RESEARCH ARTICLE

Pathological Study of Various Types of Pneumonia Prevalent in Sheep of Rajasthan

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Abstract

For the present study, 480 tissue specimens of lungs were examined from carcasses of sheep of either sex, irrespective of age groups or breeds subjected to post-mortem examination from October 2023 to March 2024. Out of these, 126 samples representative of gross lesions were processed for subsequent histopathological examination. The overall occurrence of pneumonia in sheep recorded was 53.17 (67/126) %. The occurrence of various types of pneumonia, *i.e.,* bronchopneumonia, interstitial pneumonia, fibrinous pneumonia, haemorrhagic pneumonia, suppurative pneumonia and granulomatous pneumonia were reported as 22.22, 18.25, 2.38, 4.76, 3.17 and 2.38 %, respectively. Bronchpneumonia was reported as the most prevalent, and fibrinous and granulomatous pneumonia least prevalent pneumonia affecting lungs of sheep during the study period.

Key words: Histopathology, Lungs, Pneumonia, Sheep.

Ind J Vet Sci and Biotech (2025): 10.48165/ijvsbt.21.2.18

Introduction

Small ruminants play a crucial role in Indian economy and they are a source of income and employment to millions of rural households (Dangi *et al.,* 2024). Respiratory ailments arising from various causes affect different domestic animals, but sheep are particularly susceptible. This heightened vulnerability is attributed to the low ratio of alveolar surface to metabolic weight in sheep, distinguishing them from other species (Kumar *et al*., 2014). Furthermore, the lungs are also susceptible to microbes, toxins, and emboli transported via the bloodstream. This susceptibility is not surprising, given that the pulmonary capillary bed is the largest in the body.

Pneumonia is regarded as a highly severe condition, leading to at least a 10 % mortality rate in the sheep population in India (Maru *et al*., 1990). Pneumonia, both clinical and sub-clinical, is prevalent among sheep in major sheep-producing nations. Pneumonic lesions are commonly observed in sheep of all age groups during necropsy. This suggests that pneumonia, either independently or in conjunction with other diseases, poses a significant threat to the sheep industry, resulting in substantial losses (Goodwin *et al*., 2004; Daniel *et al*., 2006).

Several pathogens have been associated to sheep pneumonia, including bacteria, mycoplasma, chlamydiae, viruses, fungi, and parasites. The frequent pathological lesions that one comes across in various diseases of sheep comprise of the involvement of lungs. In many instances, such lesions in lungs are of great value in diagnosis of sheep diseases. Even though, highly sophisticated and costly equipment and modern techniques are available, the value of postmortem diagnosis and histopathological confirmation is evident in disease diagnosis and it is considered as the most important tool in early diagnosis of diseases. The present study deals with the occurrence and pathological manifestations of various types of pneumonia in sheep.

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How to cite this article: Shubham, Asopa, S., Mathur, M., Choudhary, S., Arora, A., & Joshi, J. (2025). Pathological Study of Various Types of Pneumonia Prevalent in Sheep of Rajasthan. Ind J Vet Sci and Biotech, 21(2), 89-92.

Source of support: Nil

Conflict of interest: None.

Submitted 01/08/2024 **Accepted** 02/09/2024 **Published** 10/03/2025

Materials and Methods

For the present study, a total number of 480 specimens of lungs of sheep of different age groups, sex and breeds were examined from various slaughterhouses and meat outlets, Veterinary hospitals, municipals and rural areas situated in and around Bikaner district of Rajasthan. Out of these, 126 samples of lungs showing frank macroscopic lesions were further processed for histopathological examination. All the representative samples were properly preserved in 10 % formalin and processed mechanically for paraffin embedding by acetone benzene technique (Lillie, 1965). Sections of 4-6 µm were cut and stained with haematoxylin and eosin staining method.

Results and Discussion

Various types of pneumonia recorded in present study are placed in Table 1. An overall occurrence of pneumonia in lungs was recorded as 53.17 % (67 out of 126).

Table 1: Various types of pneumonia recorded in sheep

Type of pneumonia	No. of cases	Percentage
Bronchopneumonia	28	22.22
Interstitial pneumonia	23	18.25
Fibrinous pneumonia	03	2.38
Haemorrhagic pneumonia	06	4.76
Suppurative pneumonia	04	3.17
Granulomatous pneumonia	03	2.38

Bronchopneumonia was recorded as 22.22 % in the present study but a higher incidence of 27.75 % was reported by Mishra *et al*. (2018), whereas Ferdausi *et al*. (2008) and Buri (2017) reported a lower incidence as 3.33 and 10.62 %, respectively. Grossly, patchy to diffuse areas of consolidation and hepatization and oozing of straw-yellow fluid from bronchi and bronchioles on incision was recorded. Microscopic analysis showed obliteration of bronchiolar lumen due to inflammatory exudates and hypertrophy of bronchiolar wall epithelium with severe infiltration (Fig. 1). Additionally, desquamated bronchiolar epithelial cells and thickened alveolar walls were observed. Similar findings were described by Singh *et al*. (2017), Mekibib *et al*. (2019) and Rania *et al*. (2021).

Interstitial pneumonia was reported as 18.25 % in present study, however a lower incidence of 7.00 % was reported by Dar *et al*. (2014) and 7.88 % by Kumar *et al*. (2014), whereas a higher incidence of 30.0 and 41.9 % was reported by Obaid and Khudair (2016) and Mekebib *et al*. (2019), respectively. Gross examination revealed patchy areas of congestion with an elastic consistency and rib imprints on the lung surface. Additionally, consolidation with thickened interlobular septa was noted. Microscopic examination showed congested alveolar vessels and irregular thickening of interalveolar septa, inflammatory cells infiltration (Fig. 2) accompanied by alveolar edema as well as desquamation of alveolar epithelial cells. The findings corresponded well with Ferdausi *et al*. (2008), Amaravathi *et al*. (2016), Obaid and Khudair (2016), Buri (2017) and Rania *et al*. (2021).

Fibrinous pneumonia observed was 2.38 %. Almost similar incidence (3.94 %) was reported by Mishra *et al*. (2018), whereas Buri (2017) and Mekbib *et al*. (2019) reported higher incidence as 32.0 and 24.3 %, respectively, in sheep lungs. Grossly consolidated areas with dark red to reddish-black or black coloration noticed. A yellowish fibrinous layer covering the lung surface revealed fibrinous exudation upon cut section. Microscopic examination showed loss of airspace due to fibrin and, to a lesser extent, leukocytes exudation (Fig. 3). Additionally, peribronchiolar fibrosis was observed in some cases. Findings were similar to those reported by Emipke *et al*. (2013), Singh *et al*. (2017) and Buri (2017).

Haemorrhagic pneumonia was recorded in 4.76 % cases in current study. A lower incidence of 3.3 % was reported by Ferdausi *et al*. (2008) and 3.5 % by Mohammed *et al*. (2022). During gross examination, areas affected by haemorrhagic pneumonia displayed a dark red to brown coloration. Within these regions, scattered ecchymotic patches ranging from pinpoint to large in size were evident. Microscopic examination showed pronounced pulmonary vascular congestion, alveolar flooding with erythrocytes, and sparse neutrophil infiltration (Fig. 4). These findings are in conformity with Buri (2017), Mohammed *et al*. (2022) and Bano (2023).

Suppurative pneumonia was found as 3.17 % in present study. A higher incidence of 44.33 % was reported by Kumar *et al*. (2014), whereas Buri (2017) reported a lower incidence of 1.67 %. Gross examination indicated the presence of variable-sized abscesses in lung lobes, ranging from pea to walnut-sized. Microscopic examination showed exudates in bronchiolar and alveolar lumens, primarily consisting of polymorphonuclear cells, denuded epithelial cells and smaller number of mononuclear cells (Fig. 5). Additionally, extensive destruction of alveolar walls was evident. The findings are in close accordance with those reported by Singh *et al*. (2017) and Bano (2023).

Granulomatous pneumonia was observed in 2.38 % cases in this study. Similar incidence (2.65 %) was reported by Bano (2023), whereas a higher incidence of 10.0 % was reported by Mahdi *et al* (2015). Grossly lungs showed congestion and contained yellowish to grey nodules. Upon sectioning, these nodules produced a cheesy material. Microscopic examination revealed granulomas with dense infiltration of macrophages, giant cells, epithelioid cells, and lymphocytes, forming distinct structures within the lung tissue (Fig. 6). Similar findings were reported by Filioussis *et al*. (2015), Swamy *et al*. (2017) and Bano (2023).

The variation in the occurrence of pneumonia might be due to changes in the disease pattern and prevalence of various infectious diseases in the present scenario. In-addition, other factors like adverse climatic conditions, poor management practices, lack of proper feeding regimen, indiscriminate use of antibiotics leading to drug resistance etc. might have also contributed to the increased occurrence of pneumonia leading to substantial economic losses.

Conclusion

The study concludes that pneumonia is an inflammation of lungs associated with various degenerative processes and necrosis, accompanied by leucocytic infiltrations, affecting overall health and productivity of sheep. The occurrence and pathological lesions and the pattern of changes in pneumonia are of great value in diagnosis of sheep diseases. Proper treatment measures and managemental practices must be incorporated on sheep farms to reduce the mortality and improve the productivity of sheep.

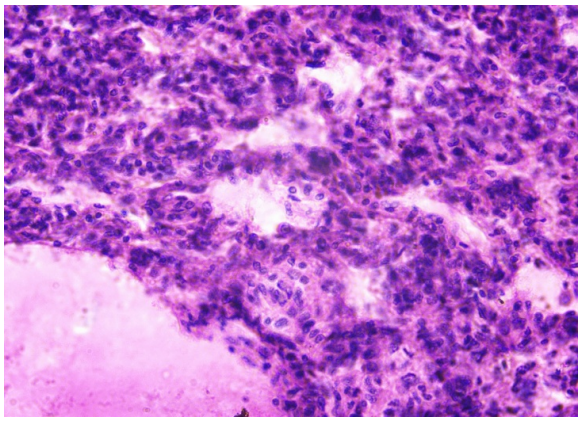

Fig.1: Microphotograph of lung showing interstitial pneumonia with thickening of interalveolar septa with inflammatory cells infiltration, predominantly neutrophils and lymphocytes. H&E. 400X

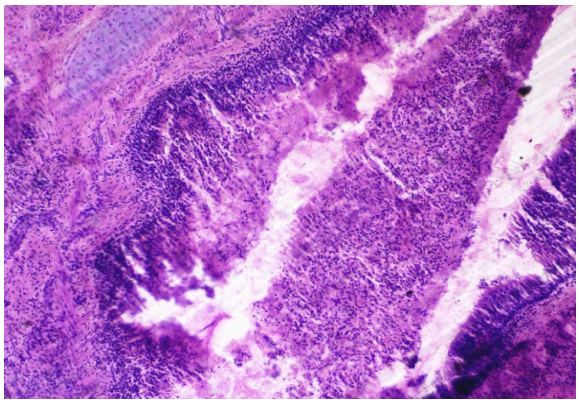

Fig.2: Microphotograph of lung showing bronchopneumonia with obliteration of bronchiolar lumen due to inflammatory exudates and hypertrophy of bronchiolar wall epithelium with severe leucocytic infiltration. H&E. 100X.

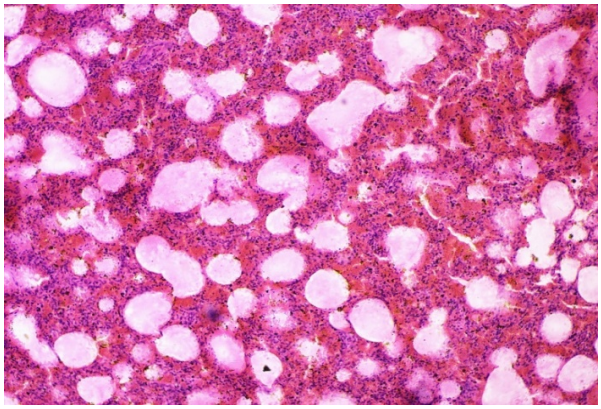

Fig.3: Microphotograph of lung showing haemorrhagic pneumonia with large number of RBCs, neutrophils, and lymphocytes infiltration in alveolar spaces. H&E. 100X.

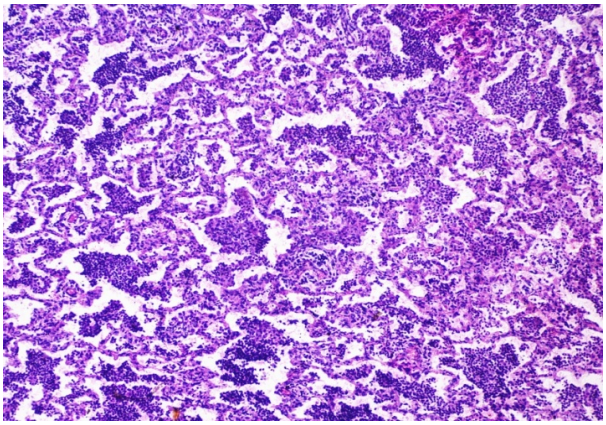

Fig.4: Microphotograph of lung showing suppurative pneumonia with severe infiltration of neutrophils along with degenerated epithelial cells in alveolar lumen. H&E. 100X.

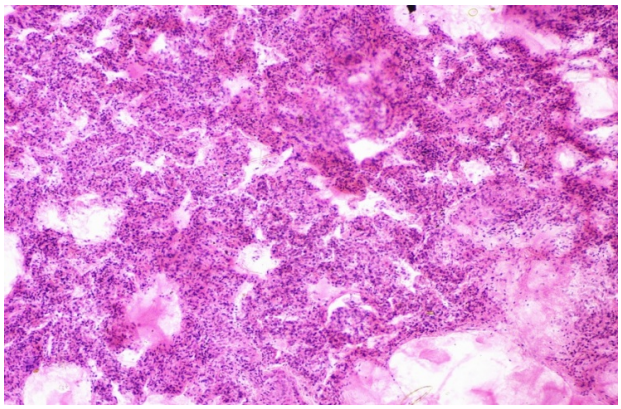

Fig. 5: Microphotograph of lung showing fibrinous pneumonia with loss of airspaces due to exudation of fibrin and severe lymphocytic infiltration. H&E. 100X.

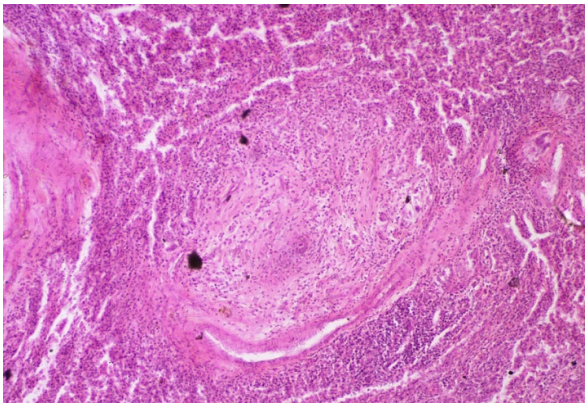

Fig. 6: Microphotograph of lung showing granulomatous pneumonia with granuloma with heavy infiltration of inflammatory cells predominantly epithelioid cells and giant cells. H&E. 100X

Acknowledgements

Authors are thankful to the Dean, College of Veterinary and Animal Science, Bikaner for providing necessary facilities to conduct the research work.

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