

Original Research Article

Spectrum of lung, liver and kidney pathology in autopsy cases: a study at a tertiary center

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Received: 16 June 2024

Revised: 23 July 2024

Accepted: 24 July 2024

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ABSTRACT

Background: Autopsy, particularly pathological autopsy, plays a crucial role in understanding the causes of death and disease processes that lead to mortality. This retrospective study aimed to analyze the prevalence, patterns, and etiological factors of lung, liver, and kidney injuries in autopsy cases conducted at Jorhat Medical College and Hospital, Assam, from January 2019 to October 2023.

Methods: A total of 90 cases were included, comprising various causes of death, excluding decomposed bodies and cases primarily due to extensive trauma. Histopathological analysis was conducted on tissue samples collected by forensic experts.

Results: Lung pathology was more common in males, with congestion and inflammation being predominant, possibly attributed to pneumonia and tuberculosis. Liver diseases, predominantly affecting males, showed frequent steatosis and cirrhosis. Notably, Langhans giant cells with necrosis were observed in 4.65% of cases. Renal pathology revealed predominant changes in tubular and interstitial tissue, including hydropic changes, intertubular hemorrhage, congestion, glomerulosclerosis, acute tubular necrosis, pyelonephritis, and malignancy.

Conclusions: The study findings emphasize the importance of autopsy in elucidating the spectrum of lung, liver, and kidney injuries, providing insights into the demographic associations and underlying etiological factors. These findings have significant implications for understanding disease prevalence, guiding clinical management, and informing public health strategies. Further research focusing on preventive measures and early detection of these pathologies is warranted to mitigate their impact on mortality and morbidity.

Keywords: Autopsy, Histopathology, Kidney, Liver, Lung

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 the histopathologist to determine the cause of various unnatural and natural death along with various underlying factors which aid to reach a proper medicolegal autopsy finding.

This study aimed to determine the prevalence and patterns of lung, liver, and kidney injuries through histopathological analysis of tissues from autopsies. It will examine the relationship between these pathologies and demographic factors, including age, sex, and comorbidities, as well as identify etiological factors contributing to the observed injuries.

METHODS

Study design

This was a non-interventional, record-based, cross-sectional, retrospective study.

Study duration and place

This study was conducted from 1st January 2019 to 31st October 2023 in the Department of Pathology in collaboration with Department of Forensic Medicine at Jorhat Medical College and Hospital, Jorhat, Assam.

Inclusion criteria

Cases with various causes of death, including brought dead cases, hospital deaths during treatment, and deaths in the emergency department were included. Also, all medico-legal autopsy cases conducted within the study period and cases where tissue samples from the lungs, liver, or kidneys were available for histopathological examination were included.

Exclusion criteria

Decomposed bodies that hinder accurate histopathological examination, and cases with extensive trauma, such as road traffic accidents (RTAs), where the cause of death is primarily traumatic injuries were excluded.

Methodology

The department received tissue samples from medico-legal autopsies conducted by Forensic Medicine expert. Tissue fragments from were preserved in 10% formalin and sent along with history, clinical details and gross findings. Tissue pieces measuring 4 to 5 mm were taken in cassettes, processed, embedded in paraffin, and sectioned. All histological sections were stained with Haematoxylin & Eosin stain and examined under a microscope. Additional staining with Ziehl-Neelson and

Periodic Acid-Schiff (PAS) stains were performed as necessary, and microscopic findings were recorded.

Sample size

The study population comprised 90 autopsy cases, encompassing a diverse range of individuals who were brought dead, died during treatment in the hospital, or passed away in the emergency department. This allowed for a comprehensive analysis of various circumstances leading to death and their pathological implications. Detailed demographic data were recorded for each case, including age, gender, and cause of death. Gender distribution was meticulously recorded, providing insights into any potential gender-specific pathological patterns. The cause of death for each case was categorized based on clinical history, circumstances of death, and preliminary findings, which helped in correlating the pathological findings with the clinical scenarios. This thorough documentation aimed to provide a holistic understanding of the spectrum of pathological changes observed in the lungs, liver, and kidneys across different age groups and genders within the study population.

Data analysis

Data analysis was conducted in MS Excel, utilizing calculations to determine percentages and derive insights from the data.

RESULTS

Table 1 shows the annual collection of lung, liver, and kidney tissues from 2019 to 2023, with a total of 143 tissue samples collected. Despite having 90 cases in total, the number of tissue samples exceeds this due to overlapping collections from the same cases. This means that in several instances, multiple tissue types (lung, liver, and/or kidney) were collected from the same case, leading to a higher overall tissue count than the number of cases.

Table 1: Year wise distribution of cases.

Year	Lung	Liver	Kidney	Total
2023	22	17	19	58
2022	23	14	14	51
2021	02	04	03	09
2020	02	03	02	07
2019	06	05	07	18
Total	55	43	45	143

Table 2 depicts the distribution of organ involvement among the 90 cases, showing overlapping tissue collection. Specifically, lung tissues were collected in 55 cases (61.1%), liver tissues in 43 cases (47.7%), and kidney tissues in 45 cases (50%). These percentages reflect that in many instances, more than one type of

tissue was collected from the same case, thus increasing the total number of tissue collections beyond the number of individual cases.

Table 2: Organ wise distribution of cases.

Organs involved	Cases	Percentage
Lung	55	61.1
Liver	43	47.7
Kidney	45	50

Table 3 depicts the distribution of lung and liver pathology patterns. The data shows that among 66 cases of lung pathology, inflamed and congested lungs were the most common condition, affecting 48 cases (31 males and 17 females). Granuloma with caseating necrosis, indicative of TB, was identified in 3 cases, all male, while fungi-associated conditions were recorded in just one female. For liver pathology, out of 61 cases, steatosis was the most prevalent condition, found in 22 cases (16 males and 6 females). Cirrhosis was observed in 9 cases, all male, and chronic inflammation appeared in 8 cases (6 males and 2 females). Normal liver tissue was more common in females, seen in 17 cases (6 males and 11 females). These results highlight a higher prevalence of inflammatory lung conditions and liver diseases such as steatosis and cirrhosis among males, while normal liver conditions are more frequent in females.

Table 3: Gender wise distribution of pattern of lung and liver conditions.

Pattern	Male	Female	Total
Lung pathology			
Normal	06	04	10
Congestion with inflammation	31	17	48
Inflammation of lung parenchyma	02	02	04
Granuloma with caseating necrosis	03	00	03
Fungi associated conditions	00	01	01
Liver pathology			
Normal	06	11	17
Steatosis	16	06	22
Chronic inflammation	06	02	08
Cirrhosis	09	00	09
Congestion	02	01	03
TB liver	02	00	02

Table 4 presents the gender-wise distribution of kidney conditions among 55 cases. The most common condition is hydropic changes of tubules, found in 15 cases (12 males, 3 females). Intertubular hemorrhage with mesangial proliferation was observed in 11 cases (7 males, 4 females). Congestion with inflammation appeared in 8 cases (4 males, 4 females). Glomerulosclerosis was present in 7 cases (3 males, 4 females). Normal kidney tissue was found in 9 cases (5

males, 4 females). Acute tubular necrosis occurred in 3 cases (2 males, 1 female). Pyelonephritis and malignancy were each identified in 1 case, both in females. This distribution highlights a higher prevalence of hydropic changes and intertubular hemorrhage among males.

Table 4: Gender wise distribution of pattern of kidney conditions.

Pattern	Male	Female	Total
Normal	05	04	09
Acute tubular necrosis	02	01	03
Glomerulosclerosis	03	04	07
Congestion with inflammation	04	04	08
Pyelonephritis	00	01	01
Hydropic changes of tubules	12	03	15
Intertubular haemorrhage with mesangial proliferation	07	04	11
Malignancy	00	01	01

Table 5 details the distribution of causes of death among a total of cases, along with their percentages. Sudden death is the most common cause, accounting for 18 cases (20%). Chronic alcohol abuse follows with 15 cases (16.7%). Both road traffic accidents (RTA) and chronic drug abuse each account for 10 cases (11.1%). Hanging and poisoning are each responsible for 7 cases (7.8%). Cancer caused 5 deaths (5.6%). Homicide and machine injury each account for 3 cases (3.2%). Drowning caused 2 deaths (2.1%). Other causes collectively account for 10 cases (11.4%). This distribution highlights sudden death and chronic substance abuse as the leading causes of death.

Table 5: Distribution of cause of death.

Cause of death	Total	Percentage
Hanging	07	7.8
Drowning	02	2.1
Homicide	03	3.2
Poisoning	07	7.8
RTA	10	11.1
Chronic alcohol abuse	15	16.7
Chronic drug abuse	10	11.1
Cancer	05	5.6
Machine injury	03	3.2
Sudden death	18	20
Others	10	11.4

Figure 1 displays a histological section of a lung affected by tuberculosis (TB) using Hematoxylin and Eosin (H&E) stain, observed under a 4x magnification. The characteristic necrotic tissue, often referred to as caseous necrosis due to its cheese-like appearance, is evident. This necrosis is typical in TB infections, resulting from the immune response to *Mycobacterium tuberculosis*. Surrounding this necrotic area, you may observe a

granulomatous reaction, which includes collections of macrophages, lymphocytes, and multinucleated giant cells, a hallmark of chronic inflammation in TB. The granulomas attempt to contain the spread of the infection, but their necrotic centers indicate tissue destruction and ongoing disease activity.

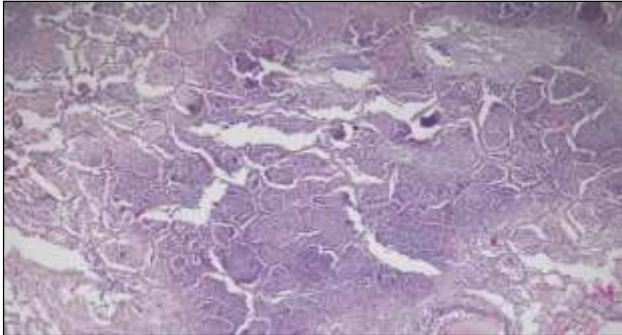


Figure 1: Tuberculosis of post mortem lung showing necrosis (H&E stain, 4x).

Figure 2 illustrates a histological section of lung parenchyma displaying signs of inflammation, stained with Hematoxylin and Eosin (H&E) and viewed under 4x magnification. The parenchyma, which comprises the alveolar sacs and interstitial tissue, shows notable inflammatory changes. These changes are characterized by the infiltration of inflammatory cells such as neutrophils, lymphocytes, and macrophages into the lung tissue. The alveolar spaces may appear filled with inflammatory exudate, leading to a disruption in the normal architecture of the lung tissue. The increased cellularity and tissue swelling reflect an active inflammatory response, which may be indicative of an acute infection, chronic disease, or an immune response to injury. This inflammation can impair the lung's ability to facilitate gas exchange, contributing to respiratory symptoms.

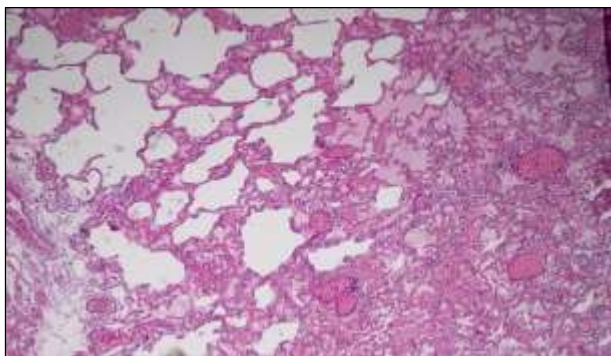


Figure 2: Inflammation of post mortem lung parenchyma (H&E stain, 4x).

Figure 3 depicts hepatic steatosis in a liver sample stained with Hematoxylin and Eosin (H&E) at 20x magnification. Hepatic steatosis, commonly known as fatty liver, is characterized by the abnormal accumulation

of lipid droplets within hepatocytes. In this image, these lipid droplets appear as large, round, clear vacuoles that displace the hepatocyte nuclei to the periphery of the cell, giving the cells a swollen appearance. The clear vacuoles are a result of the dissolved lipids during tissue processing. This condition is indicative of metabolic disturbances within the liver and can be associated with conditions such as alcohol consumption, obesity, diabetes, or metabolic syndrome. Over time, hepatic steatosis can progress to more severe liver diseases, such as steatohepatitis, fibrosis, or cirrhosis if the underlying causes are not addressed.

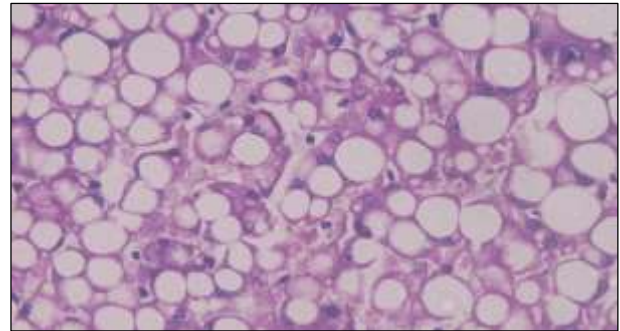


Figure 3: Hepatic steatosis of post mortem liver (H&E, 20x).

Figure 4 shows a histological section of a liver affected by cirrhosis, stained with Hematoxylin and Eosin (H&E) and viewed under 4x magnification. Cirrhosis represents advanced liver disease characterized by widespread fibrosis and the formation of regenerative nodules. In this image, the normal liver architecture is disrupted by thick fibrous septa (bands of connective tissue) that encircle nodules of regenerating hepatocytes. These fibrotic bands replace normal liver tissue, leading to impaired liver function. The dense fibrous tissue stains pink due to the eosin component, while the regenerating nodules of hepatocytes may show variations in size and arrangement, indicating the liver's attempt to repair and regenerate. This regenerative activity is typically disorganized, leading to the formation of nodules separated by fibrous septa. The overall appearance reflects the liver's chronic injury response, which can result from various causes, such as chronic alcohol abuse, viral hepatitis, or non-alcoholic steatohepatitis (NASH). This extensive fibrosis and nodule formation compromise the liver's ability to perform its metabolic and synthetic functions, leading to clinical symptoms of liver failure and portal hypertension.

Figure 5 presents intertubular hemorrhage in a kidney section, stained with Hematoxylin and Eosin (H&E) and viewed under 20x magnification. Intertubular hemorrhage involves the presence of red blood cells within the interstitial spaces between the renal tubules, indicating bleeding into these areas. In this image, the intertubular regions show a prominent accumulation of erythrocytes, appearing as densely stained red areas between the

kidney tubules. The hemorrhaged red blood cells disrupt the normal architecture of the renal interstitium. Surrounding the hemorrhage, the renal tubules themselves may appear distorted or compressed due to the presence of blood, and there might be evidence of tubular injury, such as epithelial cell swelling or necrosis. This condition can result from various causes, including trauma, vascular injury, or severe systemic conditions like disseminated intravascular coagulation (DIC). Intertubular hemorrhage can compromise kidney function by disrupting the delicate balance required for efficient filtration and urine formation, potentially leading to acute kidney injury or exacerbating existing renal pathologies.

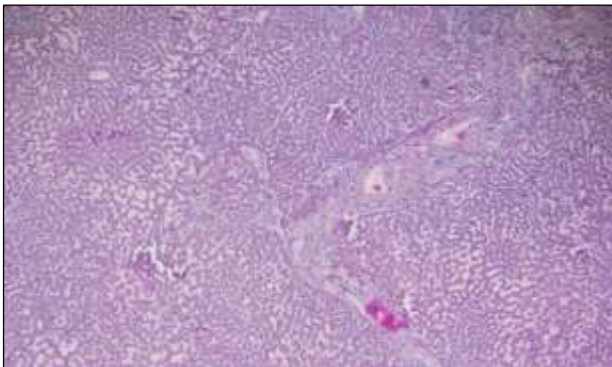


Figure 4: Cirrhosis of post mortem liver (H&E stain,4x).

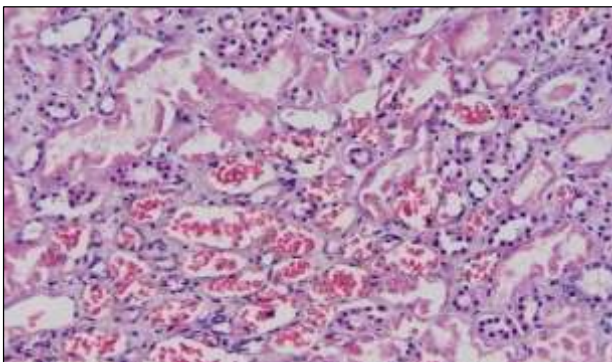


Figure 5: Intertubular haemorrhage of tubules of post mortem kidney (H&E stain,20x).

DISCUSSION

We analyzed 90 autopsy cases at Jorhat Medical College and Hospital, revealing significant findings in lung, liver, and kidney pathology. Comparing our results with those of similar studies provides a broader context and helps identify patterns and variations in autopsy-detected diseases.

Lung pathology

In our study, lung pathology was observed in 61.1% of cases more common in males, with congestion and inflammation being the predominant patterns (87.2% and

7.27% respectively), most likely due to pneumonia. This is consistent with the findings of Garg et al, Kurawar et al, and Selvambigai et al, where lung pathology was also more common in males.³⁻⁵ The higher prevalence in males may be attributed to higher smoking rates and occupational exposures. Our observations of tuberculosis (5.45%) and fungi-associated lung conditions (1.81%) align with Selvambigai et al.'s findings, highlighting the role of infectious diseases in lung pathology.⁵

Pandurang's study also found common lung conditions such as pulmonary edema, pneumonia, emphysema, tuberculosis, and malignant lesions, emphasizing the prevalence of lung congestion and inflammation.⁶ Both studies highlight the importance of these conditions in autopsy examinations. Additionally, the high incidence of emphysema in smokers noted in study by Tahir et al which is comparable to our observation of emphysema, despite the lack of specific smoking-related data in our study.⁷ This suggests that smoking-related lung damage is a significant factor in autopsy findings.

Liver pathology

Liver diseases were identified in 47.7% of our cases, with steatosis and cirrhosis being notable findings, particularly among males. This aligns with the results of Kour et al, Bal et al, Sotoudehmanesh et al, Fubara et al, Selvi et al and Merat et al where fatty changes, chronic venous congestion, and steatohepatitis were common.⁸⁻¹³ Our findings are also supported by study from Russia, which reported steatosis and inflammatory disorders as frequent hepatic lesions.¹⁴ The high prevalence of steatosis (51.1%) in our study is comparable to the findings of Umesh et al and Devi et al, indicating a common occurrence of fatty liver changes.^{15,16} Cirrhosis accounted for 20.9% in our study, similar to Berry's reports from autopsies in South-East London, which may be linked to chronic alcohol consumption.¹⁷

The presence of Langhans giant cells with necrosis in 4.65% of our cases is consistent with findings by Umesh et al and Pudale et al suggesting a similar pattern of granulomatous liver disease.^{15,18} The higher rates of liver pathology in males in our study may be due to higher alcohol and smoking rates among men, as supported by various studies.

Kidney pathology

Kidney pathology was present in 50% of our cases, showing a variety of changes such as hydropic changes of tubules, intertubular hemorrhage, and glomerulosclerosis. This spectrum of renal lesions aligns with Yadav et al findings, where chronic glomerulonephritis, chronic kidney disease, and other renal abnormalities were identified.¹⁹ Similarly, Kumar et al reported a range of kidney pathologies including glomerular and vascular lesions, underscoring the diverse renal findings seen in autopsy cases.²⁰ These findings highlight the importance

of autopsy in identifying renal lesions that may remain undiagnosed during life.

Khare et al observed predominant changes in the tubular and interstitial tissue, which concurs with our findings of hydropic changes of renal tubules.²¹ Muley et al reported tubular and interstitial lesions in a lower percentage of cases (30.90%), including acute tubular necrosis and chronic pyelonephritis, indicating variability in the prevalence of specific renal lesions across different populations and studies.²²

Despite providing valuable insights, the study has several limitations that should be considered. The study's retrospective nature relies on previously recorded data, which may be subject to documentation biases and incomplete records. The sample size, though significant, is limited to a single tertiary care center and may not represent broader regional or national trends. Additionally, the findings are based on a specific population over a defined period, and changing epidemiological trends or healthcare practices over time could impact the generalizability of the results.

CONCLUSION

The finding of the current study emphasizes the importance of autopsy 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 on the spectrum of lung, liver, and kidney pathology in autopsy cases has limitations. These include 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 these organs. Future research should aim to address these limitations for a more comprehensive understanding of disease pathology.

ACKNOWLEDGEMENTS

Authors would like to thank the Principal cum Chief Superintendant of Jorhat Medical and Hospital for allowing to conduct the study by collecting data from the medico-legal cases for academic and research purposes.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of Jorhat Medical College and Hospital, Jorhat, Assam

REFERENCES

1. Kotabagi RB, Charati SC, Jayachandar D. Review article clinical autopsy vs medicolegal autopsy. Med J Armed Forces India. 2005;61(3):258-63.
2. Khare P, Gupta R, Ahuja M, Khare N, Agarwal S, Bansal D. Prevalence of lung lesions at autopsy: A histopathological study. J Clin Diagn Res. 2017;11(5):EC13-6.
3. Garg P, Sharma A, Kundal RK. Spectrum of pulmonary histopathological lesions: A study of 100 autopsy cases. J Med Sci Clin Res. 2017;5(12):31305-6.
4. Kurawar RR, Vasaikar MS. Spectrum of histomorphological changes in lungs at autopsy: A 5 year study. Annals Pathol Lab Med. 2017;4(1):31304-8.
5. Selvambigai G, Amudhavalli S, Deepak Chakravarthi CD, Ravi S. Histopathological study of lung in autopsy cases: A prospective study. IJRMS. 2016;4(11):4816-9.
6. Pandurang BS. Histopathological study of lung lesions using autopsy. Int J Adv Biotechnol Res. 2021;12(4):16-21.
7. Tahir TM, Rehman F, Anwar S, Kamal F. Patterns of pulmonary morphological lesions seen at autopsy. Biomedica. 2013;29(2):64-65.
8. Kour B, Choudhary M, Singh K. Incidental findings in autopsy examination of liver-a one year retrospective study. Int J Health Sci Res. 2019;9(8):68-70.
9. Bal MS, Singh SP, Bodal VK, Oberoi SS, Surinder K. Pathological findings in liver autopsy. Jo Ind Acad For Medi. 2004; 26(2):971-73.
10. Sotoudehmanesh R, Sotoudeh M, Asgari A, Abedi-Ardakani B, Tavangar SM, Khakinejad A, et al. Silent liver diseases in autopsies from forensic medicine of Tehran. Arch Iran Medi. 2006;9(4):324-28.
11. Fubara DS, Jebbin NJ. Hepatocellular carcinoma in Port Harcourt, Nigeria. Clinicopathologic study of 75 cases. Ann Afri Medi. 2007;6(2):54-7.
12. Selvi RT, Selvam V, Subramaniam PM. Common silent liver diseases in and around of Salem population: An autopsy study. J Clin Diagnost Res. 2010; 6(2):207-10.
13. Merat S, Sotoudehmanesh R, Nouraie M, Peikan-Heirati M, Sepanlou SG, Malekzadeh R, et al. Sampling error in histopathology findings of non alcoholic fatty liver diseases: A postmortem liver histology study. Arch Iran Medi. 2012;15(7):418-20.
14. Voinova LV. Aetiological and nosological structure of liver diseases (on autopsy data of clinics of I.M. Sechenov Moscow Medical Academy in 1988-1997). Arkh patol. 2000;62(2):45-7.

15. Umesh BR, Gayathri BN, Harendra Kumar ML. Spectrum of liver pathology at autopsy. *Int J Res Rev.* 2015;2(3):79-86.
16. Devi PM, Myrthong BG, Meera T, Nabachandra H. Pathological findings of liver in autopsy cases: A study at Imphal. *J Ind Acad Foren Med.* 2013;35(3):206-10.
17. Berry CL. Liver lesions in an autopsy population. *Hum Toxicol.* 1987;6(3):209-14.
18. Pudale SS, Ashok BS, Ambadas PG, Gajanan DR, Pandharinath CN. Study of liver pathology in autopsy cases. *Int J Curr Res.* 2014;6(3):5795-7.
19. Yadav SNS, Bhattacharya AB. Histopathological spectrum of kidney lesions in autopsy: A study at VIMSAR Burla. *Int J Acad Med Pharm.* 2022;4(4):945-951.
20. Kumar M, KP A, BE C. Histomorphological spectrum of liver and kidney lesions in autopsy cases. *Asian J Pharm Clin Res.* 2023;16(4):154-6.
21. Khare P, Gupta R, Agarwal S, Bhatnagar A, Anand R, Bhatnagar Sr A. Spectrum of renal lesions on autopsy: experience of a tertiary level institute based on retrospective histopathological analysis. *Cureus.* 2021;13(8).
22. Mulay PS. Kidney lesions in an autopsy: 3-year study in a tertiary health care hospital. *J Med Sci Clin Res.* 2020;08(2):878-83.

Cite this article as: Borah KK, Thakuria D, Saikia P, Borsaikia K. Spectrum of lung, liver and kidney pathology in autopsy cases: a study at a tertiary center. *Int J Res Med Sci* 2024;12:3284-90.