

Lung lesions in autopsy, a histopathological study at Medico-legal Directorate, Iraq/ Baghdad

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ABSTRACT

Introduction: Autopsies are carried out to establish the identity, cause of death, time of death, and ante-mortem or post-mortem nature of death. These help in establishing the cause of death and ascertain the disease process, which led to the death.

Objective: To study the frequency of the lung lesions in medico-legal autopsies, confirmed by histopathological examination.

Methods: This retrospective descriptive cross sectional analytical study was carried out in the Department of Pathology of Medico-Legal Directorate in Baghdad/Iraq. Tissue bits from the lungs, retrieved at the time of autopsy, were preserved in 10% formalin. These were processed and examined microscopically. A total of 3072 cases were received during the period of study.

Results: Among these 3027 cases, in 194 cases (6.3%), the tissue was autolyzed and in another 1247 cases (40.6%), histopathology was unremarkable changes. Significant microscopic findings were found in 1631 cases (53.1%). Wide spectrum of the microscopic findings were seen, the commonest being emphysema 331 (10.8%) followed by the inflammatory process in the form of pneumonia 318 (10.4%), bronchiolitis/bronchitis 226 (7.4%) and pleurisy 45(1.5). There were interstitial changes 262 (8.5%). There were 78 (2.5%) cases of granulomatous inflammation.

Conclusion: About half of the autopsies were shown to have lung lesions, incidental or not. Emphysema and pneumonia were the commonest lung findings. While granulomas and tumours were relatively rare.

Key words: Autopsy, lung lesions, Emphysema, Pneumonia, Histopathology.

INTRODUCTION

An autopsy is a surgical procedure involving a detailed examination of a deceased body through dissection, primarily to determine the cause, mode, and manner of death. It can also be performed to assess the presence of disease or injury for research or educational purposes.^[1,2] An autopsy consists of both external and internal examinations of each organ, followed by tissue sampling and histopathological examination. This process not only identifies the

cause of death but also uncovers undiagnosed conditions, particularly those affecting the respiratory system.^[3]

Chronic respiratory diseases affect a large portion of the global population and are considered largely preventable. Clinical and radiological findings in pulmonary diseases are often non-specific, making pathological examination and diagnosis critical for improving patient outcomes, slowing disease progression, and avoiding unnecessary invasive procedures.

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Identifying the leading causes of death through autopsy can inform appropriate preventive measures, which are cost-effective in reducing further pulmonary dysfunction. [4,5]

The lung parenchyma can be directly affected by inflammatory, infectious, neoplastic, and other processes or indirectly as a terminal consequence of cardiovascular disease. [3]

Different studies were done concentrating on the frequency of the lung diseases among autopsy especially in developing country the newest one was done by Siddaganga et al, which is an indian study focused on histomorphological spectrum of lung lesions in medico-legal autopsies and highlighted various pathological conditions, [6] on the other hand in our country similar studies were not found, so we felt the need to do research deling with this subject .

The objectives of this study are to find the frequency of various lung pathologies among autopsies of persons who died suddenly due to medical causes brought to the Medico-legal directorate in Baghdad/Iraq during 2022 and 2023, and to find out the association between these pathologies and age and sex.

METHODS

Setting and study design: A retrospective descriptive cross-sectional study with analytic elements was conducted at the Department of Histopathology, Medico-Legal Directorate in Baghdad/Iraq in 2024 on medical records of the autopsies conducted from 1st of January 2022 to 31st December 2023.

Ethical consideration: The research ethics committee of the Medico-Legal Directorate approved the proposal for this study. We took the agreement of the administration of the Medico-Legal Directorate to use the data required to complete this study. All data were kept confidential during all the stages of this study.

Definition of the cases and exclusion criteria: We enrolled all histopathology records of specimens extracted from corpses of medically

suspected deaths received in our department during 2022 and 2023. Medically suspected death included sudden death without a history of medical illnesses, suspected death in the presence of medical diseases and or dead person found at home or on the street without a history. Records that included incomplete data were excluded from this study.

Sampling: During the study period, three histopathologists worked in the department . In our analysis, we included the histopathological records performed by only one histopathologist, the author of this research.

Outcomes: For the sake of this study, we used these histopathological features to define the following respiratory pathology: [3]

Normal: composed of alveoli, airway, broncho-vascular bundles, blood and lymphatic vessels.

Autolyzed: there is a total loss of epithelium with intact alveolar septae.

Emphysematous changes: The walls between many air sacs in the lungs are damaged.

Acute pneumonia: Uniform inflammatory infiltrate, intra-alveolar fluid with few neutrophils and often bacterial colonies. Sometimes, with a patchy intra-alveolar fibrinopurulent exudate and neutrophils.

Aspiration pneumonia: the presence of food particles (e.g. vegetables, pill fragments).

Granulomatous lung disease: epithelioid granuloma with or without central caseous necrosis surrounded by lymphocytes and multinucleated giant cells.

Acute lung injury pattern: Diffuse alveolar damage (DAD): hyaline membrane formation. Pleurisy: showed inflammation, fibrosis, vascular proliferation, haemorrhage, fibrin, oedema and mesothelial hyperplasia.

Interstitial changes: in the form of inflammation, fibrosis, and calcification.

Pulmonary oedema: The alveoli in this lung are filled with smooth to slightly floccular pink material, which is characteristic of pulmonary oedema.

Pulmonary thromboembolism is defined as arterial or venous occlusion by thrombi.

Tumor: atypical cellular proliferation.

Procedure: The protocol for dealing with medically suspected death at our directorate is to examine the cadaver thoroughly by expert forensic physicians in the forensic department.

The usual is to biopsy any grossly suspected organ or area of the body or guided by the medical history of the deceased person for further histopathology examination.

At our department of histopathology, we adequately fixed all the specimens received in 10% formalin. A gross examination of the lungs is done to notice gross pathology, and then sections from the representative areas were taken. After routine processing in different concentrations of alcohol and paraffin embedding, sections are cut and stained with Hematoxylin and Eosin (H&E) stains according to a standard procedure. An experienced histopathologist microscopically examines all the histological sections and writes the final report using a light microscope. The author reviewed the reports enrolled in this study. In complex or difficult histopathology the final decision is made based on multidisciplinary discussions among all the department's histopathologists.

To retrieve the data, the authors designed an excel sheet. Into this sheet, age, gender and histopathological diagnosis were coded.

Statistical analysis: we reported the lung lesions in 2022 and 2023 to the total autopsies examined. Microsoft Excel program has been used to tabulate the results and calculate the data. Data input and analysis were performed using the statistical package for the social science version 24 (SPSS 24) program. Simple frequency and percentage measures were used to display the data. The chi-square test was used to determine the significance of the

association between the variables. A p-value of 0.05 or less was deemed statistically significant.

RESULTS

During the period from January 2022 to December 2023, 3072 biopsies of lung tissue from autopsy subjects received at the histopathological department of Medico-Legal Directorate in Baghdad/Iraq. The age range of the deceased person enrolled in the analysis was 1 day to 91 years, 1872 (60.9%) were males and 1200 (39.1 %) were females.

We found that 194 (6.3%) of the tissue samples were autolyzed (See [figure 1A](#)), 1247 (40.6 %) have unremarkable changes ([figure 1B](#)), and 1631 (53.1 %) have microscopic changes suggestive of a lung pathology. For effect of age and sex on the pathological status, age group was found to have a statistically significant association with the pathological status with a p-value of 0.0001. on the other hand, gender has no statistically significant association with the pathological status. For other data see [table 1](#).

Emphysematous changes were the commonest histopathological diagnosis and it was found in 331 cases (20.3%) (see [Figure 1C](#)). Followed by acute pneumonia changes were reported in 318 (19.5 %) ([figure 1 D](#)), interstitial lung diseases 262 (16.1%) ([Figure 1E and F](#)), bronchiolitis/bronchitis in 226 (13.9), severe pulmonary oedema in 226 (13.9 %). For frequency distribution of other lung pathologies see [table 2 and figure 1 G, H, I and J](#). Age and sex

Table 1 | Histopathological lung status distributed according to gender and age.

Demographic features	Autolysis (%)	unremarkable	Diseased lung	Total	P value
Gender					0.1
Male	129 (66.5)	738 (59.2)	1005 (61.6)	1872 (61)	
Female	65 (33.5)	509 (40.8)	626 (38.4)	1200 (39)	
Age groups (year)					0.0001
0-19	25 (12.9)	326 (26.1)	311 (19.1)	662 (21.6)	
20-39	45 (23.2)	274 (21.9)	330 (20.2)	649 (21.1)	
40-59	75 (38.6)	478 (38.4)	574 (35.2)	1127 (36.7)	
≥ 60	49 (25.3)	169 (13.6)	416 (25.5)	634 (20.6)	
Total	194	1247	1631	3072	

Table 2 Association between lung lesions and age.								
Lung lesions	Age group				Sex		Total	Percent
	0-19	20-39	40-59	≥ 60	Male	Female		
Autolysis	25	45	75	49	129	65	194	6.3
Unremarkable histopathological changes	326	273	479	169	738	509	1247	40.6
Lung Lesion	311	331	573	416	1005	626	1631	53.1
Emphysematous disease	2	20	159	150	217	114	331	20.3
Acute pneumonia	91	68	87	72	199	119	318	19.5
Interstitial disease	50	55	100	57	192	70	262	16.1
Bronchitis/bronchiolitis	78	42	64	42	127	99	226	13.9
Severe oedema	55	30	36	10	59	72	131	8.0
Pulmonary thromboembolism	6	38	46	39	58	71	129	7.9
Granuloma	1	30	27	20	55	23	78	4.8
Pleurisy	1	17	20	7	36	9	45	2.8
Diffuse alveolar damage	15	18	6	2	19	22	41	2.5
Tumor	2	5	11	10	17	11	28	1.7
Aspiration	6	1	6	5	10	8	18	1.1
Abscess	1	5	4	1	9	2	11	0.7
Asthma	2	2	5	1	7	3	10	0.6
Haemorrhage	1	0	0	0	0	1	1	0.1
Infarction	0	0	2	0	0	2	2	0.1
Total number of the biopsies studied	662	649	1127	634	1872	1200	3072	100.0
P value	0.0001				0.0001			

has statistical significant association with the type of lung pathology reported, with a p value of 0.0001 for both.

DISCUSSION

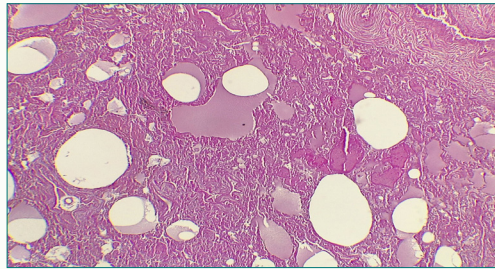
In medico-legal autopsy, a histopathological examination is necessary to establish the cause of death if any morbid anatomical changes in the tissue are observed. This study was done on the biopsies of the lung tissue received in our histopathological department from the forensic department of the Medico-legal Directorate in Iraq/Baghdad from 1 January 2022 to 31 December 2023.

Out of the 3072 cases, males were 1872 (60.9%) and female 1200 (39.1%). This result is similar to the study done by Rupali et al, who showed that 56.13% of his cases were males and 43.86% were females.^[8]

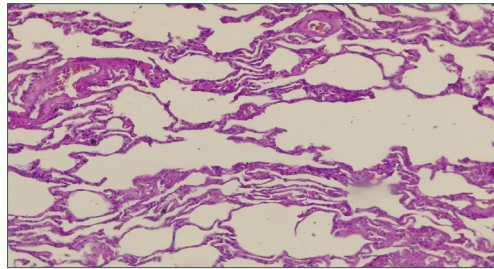
In our study, the tissue showed unremarkable histopathological changes in

1247 (40.6%) cases, and 1631 (53.1%) cases showed pathological lung lesions. These results are nearly similar to that reported by Patel et al where 46.4 % of their biopsies showed unremarkable histopathological changes, and 53.6% showed pathological lung lesions.^[4] On the other hand, autolytic changes were seen in 194 (6.3%) of cases; however, Bhavneet et al^[7] and Rupali et al^[8] found a higher percentage of autolytic changes, 9.2% and 12.0 %, respectively.

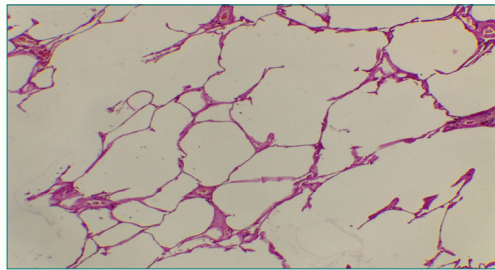
The most common pathology found in the lung in our series was emphysematous changes, reported 331 (10.8%), more commonly in the older age group. Udayashankar et al,^[1] reported emphysematous changes in 9.09% of the cases; however, Puneet Garg et al^[9] reported them in 23%. Cigarette smoking and long-term exposure to industrial pollutants and dust, which are reported by Faris et al to be high in our communities,^[10] might explain the high percentage of emphysematous changes in our



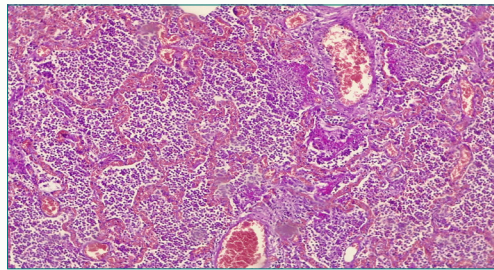
A: Autolyzed: there is total loss of epithelium with intact alveolar septae.



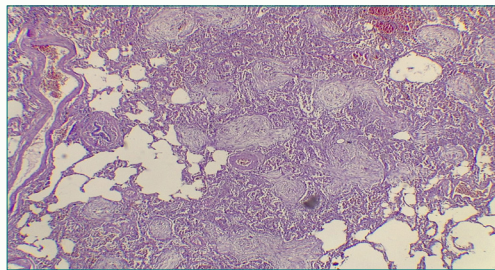
B: Unremarkable histopathological changes: composed of alveoli, airway, bronchovascular bundle, blood and lymphatic vessels.



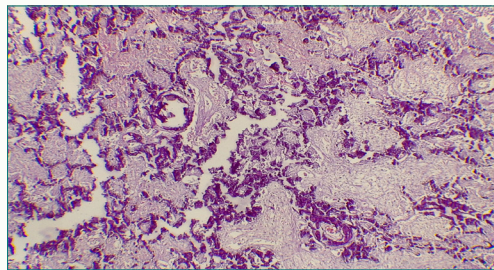
C: Emphysematous changes: the walls between many of the air sacs in the lungs are damaged.



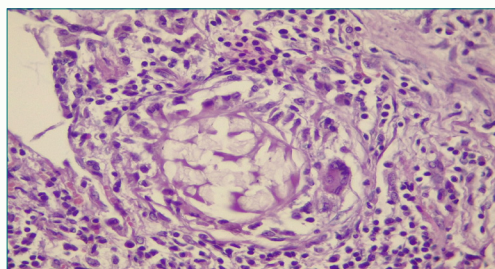
D: Acute pneumonia: uniform inflammatory infiltrate, intra-alveolar fluid with few neutrophils.



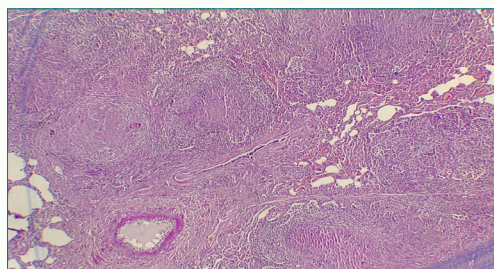
E: Interstitial changes: in the form of fibrosis.



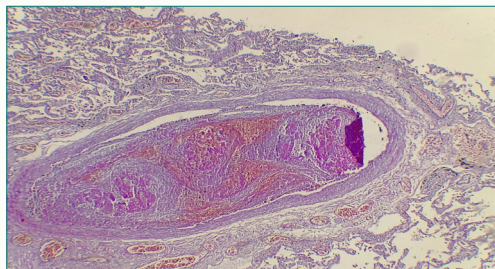
F: Interstitial changes: in the form of calcification.



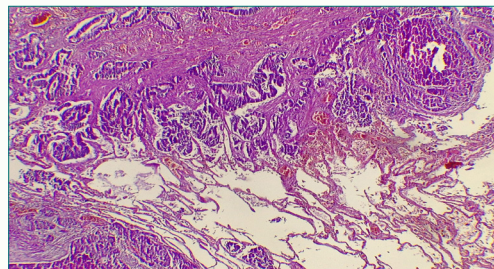
G: Aspiration pneumonia: presence of foreign body (food particle) with granulomatous inflammation.



H: Granulomatous lung disease: Well-defined granulomas rounded outlines with discrete borders, composed of epithelioid cells, along with lymphocytes and Langhans giant cells, central caseous necrosis.



I: Pulmonary thromboembolism: within this pulmonary artery are interdigitating areas of pale pink and red that form the lines of Zahn characteristic of a thrombus.



J: Tumor: atypical cellular proliferation arranged in glandular growth pattern.

Figure 1 | Sample of histopathological pictures with H & E, original magnification, X4

study.

In the present study, the inflammatory process in the form of acute pneumonia, bronchiolitis/bronchitis and pleurisy (visceral pleuritis) was the second most common lung lesions diagnosed in 318 (10.4%), 226 (7.4%), and 45 (1.5%) respectively, which was consistent with the study by Pulak Chakma,^[11] in which he found pneumonia in (10.56%) of cases. However, Udayashankar et al^[1] and Divyarani et al^[12] observed pneumonia in 31.81% and 32%, respectively, surpassing our results.

Interstitial changes were noted in 262 cases (8.5%), which include a wide range of microscopic findings of the interstitium in the form of inflammation, fibrosis, and even calcification.

The study done by Pulak Chakma et al^[11] showed fibrosis in 7.98 % of cases, which is close to ours, while Pratima Khare et al^[13] showed a bit higher rate of interstitial change reported in 11.9% of cases.

In our series, the incidence of pulmonary oedema was seen in 131 (4.3%) of the cases; this is lower than those reported in Pulak Chakma^[11] and Divyarani^[12] studies, where pulmonary oedema was reported in 62.91% and 36%, respectively. This could be due to the sampling method used by different studies and the definition of the sudden death used in these studies.

In our series, we reported pulmonary emboli in 129 cases (4.2%). This percentage is higher than those reported by Patel, 0.29 %, ^[4] and Divyarani, 1.2 %, ^[12] but lower than that reported by Siddaganga, 6.66 %.^[6] Again, sample size, definition of the inclusion criteria and the protocol used for the diagnosis might explain these differences.

In our study, granulomatous lung diseases, caseous or non-caseous, were found in 78 cases (2.5%). This percentage is lower than the 7.2 % reported by Divyarani,^[12] in which granuloma accounted for 7.2% in his study on the other hand, granuloma was accounted for 2.53%, (1.7%) respectively by Rupali et

al.,^[8] and Hanmate et al.^[14] Granulomatous lung diseases could be related to infectious causes as bacterial- tuberculosis, a fungal and parasitic infection or non-infectious causes as sarcoidosis, vasculitis and connective tissue disease, this specification of the cause of the granuloma is out of our study.

Diffuse alveolar damage is found in 41 cases (1.3%). The rate was lower than the 9.09% and 6.66% reported by Udayashankar^[1] and Siddaganga.^[6] On the contrary, Patel^[4] and Rupali^[8] found diffuse alveolar damage in 0.86% and 0.55%, respectively.

We found aspiration pneumonia in 18 cases (0.6%), similar to that stated by Rupali^[8] in his study, which was 0.41%. Malignant lesions are found in 28 cases (0.9%), which is similar to that reported by Hanmante et al.^[14] with a frequency of (0.8%).

The shortcoming in the present study was the non-receipt of a whole organ or representative sample at the time of autopsy, which if overcome will set much higher standard of autopsy reporting and would be a more useful tool in understanding cause of death.

CONCLUSION

In this study, lung lesions were confirmed in about half of the cases examined by post-mortem histopathology, and they were either incidental or direct causes of death. The most common histopathological findings were emphysematous changes followed by inflammatory processes. Interstitial pathologies were not uncommon. Diffuse alveolar damage, aspiration pneumonia and lung malignancies are rarely reported in this study.

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Abbreviations list: Diffuse alveolar damage (**DAD**), Hematoxylin and Eosin (**H&E**), The Statistical Package for Social Sciences (**SPSS**).

Conflict of interest: Authors have nothing to declare.

Funding: Nothing apart from personal fund.