



Marek's Disease Saliency in Domestic Poultry: Gross and Histopathological Study at Mosul City, Iraq

H.B. Al-Sabaawy*, A. N. Taha, S.S. Al-Mahmood, Zad Elhana N.A. and Faten Saad Ajeel

Department of Pathology and Poultry Diseases, Collage of Veterinary Medicine, University of Mosul, Iraq

*Corresponding Author: H.B. Al-Sabaawy, E-Mail: hadeelbasim2006@gmail.com

ABSTRACT

Marek's disease is a contagious disease that affects chickens all over the world; infected birds may exhibit one or more of the four forms (cutaneous, visceral, ocular, and neural). MD is caused by the infection of lymphocytes by Gallid alphaherpesvirus 2. Vaccines have been used successfully in many nations to control and stop the spread of the disease, but recent data indicates that their effectiveness is declining now as a result of viral evolution. The current study was carried out from July to November 2022 to diagnose MD in 20 naturally infected chickens chosen at random from various regions and brought to the veterinary teaching hospital. The presence of gross and histopathological lesions of MDV infection was found to be (2,4% in the liver, 1,6% in the lung and kidney, respectively, 1,2% leg paralysis, 0,8% in the brain, and finally, 0,4% in the spleen) in a recent study. The gross lesion is distinguished by hemorrhage, congestion, splenomegaly, a nodular lesion of the liver, and a sprain of the leg nerve, whereas the histopathological lesions are distinguished by hepatocyte congestion, degeneration, and necrosis, infiltration of monocular cells, vasogenic edema, cell swelling, a hyaline cast of renal tubules, and lymphoproliferative foci. Based on our findings, we conclude that MDV is present in backyard chickens in various areas of Mosul.

Original Article:

DOI: [HTTPS://DX.DOI.ORG/10.21608/JVS.2023.190440.1213](https://dx.doi.org/10.21608/jvs.2023.190440.1213)

Received : 29 January, 2023.

Accepted : 17 March, 2023.

Published in April, 2023.

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Keywords: Backyard chicken, Gallid alphaherpesvirus, Iraq, Marek's disease, Mosul city. *J. Appl. Vet. Sci.*, 8 (2) : 98-103.

INTRODUCTION

Marek's disease (MD) is an alymphoprolifative contagious disease that threatens industries worldwide. It affects birds such as turkeys, quail, and chickens, which are considered the most important hosts for this disease (Gimeno, 2014). Once infected, birds become lifelong carriers of this virus. MDV belongs to the Mardivirus genus in the Herpesviridae family (Suchodolski *et al.*, 2010). The economic industry is suffering as a result of the clinical outbreak and vaccination costs for preventing this disease (Payne *et al.*, 2000; Saleh and Khoudeir, 2020).

In 1907, Josef Marek, a veterinarian who originally identified this disease more than a century ago, described it as "polyneuritis," which primarily affected old broilers with low morbidity and fiddling deaths (Zhuang *et al.*, 2015). MDV transmission occurs via dander, feathers, poultry house dust, blood, litter and faeces (DAS *et al.*, 2018). MD influenced multiple organs, including visceral organs, the

peripheral nervous system, skin, and muscle (Kennedy *et al.*, 2017). Because fowls are exposed to MD infection at a young age, they must be immunized.

Hatcheries vaccine is used all over the world (Witter, 2001). Immunization against Marek's diseases results from both innate and adaptive immunity. Because MDV is a cell-associated virus, the vaccine induces a cell-mediated immune response. Safeguard is provided by T-cell activation, the release of IL-1B and IFNs and pro-inflammatory cytokines. In Iraq, the poultry industry plays an important role in the economy and includes different species of birds (duck, quail, and broiler).

The current study was carried out to investigate the pathological cases of MD in domestic chicken for cases received by the veterinary teaching hospital, faculty of veterinary medicine at University of Mosul .

MATERIALS AND METHODS

Ethical approval

The current research was ratified by the ethical committee for the extermination of animals at the College of Veterinary Medicine, University of Mosul based on a meeting on August 24, 2022.

Animals

The current study was carried out from July 2022 to November 2022. Twenty infected samples out of fifty examined samples were collected from birds that were randomly received from different regions in Mosul city and brought to the veterinary teaching hospital. All samples were submitted to the pathology laboratory of the department of pathology and poultry diseases at college of Veterinary Medicine, University of Mosul. The chickens that showed clinical signs were killed and then examined for any pathological changes and lesions in the internal organs, including (liver, kidneys, spleen and brain).

Gross and Microscopic examination

The macroscopic pathological examination of infected chicken cases was conducted in the post-mortem laboratory to detect the presence of pathological changes within the affected organs. Affected samples were taken with a volume of 1–3 cm and placed in a 10% neutral buffered formalin solution for a week. After that, passes and treatments were carried out with alcohols, xylol, and paraffin wax, pouring them into wax molds, cutting, and making tissue slices with a thickness of 4-5 microns using the microtome (Al-Sabaawy *et al.*, 2022). Finally all slides were stained with the routine stain hematoxylin and eosin and examined under an Olympus Japan microscope.

RESULTS

Gross lesion

As shown in Fig.1, A total of 20 of the 50 cases had gross visceral lesions; the most commonly infected organs were the liver (6 cases, accounting for 2.4% of the total) (Figs 2 and 3), as well as the lung and kidney (4 cases for each organ, accounting for 1.6%), both unilateral. Fig. 4 shows a sprain of the leg nerve (3 cases, accounting for 1.2%), a brain lesion (2 cases, accounting for 0.8%), and spleen enlargement (1 case, accounting for 0.4%) as shown in Fig.5.

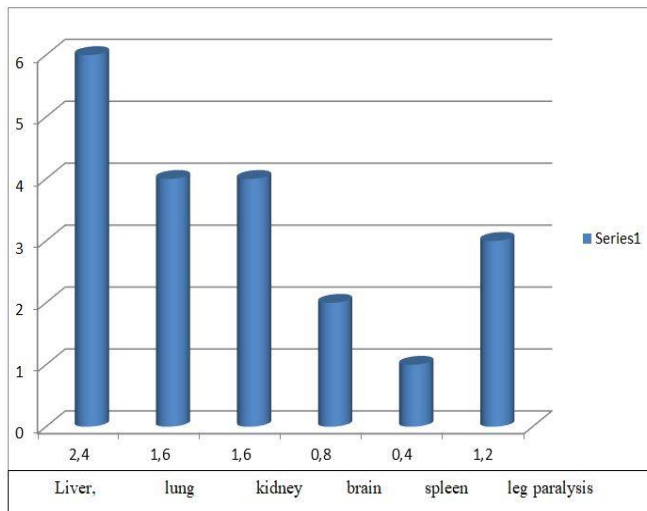


Fig.1: Showed the affected visceral organs with prevalence of it.

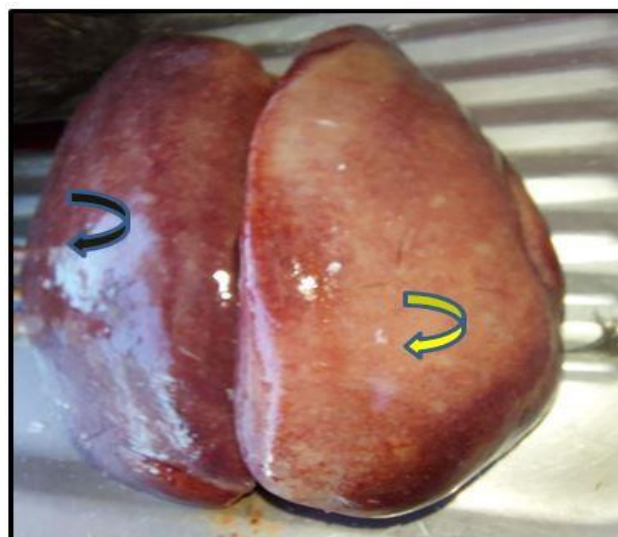


Fig.2: chicken liver showed sever paleness (yellow arrow) in addition to patches of hemorrhage (Blake arrow).



Fig.3: chicken abdominal muscle showed haemorrhage.



Fig.4: sprain of leg nerve

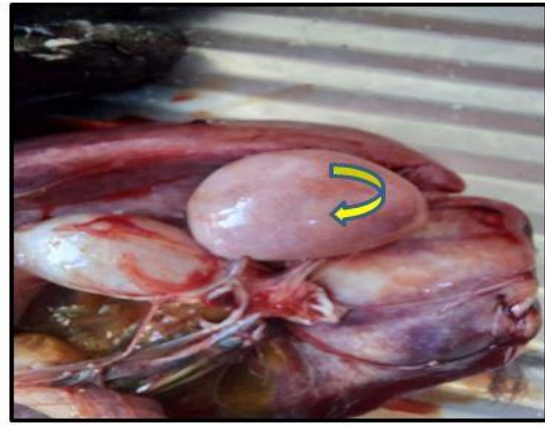


Fig.5: splenomegaly of affected chicken

Histopathological lesion

As shown in table (1), histological sections were present in the liver, which was undergoing severe congestion inside the blood vessels with severe necrosis of hepatocytes (Fig. 6), cell swelling in the epithelial cell lining the renal tubules, hyaline cast and coagulative necrosis in the kidney section (Fig.7), and the brain section, which showed the presence of vasogenic edema (Figs. 8 and 9).

Table 1 Display the affected organs, lesion categories, and grade (severe grade = 3, moderate grade = 2, and mild grade = 1).

Affected organs	Categories	Grades
Liver	Circulatory disturbances and necrosis	3
Lung	Inflammation	1
	Circulatory disturbances	3
Kidney	Necrosis	3
	inflammation	1
Leg paralysis	Inflammation	1
Brain	Degeneration	2
	necrosis	3
Splenomegaly	Disturbances of growth	3

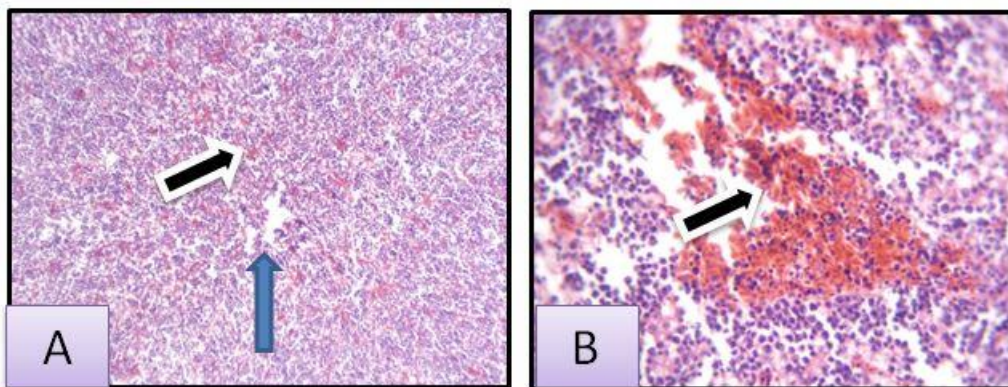


Fig. 6: liver section **A**: black arrow showed congestion while blue arrow showed degeneration and destruction of hepatic tissue, also there is loss of hepatic cord X (10). **B**: showed sever hemorrhage of hepatic tissue black arrow X(100)

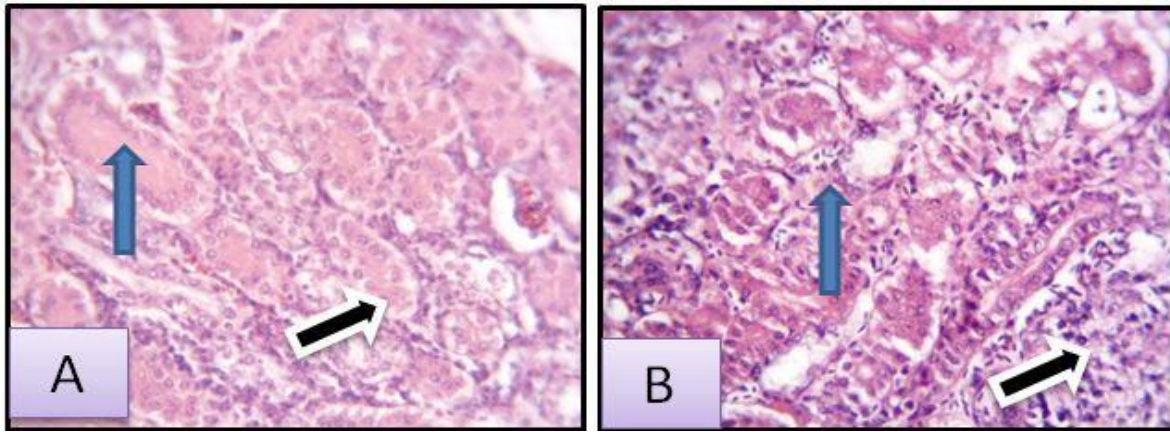


Fig.7: kidney section (A) black arrow showed coagulative necrosis of tubule & blue arrow showed presences of hyaline cast X 40, while B: the blue arrow showed the cell swelling & black arrow showed infiltration of inflammatory cell X 40.

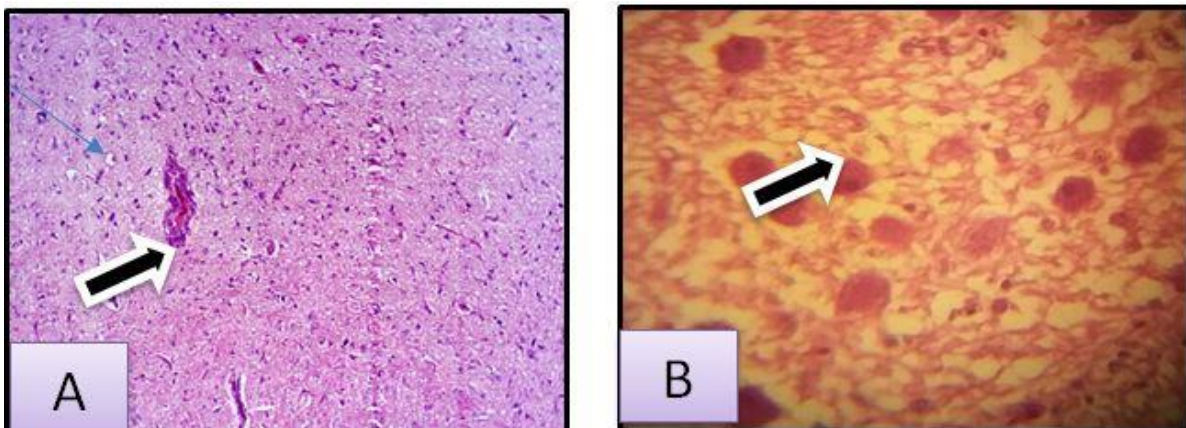


Fig. 8: A: brain section ; black arrow showed congestion of blood vessels while blue arrow showed glial cell(gliosis) X 10,while section. B: showed central chromatolysis of neuron (in which the neuron showed spherical perikaryo and loss of nuclei (black arrow) X 40

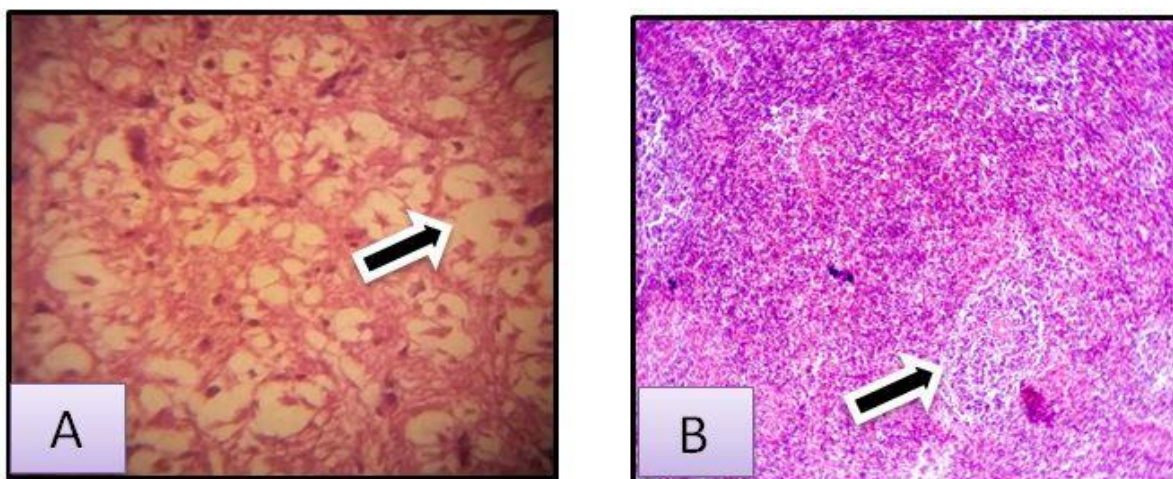


Fig.9: A: brain section showed spongy form (neurophagia) due to death and lyses of the neuron black arrow X 40, while B: showed spleen section with depletion (back arrow) of white pulp and proliferation X 10.

DISCUSSION

Marek's disease is an oncogenic lymphoproliferative disease with a high morbidity and mortality rate that causes massive economic loss in farms worldwide (Boodhoo *et al.*, 2016). Despite the fact that there are numerous vaccines available to prevent infection with this disease and the development of neoplasms and paralysis in affected poultry, shedding and subclinical circulation of the virus continue in farms (Gimeno *et al.*, 2008).

At the current work, most of the carcasses were in poor condition, exhibiting dehydration and emaciation during postmortem assessment. The liver was enlarged, pale in colour in some parts, while other sections showed bleeding, hemorrhage, and splenomegaly.

Histopathological examination of the liver section showed infiltration of inflammatory cells, especially lymphocytes, degeneration of hepatocytes with loss of architecture in addition to some areas of necrosis, as well as there is depletion of white pulp and proliferation of red plp due to immunosuppression with noticeable haemorrhage and congestion. These changes in the liver and spleen were related to the strain of the virus, immunosuppression of the affected farms. Previously, similar types of lesions were discovered (Ravikumar *et al.*, 2016; Bhut *et al.*, 2017; Sneha *et al.*, 2017).

Histological kidney lesions showed cell swelling, interstitial infiltration of lymphocytes, and degeneration of tubular epithelium like coagulated necrosis and hyaline cast, and these contributed to the virulence of MDV and the antigenicity of it. These results confirmed the observation of Meng *et al.*, (2018). Brain lesions occurred at both the early and late stages of infection, with early infection characterized by paralysis of the legs and the nerve sign, and late infection characterized by congestion, inflammation of glial cells, and a spongy form. These findings indicated that the lymphoid population was activated to varying degrees, which may have been relevant in the pathogenesis of the central nervous system response and the infection of endothelial cells, both of which are considered important (Zhuang *et al.*, 2015).

CONCLUSION

These research results enhance our information on the pattern and type of Marek's disease virus infection in backyard chickens; additional research on virus mutation, virulence strain, control methods, and molecular investigation (RT-PCR) should be done.

Conflict interest

The authors reports that there are no conflicts of interest.

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How to cite this article:

H.B. Al-Sabaawy, A. N. Taha, S.S. Al-Mahmood, Zad elhana N.A and Faten saad ajeel, 2023. Marek's Disease Salienc in Domestic Poultry: Gross and a Histopathological Study at Mosul City, Iraq. *Journal of Applied Veterinary Sciences*, 8 (2): 98-103.
DOI: [HTTPS://DX.DOI.ORG/10.21608/JAVS.2023.190440.1213](https://dx.doi.org/10.21608/JAVS.2023.190440.1213)