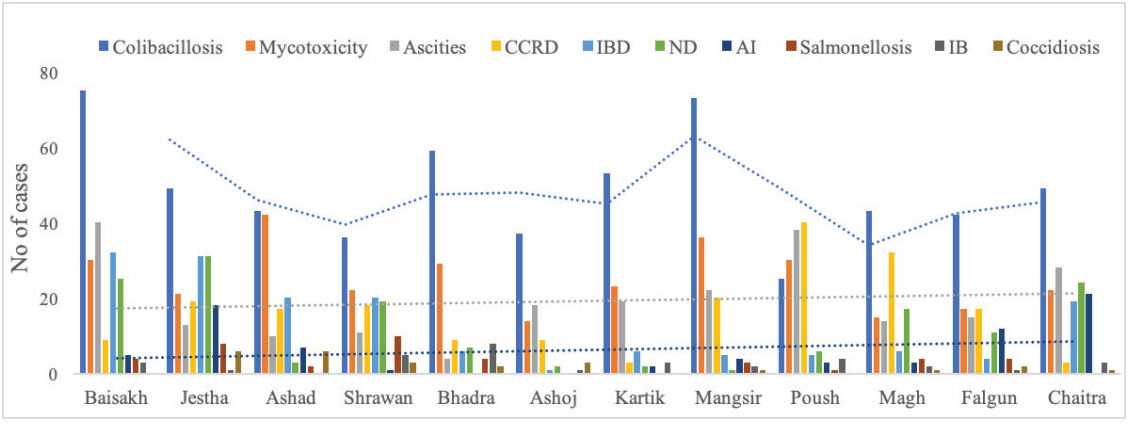

Fig 2: Graphical representation of monthly cases distribution of major poultry diagnosed at CVL during mid-April 2018 to mid-April 2019.

DISCUSSION

Among the major poultry diseases, *E. Coli* infections and their clinical complications in birds is a challenging issue in poultry production system. It is the most common infection in poultry farms (Shrestha and Shrestha 2017; Gautam *et.al.,* 2017; CVL, 2017). This may be due to poor farm hygiene in a poultry house where birds get infected through the accumulation of *E. Coli* in

aerosols and fecal contamination along with egg contaminations at hatcheries (Nolan, 2019; Carli *et.al.,* 2016; Ibrahim *et.al.,* 2019). Colibacillosis is endemic through all seasons in poultry farms, which indicated the poor poultry farm management status in Nepal.

Mycotoxicosis is, the second, leading cause of mortality in poultry that develops mainly by the ingestion of feed with higher concentrations of mycotoxins such as aflatoxins B1 and B2 (Aryal and Karki, 2009; Karki *et.al.,* 2003). This condition is predominant at pre-monsoon (spring) season as the environmental temperature keeps rising above 30^0C. And, during monsoon, the humidity of the environment is too high. Both of these conditions are favorable for fungi like *Aspergillus* spps. to produce toxins in them (Amrutkar *et.al.,* 2015; Jurjevic *et.al.,* 2007) (http://benisonmedia.com/mycotoxin-challenges-in-production-of-poultry-feed-during-rainy-season/).

Our study revealed that the incidence of ascites was predominant during the winter and spring season than in other seasons. It is because, in winter, in an attempt to keep chicks warm, the ventilation is poorly kept which leads to minimal availability of oxygen inside the farmhouse (Julian et.al., 1989; Acar et.al., 1995; Gupta, A.R., 2011). While in spring, with the rise of temperature there is an increased demand for oxygen in birds that causes ascites in them (Tattori et.al., 1995).

Mycoplasma gallisepticum is also prevalent in Nepal *(*Khanal *et.al.,* 2018; Mahato *et.al.,* 2015) that is mostly complicated by *E. coli* to develop cCRD. Our study results were similar to the study conducted by Shrestha and Shrestha (2017) in 2016-17 at the National Avian Disease Investigation Laboratory (NADIL), who demonstrated around 10.60 percent of cases of cCRD. However, Sharma and Tripathi (2015) found 18% (401/2229) of cCRD at NADIL, Chitwan during 2014-15.

Our study reveals that cCRD is most common during winter and summer months. The findings were similar to a study by Rajkumar *et.al.,* (2017), who observed the highest incidence of CRD during summer and winter months. It is because, in summer the heat stress and poor availability of oxygen lead to increase susceptibility to CRD (Rajkumar *et.al*., 2017). The detection of avian influenza at CVL is 3% (76/2271), which is almost similar to the study by Sharma and Tripathi (2015).

The cases of salmonellosis diagnosed at CVL was around 2% (40/2271) which was almost similar (4.5%) to findings by Shrestha and Shrestha (2017) but the result is far lower from the study by Sharma and Tripathi (2015), who recorded incidence of salmonellosis as high as 11.08% (245/229) at NADIL. The variations in the proportions of case detection may be either due to differences in sample sizes or the differences in the diagnostic capabilities of laboratories or the competencies of the veterinary clinicians to identify the cases.

Around 1% of cases at CVL comprised of coccidiosis during the year 2018-19 which was almost similar (0.8%) to study by Shrestha and Shrestha (2017). Detections of infectious bronchitis at CVL all year-round are around 1% of all poultry cases yet any other relevant pieces of literature

related to infectious bronchitis in Nepal were not found. The prevalence of IBD was 7% (155/2271) in our study, which was almost similar to the study by Shrestha and Shrestha (2017) but lower (12.3%) than that of Sharma and Tripathi (2015).

IBD cases were more common found during spring and summer in year 2018-19, which may be due to the stability of IBD virus that can survive even in the peak of summer (Rani and Kumar, 2015). The second reason may be due to the failure of vaccines because of improper storage as IBDv vaccines are ineffective once the environmental temperature rises above 42^0C (Rani and Kumar, 2015).

CONCLUSIONS

The poultry sector has an important contribution in uplifting economy and livelihoods among the people of Nepal. Proper identification of major poultry diseases and discovering their seasonal distributions are useful approach in undertaking preventive measures, such as vaccinations, good management practices, which ultimately minimize their incidences in upcoming days.

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