Pattern of poultry diseases brought at Veterinary Teaching Hospital (VTH), Rampur and National Avian Disease Investigation Laboratory (NADIL), Bharatpur, Chitwan, Nepal during 2017/18

S. P. Bhusal[1], G. Gautam[1,], R. Dhakal[1], B. Paudel[1] and D. R. Chapagai[2]*

[1] Faculty of Animal Science Veterinary Science and Fisheries, Agriculture and Forestry University (AFU), Rampur Chitwan, Nepal
[2] National Avian Disease Investigation Laboratory (NADIL), Bharatpur, Chitwan, Nepal
***Corresponding author**: Gokarna Gautam, ggautam@afu.edu.np

ABSTRACT

A study was conducted to analyse the case flow pattern of poultry diseases brought at Veterinary Teaching Hospital (VTH), AFU, Rampur and National Avian Disease Investigation Laboratory (NADIL), Bharatpur during the year 2017/2018 AD. All the poultry cases from record books of respective institutions were analyzed using MS-Excel 2016. A total of 398 and 4,132 cases were brought at VTH and NADIL respectively. At VTH, almost all cases (92.7%) were from western Chitwan, whereas at NADIL, the highest number of cases were from Western Chitwan (44.4%) followed by eastern Chitwan (25.2%), western to Chitwan (i.e. Nawalpur and Parasi) (17%) and others. In total, the highest numbers of cases were brought in April and the lowest were in October. Most of the cases were of broilers (69.8%), followed by layers (23.2%), parent stocks (3.5%), Giriraja (2.3%), and others (1%). The highest number of cases were from flock size ≤500 (32.8%), followed by 501-1000 (32.6%), 1001-3000 (27.7%) and >3000 (6.9%). In total, bacterial, mycotoxicity, viral, mycoplasma, metabolic, protozoal, parasitic and miscellaneous diseases were diagnosed in 43.4%, 19%, 18.6%, 13.8%, 13.6%, 1.5%, 1.3% and 3.7% poultry cases, respectively. Among bacterial diseases, E. coli infection was the most prevalent (27.4%) followed by Salmonella infection (2.4%), necrotic enteritis (1.5%) and others. Likewise, among viral cases, infectious bursal disease (IBD) was the most prevalent (12.2%) followed by low pathogenic avian influenza (2.1%), Newcastle disease (1.6%) and others. E. coli infection was most prevalent in summer (32.8%) followed by autumn (29.6%), winter (29.1%) and spring (28.6%). Likewise, IBD was most prevalent in summer (17.5%) followed by spring (16.6%), autumn (11.4%) and winter (8%). In conclusion, poultry cases flow at VTH were less than one-tenth of NADIL. Most of the poultry cases brought at these governmental diagnostic centers were from smaller farms. Typical seasonal pattern of major poultry diseases warrants for special measures for their prevention and control during particular seasons.

***Keywords:** Case flow pattern; Flock size*; *Poultry disease**;** Season;*

INTRODUCTION

Poultry business is considered an important agricultural practices in Nepal and its farming is in increasing trend (Bhattarai, 2017). This is because of easiness for rearing, less human resources, and less investment. In spite of having high growth rate of poultry production of commercial sector (17%-18%) and 4% contribution in national GDP of Nepal, poultry consumption in Nepal is below

global average which accounts just 4.1 kg chicken meat and 44 eggs annually (Nepal country poultry statistics data, 2015), whereas globally, 12 kg chicken meat per person and 153 units eggs are consumed annually (FAO, 2017).The commercial poultry farming exists in 64 districts in Nepal with 21,956 farms out of which 20,483 (93.29%) are broiler farms, 1,337 (6.09%) layer farms, 128 (0.58%) hatchery and (0.04%) Giriraja/Kuroiler farms throughout the country (Nepal country poultry statistics data, 2015).

Poultry farming is increasing in Nepal in the recent decades and Chitwan is considered as the poultry hub (Thapa, 2016) with 15,289,019 poultry number, 9,973 metric ton poultry meat and 5,879,848 units of eggs (Statistical information on Nepalese agriculture 2016/17). The marketing and transportation of chicks and adults for production and selling, and prevalence of disease pattern is changing each year. Veterinary Teaching Hospital (VTH), Rampur and National Avian Disease Investigation Laboratory (NADIL), Bharatpur are two non-private and largest poultry disease diagnostic centers in Chitwan. Thus, case flow of poultry disease in these centers may reflect the pattern of poultry diseases in and around Chitwan district. This may help to make strategic plans for prevention and control of poultry diseases in these areas. In past, case 236 cases in fiscal year 2014/2015 and 357 cases in fiscal year 2015/2016 were brought to the VTH, Rampur (Gautam, 2017) whereas at NADIL, 2,229 cases were observed from Mid-December 2014 to Mid-June 2015 (Sharma, 2015) and 1,688 cases were recorded from August 1, 2016 to January 31, 2017 (Shrestha, 2017). However recently, there have been no studies to analyse the case flow pattern at these diagnostic centers. Also, there were no comparative studies regarding case flow pattern between these two poultry disease diagnostic centers. The objective of this study was to analyse the recent case flow pattern of poultry diseases at both diagnostic centers, VTH and NADIL.

MATERIALS AND METHODS

One-year registered data of poultry diseases (April 2017 to March 2018) from VTH, Rampur and NADIL, Bharatpur were collected. The collected data were entered in MS- Excel 2016 and presented in table, bar diagram and pie chart. In NADIL, the cases were brought from Chitwan and surrounding districts such as Nawalpur, Parasi, Makwanpur, Tanahu, Gorkha, Bara, Parsa and Rautahat. Dead or sick birds were brought by the poultry producers for disease diagnosis. The diseases were mainly diagnosed through clinical signs and history of flock, postmortem lesions, rapid diagnostic test kit, plate agglutination test and cultures. Commercially available rapid test kits were used for diagnosis of Avian Influenza (AI), Newcastle disease (ND), Infectious Bursal Disease (IBD) and Infectious Bronchitis (IB). Similarly, plate agglutination tests were commonly used for detection of *Mycoplasma* and *Salmonella* cases. Cultures and antibiotic sensitivity tests were routinely used for diagnosis of suspected bacterial diseases. At VTH, the disease diagnosis was mainly through postmortem lesions and clinical sings and history of flocks. Microscopic examinations were done for suspected parasitic cases.

RESULTS

In total, the total number of poultry cases from April 2017 to March 2018 were 4,530 out of which 398 cases were from VTH Rampur and 4,132 cases were from NADIL Bharatpur.

Location-wise case flow pattern

Table 1 shows the percentage of case flow at VTH and NADIL during one year period from six different geographical locations namely Eastern Chitwan, Western Chitwan, Southern Chitwan, Midhills Area (Tanahu and Gorkha), Eastern to Chitwan (Makawanpur, Bara, Parsa and Rautahat) and Western to Chitwan (Nawalpur and Parasi). Overall, both at VTH and NADIL, maximum number of cases were brought from Western Chitwan. At VTH, almost all cases (92.7%) were from Western Chitwan, whereas at NADIL, the highest number of cases were from Western Chitwan (44.4%) followed by Eastern Chitwan (25.2%), Western to Chitwan (17%) and others.

Table 1. Location wise case flow pattern of poultry disease at VTH & NADIL.

Location	VTH	%	NADIL	%
Eastern Chitwan	5	1.9	1032	25.2
Western Chitwan	242	92.7	1812	44.4
Southern Chitwan	1	0.4	90	2.2
Mid-hills Area	1	0.4	171	4.2
Eastern to Chitwan	7	2.7	282	7
Western to Chitwan	5	1.9	692	17
Total	261	100	4079	100

Month-wise case flow pattern

Fig. 1 shows the month-wise case flow pattern of poultry diseases brought at VTH and NADIL during one year period. Overall, NADIL had quite higher number of cases than VTH throughout the year. At NADIL, the highest number of cases were brought in April and lowest were in October.

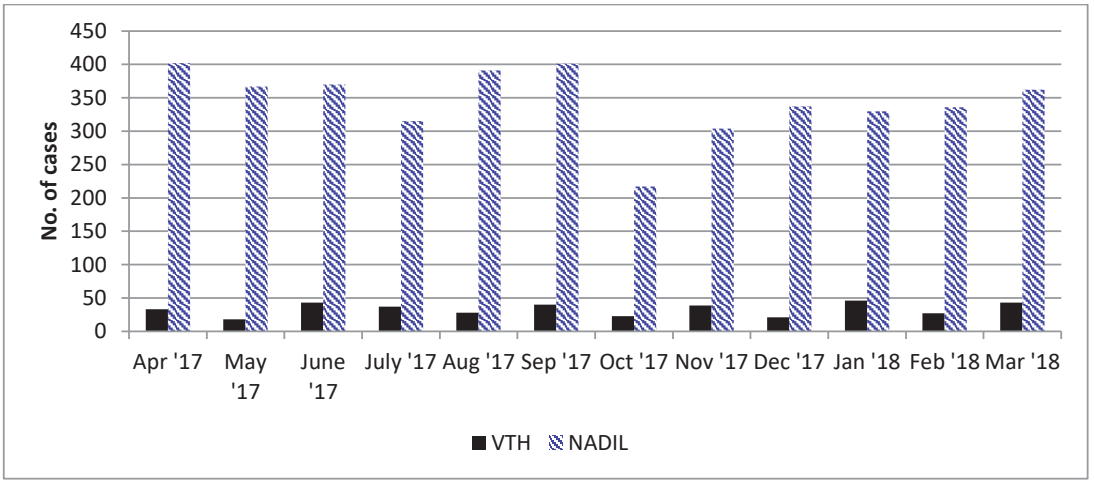

Figure 1. Month-wise poultry disease case flow pattern at VTH and NADIL

Case flow pattern according to flock size

Table 2 shows the case flow pattern of poultry diseases according to flock size at two poultry disease diagnostic centers. Overall, the highest numbers of cases were brought from small poultry farms. There were very few cases from poultry farms with a flock size over 3000 birds accounting to 7% only.

Table 2. Poultry disease case flow pattern according to flock size

Flock size (number)	VTH (%)	NADIL (%)
≤500	39	32
501-1000	31	33
1001-3000	23	28
3000>	7	7

Since the number of cases at VTH was quite a few, the data of VTH and NADIL were combined for further analyses.

Case flow pattern according to type of birds

Fig. 2 shows the case flow pattern of poultry diseases according to type of birds. The highest numbers of the cases were of broilers (69.8%) followed by layers (23.2%), parent stocks (3.5%), Giriraja (2.3%), and others (1%) including local domestic birds, duck and turkey.

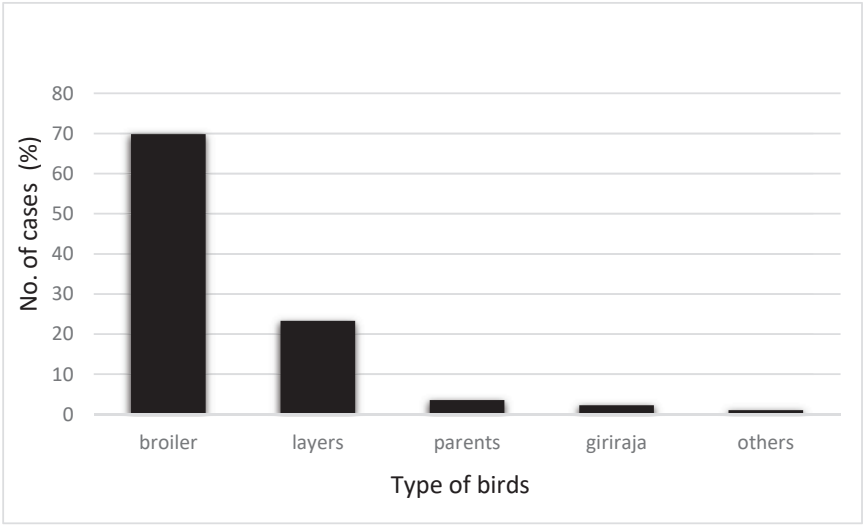

Figure 2. Case flow pattern of poultry disease according to type of birds

Age-wise case flow pattern in broiler and layers.

Fig. 3 and Fig. 4 show the case flow pattern of main commercial poultry, broiler and layers according to age at VTH and NADIL. Among broilers, the highest number of cases were from growing age (15-28 days) accounting to 46% of total broiler cases. Layers had the highest case flow at the age of laying (>18 weeks) which was 65%.

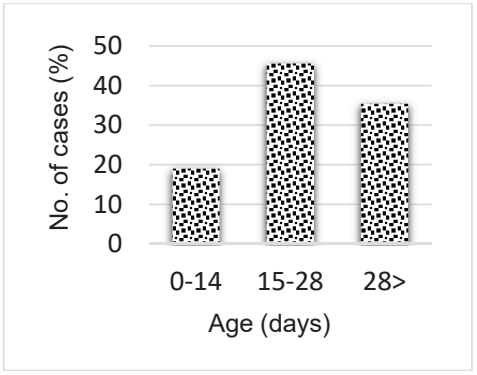

Fig. 3. Age-wise case flow pattern of broilers

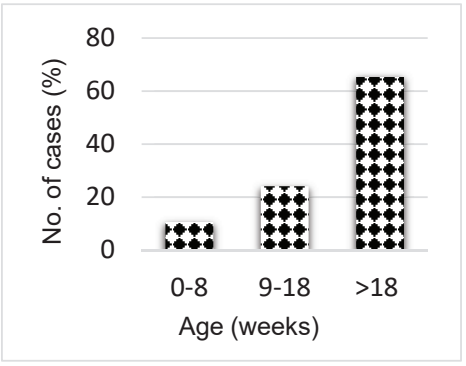

Fig. 4. Age-wise case flow pattern of layers

Etiology-wise case flow pattern

Table 3 shows the broiler cases brought at VTH and NADIL on the basis of etiological agents with or without the mixed diseases. Bacterial infections (43%) either single or in a mixed condition were the most frequent cases followed by viral infections and toxicity.

Table 3. Etiology-wise case flow pattern in broilers

Type of disease	Single disease (%)	Mixed with other (%)	Total (%)
bacterial	25	18	43
metabolic	8	6	14
mycoplasma	4	10	14
parasitic	1	<1	1
protozoan	1	1	2
toxicity	9	9	18
viral	12	7	19
miscellaneous	2	2	4

Table 4 shows the etiology-wise case flow pattern in layers. The highest number of cases were of bacterial infection (37%) followed by toxicity, viral infection, mycoplasma and metabolic diseases.

Table 4. Etiology-wise case flow pattern in layers

Type of disease	Single disease (%)	Mixed with other (%)	Total (%)
bacterial	20	17	37
metabolic	7	5	12
protozoan	<1	1	1
parasitic	<1	<1	<1
mycoplasmas	4	10	14
toxicity	9	9	18
viral	10	6	16
miscellaneous	1	1	2

Trends of various diseases in broilers and layers

Fig. 5 shows the trends of common diseases in broilers brought at VTH and NADIL during one year period of time. In commercial broilers, the *E. coli* infection (30%) was the highest encountered case followed by mycotoxicosis (20%), IBD (17%), complicated chronic respiratory disease [cCRD] (10%), chronic respiratory disease [CRD] (7%), gout (7%), ascites (6%), stress (2%), *Salmonella* infection (2%) and others.

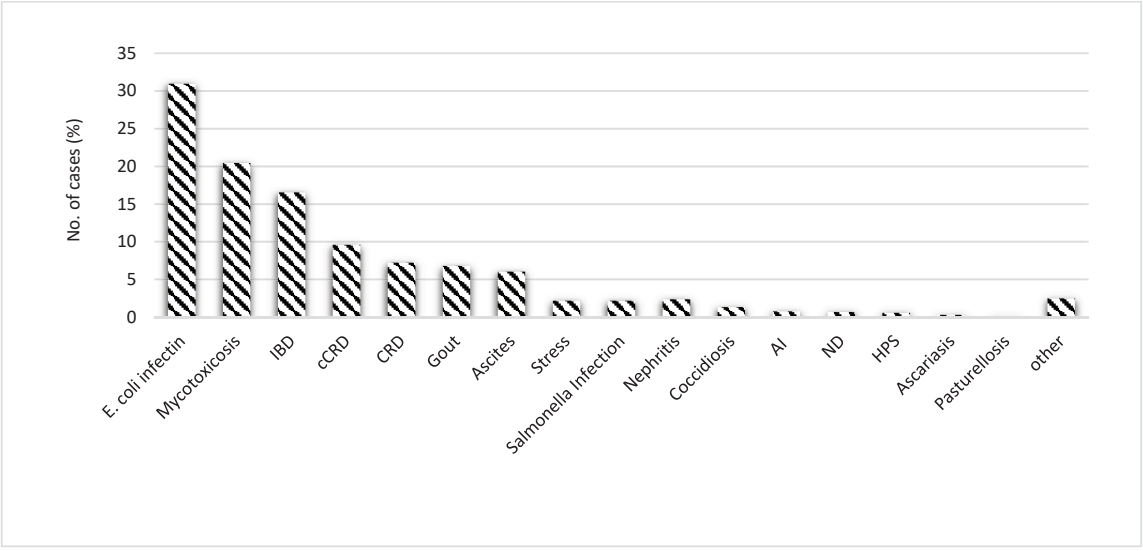

Figure 5. Trends of various diseases in broilers

Fig. 6 shows the trend of case flow of various diseases in layers at VTH and NADIL. In commercial layers, the *E. coli* infection (34%) was the highest encountered case followed by mycotoxicosis (17%), stress (9%), CRD (8%), AI (6%), IBD (6%), ND (5%), gout (4%), fowl cholera (4%), *Salmonella* infection (3%) and others.

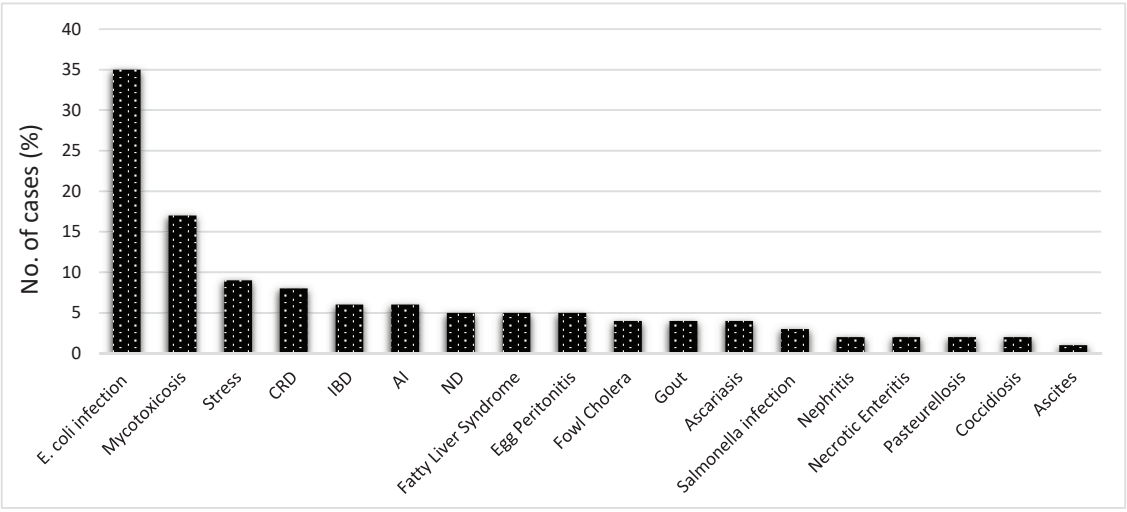

Fig. 6. Trends of various diseases in layers

Seasonal case flow pattern

Among all poultry cases, the highest number of cases were brought in spring (27%) followed by summer (26%), winter (24%) and autumn (23%).

Seasonal case flow pattern of major bacterial diseases

Table 5 shows the major bacterial diseases brought at VTH and NADIL during different seasons. *E. coli* infection was the most common bacterial case in all seasons. CRD was observed second most encountered bacterial disease and was seen more common in spring (18%) than in autumn (13%), summer (12%), and winter (14%). *Salmonella* infection, necrotic enteritis and fowl cholera cases were below 5% of total in all seasons.

Table 5. Season-wise case flow pattern of major bacterial diseases

Major bacterial diseases	Spring (%)	Autumn (%)	Summer (%)	Winter (%)
E. coli infection	29	30	33	29
CRD	18	13	12	14
Salmonella infection	2	2	4	2
Necrotic enteritis	1	2	3	1
Fowl cholera	2	2	2	1

Seasonal case flow pattern of major viral diseases

Table 6 shows the season-wise major viral case flow pattern during last one year. Among major viral diseases, IBD was the most encountered case throughout all seasons and the highest cases were observed in summer (18%) followed by spring (17%), autumn (11%) and winter (8%). AI cases were reported in three seasons: spring (7%), winter (3%) and autumn (<1%).

Table 6. Season-wise case flow pattern of major viral diseases

Major viral diseases	Spring (%)	Autumn (%)	Summer (%)	Winter (%)
IBD	17	11	18	8
AI	7	<1	0	3
ND	2	1	3	1
HPS (Hydropericardium syndrome)	<1	<1	<1	1

Seasonal case flow pattern of major metabolic diseases

Table 7 shows the seasonal case flow pattern of major metabolic diseases of poultry during last one year. Among metabolic diseases, gout was the most encountered case in autumn (12%) whereas ascites was the most prevalent during winter (13%).

Table 7. Season-wise case flow pattern of major metabolic diseases

Major metabolic diseases	Spring (%)	Autumn (%)	Summer (%)	Winter (%)
Gout	4	12	3	6
Ascites	3	2	1	13
Fatty Liver Syndrome	1	1	1	1

DISCUSSION

This study showed that the number of cases brought at VTH was around one-tenth of that brought at NADIL. This differences might be due to the availability of only few diagnostic facilities at VTH Rampur compared to that available at NADIL. In addition, the location of the laboratories might have played a role. NADIL is located at city area and possess larger case coverage whereas VTH is located 10 km away from city area. Also, these data signifies that VTH Rampur needs to upgrade their diagnostic facilities and have to advertise the facilities among farmers of surrounding area.

The number of poultry disease cases did not vary greatly among the months and seasons of the year. This result is different with the findings of Shrestha et al. (2017) who reported that higher numbers of cases were brought in spring and summer seasons compared to that in autumn and winter seasons at NADIL. Broiler birds constitutes the highest number of cases (70%) brought which is similar with Joshi et al. (2013) where out of 558 cases brought at VTH, 72.22% cases were broiler followed by layers, Giriraja, parents and others. Broilers are more popular because of high economic return in short period of time and more farmers are engaged in broiler farming as compared with layers and other birds. In addition, broilers are more susceptible to disease than layers and other species. The case flow pattern according to flock size indicates that the farmers

with small number of poultry (< 500 birds/household) often visited diagnostic centers as compared with larger flock size rearing farmers. This might be due to their low investment in business and they may not afford to bring sick birds in private clinics or cannot hire doctor and thus might have preferred to bring in these two public diagnostic centers. In addition, small scale poultry raisers are not much familiar with poultry rearing advanced tools and techniques, biosecurity and management practices. This theory is supported by Yemane et al. (2016); the farmers which are now established as a large scale producing farmer were small scale producing farmer in the past so that we can say that the inexperience or first attempt bring difficulties and problems in business too. On the other hand, there are many big poultry farms but the case flow is relatively low in comparison with small farmers. This might be because of larger poultry farmers have their own diagnostic facilities and hire private doctors to diagnose and treat their birds. In addition, the large scale producing farmers are experienced, biosecurity measures are relatively better and disease incidences might be comparatively lower.

Age of poultry and expected flock performance is considered important in poultry farming. On age-wise case flow pattern, in broilers, the highest number of cases were of 15-28 days age whereas in layers the highest number of cases were of laying stage (i.e. > 18 weeks of age). These findings are similar with the findings of Shrestha et al. (2017). In case of broiler, the reason might be due to fact that the middle age poultry can be susceptible to variety of diseases because of faster growth rate at that age which in turn would be responsible for cellulitis and various non-infectious diseases (Companion in World Farming Trust, 2005). But, in the later life of broiler people prefer to sell their birds immediately instead of treating the sick birds in most of the cases. On the other hand, high poultry case flow of layers after 18 weeks of age indicates that the layer cases near to their laying to whole laying period encounter more disease condition which is also supported by the study carried out by Uddin et al. (2011). In contrast, Bhattarai et al. (2017) reported that the higher mortality of layers were observed before the age of eight weeks and the reason behind this might be due to prevalence of Newcastle disease (ND) and chronic respiratory disease (CRD) in that area.

Bacterial diseases were more common which is similar with the finding of Shrestha et al. (2017) that analyzed the poultry disease case flow pattern at NADIL during 2016/17. In case of broiler, bacterial following toxicological, viral, mycoplasma and metabolic were major problem to those farmers who brought poultry in diagnostic centers. On the other hand, in case of layers bacterial following viral, toxicological and metabolic were major diseases. The obtained data signified that toxicity was more among broiler after bacterial whereas viral was more prevalent among layers. The mycoplasmas infection was more common in broiler than in layers. The high number of bacterial infection in poultry might be due to unhygienic practice inside the poultry farm and weak biosecurity inside the farm. More cases of broilers were suffered from mycotoxicity than the layers. This is supported by the fact that the broilers are highly susceptible to mycotoxin than the layers (Kamalzadeh A. et al., 2009; Suksombat W. et al., 2011).

Both in broilers and layers, *E. coli* infection was the most common disease. This might be due to organism's nature that is organism is naturally present in gut of birds (Pan D. et al., 2013) and if they suffer from stress or some contamination from water and feed sources the bacterial concentration increases causing symptoms (Kim J.Y., 2017). Mycotoxicosis was the second major disease both in broilers and layers. Following that, the IBD, cCRD, CRD, gout and ascites were

major diseases in broilers. In case of layers, the stress was the third most common disease/problem. Research shows that layers at the age between 24 weeks to 28 weeks are more susceptible to heat stress because of heavy body making which makes heat exchange difficult compared to younger birds and possess high metabolic rate due to peak lay and this ultimately demands more nutrient, particularly amino acids and energy generating more metabolic heat and hence more susceptible to heat stress. In addition to that, temperature higher than 19.5 °C predisposes the layers to the heat stress (Pereira D. F. et al, 2010) and the temperature is almost higher than that in our environment except during winter season. Following that, IBD, ND, Gout, *Salmonella* infection and ascariasis were major prevailing diseases in layers.

Season-wise, etiological analysis of diseases showed important information about the case flow pattern. Among bacterial disease, highest number of cases were observed in summer except for CRD, which was more common in spring. This result is different from finding of Islam A. et al., (2009), who reported that bacterial diseases were more prevalent during winter and rainy seasons as compared to that in summer season in Gaibandha district of Bangaldesh. On the other hand, viral cases varied season to season. The most threatening disease, AI was seen only in winter, spring and autumn seasons. The reason behind this might be due to an outbreak in a certain region and as we know because of its high spreading capacity it was prevalent mainly during two seasons winter and spring possess cooler environment with low humidity in comparison with other seasons which favors the survival of influenza virus (Foster H., 2014). Another common viral disease, IBD was prevalent in all seasons but summer was found to be more common for this disease and this is similar with the case of ND too. Similarly, ascites and gout were most prevalent in winter. This might be possibly due to management defects in farms as there is water deprivation during winter and also, the farmers cover whole shed during nights which promotes low oxygen and thus causes ascites. Also, high energy diet for the optimal growth of chickens favoring high metabolic rate accounts ascites in poultry (Dahal G.K., 2011; Alice M., 2015).

CONCLUSION

In conclusion, poultry case flow at VTH Rampur was about one tenth of that at NADIL Bharatpur. Most of the poultry cases brought at these governmental diagnostic centers were from smaller farms. Typical seasonal pattern of major poultry diseases warrants for special measures for their prevention and control during such particular seasons.

ACKNOWLEDGEMENTS

The authors would like to thank the staffs of Veterinary Teaching Hospital Rampur and that of National Avian Disease Investigation Laboratory Chitwan for their help and support during this research work.

REFERENCES

1. Alice, M. (2015). Gout Management in Poultry. *The poultry site*. 5m Publishing, England. https://thepoultrysite.com/articles/gout-management-in-poultry
2. CBS (2016). Nepal Commercial Poultry Survey 2015. Central Bureau of Statistics (CBS), Nepal.

3. Dahal, G. K. (2011). Ascites (water belly) in broiler chickens during winter season. Engormix. https://en.engormix.com/poultry-industry/articles/ascites-in-broiler-chickens-t35214.htm
4. Foster, H. (2014). The Reason for the season: why flu strikes in winter. http://sitn.hms.harvard.edu/flash/2014/the-reason-for-the-season-why-flu-strikes-in-winter/
5. Gautam, G., Devkota, B. and Thapaliya, S. (2017). Recent case flow pattern in Veterinary Teaching Hospital of Agriculture and Forestry University, Chitwan, Rampur, Nepal. *Journal of Agriculture and Forestry University*, Nepal, 1: 119-128.
6. Islam A., Trisha, A. A., Das, M. and Amin, M. R. (2009). Retrospective study of some poultry diseases at Gaibandha district in Bangaldesh. *Bangladesh Journal of Veterinary Medicine*, 7 (1): 239 – 247.
7. Joshi, L.R., T. Khanal, A. Tiwari. (2013). A retrospective study of poultry diseases diagnosed in Veterinary Teaching Hospital, Rampur, Chitwan. *The Blue Cross*, 13: 33-37.
8. Kamalzadeh, A., Hosseini, A. and Moradi, S. (2009). Effects of yeast glucomannan on performance of broiler chickens. *International Journal of Agriculture and Biology*, 11: 49–53.
9. Kim, J. Y. (2017). Management and control of *Escherichia coli* infections in laying hens. *International Hatchery Practice*, 31 (3): 13-14.
10. MoAD (2017). Statistical information on Nepalese agriculture (2016/17). Ministry of Agricultural Development, Government of Nepal.
11. Nepal country poultry statistics. (2015). Nepal poultry and livestock expo, November 3-4-5, 2017. http://nepalpoultryandlivestock.com/testimonials/#
12. Osti, R., Bhattarai, D., Choudhary, H. and Singh, V. (2017). Poultry production in Nepal: characteristics, productivity and constraints. *International Journal of Applied Sciences and Biotechnology*, 5 (2): 222-226.
13. Pan D. and Yu Z. (2013). Intestinal microbiome of poultry and its interaction with host and diet. *Gut Microbes*, 5(1): 108–119.
14. Pereira, D. F., Do Vale, M. M., Zevolli, B. R. and Salgado, D. D. (2010). Estimating mortality in laying hens as the environmental temperature increases. *Brazilian Journal of Poultry Science*, 12 (4): 265–271.
15. Mitchell, A. (2016). Nepal poultry consumption below global average, *Poultry news*. July 11, 2016. http://www.thepoultrysite.com/poultrynews/37291/nepal-poultry-consumption-below-global-average/
16. Shrestha, S. and Shrestha, B. K. (2017). Case flow analysis of National Avian Disease Investigation Laboratory (NADIL), Chitwan during August 2016 to January 2017. https://www.farm.com.np/research/poultry-disease-in-nepal/
17. Suksombat, W., Suksombat, P. and Mirattanaphrai, R. (2011). Effect of commercial or bovine yeasts on the performance and blood variables of broiler chickens intoxicated with aflatoxins. *International Journal of Biological, Biomolecular, Agricultural, Food and Biotechnological Engineering*, 5 (10): 613-617.
18. Thapa, A. (2016). Chitwan; the poultry hub and a center of business activities, November 11, 2016. http://dynamicthapaspace.blogspot.com/2016/11/chitwan-poultry-hub-and-center-of.html

19. Turner, J., Garcés, L. and Smith, W. (2005). The welfare of broiler chickens in the European Union. *Compassion in World Farming Trust*, UK.
20. Uddin, M. Z., Samad, M. A. and Kabir, M. L. (2011). Mortality and disease status in Hy-line and Isa-brown strains of layer chickens related in cage system in Bangaladesh. *Bangladesh Journal of Veterinary Medicine*, 9 (1): 1–16.
21. Wikipedia. (2019). Poultry farming in Nepal, February 4, 2019. https://en.wikipedia.org/wiki/Poultry_farming_In_Nepal#Present_condition
22. Yemane, N., Tamir, B. and Mengistu, A. (2016). Constraints, opportunities and socio-economic factors affecting flock size holding in small scale intensive urban poultry production in Addis Ababa, Ethiopia. *Agriculture and Biology Journal of North America*, 7(3): 146-152.