



AUTOPSY-BASED EXPLORATION OF LUNG PATHOLOGY PATTERNS AT TERTIARY HEALTH CARE CENTRE

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ABSTRACT

Background: Acute lower respiratory tract infections have been one of the top three causes of mortality and disability in the world for many years, affecting both adults and children. While respiratory impairment is a global health concern that affects all socioeconomic classes and locations of the world, its susceptibility is increased by environmental exposures, poverty, crowded living situations, and other factors. **Methods:** This study is a cross-sectional observational study, and done on 550 cases of medico-legal autopsies. The tissue specimens were fixed and processed. Routine paraffin sectioning was done followed by Hematoxyline and eosin (H and E) staining. Special stains were done whenever required. Relevant clinical and postmortem findings and gross and microscopic examination findings were recorded. **Results:** After thorough histopathological examinations, of a total of 550 cases, various pulmonary lesions were identified in 500(91%) cases while in 50(9%) cases no significant pathology was seen. The most commonly affected age group was 30-49 years (24.6%) followed by the age group of >40-49 (19%). The majority of the diseased were male 381 (76.2%). The most common lung pathology found was Terminal events in 354 cases (70.8%), Pneumonia in 60 cases (12%), chronic venous congestion in 44 cases (8.8%) followed by Tuberculosis/Tuberculous pneumonia in 30 cases (6%). **Conclusions:** The pathological analysis of autopsied organs is a crucial diagnostic technique that helps determine the range of illnesses, comprehend the pathophysiology of a certain illness, and evaluate different morphological patterns associated with the same illness.

KEYWORDS : Autopsy, Pneumonia, Sickle cell disease, Histomorphological examination, tuberculosis.

INTRODUCTION

An autopsy involves dissection of the organs from the various bodily cavities (cranial, thoracic, abdominal, and pelvic) in addition to a thorough exterior inspection.¹

While respiratory impairment is a global health concern that affects all socioeconomic classes and locations of the world, its susceptibility is increased by environmental exposures, poverty, crowded living situations, and other factors.²

Developing nations must concurrently deal with the burden of non-communicable and communicable illnesses. According to statistics from the most current Global Burden of Disease (GBD) study, India has a significant prevalence of both acute and chronic respiratory disorders.³

Acute lower respiratory tract infections have been one of the top three causes of mortality and disability in the world for many years, affecting both adults and children. Lower respiratory tract infections are thought to be the primary cause of mortality for children under the age of five and to account for about 4 million fatalities yearly, despite the burden being difficult to measure.⁴

Globally, an estimated 10.0 million (range, 9.0–11.1 million) people fell ill with TB in 2018⁵

It is impossible to overstate the significance of histopathologically examining lung tissue since, regardless of whether the underlying disease is extrapulmonary or pulmonary, the lungs are impacted in nearly all fatal occurrences.⁶

Lung pathologies are of significance because lung biopsies

are difficult and infrequently performed. For this reason, post-mortem histopathological examination of the lungs during medicolegal autopsies becomes extremely important for determining the disease process that may have contributed to a person's death.⁷ Thus it will also help in the treatment of other patients. To develop preventative control measures, it is crucial to determine the primary causes of death in a given location by the histopathological analysis of lung tissues.⁸

Method

The present study is a cross-sectional observational study that was conducted at the Department of Pathology at a tertiary care hospital affiliated with the medical college and included the study of 550 autopsy specimens received from the Department of Forensic Medicine from August 2019 to June 2020 and observed the morphological changes in the lungs after death. The study is done after clearance is given by the ethical committee. The undertaking was done that in the present study correlation with cause of death will not be done.

All the autolyzed specimens and partial autopsies where lung specimens were not received were excluded from the study.

All lung specimens were examined grossly as well as microscopically for changes in pneumonia, tuberculosis, chronic venous congestion, and other pulmonary pathology.

Other specimens were also examined for abnormal pathology and their findings were correlated with pulmonary pathology, whenever possible.

Table – 1 Distribution Of Various Pulmonary Lesions In Autopsy Cases

Pulmonary pathology	Number	Percentage
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Pneumonia	60	12%
Tuberculosis	30	6%
Chronic venous congestion	44	8.8%
Emphysema	2	0.4%
Ards/ diffuse alveolar Damage	5	1%
Malignant lesion	4	0.8%
Atelectasis	1	0.2%
Terminal events	354	70.8%
Total	500	100%

RESULT

Out of 550 cases examined, 50(9%) cases showed no abnormal pathology, which is not included in further observation. The majority of lesions reported are inflammatory and other pulmonary lesions, which are 496(90.18%). 4 cases (0.72%) with malignant lesions are reported. Of the total 500 cases, 381 (76.2%) were male and 119(23.8%) were female.

Maximum autopsy was received in the age group of 30-39 years old, a total of 123(24.6%) cases, followed by the age group of 40-49 years – 95(19%) cases.

In males, the majority of pathological lesions reported are in the 30-39 years age group, which is 107(21.4%) cases. While in females, the majority of cases are reported in the 20-29 years and >60 years of age group, which are 25(5%) cases.

Out of 30 cases of Tuberculosis, 23(76.66%) were male and 7(23.33%) were female. Maximum numbers of males were present in the age group of 30-39 years, with a total 8 (26.6%) cases.

Out of all cases, 2 cases (6.66%) of miliary tuberculosis were reported, one in 37-year-old male and another in 18-year-old female. Among these 2 cases, involvement of other organs like the spleen, liver and kidney observed in 1 case, whereas in the other case only lungs were involved.

Among all 30 cases of tuberculosis, in 19 cases (63.3%) grossly multiple whitish tubercles were reported. 7 cases (23.3%) with single small whitish nodules were observed. While 2 cases (6.66%) with only firmness and 2 cases (6.66%) with miliary tubercles were reported.

Other than the lung, the most common organ observed to be involved in tuberculosis is the liver, followed by the spleen and kidney. Involvement of liver was observed in 14 cases (46.6%), spleen in 9 cases (30%) and kidney in 8 cases (26.6%).

Terminal events like congestion, edema, hemorrhage, bone marrow embolism, chronic inflammatory infiltrates, and pigment-laden macrophages were seen in 354 (70.8%) cases.

DISCUSSION

Lungs are the most commonly affected organs worldwide and disease can show in a variety of intricate ways. For physicians, diagnosis remains a difficult task even with the availability of sophisticated, modern diagnostic techniques.⁹

As pathological investigations and diagnoses are necessary to increase patient survival, prevent the illness from progressing too quickly, and save patients from more invasive operations, it is important to act quickly when it comes to lung disorders because clinical and radiological results are non-specific.¹⁰

Autopsy not only helps determine clinic-pathological distinctions but also contributes to the new knowledge of ancient illnesses. It makes it easier to learn about the pathophysiology of novel illnesses.¹¹

Out of the 550 patients in the current research, 500 (91%) had

pathology, and 50 (9%) had normal lung tissue. It is comparable with Gunja et al (17.1%)⁹, P. Biswal et al(10%)¹², Kalpana et al (9.68%)¹³, and Chauhan et al(12.53%)¹⁴.

The age and gender distribution of pulmonary cases in this study indicate that the age group of 30-39 years old accounted for the greatest number of cases (24%). It is comparable with Selvam et al (26%)¹⁵ Zanjid et al and DS Akarte et al (22%).¹¹

The present study shows that males (76.2%) predominated the females (23.8%), which is comparable with a study done by Selvam et al (75.9%), Chandni et al(81.9%)[57] and Thej et al(71%)^{16,17,15}. This can be the case since men work to support their families and live away from home in stressful environments. In addition, drug abuse—including alcohol and tobacco—is more prevalent among men.

Grossly, 73.33% of cases with changes of Gray hepatization reported on gross, while in other 26.6% with firmness reported.

Pneumonia

The present study shows most common pathology observed in the lung is Pneumonia, which is in 60(12%) cases. A similar result is observed in the study done by Chauhan et al (14.62%), B. Kaur et al (10%), and Kalpana et al (7.99%).^{18,14,13}

A study done by Tariq et al (4%) shows lower cases compared to our study. Chandni et al (18.7%) and Smita et al (17.5%) showed relatively higher cases of pneumonia compared to our study.^{17,19} This discrepancy might be the result of environmental influences, regional variance, or variations in the research population.

In our study, male preponderance was seen (9.2%), which is comparable with almost all studies. Among total cases of pneumonia, 76% cases were observed in males and 23% cases in females.

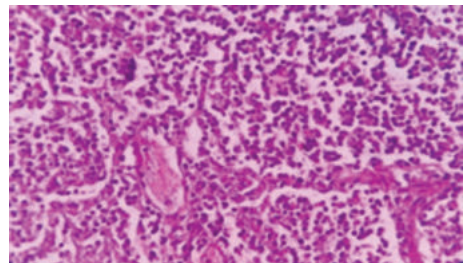


Figure 24 – Pneumonia: Alveolar Space Filled With Inflammatory Infiltrates

The majority of pneumonia cases belonged to the age group of >50 years (40%), which is comparable with Chauhan et al (50%).¹⁴ In Children most common pulmonary lesion observed was that of pneumonia. Pneumonia was likewise the most common cause of illness in the age group of over 60. This might be explained by the poor immunity in this age range, which makes them very susceptible to infectious infections.

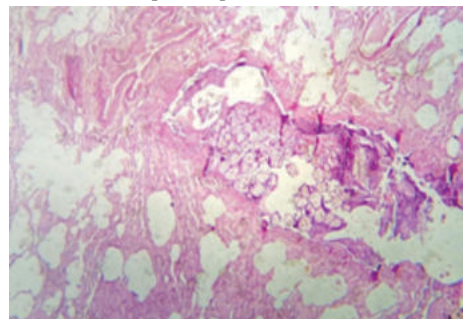


Figure 26– Aspiration Pneumonia Vegetative Material Seen In Adjacent Bronchiole

The high fatality rate from pneumonia is a result of homeless people's insufficient nutrition, exposure to the cold, and lack of access to healthcare. Among types of pneumonia, aspiration pneumonia is reported in 0.57% of cases. We found other 2 studies, MS Bal et al found 0.66% cases, and Kalpana et al found 0.12% cases with aspiration pneumonia.

Grossly, 73.33% of cases with changes of Gray hepatization were reported, while in other 26.6% with firmness were reported.

A total of 20% of pneumonia cases showed concomitant lesions. The most common being ARDS, reported in 5% of cases among total cases of pneumonia.

Tuberculosis

In the present study, there were 30(6%) cases of secondary pulmonary tuberculosis, out of which 2 cases (6.6%) showed miliary tuberculosis. These findings are comparable with the study of Chandni et al (6.9%), Chauhan et al (6.26%), P Biswal et al (8%), and Kalpana et al (4.08%).^{14,12,13,17}

DS Akarte et al showed relatively more cases (20%) and Rupali et al (2.7%) showed lower cases (2.5%) compared to our study. Geographic distribution may account for the same.^{11,20}

In our study, the majority of cases of tuberculosis are reported in the 30-39 years of age group (33.33%), which is comparable with a study done by Chauhan et al showed the same result (33.33%).¹⁴

Among 30 cases of tuberculosis, the mean age recorded is 42 years, which is comparable with Gupta et al (41 years)²¹

Along with lung, in 46.6% of cases, liver involvement was observed, in 30% of cases spleen involvement, and in 26.6% of cases, kidney involvement was observed.

Grossly, in 63.3% of cases multiple whitish tubercles were observed, in 23.3% of cases single small whitish nodules, 6.66% of cases with firmness, and 6.66% of cases with miliary tubercles observed.

Zeihl-Neelsen Staining

Positivity for Zeihl-Neelsen stain (Acid fast stain) was observed in 56.6% of cases, whereas other 43.33% of cases showed negative results. This is comparable with a study done by Flavin et al (57.7%).²²

Chronic Venous Congestion (CVC)

Chronic Venous Congestion contributed to 8.8% (44 cases) of studied cases. The majority of cases belonged to the age >40 years male, which is comparable with B Kaur et al.¹⁸ Specimen of heart received in almost all cases of chronic venous congestion, which showed features of ischemic heart disease.

Sickle Cell Disease

Among 500 lung specimens with pathology, vessels clogged with sickle-shaped red blood cells are reported in 6% of cases (30). 4.4% (22) cases are male and 1.65% (8) cases are female.

Out of which, 22 cases (4.4%) showed congested vessels in the spleen and 8 cases (1.65%) showed congestion in multiple organs like the heart, kidney, and brain with sickle-shaped RBCs. Thus, it signifies that the lung and spleen, are the common organs for congestion in sickle cell disease.

Cases of pneumonia with sickled cells were reported in 2 cases (6.66%), which is comparable with P. Shah et al (8%).²³

2 cases (6.6%) of bone marrow embolism with sickle cell disease also reported. It could be explained by sickle cell disease patients' heightened vulnerability to infections.

7 cases (23.3%) with h/o sudden death, 5 cases (16.6%) with fever, diarrhea, and vomiting, 4 cases (13.3%) with chest pain, 3 cases (10%) with convulsion, 2 cases (6.66%) with breathlessness 1 case (1.42%) of alcoholism and 1 case (1.42%) with 10th post-partum day. Where in 6 cases (20%) history was not traced which is due to unattended cases.

Out of all cases, 6.66% (2 cases) were known cases of sickle cell disease, while in the other 93.33% (28 cases) no such history was traced.

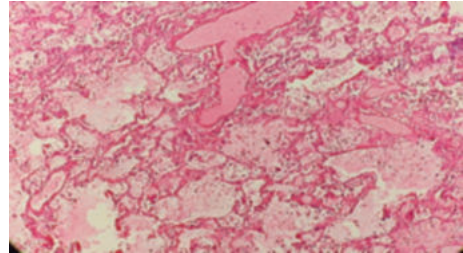


Figure 35 – Acute Respiratory Distress Syndrome Showing Hyaline Membrane in Alveolar Space

In the present study, 5 cases (1%) of ARDS and Diffuse alveolar damage were reported, which is comparable with G. Kaur et al (1.33%).¹⁸ Grossly red, firm, and boggy lungs were observed in all cases.

0.8% (4) cases of malignant lesions are reported in our study, all of which are of Adenocarcinoma, which is comparable with almost all studies- Chauhan et al (2.1%), Smita et al (1.5%), Rupali et al (0.4%) and P Garg et al (1%).^{14,19,20,24} While a study done by Pratima et al (8.9%), showed higher cases.¹

Out of all cases, 50% are that of primary lung carcinoma, which were known cases of lung carcinoma antemortem. One case of secondary (metastatic) carcinoma is in which the patient is having metastasis from breast carcinoma. One case is that of poorly differentiated carcinoma, in which comment on primary or secondary cannot be given as confirmatory. Grossly grayish-white nodule(s) identified in all cases.

2(0.4%) cases of emphysema were reported in our study. The same results are observed in Smita et al (1.5%) and D.S. Akarte et al (1.85%).^{11, 19} Out of 2 cases, 1 case of emphysematous bullae was reported in 25 years old female.



Figure 41- Adenocarcinoma - Showing Foci Of Adenocarcinoma Along With Adjacent

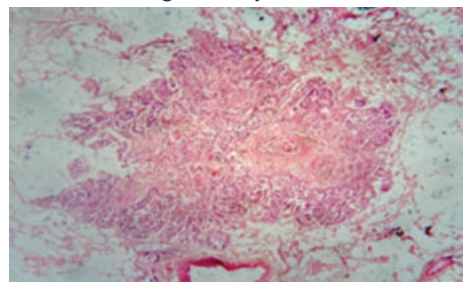


Figure 30 – Emphysema: Gross Showing Dilated Air Spaces Seen

1 case of atelectasis was also recorded in the present study, in 7 years old male child, which is not reported by the majority of other studies.

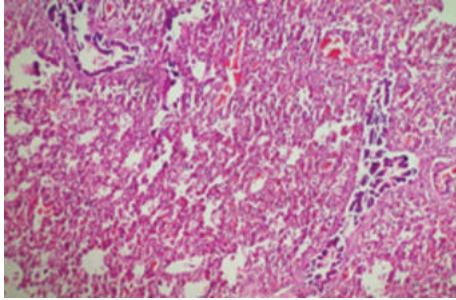


Figure 37 - Atelectasis: Showing Unexpanded Alveoli

Figure - Age & Sex-wise Distribution Of Cases Of Pneumonia

Concomitant Lesion	Total case	Male	Female
Pneumonia with Fibrous pleuritis	1(1.66%)	1(1.66%)	Nil
Pneumonia with Giant cell reaction	2(3.33%)	2(3.33%)	Nil
Pneumonia with Sickle cell disease	2(3.33%)	2(3.33%)	Nil
Pneumonia with Pulmonary infarct	1(1.66%)	1(1.66%)	Nil
Pneumonia with CVC	2(3.33%)	2(3.33%)	Nil
Pneumonia with Metastasis	1(1.66%)	Nil	1(1.66%)
Pneumonia with ARDS	3(5%)	2(3.33%)	1(1.66%)

Figure 20 - Terminal Pulmonary Changes In Autopsy Cases

Terminal changes	CASES	PERCENTAGE
Hemorrhage	55	11%
Edema	185	37%
Congestion	293	58.6%
Pigment laden Macrophages	42	8.4%
Bone marrow embolism	5	1%
Chronic inflammatory Infiltrate	7	1.4%

Age Wise Distribution Of Various Pulmonary Pathologies Other Than Pneumonia And Tuberculosis

LESION	AGE GROUP IN YEARS (%)							Total
	0-9	10-19	20-29	30-39	40-49	50-59	>=60	
Chronic Venous Congestion	-	-	5 (1%)	6 (1.2%)	13 (2.6%)	9 (1.8%)	11 (2.2%)	44 (8.8%)
Adenocarcinoma	-	-	-	-	1 (0.2%)	2 (0.4%)	1 (0.2%)	4 (0.8%)
Emphysema	-	-	1 (0.2%)	-	-	-	1 (0.2%)	2 (0.4%)
Atelectasis	1 (0.2%)	-	-	-	-	-	-	1 (0.2%)
ARDS & Diffuse Alveolar Damage	-	-	-	-	1 (0.2%)	1 (0.2%)	2 (0.4%)	4 (0.8%)

Terminal Events

The present study showed 70.8% (354) cases with terminal changes reported. Studies done by B Kaur et al and Kaplana et al also showed comparable results, 63% and 77.26% respectively.^{18, 13}

More than one change was observed in many cases.

Among terminal events, congestion is the most common finding reported, which accounts for 53.27% of cases. Other studies that showed similar findings are Chauhan et al (54.32%) and B Kaur et al.^{14, 18}

In our study, we found 1% (5) cases of bone marrow embolism in pulmonary vessels. A study done by Thej et al showed 1.8% of cases with thromboembolism.¹⁶

CONCLUSION

The autopsy continues to be a valuable supplementary tool for detecting and comprehending a significant proportion of instances of avoidable respiratory disorders, especially in the face of recent advancements in diagnostic technologies. As a result, autopsies continue to be a helpful and instructive tool for determining the underlying cause of death. The pathological analysis of autopsied organs is a crucial diagnostic technique that helps determine the range of illnesses, comprehend the pathophysiology of a certain illness, and evaluate different morphological patterns associated with the same illness. Because there must be innovative treatments for old diseases and room for the identification of emerging diseases, its significance must be appreciated.

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