

## Original Research Article

# Clinical profile and treatment outcome of patients with spontaneous pneumothorax

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## ABSTRACT

**Background:** The burden of Spontaneous Pneumothorax has been recorded as alarming health problem in medical sciences and is adversely influenced by environmental factors. Objectives of the study were to determine the incidence of spontaneous pneumothorax and to assess the clinical profile and outcome of patients of spontaneous pneumothorax admitted in Government tertiary health care centre.

**Methods:** A hospital based cross-sectional study was conducted in year 2014-15 in the department of Pulmonary Medicine, Government Medical College, Miraj, Maharashtra, India. A total of 2142 patients were admitted with chest complaints during study period were enrolled as study subjects, of which 50 were diagnosed as spontaneous pneumothorax and treated as cases under study. The data were elicited by utilizing structured proforma includes clinical and outcome indicators of Spontaneous Pneumothorax. Qualitative information was computed in tabular and graphical form and analyzed into frequency percentage.

**Results:** Incidence rate of Spontaneous Pneumothorax was 2.33% with higher proportion of cases were belonged male gender (78%) as compared to female (22%). Maximum cases were found in age group, 25-34 years with case ratio of 1:4 for Primary to secondary Spontaneous Pneumothorax. The most common lung disease in secondary spontaneous pneumothorax observed was tuberculosis. Max. 48% cases showed full expansion of lungs followed by 32% with partial expansion with an intervention of appropriate line of management.

**Conclusions:** Tuberculosis is the common cause for secondary spontaneous pneumothorax in India and it should be looked for, in all cases of spontaneous pneumothorax.

**Keywords:** Clinical profile, Incidence rate, Spontaneous pneumothorax, Treatment outcome

## INTRODUCTION

The term pneumothorax was first coined in 1803 by Itard and its clinical descriptions were described by Laennec in 1819.<sup>1</sup> Pneumothorax is defined as the entry of air into the pleural space without any external cause and with secondary lung collapse. Pneumothorax can occur spontaneously or after trauma to the lung or chest wall.<sup>2</sup> Pneumothorax can also be divided into tension and non-

tension. A tension pneumothorax is a medical emergency due to rising intra-thoracic pressure from progressive air accumulation in the pleural space. Circulatory or respiratory failure might be developed from subsequent lung or mediastinal compression.<sup>3,4</sup>

Spontaneous pneumothorax (SP) can be classified as either primary or secondary. Primary spontaneous pneumothorax (PSP), which is defined as a

pneumothorax without underlying lung disease, predominantly occurs in young, thin male. It is usually caused by ruptured sub-pleural blebs or bullae or changing pleural porosity secondary to inflammation.<sup>5-7</sup> PSP might be associated with some congenital disorders such as Marfan's syndrome, or some environmental factors such as smoking.<sup>8</sup>

There are some precipitating factors, such as change in atmospheric pressure or emotional change. Hearing loud music has also being reported as a risk factor of PSP, which may be due to changes in trans-pulmonary pressure by exposure to sound energy. Some patients with PSP have a positive family history (Hereditary predisposition).<sup>9</sup> Some gene mutations, such as folliculin (FLCN, rel disease, Birt-Hogg-Dube syndrome), have been found with relation to the development of PSP.<sup>10</sup> The relative risk of getting pneumothorax is of 7 to 100 times higher in light to heavy smokers.<sup>11</sup>

Secondary spontaneous pneumothorax (SSP) usually occurs in older people with underlying pulmonary disease, such as pulmonary tuberculosis, emphysema, asthma, acute or chronic infections, lung cancer and congenital diseases including cystic fibrosis, catamenial pneumothorax, or lymphangioleiomyomatosis (LAM).<sup>12</sup> The clinical symptoms associated with SSP are more severe than those associated with PSP. Dyspnea is most prominent clinical feature in SSP. Recurrence rate usually higher in SSP. Spontaneous Pneumothorax is one of the respiratory emergencies in medical practice.

This study aimed to determine the incidence of spontaneous pneumothorax among the patients coming from rural area of western Maharashtra and to assess the clinical and treatment outcome profile for further treatment modalities and epidemiological interventions.

## METHODS

This was a prospective observational study conducted at the Department of Pulmonary Medicine, Government Medical College, Miraj, Maharashtra, India during the year, 1<sup>st</sup> July 2014 to 30<sup>th</sup> June, 2015. A total of 2142 patients admitted in this hospital during study period with chest complaints were considered as study population and of which, 50 patients were diagnosed as spontaneous pneumothorax cases.

### Inclusion criteria

Patient with age more than 15 years, with chest complaints, showing radiological evidence of pneumothorax.

### Exclusion criteria

Patient with age less than 15 years, old cases of pneumothorax, not given consent, pregnant mothers and traumatic pneumothorax.

Total 50 patients were admitted in Department of Pulmonary Medicine with a diagnosis of spontaneous pneumothorax, were taken into the study after obtaining consent. A self-designed structured pre-tested proforma utilized to collect data pertained to study variables viz. demographic data, clinical features like chest pain, breathlessness, cyanosis, heart rate, respiratory rate, blood pressure recorded at the time of presentation. History of previous pneumothorax, tuberculosis, obstructive airway disease or other lung diseases and treatment history recorded. Chest radiograph taken in all patients and high resolution computed tomography of chest done whenever necessary. Depending on underlying lung condition pneumothorax divided into PSP and SSP. Other investigations done were gram stain, culture sensitivity for pyogenic organisms, sputum for acid fast bacilli (AFB), blood sugar, oxygen saturation and spirometry.

Treatment plan decided based on degree of dyspnea, underlying lung condition, cyanosis, extent of pneumothorax in chest radiograph as per British Thoracic Society guideline of pleural disease.<sup>13</sup> PSP without dyspnea and pneumothorax less than 15% were treated with rest, oxygen inhalation and observation. Patients with less dyspnea, no cyanosis, stable and more than 15% pneumothorax were treated with oxygen inhalation, observation and ICTD as and when required. Patients with severe dyspnea, cyanosis were treated with ICTD under water seal irrespective of the size of pneumothorax.<sup>14</sup> The time taken for lung expansion was recorded. In cases where lung expansion was not seen even after 4 to 6 weeks referred for surgery.

### Statistical analysis

Data so collected were tabulated, analyzed and presented in frequency percentage distribution.

## RESULTS

A total of 2142 patients admitted at the Department of Pulmonary Medicine during year 2014-15, of which 50 were diagnosed as spontaneous pneumothorax cases.

**Table 1: Incidence rate of spontaneous pneumothorax cases (N= 2142).**

Total number of pneumothorax cases	Total no of cases	Incidence rate (%)
SP cases	50	2.30
PSP cases	10	0.46
SSP cases	40	3.73

Table 1 depict, hospitalized incidence rate of SP, PSP and SSP was 2.30%, 0.46% and 3.73% respectively among the patients admitted with chest complaints at Department of Pulmonary Medicine in Government Medical College Miraj, Maharashtra, India.

**Table 2: Age and sex wise distribution of spontaneous pneumothorax cases (N=50).**

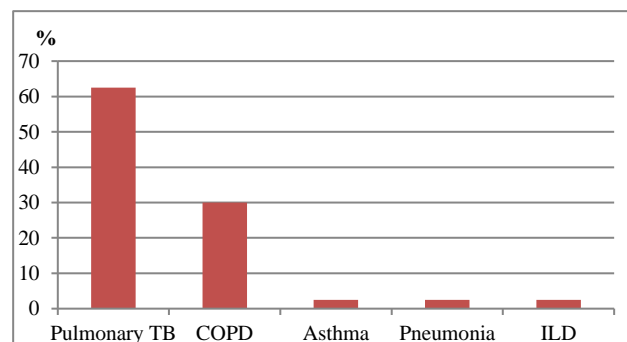
Age group in years	Male (%)	Female (%)	Total (%)
15-24	2 (4%)	2 (4%)	4 (8%)
25- 34	16 (32%)	4 (8%)	20 (40%)
35- 44	12 (24%)	2 (4%)	14 (28%)
45- 54	2 (4%)	2 (4%)	4 (8%)
55-64	4 (8%)	1 (2%)	5 (10%)
65 and above	3 (6%)	Nil	3 (6%)

The low and high age reported was 15 years and 68 years respectively with max cases, 40% were in age group 25-34 years followed by 28% in age group 35-44 years. The proportion of SP cases was higher, 78% in males as compared to females, 22% respectively (Table 2).

**Table 3: Symptoms wise distribution of spontaneous pneumothorax.**

Symptoms	Frequency (%)
Breathlessness	45 (90%)
Chest pain	43 (86%)
Cough	41 (82%)
Fever	22 (44%)
Haemoptysis	7 (14%)
Weakness (generalized)	35 (70%)
Palpitations	10 (20%)
Body ache (headache)	8 (16%)
Swelling of body	3 (6%)
Asymptomatic	2 (4%)

Table 3 shows, maximum, 90% patients of SP were presented with breathlessness followed by 86% with chest pain and 82% with cough as main symptom. Generalized weakness was perceived by 70% cases; however, 4% cases were asymptomatic and detected accidentally during routine check-up.

**Figure 1: Type of lung diseases in secondary spontaneous pneumothorax.**

Out of total 40 cases of SSP, maximum, 62.5% cases were of pulmonary tuberculosis type followed by 30% cases belonged to COPD (Figure 1). According to Figure 2, maximum 14% cases were admitted in the month of

July 2014 followed by August, December and September of year 2014 as 12% and 10% respectively.

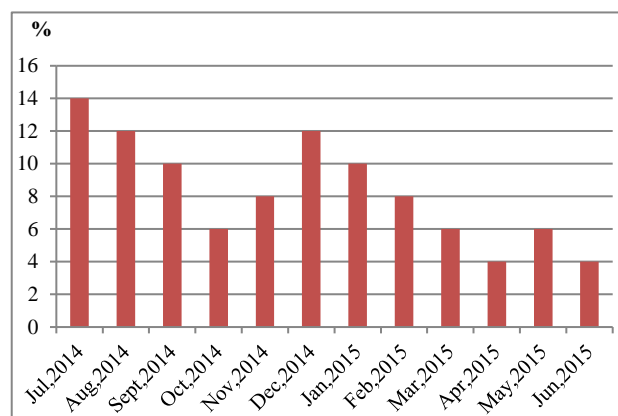
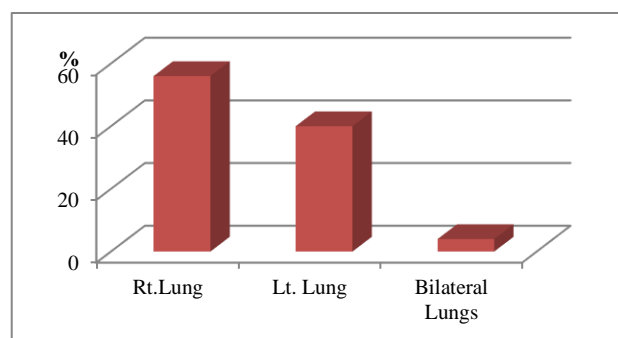
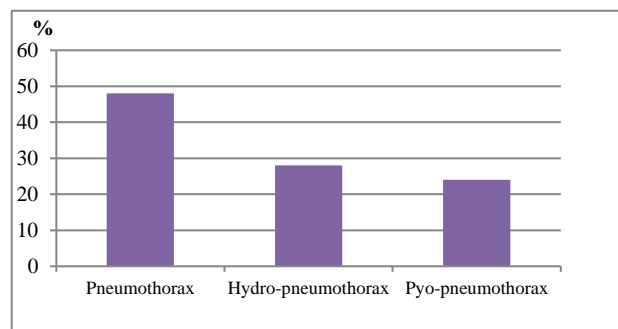
**Figure 2: Time percentage distribution of SP admissions.****Figure 3: Side of lung involvement in SP (N=50).****Figure 4: Contents of pleural cavity.**

Figure 4 shows, maximum pleural cavity content was Pneumothorax, 48% followed by Hydro-pneumothorax and Pyo-pneumothorax, 28% and 24% respectively.

**Table 4: Mode of treatment intervention used in SP cases.**

Mode of treatment intervention	Frequency (%)
Inter-costal tube drainage (ICTD) + O <sub>2</sub> Inhalation	47 (94%)
O <sub>2</sub> Inhalation+ Observation	3 (6%)
Needle Aspiration	Nil

Maximum, 94% cases were treated with ICTD+O<sub>2</sub> inhalation whereas only 6% cases managed with rest and oxygen inhalation intervention (Table 4).

**Table 5: Complications of ICTD.**

Complications/drawbacks	Frequency (%)
Surgical emphysema around the site of introduction	5 (10%)
Tube slipping out of the chest accidentally	7 (14%)
Haemorrhagic pleural fluid after tube introduction	3 (6%)
Secondary infection of pleural space in pneumothorax	5 (10%)
Tube block needing changing tube	6 (12%)

Table 5 shows that Tube slipping out the chest was the major, 14% drawback of ICTD intervention observed in SP cases followed by tube blockage, 12%. Surgical emphysema and secondary infections were reported in 10% cases respectively.

**Table 6: Treatment outcome of SP cases.**

Treatment outcome	Frequency (%)
Full expansion of lung	24 (48%)
Partial expansion of lung	16 (32%)
No expansion of lung up to last day of study	3 (6%)
Died	7 (14%)

Partial to full lung expansion was observed in 80% cases however, 6% cases didn't show any response on lung expansion. A total of 14% were died during treatment intervention (Table 6).

## DISCUSSION

The present hospital based study conducted in rural area of western Maharashtra revealed incidence rate of Spontaneous Pneumothorax was 2.30% among the chest symptomatic patients, above the 15 years of age population. Pulmonary tuberculosis is the main aetiological factor of SP in India and is supported by Indian series of Agnihotri et al, Faruqi et al and Ahangar et al.<sup>15-17</sup> There is high prevalence of tuberculosis in our country as compared with other developed countries. The pneumothorax develops by rupture of caseating subpleural tuberculus lesions or cavities into the pleural space. The calcified lesion and fibrosis can lead to formation of bullae, rupture of which can give rise to SP.

The high proportion of SP was reported in male patients, 78% as compared to female in present study. Similar findings have also been reported by Gupta et al and Faruqi et al.<sup>14,16</sup> Secondary SP is predominant, 80% in our study among total SP cases and among that Pulmonary tuberculosis stood rank 1<sup>st</sup> i.e. 62.5% followed by COPD, 24% as underlying causative chest diseases.

Secondary SP was also more common in male patients (32 out of 40) with male to female ratio, 4:1. The higher incidence in male have been attributed to higher rates of smoking, outdoor activities, environmental pollution, body habitus and different mechanical properties of the lung.<sup>18</sup> Maximum, 40% cases were seen in the age group of 25-34 years followed by 28% in age group of 35-44 years. Similar findings have also been reported by Gupta et al and Faruqi et al and the underlying cause may be high prevalence of TB, high exposure to environmental pollution, poverty or substandard occupational environment.<sup>14,16</sup>

Cran and Rumball in their study reported maximum, 99 cases of spontaneous pneumothorax admitted during winter season with preponderance of pneumothorax and they explained it by increased likelihood of respiratory infections in the winter months.<sup>19</sup> The present study revealed approximately same proportion of admissions in winter, 38% as well as 40% rainy season. The most common complaint was chest pain, 90% followed by breathlessness 86%, cough ranked third, 82%. In this study, right side of lung was predominantly involved, 56% than left side, 40% with little bilateral involvement, 4%. A study conducted by Boghaut AB and Patel RB also found right side was a little more frequently affected 52.5% than left side 45% with bilateral pneumothorax was quite rare (2.5%).<sup>20</sup>

The aim of management was to get the collapsed lung expanded at the earliest so as to prevent further complications of pneumothorax and to provide quicker relief from the distress and reduction of hospital stay of the patient. The Ruckley CV and MacCormack RJM recommend Intercostal Tube Drainage (ICTD) -Tube Thoracostomy with under water seal was the treatment of choice.<sup>21</sup> The intercostal drainage tube was always inserted in the 5<sup>th</sup> intercostal space just behind anterior axillary line, this help in drainage of pus or fluid from the pleural space in addition to the air in the pleural space. The So Sy and Yu DYC found ICTD without suction as the better way of the treatment.<sup>22</sup> Suction was not used in our study. Boghaut AB and Patel RB treated 72.5% of the patients with ICTD and 5% with rest. In the present study, 47 patients (94%) treated with ICTD and 3 patients (6%) with rest, O<sub>2</sub> inhalation and observation and no one was treated with aspiration.<sup>20</sup>

The complications of ICTD were negligible. Average ICTD time was 15 days for tuberculosis patients, 5.75 days for patients with COPD (SSP Cases) and 5 days for patients with primary pneumothorax (PSP Cases). (This was derived by dividing total expansion time in days by number of patients of that particular disease treated by ICTD). More days were required for ICTD, in SSP cases, probably the aetiology was infective one, where as in PSP cases, the aetiology was mostly non-infectious. The full expansion of lung was in 24 cases; partial expansion of lung was 16 cases, no expansion of lung up to last date of study, was 3 cases and died 7 patients. Out of 7 died

cases, 6 were from tuberculous origin and 1 was from non-tuberculous group.

Spontaneous pneumothorax remains a clinical problem worldwide with high mortality. The underlying pathogenesis is probably multifocal. The initial approach to the management differs from country to country and it is very difficult to establish an international protocol.

## CONCLUSION

Maximum, 50% of Spontaneous Pneumothorax cases were due to pulmonary tuberculosis i.e. tuberculosis is the main aetiological factor for pneumothorax. Spontaneous pneumothorax was more common in male as compared to female with maximum incidence in economical productive age group. Environmental factors could be directly and indirectly contributing for increasing the incidence of disease.

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