ABSTRACT

Aims and objectives: An autopsy or post-mortem (PM) examination is often followed by a histopathological examination to discover the cause of death or extent of disease. This study aimed to examine the results of histological examinations on lung and liver tissue obtained from autopsy viscera specimens. Methods: The present cross-sectional study of viscera samples of 38 lungs and 22 liver specimens received in parts in the “Department of Pathology, at a tertiary care hospital”. The cases were reported for six months, from July 2020 to December 2020. Gross and microscopic findings of lungs and liver were studied. Results: The majority of the lung samples were from autopsies performed at 31 to 45 years of age (36.84%), while the majority of liver samples belong to more than 60 years of age (22.72%). Males were more likely than females to have lung and liver lesions. The most common PM findings in lungs were segmental/lobar consolidations (26.31%) and pulmonary oedema (18.42%), while in liver specimen hepatomegaly (31.81%) was the commonest PM finding. Gross lung findings showed that most of the patients’ lungs were firm (13.15%), while the yellowish liver was found in most cases (31.81%) on gross findings. Pneumonia (18.42%) was the most common pathological change found in lung specimens, and fatty liver, i.e. steatosis (36.36%), was the most common histopathological finding in liver specimens. Conclusion: Preventable lung and liver diseases are still contributors to the disease process in the modern era of medicine leading to death.

KEYWORDS Autopsy, Histopathology, PM Findings, Pneumonia, Steatosis, Lungs, Liver

Introduction

An autopsy is an essential and effective method for determining the status of vital organs. It is a comprehensive analysis done on a corpse’s later death to examine diseases or damage that might be present and to identify the reason and means of a person’s death [1]. Autopsies are classified into two different kinds: forensic and clinical. The forensic autopsy is frequently conducted in situations of suspicious or medicolegal death. In contrast, pathologists typically conduct the clinical or pathological autopsy in the hospital to determine the reason for death and examine the medical procedure that led to death [2, 3].

Histopathological analysis of tissues from different organs is frequently performed after autopsies. However, lungs are still the most often damaged organs globally, and lung disease manifests itself in various complicated ways. Despite current sophisticated diagnostic technologies, practitioners frequently face diagnostic challenges. Millions of individuals worldwide suffer from chronic respiratory disorders that are avoidable [4]. The significance of lung illness in clinical medicine and pathology cannot be overstated. The lungs are frequently engaged in numerous inflammations, neoplastic, and other disorders, but they are also implicated in practically all types of terminal events.
caused by cardiovascular causes [5]. As a result, it is critical to assess the major reason for mortality to develop preventive measures.

The liver is susceptible to many metabolic, chemical, microbiological, and circulation disturbances. Occasionally when the condition is primary, it is due to cardiac decompensation, drunkenness, or extrahepatic infections [6]. Circulatory abnormalities, alcoholic liver disorders, hepatic steatosis, and neoplasms are the most common primary liver illnesses. Most chronic liver illnesses, especially in their severe stages, do not produce obvious clinical symptoms or signs. Therefore, they either go undetected or are discovered by chance through routine health checks, examinations for other disorders, surgery, or autopsies [7].

Furthermore, both the lung and the liver are the sites of numerous illnesses and are implicated in various inflammatory, neoplastic, and other disorders. Some of these cause symptoms. Most degenerative processes are asymptomatic clinically and are therefore detected through autopsies and histological examinations [8, 9].

Material and Methods

The present cross-sectional observational study of 38 lung and 22 liver autopsy viscera samples received in parts in 10% formalin at the “Department of Pathology, of a tertiary care hospital”. These cases were reported for six months, from July to December 2020. Viscera samples without lung and liver tissue, which were autolysed, were excluded from the study. The remaining autopsy specimens (60) irrespective of sex, age and mode of death were included in the study.

The clinical history and postmortem findings of individual organs were traced from the histopathology requisition form of the prosector. During trimming, physical observations were documented, and tissue pieces from lesions, if present or from random locations, were sent for histopathological processing. Sections were stained with standard Haematoxylin and Eosin stains and various specific stains as needed. They were inspected under a microscope, and histological results were documented. Case findings were examined and reported as frequencies and percentages.

Results

The majority of lung samples that belonged to autopsies were performed in 31 to 45 years of age (36.84%) followed by 16 to 30 years (31.57%) with male predominance, as shown in table 1.

Lung Findings In 38 Cases:

Unnatural death was the most common complaint observed in 12 cases (31.57%) subsequently gastrointestinal diseases/disorders like loose motion, vomiting, pain in abdomen, perforation, bleeding, peptic ulcer disease (13.15%) depicted in figure 1.

The most common postmortem (PM) findings were consolidations in 26.31% of cases, followed by pulmonary oedema (18.42%). However, gross examination of part of lung received revealed that the lungs were grossly unremarkable in 47.36% of cases. Gross findings showed that in most of the patients’ lungs were firm (13.15%) and frothy fluid in 10.52%, (Table 2).

In each case, a histopathological investigation was performed. On histological analysis of the lung, a range of abnormalities were seen, the most prevalent of which was pneumonia (18.42 percent) (figure 2), oedema (15.78 percent) (figure 3), intra-alveolar haemorrhage (IAH) (13.15%) (figure 4), bronchopneumonia (10.52%) and tuberculosis (10.52%). In addition, out of 38 cases, three cases of each showed diffuse alveolar damage and focal intra-alveolar haemorrhage, two chronic passive venous congestion (CPVC) (figure 5) and one case each of aspiration pneumonitis, IAH with bronchopneumonia, malignancy (figure 6) and pleuritis, (Table 3).

Liver Findings In 22 Cases:

The commonest affected age group was more than 60 years (22.72%) and 46-60 years (13.63%) with male predominance (86.36%), as shown in table 4. The clinical presentation of seven cases was uneventful, while five had a history of chronic liver disease. In addition, four patients died due to unnatural causes.
### Table 1  Demographic profile of 38 autopsy cases.

| Demographic data | No. of patients | Percentage |
|------------------|-----------------|------------|
| **Age (in years)** |                 |            |
| New born to 15 years | 04             | 10.52      |
| 16 to 30           | 12              | 31.57      |
| 31 to 45           | 14              | 36.84      |
| 46 to 60           | 05              | 13.15      |
| More than 60       | 03              | 7.89       |
| **Gender**         |                 |            |
| Males             | 31              | 81.57      |
| Females           | 07              | 18.42      |

### Table 2  Post Mortem (PM) and gross findings of lungs

| Findings          | No. of patients | Percentage |
|-------------------|-----------------|------------|
| **PM findings**   |                 |            |
| Smoke particles   | 01              | 2.63       |
| Congestion        | 01              | 2.63       |
| Consolidation     | 10              | 26.31      |
| Edema             | 07              | 18.42      |
| Hemorrhage        | 03              | 7.89       |
| Lobar Pneumonia   | 02              | 5.26       |
| Grey white nodules | 01             | 2.63       |
| Pleura            | 02              | 5.26       |
| TB                | 03              | 7.89       |
| Unremarkable      | 08              | 21.05      |
| **Gross findings** |                 |            |
| Pigments          | 01              | 2.63       |
| Cavity            | 02              | 5.26       |
| Congestion        | 01              | 2.63       |
| Firm              | 05              | 13.15      |
| Frothy fluid      | 04              | 10.52      |
| Nodules           | 02              | 5.26       |
| Hemorrhage        | 02              | 5.26       |
| Pleura            | 03              | 7.89       |
| Unremarkable      | 18              | 47.36      |
### Table 3 Histopathological findings in lungs.

| Microscopic Diagnosis                        | No. of patients | Percentage |
|----------------------------------------------|----------------|------------|
| Aspiration pneumonitis                       | 01             | 2.63       |
| Bronchopneumonia                             | 04             | 10.52      |
| Chronic Passive Venous Congestion            | 02             | 5.26       |
| Diffuse alveolar damage                      | 03             | 7.89       |
| Edema                                        | 06             | 15.78      |
| Focal IAH                                    | 03             | 7.89       |
| Intra-alveolar Hemorrhage (IAH)              | 05             | 13.15      |
| IAH with bronchopneumonia                    | 01             | 2.63       |
| Malignancy                                   | 01             | 2.63       |
| Pleuritis                                    | 01             | 2.63       |
| Pneumonia                                    | 07             | 18.42      |
| Tuberculosis                                 | 04             | 10.52      |
| **Total**                                    | **38**         | **100**    |

### Table 4 Demographic profile of 22 autopsy cases.

| Demographic data | No. of patients | Percentage |
|------------------|----------------|------------|
| **Age (in years)** |               |            |
| New born to 15 years        | 01            | 4.54       |
| 16 to 30                      | 02            | 9.09       |
| 31 to 45                      | 11            | 50         |
| 46 to 60                      | 03            | 13.63      |
| More than 60                   | 05            | 22.72      |
| **Gender**                   |               |            |
| Males                         | 19            | 86.36      |
| Females                       | 03            | 13.63      |
Figure 4A (40 x) & 4B: (100x) Intra alveolar hemorrhages (IAH) and Pulmonary edema: H&E images show presence of red blood cells in few alveolar spaces and eosinophilic fluid in other alveolar spaces.

Figure 5A (40 x) & 5B (100x): Chronic Passive Venous Congestion (CPVC) Lung: H&E images show presence of hemosiderin laden macrophages in alveolar spaces.

Figure 6: Gross (A) and Microscopy (B) (H & E, 40X) pictures of malignant tumour in one of the lungs. A - Grossly multiple firm greyish white nodules with necrosis. B - Microscopy revealed tumour cells arranged in glandular pattern and in nests.

The postmortem requisition form revealed that the liver was unremarkable in 40.90%, while hepatomegaly was found in 31.81% of cases. While trimming, the yellowish liver was found in the majority of cases (31.81%) followed by nutmeg liver (18.18%) and liver cirrhosis (13.63%) (Table 5).

Fatty liver (steatosis) (36.36%) (figure 8) was the commonest histopathological finding followed by nutmeg liver (18.18%), cirrhosis (13.63%) (figure 9), portal triaditis (13.63%) (figure 10), and tuberculosis 9.39%. Liver malignancy (figure 11) and storage disorders (figure 12) was found in 1 case each, as shown in table 6.

Discussion

Advances in diagnostic technology have not diminished the value of autopsy, and target-directed autopsy remains an important element for the analysis and review of disease processes, as well as a tool for quality assurance. According to Kandy et al., even in the age of high-tech medicine, autopsies remain a significant tool for assessing the quality of clinical diagnoses. Moreover, histopathological examination of autopsies often reveals some natural diseases, which may trigger issues associated with trauma, work, crime etc. and its relative contribution towards death, especially in cases of sudden death [10].

Total 38 autopsy samples of lungs were examined during our study period. The majority of cases belonged to 31 to 45 years of age (36.84%), followed by 16 to 30 years (31.57%) with male
Table 5 PM and gross findings in liver.

| Findings        | No. of patients | Percentage |
|-----------------|-----------------|------------|
| PM findings     |                 |            |
| Cirrhosis       | 03              | 13.63      |
| Grey white nodules | 02            | 9.09       |
| Nodules         | 01              | 4.54       |
| Hepatomegaly    | 07              | 31.81      |
| Unremarkable    | 09              | 40.90      |
| Gross findings  |                 |            |
| Cirrhosis       | 03              | 13.63      |
| Grey white nodules | 02            | 9.09       |
| Hepatomegaly    | 02              | 9.09       |
| Nodules         | 01              | 4.54       |
| Nutmeg          | 04              | 18.18      |
| Yellowish       | 07              | 31.81      |
| Unremarkable    | 03              | 13.63      |

Table 6 Histopathological findings in liver

| Microscopic Diagnosis | No. of patients | Percentage |
|-----------------------|-----------------|------------|
| Cirrhosis             | 03              | 13.63      |
| Fatty Liver           | 08              | 36.36      |
| Malignancy            | 01              | 4.54       |
| Nutmeg                | 04              | 18.18      |
| Portal triaditis      | 03              | 13.63      |
| Storage disorders     | 01              | 4.54       |
| TB                    | 02              | 9.09       |
| Total                 | 22              | 100        |
with compression of sinusoids, seen in storage disorder of liver. Pulmonary oedema is the most prevalent incidental finding in the lung (18.42%). According to Sulegaon et al. [16], the predominance. The bulk of the lung samples included in Khare et al.’s investigation was from an autopsy performed on people aged 16 to 60 [11]. However, the bulk of cases in Singh et al. [12] research belonged to birth to 16 years, followed by 16 to 31 and 31 to 45 years, respectively. Males outnumbered females in our survey, accounting for 31 (81.57 percent) and 07 (18.42 percent) of the totals. Many other researchers have observed a similar sex distribution [11-14].

Consolidation is a frequent symptom of lung infection, and its appearance varies depending on the underlying organism. Consolidations occur when pathological fluids or cells completely replace alveolar airspaces, increasing parenchymal density that obscures the underlying vessels and bronchial walls [15]. In the present study, the most common PM findings were segmental or lobar consolidations found in 26.31% of cases, followed by pulmonary oedema (18.42%). According to Sulegaon et al. [16], pulmonary oedema is the most prevalent incidental finding in autopsies. Pulmonary oedema builds fluid in the air gaps and other lung tissues. Respiratory failure, hypoxia, cardiac arrest, and mortality can result from acute pulmonary oedema. Viral and early bacterial pneumonia can cause vascular congestion and oedema fluid in the lungs. This fluid is caused by elevated inflammation in one or more regions of the lungs. Congestive heart failure is a common cause of chronic pulmonary oedema. The findings vary on the gross and microscopic levels as the illness advances. As the illness advances, the lungs may transform from their crowded edematous look to a process known as "consolidation." In the damaged areas, the lungs seem more substantial. Similarly, in the current study, gross findings showed that most of the patients' lungs were firm (13.15%), and frothy fluid was found in 10.52% of cases. The most prevalent histological findings in this investigation of lung autopsy tissues were pneumonia (18.42%), oedema (15.78%) and intra-alveolar haemorrhage (IAH) (13.15%), bronchopneumonia (10.52%) and tuberculosis (10.52%). Diffuse alveolar damage is a pathological alteration linked with adult "acute respiratory distress syndrome and transfusion-related acute lung injury", as well as neonatal hyaline membrane disease. Its histopathological spectrum goes through several stages: exudative phase, stage of hyaline membrane formation, and organizing phase [17]. We report 3 cases of diffuse alveolar damage. Tubercular pneumonia was seen in 10.52% of cases in the current study, comparable with the research conducted by Kandy et al. [10] and Singh et al. [12]. Out of 38 cases, 3 cases showed focal IAH. 2 chronic passive venous congestion (CPVC) and one case of aspiration pneumonitis, IAH with bronchopneumonia malignancy and pleuritis. As a result, pneumonia was discovered to be the most prevalent histopathological finding in this investigation, which is comparable to studies done by Kandy et al. [10], Khare et al. [11], and Patel et al. [18]. Plans should be made at the community level to minimise the prevalence of pneumonia. All manufacturers and enterprises should ensure that their personnel receive regular medical check-ups. In addition, people should be offered educational counselling on their exposure to environmental hazards.

The importance of histology in detecting liver illnesses cannot be overstated, as some may go undetected until autopsy. More than 60 years (22.72 percent) of the population was afflicted, followed by 46-60 years (22.72 percent) (13.63 percent). According to the findings of the current investigation, the most prevalent afflicted age group in studies done by Bal et al. [19] and Fubara et al. [20] was 41-50 years (53.85 percent) and 41-49 years (28 percent), respectively. Liver illnesses predominated (86.36 percent) in males in the current study, consistent with the findings of numerous other researchers [19-22]. This may be related to men consuming more alcohol and smoke than women. Steatosis and inflammatory diseases were the most common liver abnormalities in a study of 4908 autopsy cases from Russia.[23] In the current research, fatty liver (steatosis) (36.36 percent) and nutmeg liver (18.18 percent) were the most common hepatic lesions, which is consistent with studies conducted in several Indian states. Steatosis of the liver was a common histological finding in a routine autopsy, either in conjunction with other histological characteristics or as the sole structural abnormality. Umesh et al. [24] and Devi et al. [25] discovered 22.9 percent and 17 percent prevalence of steatosis, respectively, in their investigations done in “Kolar (Karnataka)” and Imphal (Assam), which is equivalent to the current research (36.36 percent). However, in the research conducted by Bal et al [19], fatty change liver (39 percent) comprised the most significant number of patients among the liver abnormalities. Few additional investigations [26,27] found hepatic steatosis the most prevalent finding with male preponderance. Cirrhosis (13.63 percent), portal triaditis (13.63 percent), TB (9.09 percent), storage disorders (4.54 percent), and cancer were the other pathological findings of the liver in the current investigation (4.51 percent). These findings are consistent with the Bal et al. investigation [19]. In the current investigation, a few instances had incidental discoveries on autopsy and microscopic inspection that were not identified at the

Sanjay Bijwe et al./ International Journal of Medical Reviews and Case Reports (2022) 6(7):37-45
time of death. These might be the unnoticed discoveries or the reason for death. These instances demonstrate the significance of histology in autopsies for investigating true disease prevalence.

Limitation

We received only parts of the organs for histopathological study, which is one limitation. However, this limitation was overcome by histological findings in the tissue study, which helped understand the underlying disease process. Also, due to insufficient clinical data and tissues, we did not consider other organs’ findings that may have contributed to disease progression.

Conclusion

The current study examines the prevalence of different lung and liver diseases in autopsy specimens acquired at a tertiary care hospital. This study emphasizes the significance of histological reports in lung and liver autopsies. We conclude that histological studies of the lungs and liver are a fantastic learning tool in the hands of pathologists for studying the spectrum of lungs and liver disorders, which has a high value in enhancing vision and diagnostic setup for clinical evaluation. Although autopsy-based studies may not represent the true pattern of lung and liver illnesses, they highlight the need for more research to aid in the early diagnosis and treatment of susceptible populations.

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Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

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