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Histopathological lesions of brain and bone marrow of Lymphoproliferative Diseases (LPDs) in commercial layer chicken

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Abstract

A total of 155 suspected cases of lymphoproliferative diseases (LPDs) like Marek's Disease (MD), Lymphoid Leucosis (LL) and Avian Reticuloendotheliosis Virus (REV) from 25 commercial layer chicken farms were studied in and around Namakkal District and Thalaivasal (Salem District). The age groups affected for MD affected was 36 to 45 wks., LL was 46 to 55 wks and REV was 20 wks respectively. The clinical signs of LPDs affected chicken showed lameness, forward and backward paralysis and torticollis. In MD suspected 52 brain and 24 bone marrow cases, each one showed (1/52: 1.92% and 1/24 : 4.16%) MD positive by histopathological (HP) examination and the lesion score was arrived like score 0-51 cases; score 2-1 case for brain and score 0-23 cases; score 3-1 case for bone marrow respectively. In LL suspected 3 brain and 5 bone marrow cases, brain-1 and bone marrow-3 (1/3: 33.33% and 3/5 : 60.00%) showed LL positive by HP and the lesion score was score 0-2 cases; score 1-1 case for brain and score 0-2 cases; score 1-2 cases; score 5-1 case for bone marrow respectively. In 1 case of REV suspected brain showed positive by HP and the lesion score was score 1-1. HP lesions of MD affected brain showed focal moderate PLC infiltration was seen in the perivascular area as well as a nodule in the neurophil. In addition, diffuse mild to moderate congestion, focal satellitosis, gliosis, axonal spheroids, perivascular cuffing, perivascular oedema and neuronal vacuolation were also noticed without PLC infiltration and bone marrow showed multifocal moderate PLC infiltration in the haematopoietic tissue. HP lesions of LL affected brain showed focal mild MLC infiltration with lymphoblastic tumour emboli in a blood vessel of the cerebral meninges and bone marrow showed focal mild MLC infiltration in the haematopoietic tissue. HP lesions of REV affected brain showed gliosis with multifocal mild perivascular cuffing with lymphocytes.

Keywords: Layer chicken, Lymphoproliferative diseases, Marek's disease, lymphoid leucosis, Reticuloendotheliosis, Histopathology

Introduction

Lymphoproliferative Diseases (LPDs) of chicken viz. Marek's Disease (MD), Lymphoid Leucosis (LL) and Reticuloendotheliosis (RE) pose major threat to poultry industry by causing severe economic loss due to heavy mortality and reduced performance.

Marek's Disease (MD) is an economically important and common lymphoproliferative disease of chicken caused by alpha herpesvirus, a cell associated virus that induces T-cell lymphomas, polyneuritis and immunosuppression (Ravikumar *et al.*, 2024) [8].

Lymphoid Leucosis (LL) had been the most common form of leucosis/sarcoma group of diseases seen in the field flocks, Incidence of LL was reported in 5.20% chicken flocks (Ravikumar *et al.*, 2019) [7].

Reticuloendotheliosis (RE) is a pathologic syndrome caused by the reticuloendotheliosis virus (REV) of retrovirus group. Various reports explained that REV as contaminant of Marek's disease and Fowl pox vaccines which resulted in delayed growth, feather abnormalities, anemia and leg paralysis (Ravikumar *et al.*, 2024) [8].

The main aim of the present paper is to describe the histopathological lesions of brain and bone marrow of lymphoproliferative diseases (LPDs) in commercial layer chicken.

Materials and Methods

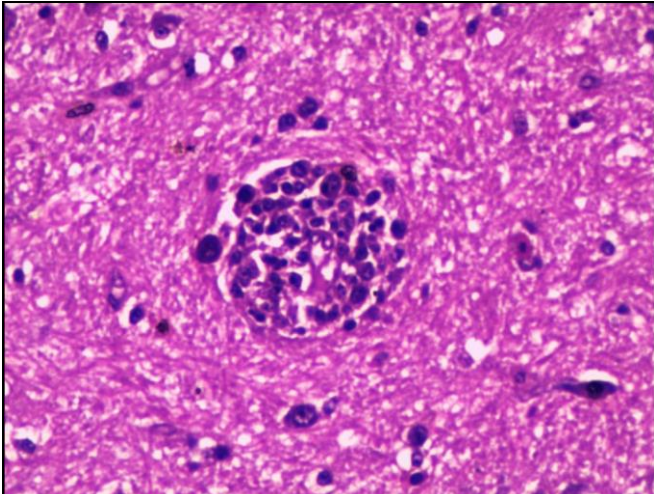
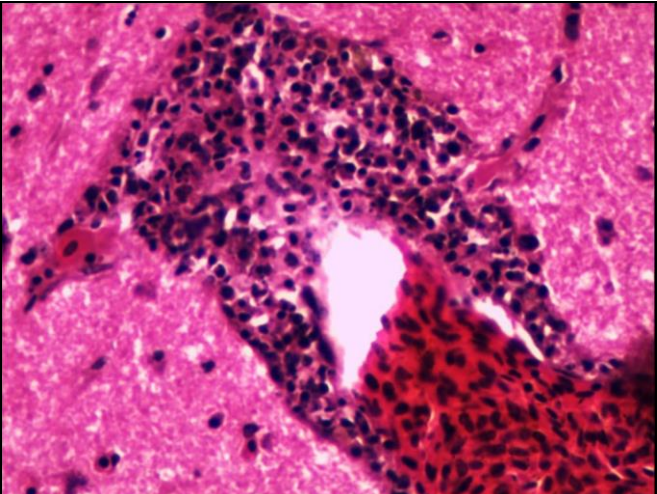
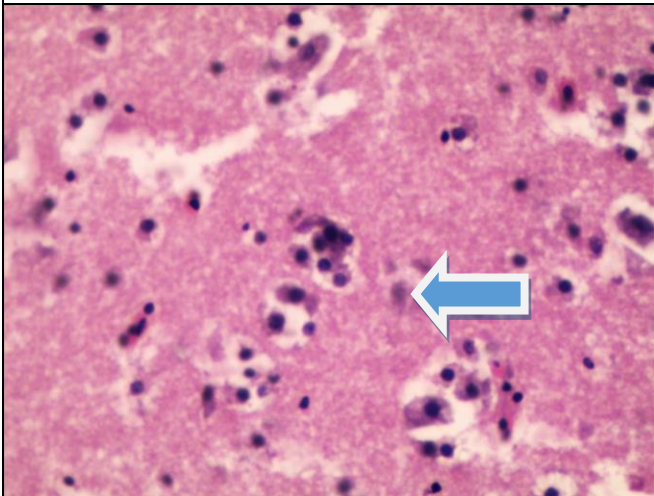
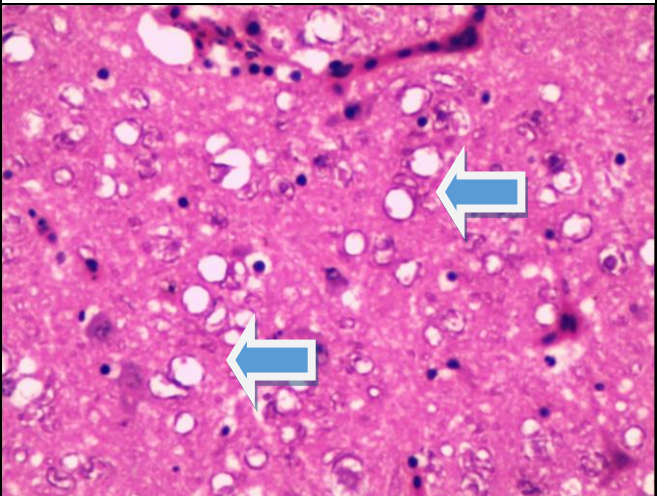
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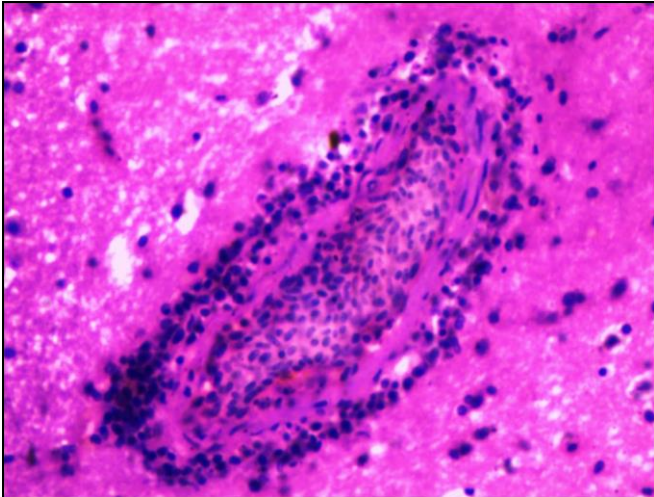
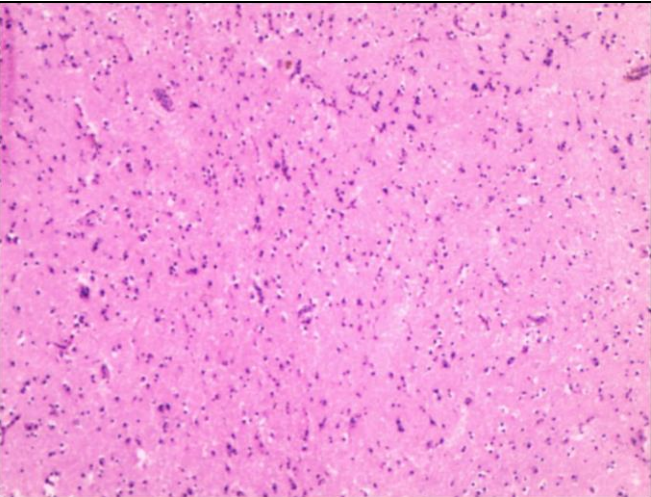
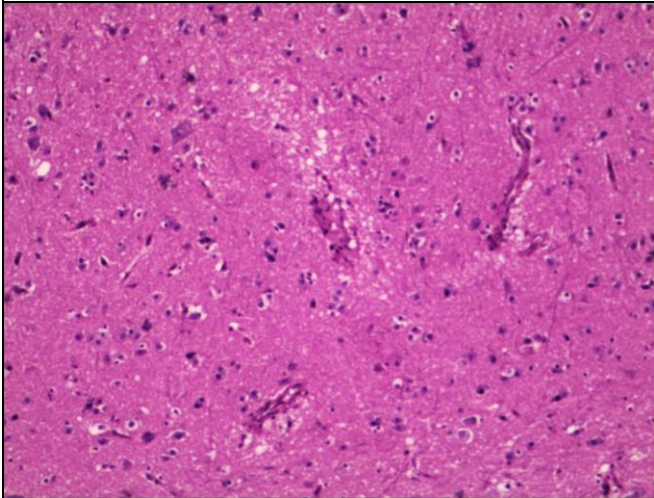
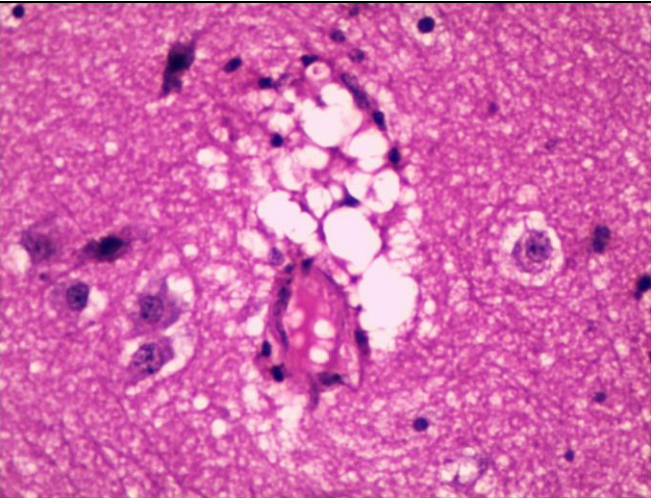
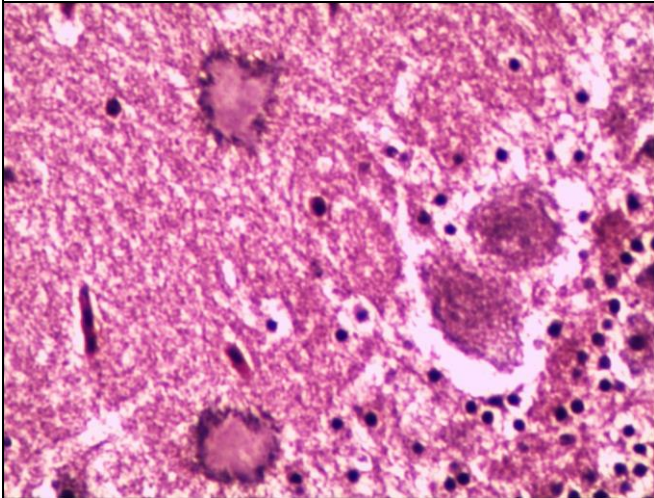
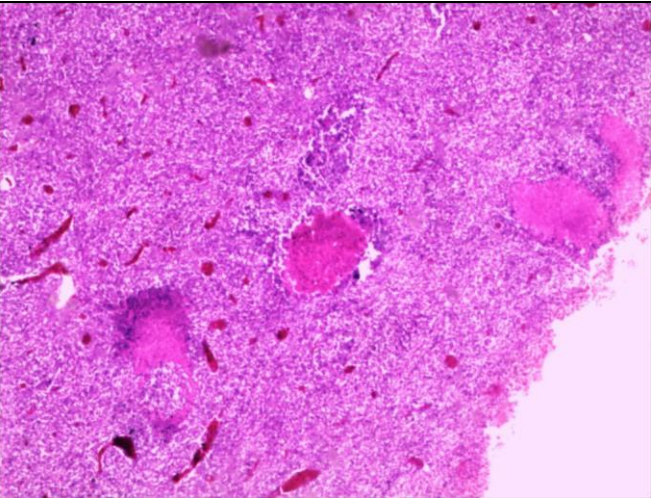
A total of 155 suspected cases of lymphoproliferative diseases (LPDs) from 25 commercial layer chicken farms were studied in and around Namakkal District and Thalaivasal (Salem District). The clinical signs of LPDs affected chicken showed lameness, forward and backward paralysis and torticollis. A detailed necropsy of all birds was carried out and tissue samples of brain and bone marrow were fixed in 10% neutral buffered formalin and a routine histological technique was performed (Suvarna *et al.*, 2013) [9].

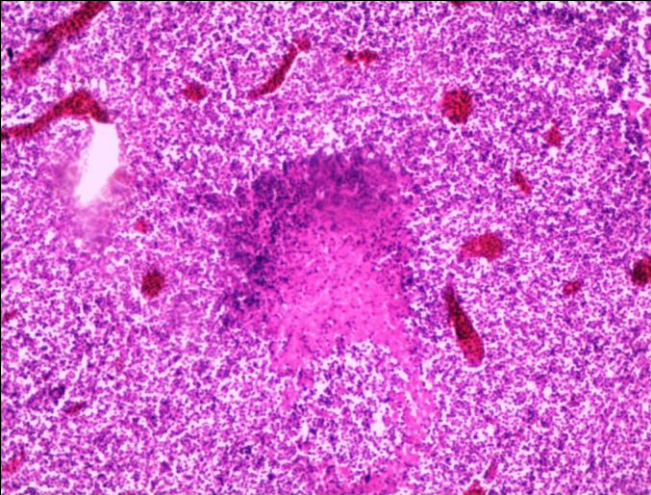
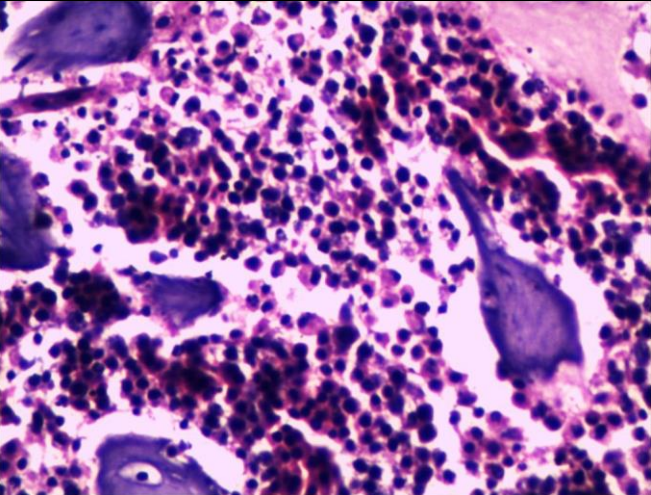
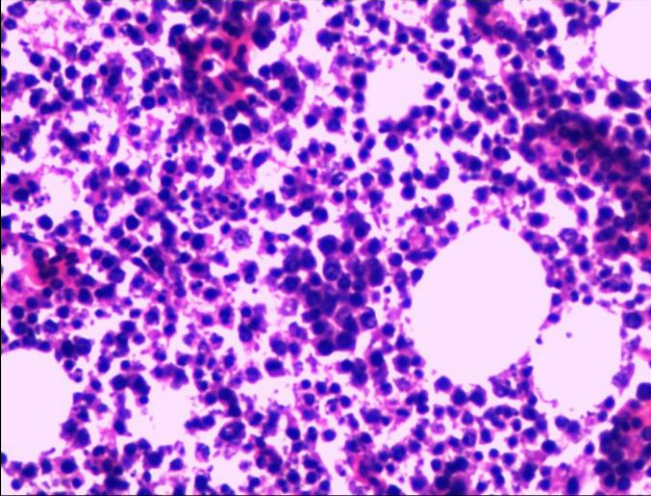
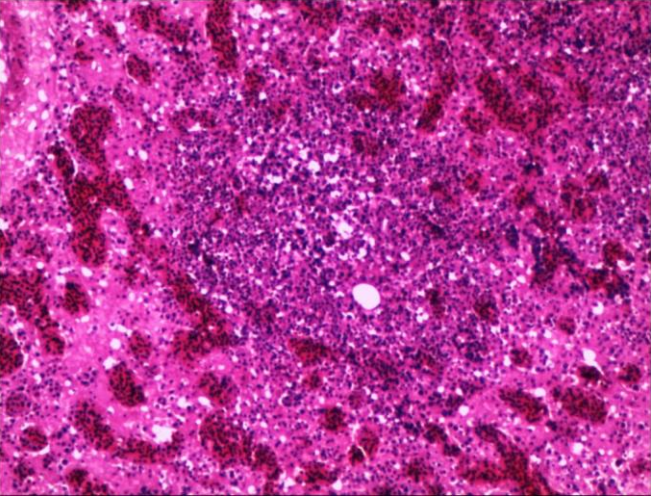
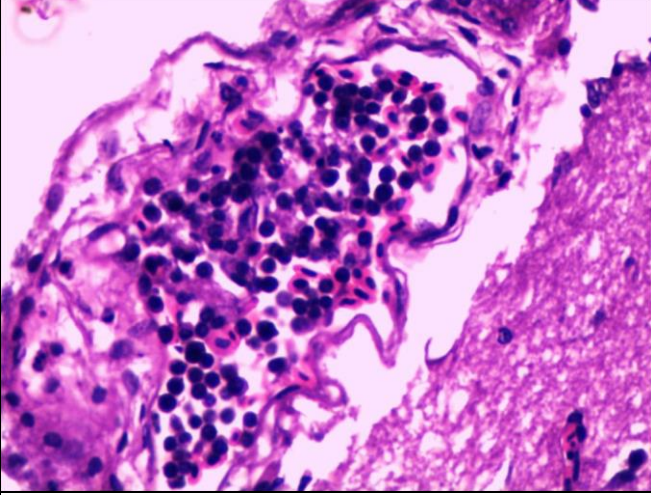
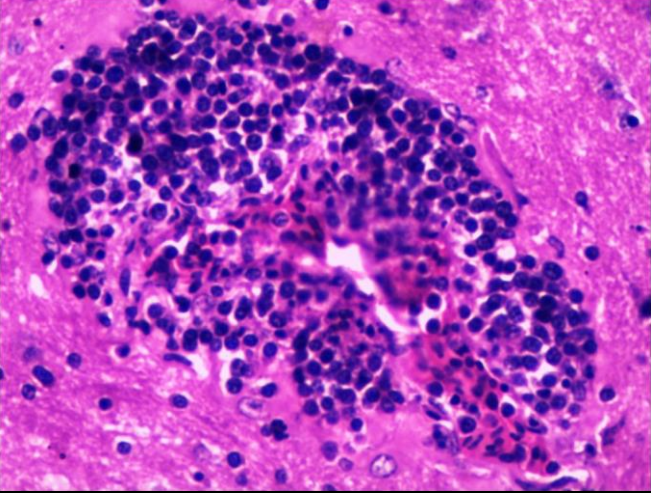
Results

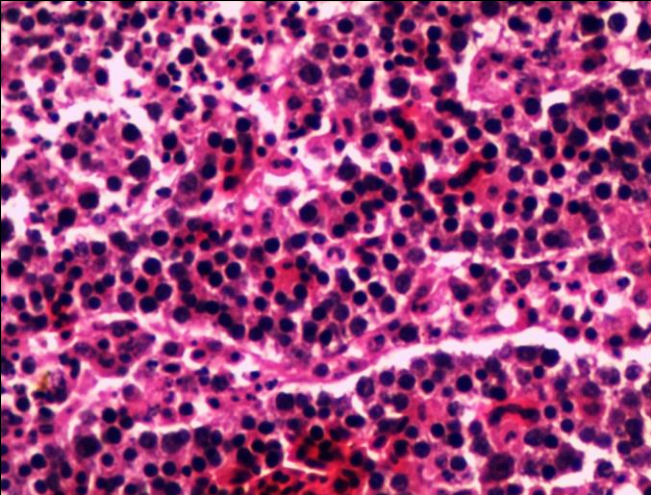
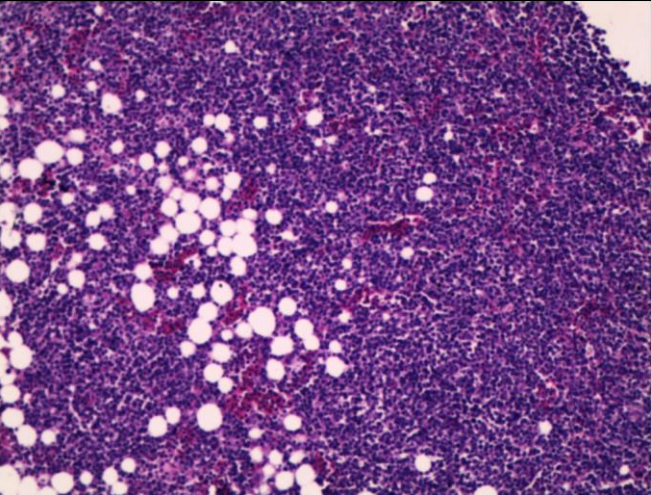
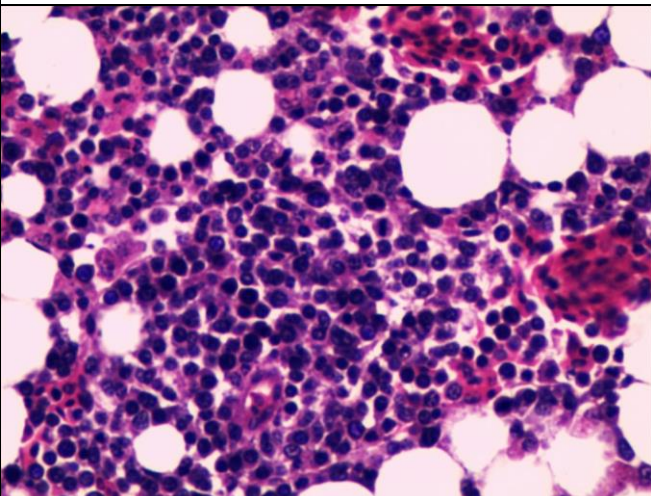
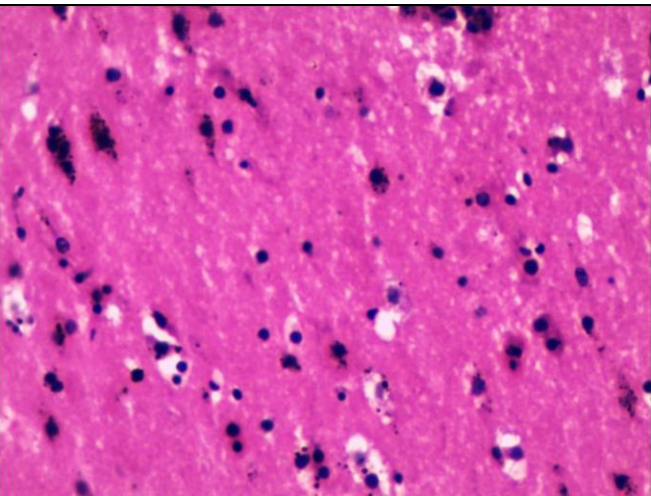
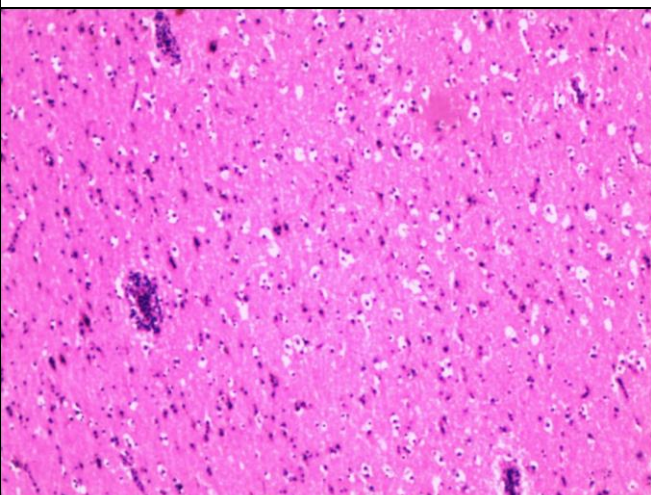
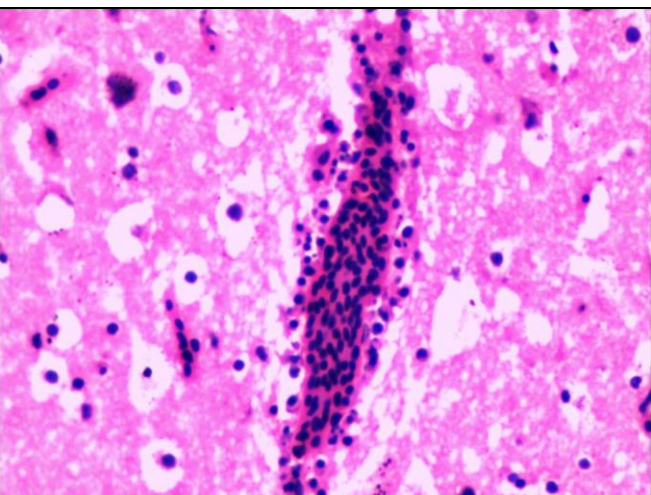
The age groups affected for MD affected was 36 to 45 wks., LL was 46 to 55 wks and REV was 20 wks respectively. In MD suspected 52 brain and 24 bone marrow cases, each one showed (1/52: 1. 92% and 1/24: 4.16%) MD positive by histopathological (HP) examination and the lesion score was arrived like score 0-51 cases; score 2-1 case for brain and

score 0-23 cases; score 3-1 case for bone marrow respectively. HP lesions of MD affected brain showed focal moderate pleomorphic lymphoid cell (PLC) infiltration was seen in the perivascular area as well as a nodule in the neurophil. In addition, diffuse mild to moderate congestion, focal satellitosis, gliosis, axonal spheroids, perivascular cuffing, perivascular oedema and neuronal vacuolation were also noticed without PLC infiltration and bone marrow showed multifocal moderate PLC infiltration in the haematopoietic tissue. In LL suspected 3 brain and 5 bone marrow cases, brain-1 and bone marrow-3 (1/3: 33. 33% and 3/5: 60.00%) showed LL positive by HP and the lesion score was score 0-2 cases; score 1-1 case for brain and score 0-2 cases; score 1-2 cases; score 5-1 case for bone marrow respectively. HP lesions of LL affected brain showed focal mild monomorphic lymphoid cell (MLC) infiltration with lymphoblastic tumour emboli in a blood vessel of the cerebral meninges and bone marrow showed focal mild MLC infiltration in the haemopoietic tissue. In 1 case of REV suspected brain showed positive by HP and the lesion score was score 1-1. HP lesions of REV affected brain showed gliosis with multifocal mild perivascular cuffing with lymphocytes.

	
MD: Score 2-Brain showing focal moderate PLC infiltrationin in the neurophil. H & E-400X	MD: Score 2-Brain showing focal moderate PLC infiltrationin the perivascular area. H & E-400X
	
MD: Brain showing focal satellitosis (arrow). H & E 400X	MD: Brain showing axonal spheroids (arrow). H & E 400X

	
MD: Brain showing perivascular cuffing with lymphocytes H & E-400X	MD: Brain showing diffuse mild gliosis H & E-100X
	
MD-Brain showing perivascular oedema and vacuolation. H & E-100X	MD-Brain showing perivascular oedema and vacuolation H & E-400X
	
MD-Brain showing central chromatolysis of neurons. H & E-400X	MD-Bone Marrow-Score 1-Necrosis. H & E-40X

	
MD-Bone Marrow-Score 1-Necrosis. H & E-100X	MD-Bone marrow-Diffuse mild PLC infiltration. H & E-100X
	
MD-Bone Marrow-Score 3-Focal moderate PLC infiltration in the haemopoietic tissue H & E-100X	MD-Bone Marrow-Score 3-Focal moderate PLC infiltration in the haemopoietic tissue, H & E-100X
	
LL: Score 1-Brain showing lymphoblastic tumour emboli in a blood vessel of the cerebral meninges. H & E 400X	LL: Score 1-Brain Cerebrum showing MLC infiltration. H & E 400X

	
LL-Bone Marrow-Score 1-Multifocal Mild MLC infiltration in the haemopoietic tissue H & E 400X	LL-Bone marrow-Score 5-Diffuse severe MLC infiltration in the haemopoietic tissue. H & E 100X
	
LL-Bone marrow Score 5-Diffuse severe MLC infiltration in the haemopoietic tissue. H & E-400X	REV: Score 1-Brain showing gliosis. H & E-400X
	
REV:Score1-Brain showing mild perivascular cuffing. H & E 100X	REV: Score 1-Brain showing mild perivascular cuffing H & E 400X

Discussion

In the present study, the brain showed focal moderate PLC infiltration in the perivascular area as well as a nodule in the neurophil. In addition, diffuse mild to moderate congestion, focal satellitosis, gliosis, axonal spheroids, perivascular cuffing, perivascular oedema and neuronal vacuolation were also noticed without PLC infiltration. Similar findings were

also made by earlier workers (Mohana, 2014) [3]. In MDV affected birds, blood vessel alteration was the first change detected in the brain followed by attachment of lymphocytes into the endothelium and their tendency to cross the vessel wall and form lymphoid aggregates in the Virchow-Robin space. This might be the cause for the occurrence of infiltration of lymphocytes in the perivascular area and

vascular congestion in the present study. The neuronal vacuolation was associated with leakage of serum proteins like albumin and IgG leading to oedema and nervous signs in the affected birds (Swayne *et al.*, 1989a) ^[10].

In the present study, the bone marrow showed multifocal moderate PLC infiltration in the haematopoietic tissue. Similar finding was also made by Mohana (2014) ^[3]. In adult layers, the metastatic lymphoma replaced or destroyed the normal bone marrow structure leading to anaemia (Haridy *et al.*, 2009) ^[1].

In the present study, the brain showed focal mild MLC infiltration with lymphoblastic tumour emboli in a blood vessel of the cerebral meninges (Score 1). Nair and Fadly (2013) ^[4] stated that LL tumours are focal and multicentric in origin. Yamagiwa and Itakura (1973) ^[11] reported that lymphocytic type proliferating cells were present frequently in the blood vessels

In the present study, focal mild MLC infiltration (Score 1) and diffuse severe MLC infiltration was noticed in the haematopoietic bone marrow tissue (Score 5). However, Payne (2001) ^[6] stated diffuse or focal LL tumours in the bone marrow.

Brain showed mild gliosis with multifocal mild perivascular cuffing with lymphocytes. However, perivascular and focal accumulations of mononuclear cells and reticuloendothelial cells in the cerebral hemisphere, central white matter of cerebellum and white matter core of the cerebellar folds of the brain were observed by Motha and Egerton (1987) ^[2].

Conclusion

In the present study the age groups affected for MD affected was 36 to 45 wks., LL was 46 to 55 wks and REV was 20 wks respectively and produce histopathological lesion in brain and bone marrow. Further, the LPDs cause immunosuppression which leads to increased susceptibility to secondary infection and sub-optimal response to vaccinations in commercial layer chicken which leads to great economic loss to poultry farmers. Since control measures against LPDs vary according to the etiology, a precise diagnosis of the LPDs caused by avian oncogenic viruses is of utmost importance. So early diagnosis of LPDs infection is at most importance to increase the profitability of the poultry farmers (Nouri *et al.*, 2001) ^[5].

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Conflict of Interest

Not available

Financial Support

Not available

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