Spectrum of lung, liver and kidney pathology in autopsy cases: A study at Jorhat Medical College and Hospital

Running title: Spectrum of lung, liver and kidney pathology in autopsy cases

Dipankar Thakuria
Department of Forensic Medicine, Jorhat Medical College and Hospital, Jorhat, Assam, India- Assistant Professor, Department of Forensic Medicine, Jorhat Medical College and Hospital, Jorhat, Assam, India, dipankar.fmt@gmail.com
ORCID ID: https://orcid.org/0009-0009-9513-723X

Karan Kumar Borah
Department of Pathology, Jorhat Medical College and Hospital, Jorhat, Assam, India- Post Graduate Trainee, Department of Pathology, Jorhat Medical College and Hospital, Jorhat, Assam, India, karan.borah420@gmail.com
ORCID ID: https://orcid.org/0009-0003-3751-9930

Projnan Saikia
Department of Pathology, Jorhat Medical College and Hospital, Jorhat, Assam, India- Professor and HOD, Department of Pathology, Jorhat Medical College and Hospital, Jorhat, Assam, India, drprojnansaikia@gmail.com
ORCID ID: https://orcid.org/0009-0003-7124-6753

Kusum Borsaikia
Department of Pathology, Jorhat Medical College and Hospital, Jorhat, Assam, India. kusum.borsaikia1973@gmail.com
ORCID ID: https://orcid.org/0009-0008-7887-5575

Corresponding author: Dipankar Thakuria
Email: dipankar.fmt@gmail.com
Tel: +917002452761
Address: Department of Forensic Medicine, Jorhat Medical College and Hospital, Jorhat, Assam, India.

Abstract

Background: Pathological autopsy plays a crucial role in understanding mortality causes, especially in cases where diagnosis during life was incomplete or impossible. The collaboration between forensic experts and pathologists provides valuable insights into the cause and manner of death. The study aimed to determine the prevalence and pattern of lung, liver, and kidney histopathology, assess demographic associations, and investigate etiological factors contributing to these pathologies.

Methods: A retrospective, non-interventional, record based cross sectional study was conducted for a period of five years from January1, 2019, to December 31, 2023. This study analyzed 90 autopsy cases excluding decomposed bodies and cases primarily due to extensive trauma.

Results: Lung pathology was observed in 61.1% of cases, predominantly showing congestion and inflammation. Liver diseases were found in 47.7% of cases, with steatosis and cirrhosis notable, especially among males. Kidney pathology was present in 50% of cases, with various changes noted. Demographic distribution indicated a higher prevalence among males, with sudden death, chronic alcohol abuse, and road traffic accidents being common causes.

Conclusion: The study emphasizes the significant burden of lung, liver, and kidney pathology in autopsy cases, particularly among males, highlighting the importance of autopsies in understanding the underlying causes of death and guiding public health interventions and forensic investigations.

Keywords: Pathological autopsy; Histopathology; Lung; Liver; Kidney

Introduction

Autopsy is the scientific examination of a dead body. Among the various types of autopsies, pathological autopsy is the one where the pathologist comes into play. It is usually done in apparently unnatural deaths where diagnosis was not possible or incomplete during life. The medico-legal autopsy is conducted by forensic expert on requisition by investigating authorities for administration of proper justice by estimating the cause of death, time since death, and rule out any foul play. The pathological autopsy is usually performed by pathologist with the consent of the guardians to find the cause of death that could not be diagnosed during life which led to death (1). It is an important way to find out the condition of internal organs, to evaluate disease or injury that could explain the cause and manner of person's death. It is important to open all the three cavities of body including cranium, thorax and abdomen to complete the autopsy procedure (2). It provides an insight to socio-demographic and spectrum of various injuries related to organs in a particular geographic area of interest. Forensic pathologist works hand in hand with histopathologists to determine the cause of various unnatural and natural death along with various underlying factors which aid to reach a proper medicolegal autopsy findings.

This study aims to determine the prevalence and patterns of lung, liver, and kidney injuries through histopathological analysis in autopsy cases. It seeks to correlate these injuries with demographic factors such as age, sex, and co-morbidities. Additionally, it investigates the etiological factors contributing to the observed pathologies in these organs.

Methods

Study design and setting

This retrospective cross-sectional study was conducted in the Department of Pathology in collaboration with Forensic Medicine at Jorhat Medical College and Hospital, Assam. Data from autopsy records over five years (2019-2023) were analyzed.

Sample selection

Among 90 cases reviewed, inclusion criteria comprised brought dead cases, hospital deaths during treatment, and emergency department fatalities. Decomposed bodies and deaths due to extensive trauma (e.g., road traffic accidents) were excluded to ensure accurate histopathological assessment.

Tissue processing and staining

Organ samples (lung, liver, kidney) were preserved in 10% formalin, processed into 4–5 mm sections, and embedded in paraffin. Sections were stained with Hematoxylin & Eosin (H&E) for routine microscopy. Special stains (Ziehl-Neelsen for acid-fast bacilli, PAS for fungi/glycogen) were applied as needed.

Data analysis

Microscopic findings were recorded and analyzed using MS Excel to calculate percentages and frequencies of specific pathologies.

Results

In our study, lung involvement was most common, observed in 55 cases (61.1%), followed by kidney involvement in 45 cases (50%), and liver involvement in 43 cases (47.7%). The study analysed 90 cases, but the total number of organ samples exceeded this count because multiple organ sections were taken from some cases.

Table 1. Gender wise distribution of pattern of lung conditions

Pattern	Male	Female	Total
Normal	6	4	10
Congestion with inflammation	31	17	48
Inflammation of lung parenchyma	2	2	4
Granuloma with caseating necrosis: TB (Tuberculosis)	3	0	3
Fungi associated conditions	0	1	1

In the analysis of lung patterns in Table1, congestion with inflammation was found to be the predominant lung condition, affecting both sexes, while normal lung tissue was less common. Inflammation of lung parenchyma, granuloma with caseating necrosis due to TB, and fungi-associated conditions were infrequent.

Table 2. Gender wise distribution of pattern of liver conditions

Pattern	Male	Female	Total
Normal	6	11	17
Steatosis	16	6	22
Chronic inflammation	6	2	8
Cirrhosis	9	0	9
Congestion	2	1	3
TB liver	2	0	2

The distribution of liver conditions as shown in Table 2 revealed steatosis as the most prevalent condition, especially in males. Normal liver tissue was more frequently observed in females, while cirrhosis was found only in males. Chronic inflammation, congestion, and TB liver were less common.

Table 3. Gender wise distribution of pattern of kidney conditions

Pattern	Male	Female	Total
Normal	5	4	9
Acute tubular Necrosis	2	1	3
Glomerulosclerosis	3	4	7
Congestion with inflammation	4	4	8
Pyelonephritis	0	1	1
Hydropic changes of tubules	12	3	15
Intertubular haemorrhage with mesangial proliferation	7	4	11
Malignancy	0	1	1

The analysis of kidney patterns in Table 3 showed that hydropic changes of tubules and intertubularhemorrhagewith mesangial proliferation were more prevalent, particularly among males, while pyelonephritis and malignancy were rare and exclusively found in females.

Table 4. Distribution of cause of death

Cause of death	Total	Percentage (%)
Hanging	7	7.8
Drowning	2	2.1
Homicide	3	3.2
Poisoning	7	7.8
Road traffic accident	10	11.1
Chronic alcohol abuse	15	16.7
Chronic drug abuse	10	11.1
Cancer	5	5.6
Machine injury	3	3.2
Sudden death	18	20
Others	10	11.4

Table 4 showed that sudden death and chronic alcohol abuse were the leading causes of death, followed by chronic drug abuse, road traffic accidents, and other causes.

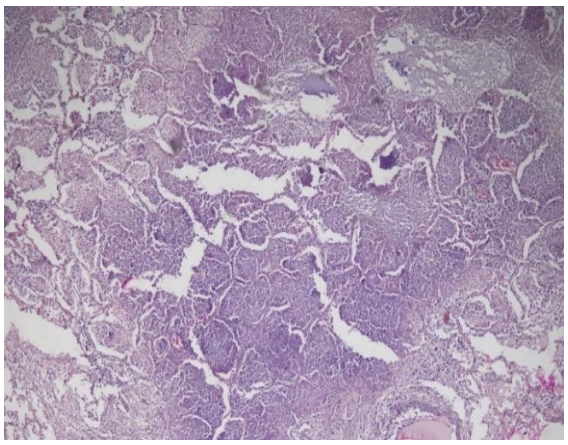

Figure 1. Tuberculosis of post mortem lung showing necrosis (H and E stain,4x)

Figure1 depicts a lung histological section affected by tuberculosis (TB), stained with Hematoxylin and Eosin (H and E) and observed under 4x magnification. It shows characteristic caseous necrosis, typical of TB infections, resulting from the immune response to *Mycobacterium tuberculosis*. Surrounding the necrotic tissue, are granulomatous reactions with macrophages, lymphocytes, and multinucleated giant cells, indicating chronic inflammation and ongoing disease activity.

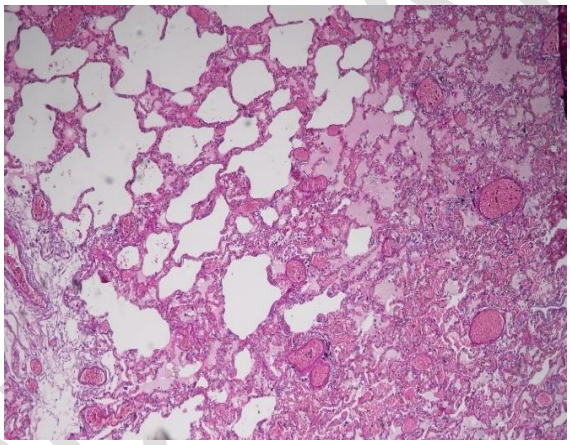

Figure 2. Inflammation of post mortem lung parenchyma (H and E stain,4x)

Figure 2 shows a histological section of lung parenchyma with inflammation, stained with Hematoxylin and Eosin (H and E) under 4x magnification. The alveolar sacs and interstitial tissue exhibited notable inflammatory changes, including infiltration of neutrophils, lymphocytes, and macrophages. The alveolar spaces appeared filled with inflammatory exudate, disrupting normal lung architecture.

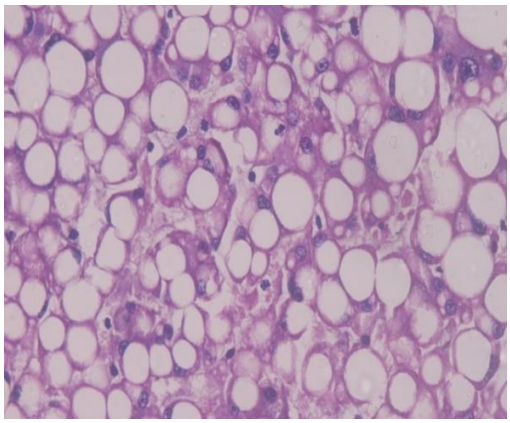

Figure 3. Hepatic steatosis of post mortem liver (H and E, 20x)

Figure 3 shows hepatic steatosis in a liver sample stained with Hematoxylin and Eosin (H and E) at 20x magnification. The image displays large, clear vacuoles of lipid droplets within hepatocytes, displacing the nuclei to the cell periphery, indicative of fatty liver.

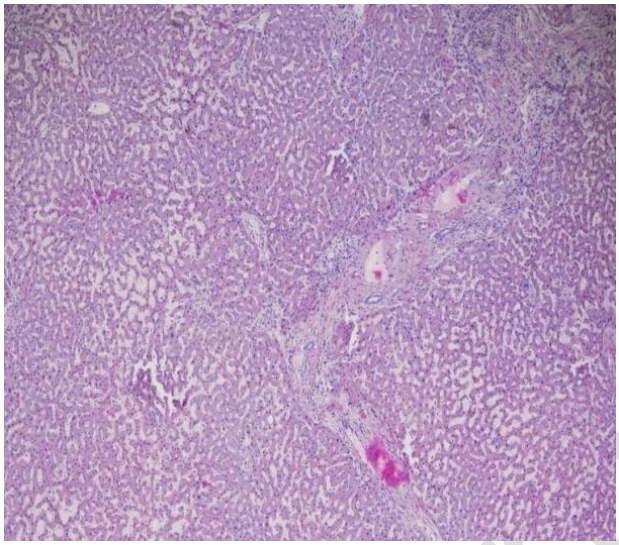

Figure 4. Cirrhosis of post mortem liver (H and E stain, 4x)

Figure 4 displays a histological section of a liver affected by cirrhosis, stained with Hematoxylin and Eosin (H and E) at 4x magnification. The image depicted shows liver architecture with thick fibrous septa surrounding regenerative nodules of hepatocytes.

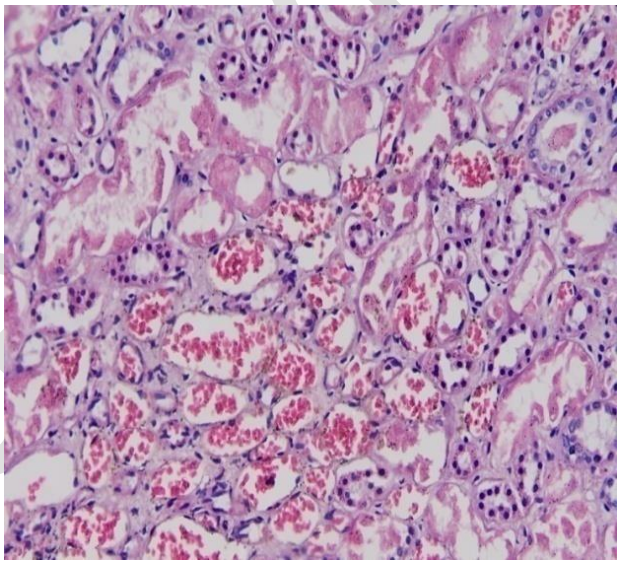

Figure 5. Intertubular haemorrhage of tubules of post mortem kidney (H and E stain, 20x)

Figure5 depicts intertubularhemorrhage in a kidney section stained with Hematoxylin and Eosin (H and E) at 20x magnification. The image shows red blood cells accumulated in the interstitial spaces between renal tubules, indicating bleeding into these areas.

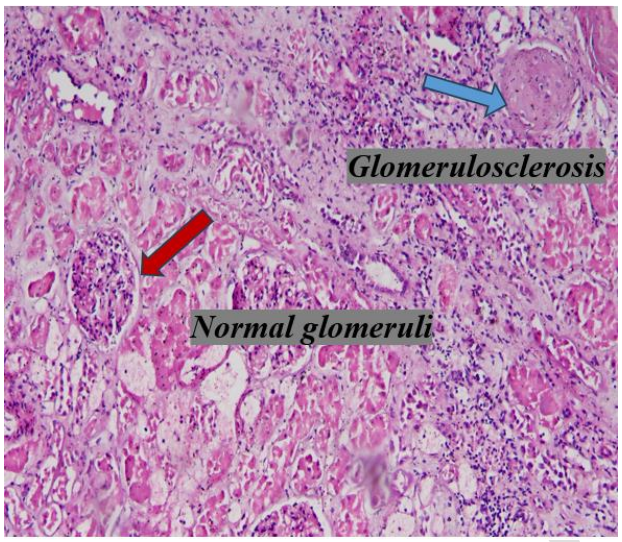

Figure 6. Glomerulosclerosis of post mortem kidney (H and E, 20x)

Figure 6 displays glomerulosclerosis in a post-mortem kidney, stained with Hematoxylin and Eosin (H and E) at 20x magnification. The image shows extensive fibrosis and hyalinization in affected glomeruli, characterized by dense, pink-staining areas due to collagen and extracellular matrix accumulation.

Discussion

In our study, we found that lung pathology was more common in males, which is consistent with findings from studies by Garg et al., Kurawar et al., and Selvambigai et al. (3,4,5). The spectrum of lung injury in our study showed congestion with inflammation (87.2%) and inflammation of lung parenchyma (7.27%), most likely due to pneumonia, similar to findings by Selvambigai et al. (5). Tuberculosis cases accounted for 5.45%, while fungi-associated lung conditions were found in 1.81% of cases. Liver diseases predominated in males in our study, possibly due to higher rates of alcohol and smoking among men, as supported by various studies (6-11). The most frequent hepatic lesions reported in a study of 4908 autopsy cases from Russia were steatosis and inflammatory disorders (10,12). Steatosis of the liver was a common finding, with a prevalence of 51.1%, comparable to findings by Umesh et al. and Devi et al. (13,14). Cirrhosis accounted for 20.9% in our study, consistent with reports by Berry in autopsies from South-East London (15). The presence of Langhans giant cells with necrosis was observed in 4.65% of cases in our study, similar to findings by Umesh et al and Pudale et al. (13,16). Among the 93 renal biopsies studied by Khare et al. found predominant changes in the tubular and interstitial tissue with majority of the cases hydropic changes of renal tubules concurrence with the present study (17). Muley et al. had tubular and interstitial lesions in a lower percentage of cases (30.90), consisting of changes of acute tubular necrosis, chronic pyelonephritis, tubular hemorrhage and interstitial nephritis (18).

Conclusion

The findings of the current study emphasize the importance of autopsies in uncovering significant pathological findings that often remain undiagnosed during life. This comparison highlights the consistent prevalence of lung, liver, and kidney pathologies in different populations, while also revealing variations in specific disease patterns and demographic distributions. Such insights are crucial for informing clinical practice and public health strategies aimed at early detection and management of these silent but significant health conditions. Histopathological analysis emerged as a magnificent learning tool, providing valuable insights into the diverse range of diseases affecting the organs. Despite providing valuable insights, our study has limitations, including a potentially biased sample size and single-center nature, lack of comprehensive clinical data, inability to assess disease progression, potential observer variability in histopathological interpretation, incomplete examination of organs, and a limited scope focusing only on the studied organs. Future research should aim to address these limitations for a more comprehensive understanding of disease pathology.

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Ethical statement

Ethical clearance was not required for this study due to the medico-legal nature of the cases, which involved the examination of deceased individuals. However, permission was obtained from the competent authorities to conduct the study.

Conflicts of interest

The Authors declare that there is no conflict of interest.

Author contributions

Dipankar Thakuria conceptualized the study, designed the methodology, and supervised the overall research process. Karan Kumar Borah was responsible for data collection, literature review, and preliminary analysis. Projnan Saikia contributed to data interpretation, drafting of the manuscript, and critical revisions. Kusum Borsaikia assisted in data management, referencing, and final proofreading. All authors read and approved the final version of the manuscript.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. Due to the medico-legal nature of the cases, the data are not publicly available.

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