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RESEARCH ARTICLE

LUNG PATHOLOGIES IN AUTOPSIES AT A TERTIARY CARE CENTRE IN INDIA: A RETROSPECTIVE HISTOLOGICAL ANALYSIS

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ABSTRACT

Background: Autopsy examination provides an opportunity to identify pulmonary abnormalities that may remain unsuspected during life and to characterise lesions that may not be apparent on gross examination. Pulmonary findings may also contribute to interpretation of the circumstances and cause of death. The present study examined the spectrum of pulmonary histopathological abnormalities encountered in medico-legal autopsies. **Objective(s):** To evaluate the spectrum and frequency of pulmonary histopathological lesions in medico-legal autopsy specimens and to describe their distribution according to age and sex, with assessment of clinicopathological correlation. **Methods:** A retrospective observational study was conducted in the Department of Pathology, Dr. S. N. Medical College and Associated Hospitals, Jodhpur, Rajasthan, India. Archived lung specimens from 350 medico-legal autopsies were evaluated. Tissue was routinely fixed in 10% neutral buffered formalin, processed for paraffin embedding, sectioned at 4–5 µm and stained with haematoxylin and eosin. Ziehl–Neelsen staining and selected immunohistochemistry were performed when required. Demographic details, cause of death, gross findings, microscopic lesions, final histopathological diagnoses and clinicopathological correlation were recorded. Age- and sex-wise distributions were assessed descriptively. Data were analysed using IBM SPSS Statistics version 29.0. **Results:** Among 350 cases, 191 (54.6%) were males and 159 (45.4%) were females; individuals aged >60 years constituted the largest age group [98 (28.0%)]. Poisoning was the most frequent recorded cause of death [113 (32.3%)], followed by coronary artery disease [93 (26.6%)] and trauma [82 (23.4%)]. Pulmonary oedema [157 (44.9%)] and congestion [136 (38.9%)] were the predominant microscopic findings, followed by diffuse alveolar damage [113 (32.3%)], hemosiderin-laden macrophages [104 (29.7%)] and haemorrhage [82 (23.4%)]. Pneumonia and aspiration pneumonia were each identified in 20 (5.7%) cases, tuberculosis and granulomatous inflammation in 11 (3.1%) cases each, silicosis in 3 (0.9%) and metastatic involvement in 2 (0.6%) cases. Clinicopathological correlation was documented in 17 (4.9%) cases. Age- and sex-wise distributions demonstrated variation across the spectrum of pulmonary diagnoses. **Conclusions:** Lung histopathology at medico-legal autopsy demonstrated a broad spectrum of pulmonary abnormalities, including common non-specific changes as well as infectious, chronic, occupational and neoplastic lesions. Systematic histopathological examination can provide additional diagnostic information and may identify unsuspected pulmonary disease. Findings should be interpreted in conjunction with the complete autopsy examination and circumstances of death.

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INTRODUCTION

The medico-legal autopsy remains an important component of death investigation, particularly in sudden, unexpected, unexplained or unnatural deaths. In addition to establishing the cause and manner of death, autopsy examination may reveal previously unsuspected disease and provide pathological evidence that cannot be obtained from the circumstances of death or gross examination alone.

Histopathological examination has an established role in selected medico-legal cases, particularly when the cause of death is uncertain or when important abnormalities require further characterisation (1,2). The lungs are frequently involved in both natural and unnatural deaths and may demonstrate a wide range of acute and chronic pathological changes. Pulmonary oedema, congestion, haemorrhage and inflammatory lesions are commonly encountered in autopsy material, although many of these findings are non-specific and may occur in association with several mechanisms of death.

A histopathological study of 86 medicolegal autopsies from India reported oedema and congestion as the most frequent pulmonary abnormalities, along with pneumonia, emphysema and granulomatous inflammation(3). Other autopsy studies have similarly demonstrated a broad spectrum of pulmonary lesions, including infectious, occupational and neoplastic abnormalities, some of which may be incidental or previously undiagnosed (4,5). The interpretation of pulmonary findings at autopsy is therefore not limited to identifying a single cause of death. Changes such as oedema, congestion and haemorrhage may accompany different terminal events and need to be assessed in relation to the circumstances of death and findings in other organs. Conversely, histological examination may identify specific lesions such as pneumonia, tuberculosis, occupational lung disease or neoplasia that may not be apparent from gross examination alone. Studies evaluating post-mortem pulmonary pathology have also demonstrated the diagnostic value of histology in identifying lung infection and other clinically occult abnormalities (6,7).

Despite the recognised value of pulmonary examination, published autopsy studies have often involved relatively small series or have assessed lung lesions as part of a broader survey of multiple organs. Consequently, there remains value in documenting the spectrum of pulmonary abnormalities encountered in a larger, systematically evaluated medico-legal autopsy series, particularly in the Indian setting where the circumstances and distribution of deaths may differ between regions. The present study was undertaken in a tertiary care centre in Rajasthan and focuses specifically on the histopathological spectrum of lung lesions identified in 350 medico-legal autopsies. In addition to documenting common and uncommon microscopic abnormalities, the study examines gross pulmonary findings and explores their clinicopathological correlation with the recorded cause of death. This approach was intended to provide a more focused account of the contribution of pulmonary histopathology to medico-legal autopsy practice. Therefore, the present study aimed to evaluate the spectrum and frequency of gross and histopathological lung lesions in medico-legal autopsy specimens and to assess their clinicopathological correlation with the recorded cause of death.

MATERIALS AND METHODS

Study Design and Setting: This retrospective observational study was conducted in the Department of Pathology, Dr. S. N. Medical College and Associated Hospitals, Jodhpur, Rajasthan, India. The study included lung specimens obtained during medico-legal autopsies and evaluated for gross and histopathological abnormalities. Institutional ethical approval was obtained before commencement of the study.

Study Population and Sample Size: The study population comprised lung specimens obtained from medico-legal autopsies fulfilling the predefined eligibility criteria. A minimum sample size of 344 specimens was calculated using an expected prevalence of pulmonary oedema of 34%, a 95% confidence level and an absolute allowable error of 5%. The calculated sample size was rounded to 345, and 350 eligible autopsy specimens were ultimately included. All eligible specimens were selected consecutively until the required sample size was achieved.

Study period: The study was conducted from December 2025 to March 2026 and involved retrospective evaluation of archived lung tissue blocks and histopathological slides obtained from medico-legal autopsies performed between January and December 2024.

Inclusion and Exclusion Criteria: Lung specimens obtained from medico-legal autopsies conducted between January 2024 and December 2024 were eligible for inclusion. Cases in which archived lung tissue blocks and/or histopathological slides were available for review, with adequate and interpretable lung tissue for histopathological examination, were included in the study. Lung specimens that were poorly preserved, extensively autolysed, or otherwise inadequate for meaningful histopathological evaluation were excluded. Cases in which adequate lung tissue blocks or histopathological slides were unavailable for review were also excluded.

Histopathological Examination: Lung tissue specimens obtained during medico-legal autopsy were submitted for histopathological examination following routine autopsy sampling procedures. Representative lung tissue was fixed in 10% neutral buffered formalin and processed routinely for paraffin embedding. Sections measuring 4–5 µm in thickness were prepared from the paraffin blocks and stained with haematoxylin and eosin (H&E) for microscopic evaluation. Histopathological examination was performed on the available representative lung tissue from each eligible case.Special stains and immunohistochemistry were performed selectively in cases where additional diagnostic confirmation was required. Ziehl–Neelsen staining was performed in cases showing granulomatous inflammation or morphological features suggestive of mycobacterial infection to demonstrate acid-fast bacilli. Immunohistochemistry with TTF-1 and CK20 was performed in selected neoplastic cases to assist in determining the likely pulmonary or metastatic origin of adenocarcinomatous lesions. The selection of ancillary stains was based on the morphological findings identifiedon routine H&E examination**.** The assessed pulmonary abnormalities included oedematous and vascular changes, emphysematous changes, inflammatory and infectious lesions, neoplastic lesions and chronic structural abnormalities. The final histopathological diagnosis and its correlation with the recorded cause of death were documented for each case.

Data Collection and Statistical Analysis: Demographic details, recorded cause of death, gross pulmonary findings, microscopic findings, final histopathological diagnosis and clinicopathological correlation were recorded in a structured data sheet. Data were compiled in Microsoft Excel and analysed using IBM SPSS Statistics version 29.0. Categorical variables were summarised as frequencies and percentages. Age-wise and sex-wise distributions of pulmonary lesions were also assessed descriptively. No inferential statistical testing was undertaken.Gross and microscopic pulmonary findings were recorded independently during gross and histopathological examination, respectively. The identical frequencies observed for oedema and congestion therefore reflected concordant findings between gross and microscopic assessment. Clinicopathological correlation was considered present when a pulmonary histopathological finding was judged to have a direct or contributory relationship with the recorded cause of death after consideration of the overall autopsy findings and available clinical or circumstantial information.



Figure 1a. Gross appearance of lung showing pulmonary edema with increased weight, boggy consistency, and frothy fluid exuding from the cut surface

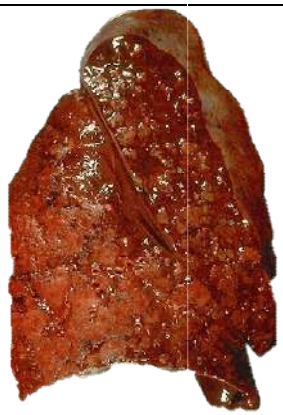


Figure 1b: Gross specimen showing pulmonary consolidation with firm, airless, and hepatized lung parenchyma



Figure 1c: Gross appearance of lung showing cavitary lesions with caseous- appearing necrotic material consistent with pulmonary tuberculosis

Figure 1. Representative Gross Pathological Findings in Post-Mortem Lung Specimens

Pulmonary findings considered incidental, non-specific, or unrelated to the recorded cause of death were classified as not correlated.

Ethical Considerations: The study was conducted following institutional ethical approval and in accordance with applicable medico-legal and institutional protocols. Data were anonymised, and personal identifiers of the deceased were not recorded. Archived autopsy specimens and histopathological material were used solely for academic and research purposes, with confidentiality maintained throughout the study.

RESULTS

Study Population and Demographic Characteristics: A total of 350 medico-legal autopsy cases were included in the study. The age of the study population ranged from infancy to more than 60 years, with the largest proportion of cases occurring in individuals aged >60 years (98, 28.0%). This was followed by the 40–49-year age group (51, 14.6%) and the 50–59-year age group (49, 14.0%). The remaining cases were distributed across the younger age groups, with 43 (12.3%) cases aged 10–19 years, 41 (11.7%) aged 20–29 years, and 34 (9.7%) each in the 0–9 and 30–39-year age groups.

Males constituted 191 (54.6%) cases, while females accounted for 159 (45.4%). A predominantly rural background was observed, with 227 (64.9%) cases originating from rural areas compared with 123 (35.1%) from urban areas (Table 1).

Table 1. Demographic Characteristics of the Study Population (n = 350)

Variables	Categories	Frequency, n	Percentage (%)
Age group (years)	0–9	34	9.7
	10–19	43	12.3
	20–29	41	11.7
	30–39	34	9.7
	40–49	51	14.6
	50–59	49	14.0
	>60	98	28.0
Sex	Male	191	54.6
	Female	159	45.4
Residence	Rural	227	64.9
	Urban	123	35.1

Distribution of Causes of Death: Poisoning was the most frequent recorded cause of death, accounting for 113 (32.3%) cases, followed by coronary artery disease in 93 (26.6%) cases and trauma in 82 (23.4%) cases.

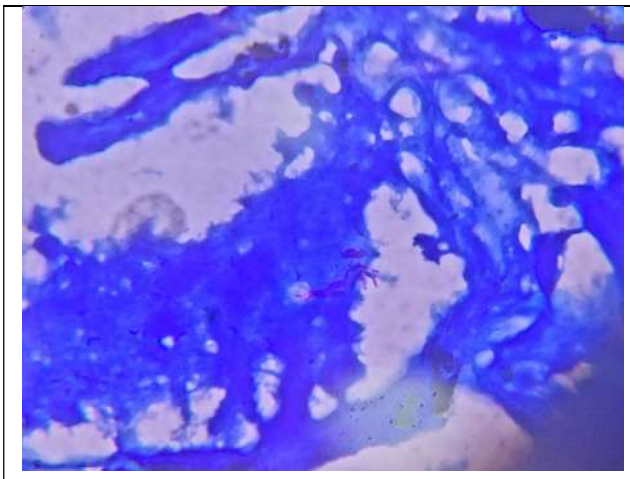


Figure 2a. Ziehl–Neelsen stained post-mortem lung tissue showing acid-fast bacilli consistent with pulmonary tuberculosis (1000×, oil immersion)

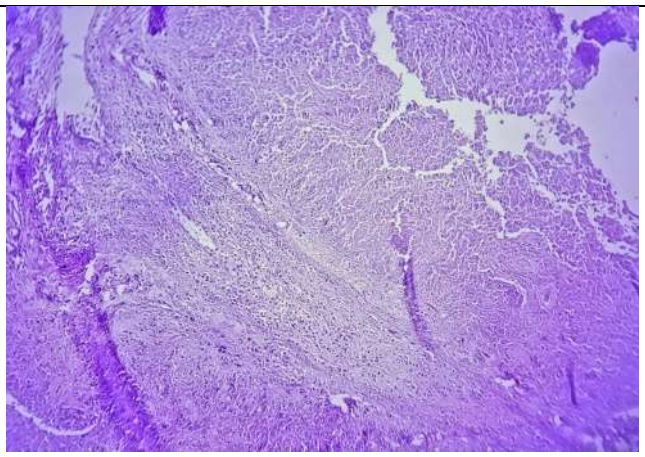


Figure 2b. Hematoxylin and Eosin (H&E) stained post-mortem lung tissue showing well-formed granulomatous inflammation with central caseous necrosis, consistent with pulmonary tuberculosis (100×)

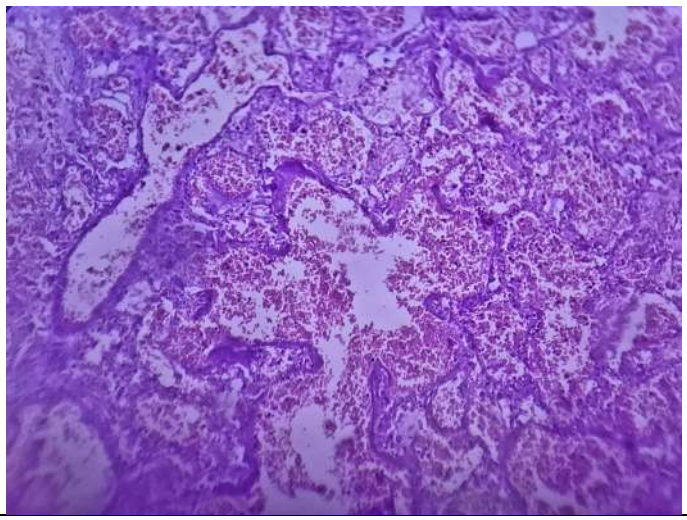


Figure 2c. Hematoxylin and Eosin (H&E) stained post-mortem lung tissue showing marked intra-alveolar hemorrhage with congestion of alveolar septal capillaries (100×).

Figure 2. Histopathological Images of Common Lung Pathologies Observed in Post-Mortem Examination (H&E and Special Stains)

Asphyxial deaths accounted for 30 (8.6%) cases, while 32 (9.1%) cases were classified as unknown or undetermined. Among poisoning-related deaths, organophosphorus poisoning accounted for 46 cases (13.1% of the total study population), followed by aluminium phosphide poisoning in 32 (9.1%) and drug overdose in 35 (10.0%) cases. Within the coronary artery disease group, acute myocardial infarction accounted for 52 (14.9%) cases and sudden cardiac death for 41 (11.7%). Among traumatic deaths, road traffic accidents constituted the largest subgroup with 48 (13.7%) cases, followed by falls from height, assault and crush injuries. Hanging was the predominant form of asphyxial death, accounting for 18 (5.1%) cases, followed by drowning and strangulation (Table 2).

Gross Pathological Findings: Gross examination of the lung specimens demonstrated pulmonary oedema as the most frequent finding, identified in 157 (44.9%) cases, followed by pulmonary congestion in 136 (38.9%) cases. Consolidation was observed in 20 (5.7%) cases, while cavitation was identified in 11 (3.1%) cases. Fibrotic changes and pulmonary nodules were less frequent, occurring in 3 (0.9%) and 2 (0.6%) cases, respectively (Table 3).

Table 2. Distribution of Causes of Death in the Study Population (n = 350)

Variables	Categories	n	%
Poisoning 113 (32.3)	Organophosphorus poisoning	46	13.1
	Aluminium phosphide poisoning	32	9.1
	Drug overdose	35	10.0
Coronary artery Disease 93 (26.6)	Acute myocardial infarction	52	14.9
	Sudden cardiac death	41	11.7
Trauma 82 (23.4)	Road traffic accident	48	13.7
	Fall from height	18	5.1
	Assault	10	2.9
	Crush injury	6	1.7
Asphyxia 30(8.6)	Hanging	18	5.1
	Drowning	7	2.0
	Strangulation	5	1.4
Unknown/ undetermined 32(9.1)	Decomposed body	18	5.1
	Cause undetermined	14	4.0

Table 3. Gross Pathological Findings in Autopsy Lung Specimens (n = 350)

Gross finding	n (%)
Pulmonary oedema	157 (44.9)
Congestion	136 (38.9)
Consolidation	20 (5.7)
Cavitation	11 (3.1)
Fibrosis	3 (0.9)
Nodules	2 (0.6)

Microscopic Pulmonary Findings: Histopathological examination demonstrated a broad spectrum of pulmonary abnormalities. Pulmonary oedema was the most frequently identified microscopic finding, present in 157 (44.9%) cases, followed by congestion in 136 (38.9%) cases. Diffuse alveolar damage (DAD)was identified in 113 (32.3%) cases, while hemosiderin-laden macrophages were observed in 104 (29.7%). Haemorrhage was present in 82 (23.4%) cases and emphysema in 53 (15.1%) cases. Pneumonia and aspiration pneumonia were each identified in 20 (5.7%) cases. Tuberculosis and granulomatous inflammation were documented in 11 (3.1%) cases each. Interstitial inflammation, fibrosisand silicosis were uncommon, each occurring in 3 (0.9%) cases, while neoplastic involvement was identified in 2 (0.6%) cases (Table 4). Because individual cases could demonstrate more than one microscopic abnormality, these findings were not mutually exclusive.

Table 4. Microscopic Pulmonary Findings in Autopsy Lung Specimens (n = 350)

Histopathological finding	n (%)
Pulmonary oedema	157 (44.9)
Congestion	136 (38.9)
Diffuse alveolar damage (DAD)	113 (32.3)
Hemosiderin-laden macrophages	104 (29.7)
Haemorrhage	82 (23.4)
Emphysema	53 (15.1)
Pneumonia	20 (5.7)
Aspiration pneumonia	20 (5.7)
Tuberculosis	11 (3.1)
Granulomatous inflammation	11 (3.1)
Interstitial inflammation	3 (0.9)
Fibrosis	3 (0.9)
Silicosis	3 (0.9)
Neoplasm	2 (0.6)

Clinicopathological Correlation: Clinicopathological correlation was identified in 17 (4.9%) of the 350 cases. Correlation was documented in 3 (2.7%) of the 113 poisoning-related deaths, 2 (2.2%) of the 93 cases attributed to coronary artery disease and 1 (1.2%) of the 82 traumatic deaths. Among cases classified as unknown/undetermined, correlation was observed in 7 (21.9%), while 4 (13.3%) of the 30 asphyxial deaths demonstrated correlation. Overall, 333 (95.1%) cases were classified as not showing clinicopathological correlation (Table 5).

Table 5. Clinicopathological Correlation According to Cause of Death (n = 350)

Cause of death	Correlated, n (%)	Not correlated, n (%)	Total, n
Poisoning	3 (2.7)	110 (97.3)	113
Coronary artery disease	2 (2.2)	91 (97.8)	93
Trauma	1 (1.2)	81 (98.8)	82
Unknown/undetermined	7 (21.9)	25 (78.1)	32
Asphyxia	4 (13.3)	26 (86.7)	30
Total	17 (4.9)	333 (95.1)	350

Age-wise distribution of histopathological diagnoses: Histopathological lesions were observed across all age groups, with the >60-year age group accounting for the largest proportion of several major diagnoses, including congestion (29.8%), oedema (28.8%), mixed lesions (28.1%) and pneumonia (30.0%). Emphysema was predominantly represented in the 40–49-year and >60-year groups (20.8% each). The two neoplastic cases occurred in the 50–59-year and >60-year groups. Silicosis was seen mainly in the 30–39-year group (66.7%), while tuberculosis was distributed across multiple age groups. Overall, several pulmonary lesions showed greater representation among older individuals, although lesions occurred across the age spectrum.

Sex-wise Distribution of Histopathological Diagnoses: The sex-wise distribution of final histopathological diagnoses is shown in Table 7. Among the 191 male cases, pulmonary oedema was the most frequent diagnosis [65 (34.0%)], followed by congestion [58 (30.4%)] and emphysema [29 (15.2%)]. Among the 159 female cases, oedema was also the most frequent finding [60 (37.7%)], followed by congestion [46 (28.9%)], emphysema [24 (15.1%)] and mixed lesions [18 (11.3%)]. Pneumonia, tuberculosis, silicosis and metastatic lesions were less frequently observed in both sexes.

DISCUSSION

This study demonstrates a broad spectrum of pulmonary histopathological abnormalities in medico-legal autopsy specimens, ranging from common acute changes to chronic, infectious and neoplastic lesions. Among the 350 cases examined, pulmonary oedema and congestion were the predominant microscopic findings, followed by diffuse alveolar damage (DAD), haemorrhage, hemosiderin-laden macrophages and emphysematous changes. Tuberculosis, granulomatous inflammation, fibrosis, silicosis and neoplastic involvement were encountered less frequently. This overall pattern is comparable with previous autopsy-based studies that have documented oedema, congestion and a variety of inflammatory and chronic pulmonary lesions (3,4). The findings also demonstrate the importance of interpreting pulmonary abnormalities alongside the circumstances of death, gross examination and findings in other organs, as several of these changes are non-specific. The study population showed a modest male predominance, with males accounting for 54.6% of cases, while individuals aged >60 years constituted the largest age group. Such demographic patterns are influenced by the population and spectrum of deaths represented in an autopsy series.

A retrospective autopsy study from Gujarat similarly examined the distribution of pulmonary lesions in relation to age and sex (8). In the present study, the demographic analysis was primarily descriptive and was not intended to establish independent age- or sex-related associations. Pulmonary oedema and congestion were the most frequent microscopic abnormalities, occurring in 44.9% and 38.9% of cases, respectively. Similar findings have been reported in previous medico-legal autopsy series (3,10). These changes can occur in a variety of terminal circumstances, including cardiovascular disease, intoxication, trauma and asphyxia, and their presence alone does not establish the cause of death (11,12). Their high frequency in the present series is therefore likely to reflect the heterogeneous spectrum of natural and unnatural deaths represented in a medico-legal autopsy population. They are best interpreted together with the remaining autopsy findings rather than in isolation. Diffuse alveolar damage was identified in 113 (32.3%) cases and represented an important component of the pulmonary pathology observed. DAD is a histopathological pattern of acute lung injury that may result from diverse pulmonary and systemic insults. Its morphology typically includes alveolar oedema and hyaline membrane formation in the exudative phase, followed by organising changes such as type II pneumocyte hyperplasia and interstitial

Table 6. Age-wise Distribution of Major Histopathological Diagnoses in Autopsy Lung Specimens (n=350)*

Age group (years)	Congestion n (%)	Oedema n (%)	Emphysema n (%)	Pneumonia n (%)	Tuberculosis n (%)	Mixed lesions n (%)	Silicosis n (%)	Metastasis n (%)
0–9	10 (9.6)	10 (8.0)	6 (11.3)	2 (10.0)	3 (27.3)	3 (9.4)	0	0
10–19	14 (13.5)	13 (10.4)	10 (18.9)	2 (10.0)	0	4 (12.5)	0	0
20–29	13 (12.5)	15 (12.0)	5 (9.4)	4 (20.0)	1 (9.1)	3 (9.4)	0	0
30–39	8 (7.7)	16 (12.8)	6 (11.3)	0	0	2 (6.3)	2 (66.7)	0
40–49	12 (11.5)	21 (16.8)	11 (20.8)	3 (15.0)	2 (18.2)	2 (6.3)	0	0
50–59	16 (15.4)	14 (11.2)	4 (7.5)	3 (15.0)	2 (18.2)	9 (28.1)	0	1 (50.0)
>60	31 (29.8)	36 (28.8)	11 (20.8)	6 (30.0)	3 (27.3)	9 (28.1)	1 (33.3)	1 (50.0)

*Values are presented as n (%). Percentages are calculated within each final histopathological diagnostic category. Diagnostic categories are mutually exclusive, with each case assigned to one final category.

fibrosis (13). Similar patterns have been described in forensic autopsy material in association with different causes of death (14). Importantly, DAD should not be considered synonymous with acute respiratory distress syndrome (ARDS), as it is present in only a proportion of patients with clinically diagnosed ARDS (15). Its identification in an autopsy specimen therefore requires appropriate clinicopathological interpretation rather than direct attribution to a specific clinical diagnosis. Pulmonary haemorrhage was observed in 82 (23.4%) cases, while hemosiderin-laden macrophages and emphysematous changes were present in 104 (29.7%) and 53 (15.1%) cases, respectively. Pulmonary haemorrhage may be encountered in trauma, asphyxia, drug-related deaths and following resuscitation, with its significance depending on the associated morphological findings and circumstances of death (16). Similarly, hemosiderin-laden macrophages indicate previous or recurrent alveolar bleeding but are not specific to a particular mechanism of death. Siderophages have also been described in association with pulmonary oedema, haemorrhage and emphysematous changes in forensic autopsy studies, particularly in cases involving drug use (17). In the present series, these findings therefore provide additional morphological information but require correlation with the complete autopsy examination.

Table 7. Sex-wise Distribution of Final Histopathological Diagnoses in Lung Autopsy Cases (n = 350)*

Final Histopathological Diagnosis	Male, n (%)	Female, n (%)
Oedema	65 (34.0)	60 (37.7)
Congestion	58 (30.4)	46 (28.9)
Emphysema	29 (15.2)	24 (15.1)
Mixed lesions	14 (7.3)	18 (11.3)
Pneumonia	14 (7.3)	6 (3.8)
Tuberculosis	7 (3.7)	4 (2.5)
Silicosis	2 (1.0)	1 (0.6)
Metastasis	2 (1.0)	0 (0.0)
Total	**191 (100.0)**	**159 (100.0)**

*Values are presented as n (%). Percentages in the male and female columns are calculated within each sex. Final histopathological diagnostic categories are mutually exclusive, with each case assigned to one final category.

Infectious and inflammatory lesions formed a smaller but clinically relevant component of the pulmonary findings. Pneumonia and aspiration pneumonia were each identified in 20 (5.7%) cases, while tuberculosis and granulomatous inflammation were present in 11 (3.1%) cases each. Previous autopsy studies have shown that histopathological examination may reveal pulmonary disease that was unsuspected or incompletely characterised before death, including pneumonia and granulomatous inflammation (3). The identification of tuberculosis is particularly relevant in the Indian medico-legal setting, where pulmonary tuberculosis has been reported as an incidental autopsy finding, including among individuals without a documented diagnosis during life (18).

In the present study, its detection in 3.1% of cases supports the role of systematic pulmonary examination and appropriate special staining when granulomatous lesions are encountered. Aspiration pneumonia may similarly provide useful contextual information when considered with the circumstances of death and other autopsy findings. Less frequent findings included interstitial inflammation and fibrosis in 3 (0.9%) cases each, silicosis in 3 (0.9%) cases and neoplastic involvement in 2 (0.6%) cases. Although uncommon, these lesions may identify previously unrecognised chronic, occupational or malignant disease and illustrate the additional information that pulmonary histopathology can provide at autopsy. Their low frequency, however, limits any further conclusions regarding specific clinical or occupational associations (19). Clinicopathological correlation was demonstrated in 17 (4.9%) cases. The relatively small proportion of correlated cases reflects, in part, the non-specific nature of several pulmonary abnormalities encountered at autopsy. Findings such as oedema, congestion, haemorrhage and emphysema may occur in different mechanisms of death and, when considered alone, cannot establish a direct causal relationship. Previous autopsy studies have similarly shown that pulmonary findings may corroborate an established cause of death, provide additional information or represent incidental abnormalities (5). In the present study, more specific lesions such as pneumonia, tuberculosis and DAD nevertheless demonstrated the potential value of histopathological examination when the gross findings or circumstances of death were insufficient to provide a complete explanation. Age-wise analysis showed that pulmonary lesions occurred across all age groups, with several common diagnoses, including congestion, oedema, mixed lesions and pneumonia, having their greatest representation among individuals aged >60 years. Emphysematous changes were also represented more frequently in the older age groups, which may be related to age-associated structural changes in the lung (20). Sex-wise analysis showed oedema as the most frequent diagnosis in both males and females, followed by congestion and emphysema, with some variation in the distribution of less common lesions. Similar sex-wise variation in pulmonary lesions has been described in previous autopsy-based research (4). These findings should, however, be regarded as descriptive because no inferential testing was performed to establish age- or sex-related associations.

The study has several strengths, including a relatively large autopsy series of 350 cases and systematic histopathological evaluation of lung tissue, allowing both common and less frequent pulmonary abnormalities to be documented. The study also provides a focused description of pulmonary pathology within a medico-legal autopsy population. However, its retrospective, single-centre design limits generalisability, and the study population was restricted to medico-legal autopsies.

The availability of clinical and circumstantial information was variable, while post-mortem autolytic changes may have influenced histological interpretation, particularly in cases with delayed examination. In addition, the descriptive nature of the study precludes establishing causal relationships between individual pulmonary lesions and the recorded cause of death. These limitations should be considered when interpreting the observed frequencies and clinicopathological correlations

CONCLUSION

This study demonstrates a broad spectrum of pulmonary histopathological abnormalities in medico-legal autopsies, with pulmonary oedema and congestion being the most frequently encountered findings. Acute lung injury, haemorrhage and emphysematous changes were also observed, while infectious, granulomatous, fibrotic and neoplastic lesions constituted less frequent but diagnostically important findings. The relatively low frequency of clinicopathological correlation highlights the non-specific nature of several pulmonary changes encountered at autopsy and the need for their interpretation in the context of the complete medico-legal examination. Systematic histopathological assessment of lung tissue can nevertheless identify unsuspected pulmonary disease and provide additional information when gross examination or the circumstances of death are inconclusive. Therefore, pulmonary histopathology should be regarded as an important complementary component of the medico-legal autopsy, particularly when integrated with gross findings and examination of other organs.

Conflict of Interest: The authors declare that they have no conflict of interest.

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Key Points

- Histopathological examination of lung tissue demonstrated a broad spectrum of pulmonary abnormalities in medico-legal autopsies.
- Pulmonary oedema and congestion were the most frequently observed microscopic findings.
- Infectious, chronic, occupational and neoplastic pulmonary lesions were identified less frequently but provided additional diagnostic information.
- Systematic pulmonary histopathological examination can complement gross autopsy findings and aid clinicopathological interpretation.

GLOSSARY OF ABBREVIATIONS

Abbreviation	Full Form
AFB	Acid-Fast Bacilli
ARDS	Acute Respiratory Distress Syndrome
CAD	Coronary Artery Disease
CK20	Cytokeratin 20
CPFE	Combined Pulmonary Fibrosis and Emphysema
DAD	Diffuse Alveolar Damage
H&E	Haematoxylin and Eosin
IEC	Institutional Ethics Committee
IHC	Immunohistochemistry
MeSH	Medical Subject Headings
NIH	National Institutes of Health
OP	Organophosphorus
RTA	Road Traffic Accident
SPSS	Statistical Package for the Social Sciences
TTF-1	Thyroid Transcription Factor-1
WHO	World Health Organization
ZN	Ziehl–Neelsen

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