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Gross and Histopathological Findings in Fatalities Caused by Pulmonary Disease: An Autopsy Study

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ABSTRACT

Background: Respiratory pathologies are some of the common causes of deaths and it has been reported that in almost 1/3rd cases of sudden deaths the primary pathology may be attributable to pulmonary pathology. One of the important aspect of respiratory pathologies is that they can progress rapidly over a short period of time and in many cases these pathologies may prove to be fatal. In such cases gross and histopathological examination of lung tissue can give valuable insights into the cause of death. We conducted this prospective study to study the pathological findings in the lungs of such cases. **Methods:** The present study was conducted in the department of forensic medicine and toxicology of a tertiary care medical college situated in an urban area. The duration of study was 2 years. All cases of natural deaths brought for medico-legal autopsy were included in this study on the basis of a predefined inclusion and exclusion criteria. Virchow's technique for dissection was followed in all the cases. The demographic details, gross and histopathological examination of lungs was done and findings were noted. Statistical analysis was done using SSPS 21.0 software. P value less than 0.05 was taken as statistically significant. **Results:** The study consisted of a total 54 patients out of which there were 34 males and 20 females with a M:F ratio of 1:0.58. The most common affected age group was found to be between 30-40 years (22.22%). The mean age of males and females were found to be comparable with no statistically significant difference (P>0.05). Most people died within 3-7 days from time of admission (25.92%). Pneumonia was found to be leading cause of deaths in lung pathology which contributed to 74.7% cases. On gross pathology consolidation and pulmonary edema were most common findings whereas on gross as well as histopathological examination. **Conclusion:** Gross and histopathological examination of lung tissue in individuals dying due to natural causes can give valuable insights into the cause of death.

Keywords: Medicolegal Autopsy, Lung lesions, Histopathological examination.

INTRODUCTION

Natural death means that death was caused entirely by the disease and trauma or poison did not play any part in bringing it about.[1] In natural deaths diseases of the cardiovascular system and diseases of the respiratory system play an important role and it has been reported by various researchers that in almost 1/3rd cases of sudden deaths the primary pathology may be attributable to pulmonary pathology. With rapid industrialisation there is a rapid increase in air pollution and consequently there is a rapid increase in respiratory morbidity in today's population particularly individuals living in urban areas.[2] The respiratory system is the second most common cause of sudden unexpected death due to pathological condition.[3]

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One of the hallmarks of respiratory diseases is that they can progress rapidly. The pathology may be such that the patient rapidly becomes breathless and before the cause of breathlessness is ascertained or imaging studies or appropriate invasive investigations are done the patient may succumb to the disease.[4] This catastrophic progression of the disease is particularly common at extremes of ages (neonates and old population) and individuals having immunocompromised status either due to congenital (severe combined immunodeficiency, X-linked agammaglobulinemia and severe combined immunodeficiency) or acquired immunodeficiencies (acquired immunodeficiency syndrome, patients on long term steroids or patients on chemotherapy etc).[5] It is worth emphasizing that lungs are not only involved in the primary diseases involving lung per se (pneumonia, abscess, fibrosis and atelectasis) but also a wide range of diseases may secondarily affect the lungs (metastasis, acute lung injury as seen in massive blood transfusion and left ventricular failure etc) leading to pathological changes in lung tissue which can be picked up by gross and

histopathological examination.[6] The importance of histopathological examination of lung tissue can't be overemphasized as lungs are affected in almost all terminal events leading to death irrespective of whether the primary pathology is pulmonary or extrapulmonary.[7] One of the important aspect of lung pathologies is that lung biopsy is a fairly complicated procedure and seldom done therefor post-mortem histopathological examination of lungs during medicolegal autopsies acquire immense significance for understanding disease process which might have caused death of individual.[8]

pathological examination during autopsy of lungs gives valuable information such as various stages of fibrosis, including early fibrosis and honeycombing lesions, and their distribution and progression in the lung.[9] Amongst infections pneumonia still remains the "captain of death".[10] Many times, it has been seen that when gross pathology could not help to evaluate the cause of death, histology had come forward to rescue the situation and a conclusive opinion could be given.[11] Now the trends are changing regarding the utility of histopathological examination in autopsy cases to ascertain the cause of death and to know the exact pathological entity that has contributed to the death. Even in cases where the aetiology of pathological process causing death is known the autopsy (gross and histological examination) may give great insights into the disease progress.[12]

With this background in mind we conducted this prospective study to find the pathological conditions present in the lungs and its role in the cause of death.

MATERIALS AND METHODS

The present study was conducted in the Department of Forensic Medicine and Toxicology of a tertiary care medical college situated in an urban area during the period from January 2016 to November 2017 with cooperation from the department of Pathology. This study included all cases of natural deaths brought for medico-legal autopsy during study period. The institutional ethics committee approved the study. The present study included 54 cases of natural deaths after fulfilling the inclusion and exclusion criteria. Routine information about age, sex, brief history/ facts about the cases collected from police inquest report, relatives and friends of the deceased. In admitted cases, information was collected from hospital records and death summaries. The socio-economic status of every case was determined by using revised Kuppuswamy and BG Prasad socio-economic scales for 2016.

Autopsy technique:

Lungs:

Routine autopsy techniques (Virchow's) were followed, the thoracic cavity opened, and lungs were examined in-situ before removal. The organs were then dissected out by routine dissection technique. The left lung was opened first. With the large knife, an incision was made along its anterior surface starting from the apex of the upper lobe and extending to the base of the upper lobe. The second incision went along the lateral margin, starting at the upper portion of the upper lobe and extending through the lower lobe to its base. During the examination of the cut surfaces of the lungs, cross section of the bronchi, their ramifications and blood vessels were investigated. The whole organs or pieces of organs showing gross pathologic changes were preserved for histopathological examination in 10% formalin solution and were forwarded to the Pathology Department. In the pathology department slides were prepared by H&E staining and observed under a microscope at 10X power. The findings were recorded and analysed statistically.

Inclusion criteria:

1. The admitted cases who had died due to natural disease of respiratory system and then were brought for post-mortem examination.
2. The cases which were brought dead in casualty and sent for post-mortem examination with the manner of death natural were included and respiratory cause was suspected or found out at autopsy.

Exclusion criteria:

The cases, where the unnatural means such as trauma, violence or poisoning had caused death.

Dead bodies in the state of decomposition were not included in this study.

RESULTS

A total 54 autopsies were included in this study. Out of 54 cases there were 34 (62.97%) males and 20 (37.03%) females with a M:F ratio of 1:0.58.

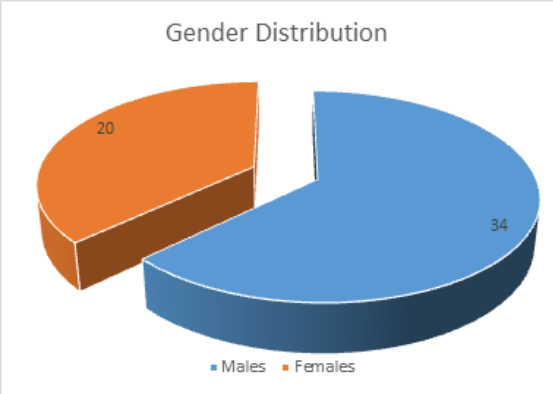

Figure 1: Gender Distribution of the studied cases.

The maximum number of cases found in the age group of 30 to 40 years (22.22%) in which male contribute 16.66% and female 5.55%. Least commonly affected age group was found to be between 80-90 years (1.85%). The mean age of male and female patients was found to be 39.96 +/- 14.21

and 34.30 +/- 19.75 respectively. The difference in the mean age of male and female patients was not found to be statistically significant (P=0.2277).

Table 1: Mean Age Of The Studied Cases.

Age	Male		Female		Total	
	No of cases	Percentage	No of cases	Percentage	No of cases	Percentage
1 -10	1	1.86	2	3.70	3	5.55
10-20	0	0	3	5.55	3	5.55
20-30	7	12.96	4	7.40	11	20.37
30-40	9	16.66	3	5.55	12	22.22
40-50	3	5.55	3	5.55	6	11.11
50-60	8	14.82	2	3.70	10	18.51
60-70	3	5.56	1	1.86	4	7.40
70-80	2	3.70	2	3.70	4	7.40
80-90	1	1.85	0	0	1	1.85
Total	34	62.97	20	37.03	54	100
	39.96 +/- 14.21		34.30 +/- 19.75			
P=0.2277 95% CI= -14.9632 to 3.6432						

Table 2: Distribution as per socioeconomic status

Socioeconomic status	Male	%	Female	%	Total	%
Upper	1	1.85	1	1.85	2	3.70
Upper Middle	1	1.85	0	0	1	1.85
Middle	6	11.11	3	5.55	9	16.66
Lower Middle	15	27.77	6	11.11	21	38.88
Lower	11	20.37	10	18.51	21	38.88
Total	34	62.97	20	37.03	54	100

The analysis of cases based on socio economic status showed that most of the cases belong to lower middle and lower class and both contributed equally (38.88% each). 9 (16.66%), 1 (1.85%) and 2 (3.70%) patients came from Middle, Upper middle and upper class respectively.

Rural population were mostly affected which contributed total (51.85%) in which male contributed for (29.63%) and female (22.22). 26 (48.15%) patients came from urban areas. The difference was not found to be statistically significant (P=0.4083).

Table 3: Urban and Rural distribution.

Locality	Males		Females		Total	
	No Of Cases	%	No Of Cases	%	No Of Cases	%
Rural	16	29.63	12	22.22	28	51.85
Urban	18	33.34	8	14.81	26	48.15
Total	34	62.97	20	37.03	54	100
P=0.4083 (Not Significant)						

Most people died in 3 to 7 days from the time of admission (25.92%) in which male contributed for (18.51%) and female (7.40%) followed by 2 to 6 hrs contributing (18.51%). Most of the males survived up to 3 to 7 days and most of the females survived up to 6 to 24 hours. Survival beyond 5 days was exclusively seen in males.

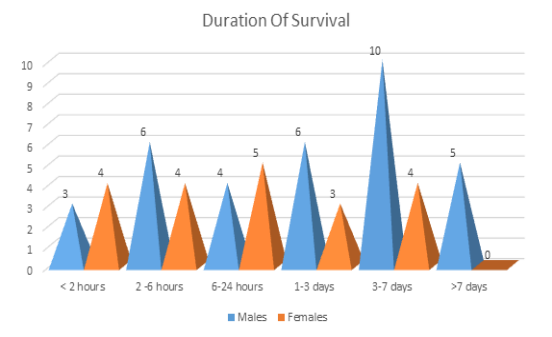

Figure 2: Duration of Survival in Studied Cases.

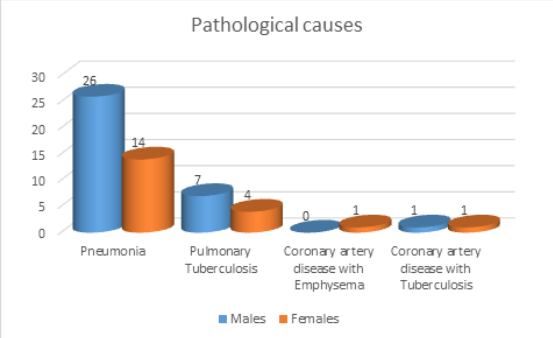

Figure 3: Pathological Cause of Death in Studied Cases.

Pneumonia was found to be leading cause of death in lung pathology which contributed for 74.7% cases. Out of patients found to be having pneumonia on autopsy males contributed for 48.14% and females contributed for 25.92% cases. Pneumonia was followed by pulmonary tuberculosis which was seen

in 11 (20.37%) patients. Out of 11 patients found to be having Kochs focus there were 7 (12.96%) males and 4 (7.40%) females.

Consolidation was found in 53 (98.14%) patients. Only in 1 female consolidation was absent. The second most common finding was pulmonary edema which was seen in 42 (77.77%) patients. Tuberculosis, fibrosis and emphysema was seen in 13 (24.07%), 2 (3.70%) and 1 (1.85%) patients respectively.

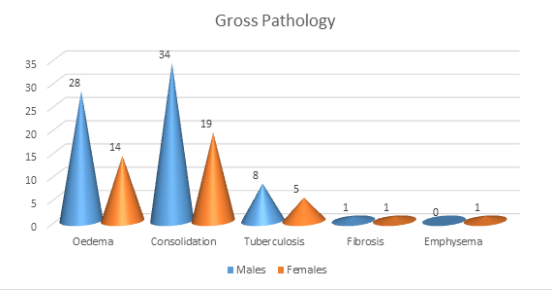

Figure 4: Gross Pathology in Studied Cases.

On histopathological examination also consolidation was found in 53 (98.14%) patients. Only in 1 female consolidation was absent. The second most common finding was pulmonary edema which was seen in 34 (62.92%) patients. Tuberculosis, fibrosis and emphysema was seen in 13 (24.07%), 3 (5.55%) and 1 (1.85%) patients respectively.

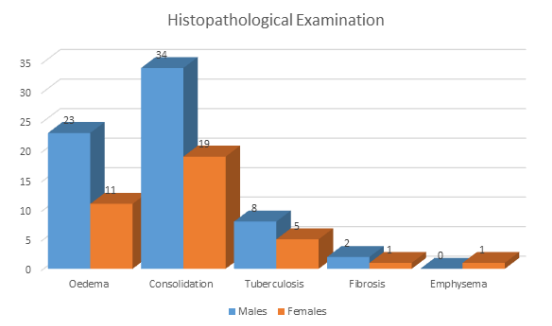

Figure 5: Histological Findings in Studied Cases.

DISCUSSION

Present study was undertaken to understand the pulmonary lesions in Central Indian population. A total number of 54 cases were studied. In our study, maximum number of cases were found in the age group of 30 to 40 years (22.22%). The study was found to be consistent with Zanjad et al,[13] who found that the maximum number of cases belonged to age group 31-40 years (28.50%). Similarly, Selvam et al,[14] also found that the incidences were higher in 3rd and 4th decades of life. In contrast to our study Rastogi et al,[15] found that one-third of deaths were seen in the 5th decade of life. As this age group is more prone to pathological changes due to various eating habits, indiscriminate use of alcohol, smoking and tobacco in males, sedentary lifestyle, stress and strain in life and lack of regular medical check-up. Females of this age group were repeatedly subjected to mental and physical stress due to social and surrounding environmental conditions and ignorance towards health problems.

In the present study, males predominated the females, with male to female ratio of 1:0.58. This male predominance was also reported by Selvam et al,[14] who reported that males constituted 75.9% cases and females 24.07% cases. Rastogi et al,[15] study showed that males were predominantly affected (86.67%). Udayashankar et al,[16] found out of 22 lung specimens from medicolegal autopsies, 17 were males and 5 were females. This may be because of male earning for family and living outside home for earning and stressful environment. Moreover substance abuse such as tobacco and alcohol is more common in males.

In the current study, most of the cases belonged to lower middle and lower class, both contributing equally (38.88%). These findings were consistent with the study of Chaudhari et al,[17] who reported 36.42% cases in lower middle class and 20.87% cases in the lower class. It was very likely that these classes are more exposed to stress due to financial problems and indulge in consumption of tobacco, bidi smoking and alcohol consumption non-maintenance of hygiene and residence in the slum area.

In the current study, the rural population was predominantly affected which contributed to 51.85% in which male contributed for 29.63% and female contributed to 22.22%. Selvam et al,[14] reported 61% urban population and 38.9% rural population which is not consistent with present study. The preponderance to rural area could be because of the fact that our hospital is in the heart of city and serves to many surrounding villages.

Most of the people died in 3 to 7 days in which male contributed for 18.51% and female to 7.40% followed by 2 to 6 hrs (18.51%). Pneumonia was found to be the captain of death in lung pathology which contributed for 74.7% in which males and females contributed for 48.14% and 25.92%. Similar findings were reported by Zanjad et al,[13] reported 26.22 % cases and Pathak et al,[18] reported 31.11% cases. The high rate of death due to pneumonia is attributable to lack of health care, exposure to cold and inadequate nourishment of homeless people.

Pulmonary tuberculosis contributed for 20.37% in studied cases. Same was noted by Bal et al.[11] This was in contrast with the study conducted by Kurdukar et al[19] who reported that acute pulmonary congestion (58.95%) followed by pneumonia (41.47%) were common pulmonary pathologies in studied cases. Lower socioeconomic status and treatment default may be the reason for incidences of pulmonary tuberculosis in our study. Consolidation was the most common lung lesion found on gross and histopathological examination constituting

98.14% of studied cases and this finding was found to be consistent with findings of Pathak et al.[18] Maximum cases in the study were from the lower and lower middle class who faces the extreme hardship for want of proper sanitation, housing, hygiene and lack of proper health care.

Oedema was found to be the second most common pathology found on gross and Histopathological examination. On gross examination oedema was found in 77.77% of cases whereas on histopathological examination 62.92% cases were found to have edema. Selvam et al,[14] reported 31.5% oedema lesion on gross and 29.6 % on histopathological examination. Pathak et al,[18] reported 37.7 % oedema lesion on gross and 33.3 % on histopathological examination. Tuberculosis was found in 24.07% cases on gross and histopathological examination. Kandy et al,[20] reported 10.52 % tuberculosis lesion on gross and 15.78% on histopathological examination.

CONCLUSION

The present study was undertaken to discuss the pattern of gross and histopathological findings in pulmonary lesion in the present study and the results are summarized as follows. The maximum number of cases found in the age group of 30 to 40 years (22.22%). Males predominated females with the male to female ratio of 1:0.58. The analysis of cases based on socio economic status, most of the cases belong to lower middle and lower class and both contributed equally (38.88%). Rural population were mostly affected that urban which contributed total (51.85%). Most people died in 3 to 7 days from the time of admission (25.92%). Pneumonia is the captain of death in lung pathology which contributed for (74.7%). Consolidation is the most common lung lesion found on gross examination constituting (98.14%). Consolidation was also the most common lesion found on histopathological examination constituting (98.14%) followed by oedema. Histopathological study helps in confirmation of the cause of death in natural death cases. The need for early intervention is necessary as cause of death is mostly chronic in nature. The present study has significantly helped in avoiding unnecessary medico legal investigation of death.

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