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Pathological Study of Bacterial Infection that Causes Liver Lesions in Chickens

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Authors' contributions

This work was carried out in collaboration among all authors. Author SR supervised the present study. Author MMAS designed the study, performed the statistical analysis, wrote the protocol and managed the analyses of the study. Authors MMAS and MSH wrote the first draft of the manuscript. Authors MRS and SAH managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

In Bangladesh, poultry disease diagnosis almost entirely depends upon the post mortem examination. The present study was conducted to determine the prevalence of bacterial diseases and liver lesions in chickens based on gross and microscopic lesions. The study was conducted to 377 liver samples collected from chickens from July to December 2017 in the Rajshahi district, Bangladesh. During the collection of samples, clinical signs and gross changes were recorded very carefully. Histomorphological changes were investigated under a light microscope and the lesions were characterized. In this study, the overall prevalence of bacterial diseases was recorded as 14.05% whereas layer chickens (9.54%) and broiler chickens (4.50%). During the study, the prevalence of Salmonellosis was found 8.22% whereas 11.66% in layer chickens and 3.25% in broiler chickens. On the other hand, the prevalence of Colibacillosis was identified 5.83% in chickens in which 3.18% were broiler chickens and 2.65% were layer chickens. In the case of Salmonellosis, grossly livers were friable, congested, enlarged, bronze discoloration with white focal necrosis, egg follicles were congested and hemorrhagic with stalk formation; microscopically livers

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formed multifocal nodules with coagulation necrosis. Birds with Colibacillosis grossly showed fluid accumulation in the peritoneal cavity of chicks, dark-colored swollen liver and spleen, and perihepatitis. The fatty liver hemorrhagic syndrome showed clotted blood on the liver, congested, enlarged and friable liver, paleness of the body and excess abdominal fat. From the present study, it was evident that considerable numbers of liver lesions were observed in chicken and a systematic study of liver lesions is helpful in making a diagnosis of various poultry diseases.

Keywords: Colibacillosis; Salmonellosis; liver lesions; necropsy findings.

1. INTRODUCTION

In Bangladesh, poultry plays a significant role in the rural socio-economic system by contributing to economic growth as well as poverty reduction particularly involving the women and unemployed youths by means of self-employment [1]. Although, poultry farming developed very rapidly in the last few years where several factors cause reduce growth rate and high mortality, which bring economic losses. It is well recognized that outbreaks of infectious and non-infectious poultry diseases are the major constraints in the poultry industry [2,3]. On the other hand, the age of the chicken and weather of a particular area also related to the disease prevalence [4].

The prevalence of bacterial diseases is considered one of the most important issues for establishing a profitable poultry farm. In most cases, poultry disease diagnosis almost entirely depends on the post mortem examination [5]. Even though highly sophisticated and modern equipment and techniques are available, the value of postmortem diagnosis and histopathological examination consider as the most important tool in early diagnosis of poultry diseases. The liver is the most important organ for disease diagnosis during the post mortem of commercial chicken. The liver performs versatile functions in birds and plays a crucial role in digestion, metabolism of proteins, fats, and carbohydrates as well as detoxification of metabolites [6,7]. Therefore, the liver disorders often by far-reaching consequences and the subsequent pathological changes. In many instances, such postmortem lesions and the pattern of changes in the liver have great value in disease diagnosis. Hence, keeping this scenario in mind the present study was designed to find out the prevalence of different bacterial diseases and lesions in the chicken liver.

2. MATERIALS AND METHODS

The present study was carried out from July to December 2017 in the Pathology lab in the Department of Veterinary and Animal Sciences, Rajshahi University, Rajshahi. A total of 377 livers were collected for postmortem examination from 377 chickens (223 layers, and 154 broilers) in Rajshahi District of Bangladesh. The postmortem examination of all the cases has performed the method described by Swayne et al. [5].

The diagnosis of different diseases was based principally on clinical signs, and characteristic gross and microscopic lesions. Histopathological examination of some selective samples was performed to substantiate the diagnosis. At necropsy, gross tissue changes were observed and were recorded by systemic dissection. During necropsy, different representative portions of livers were collected which showing apparent gross lesions as well as those without apparent lesions. The tissue pieces were preserved in 10% formal saline and were processed by routine paraffin embedding method. Sections of five-micron thickness were cut and stained by Haematoxylin and Eosin (H & E) method. Finally, the histopathology of the collected tissues was done by following the procedures described by Luna [8].

3. RESULTS

The overall prevalence of bacterial infection was recorded as 14.05%, where 9.54% in layer chickens and 4.50% in broiler chickens, respectively. During the study, the prevalence of Salmonellosis was 8.22% whereas 11.66% in layer chickens and 3.25% in broiler chickens. The prevalence of Colibacillosis was recorded 5.83% in chickens in which 4.48% in layer chickens and 7.79% in broiler chickens (Table 1 and Fig. 1).

At necropsy, livers were enlarged, congested, bronze discoloration with white focal necrosis, egg follicles were congested, hemorrhagic and discolored with stalk formation (Fig. 2); intestines were congested, hemorrhagic to

catarrhal enteritis; lungs were severely congested & pneumonic. The microscopic lesions in the present investigation revealed that livers were congested and formed multifocal nodules with coagulation necrosis while other livers showed hepatitis (Fig. 3).

The most obvious clinical signs of Colibacillosis were observed as diarrhea, soiling of cloaca with semisolid cheesy material, respiratory distress (coughing, sneezing), reduced egg production, and death. Recorded postmortem lesions were omphalitis and fluid accumulation in the peritoneal cavity of chicks, dark-colored swollen liver and spleen (Fig. 4), pericarditis, fibrinopurolent airsacculitis, perihepatitis, hemorrhagic enteritis with fluid accumulation in ligated intestinal loops, arthritis, panophthalmitis, and salpingitis in some cases. Microscopically, the liver showed coagulative necrosis, congestion, and infiltration of inflammatory cells (Fig. 5).

Table 1. Prevalence of bacterial diseases during necropsy examination

Bacterial diseases	Prevalence of bacterial diseases in layer chickens (n=223)	Prevalence of bacterial diseases in broiler chickens (n=154)	The overall prevalence of bacterial diseases (n=377)
Salmonellosis	26 (11.66%)	5 (3.25%)	31 (8.22%)
Colibacillosis	10 (4.48%)	12 (7.79%)	22 (5.83%)
Total	36 (16.14%)	17 (11.04%)	53 (14.06%)

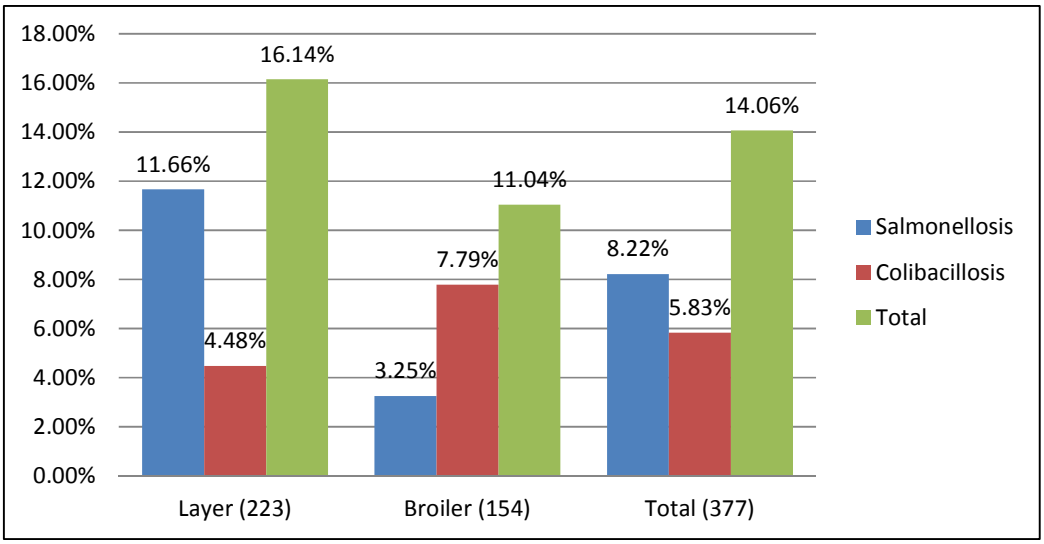

Fig. 1. Prevalence of bacterial diseases at necropsy examination in chicken based on gross and microscopic lesions in liver

Fig. 2. (a) Congested liver with bronze discoloration and (b) Haemorrhagic egg follicles with stalk formation in chicken infected with Salmonellosis

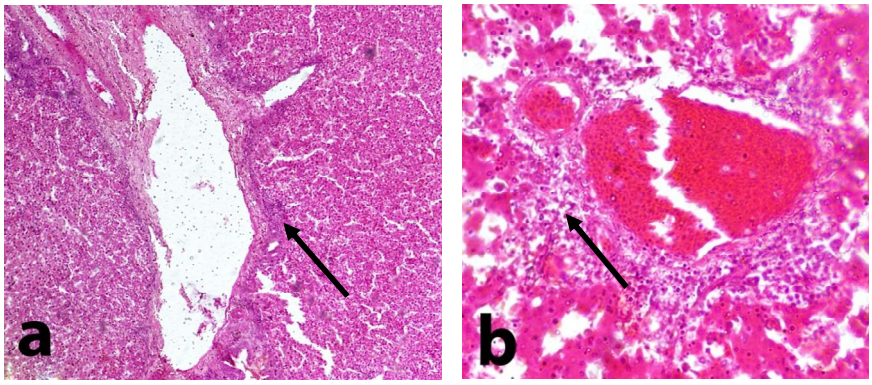

Fig. 3. The section of liver showing multifocal nodules with coagulation necrosis (arrows) in chicken infected with SImonellosis with H&E stain (a, 10x and b, 40x)

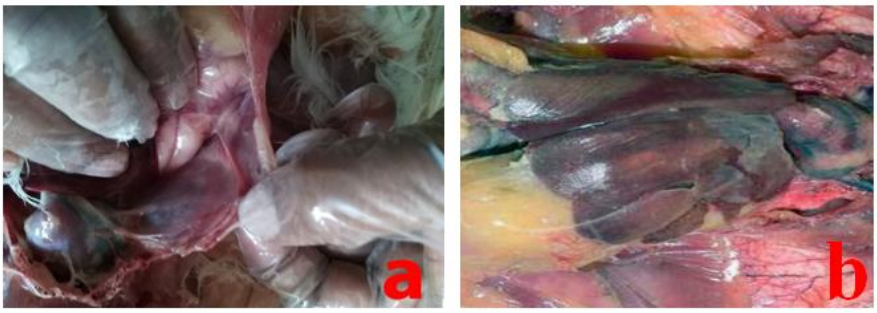

Fig. 4. (a) Fluid accumulation in the peritoneal cavity of chicks and (b) Congested liver with perihepatitis in chicken infected with Colibacillosis

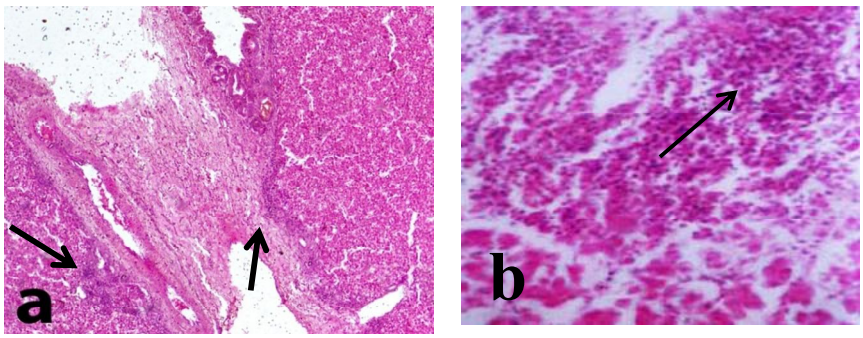

Fig. 5. The liver section showing infiltration of heterophils, lymphocytes and macrophages with coagulative necrosis (arrows) in chicken infected with Colibacillosis with H&E stain (a, 10x and b, 40x)

4. DISCUSSION

During this study, the overall prevalence of Salmonellosis was recorded as 8.22%, which was supported by the findings of Uddin et al. [9] and Hossain et al. [10]. Uddin et al. [9] and Hossain et al. [10] showed that the salmonellosis prevalence was 7.68% and 9.47%, respectively. However, the finding was lower than Badruzzaman et al. [11] and Hossain et al. [12] where the recorded prevalence was 12.18% and 22.79%. In the present study, gross lesions of Salmonella infected chickens were livers enlarged, friable, and bronze discolored, egg follicles were hemorrhagic and discolored stalk formation, intestines were hemorrhagic, similar findings were described by Habib-ur-Rehman et al. [13]; Beyaz and Kutsal [14]; Prasanna and

Paliwal [15]. This difference may be due to the geographic location, farm management or biosecurity present on the farm.

In our study, the prevalence of colibacillosis was recorded as 5.83%, which was an agreement with Hossain et al. [10] and Uddin et al. [9]. Hossain et al. [10] and Uddin et al. [9] found that the disease prevalence was 5.19% and 5.70%, which was similar to our findings. However, our finding was lower than the findings of Rahman et al. [16]; Badruzzaman et al. [11] and Talukdar et al. [17] where they reported prevalence were 53.90%, 14.03%, 14.72%, respectively. In the present study, clinical signs of colibacillosis infected chickens were diarrhea, cloaca soiling with cheesy material, swollen dark-colored liver, accumulation of fluid in the peritoneal cavity, airsacculitis, and hemorrhagic enteritis similar findings were described by Calnek et al. [18]; Vegad and Katiyar [19]; Chauhan [20]; Nakamura et al. [21]. The causes of these differences may be due to the difference in the study area, seasonal variation or farm management.

5. CONCLUSION

The systematic study of liver lesions in chicken was undertaken to know the incidence of various pathological conditions affecting the liver along with their possible etiological basis. Though the liver lesions are not pathognomic of each disease, a study of gross and microscopic lesions of the liver is often helpful in making a diagnosis of various disease conditions in chicken. In addition, it is suggested that the liver lesions can be taken as an indicator of carcass condemnation at slaughterhouses to avoid foodborne illnesses.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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