

Original Research Article

## Clinical Profile and Etiological Factors of Spontaneous Pneumothorax in Rajasthan (North-West India)

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**Abstract:** Limited data is available on epidemiology of spontaneous pneumothorax (SP) from India. The current study was aimed at studying aetiology and clinical profile of patients with SP. Diagnosed cases of spontaneous pneumothorax attending SMS Hospital were included in study as per inclusion and exclusion criteria. Detailed demographic & clinical data was recorded. Patients were divided into two groups primary spontaneous pneumothorax (PSP), if no underlying aetiology for pneumothorax was found, and secondary spontaneous pneumothorax (SSP), when an underlying respiratory disorder could be identified. The clinical features were compared between the two groups. Seventy patients (9 with PSP and 61 with SSP) were included in the study. Age distribution showed a biphasic pattern and the overall male to female ratio was 4.3: 1. The most common etiology of SSP was found to be pulmonary tuberculosis 49.18 % (30 cases of 61 total) in which active tuberculosis was present in only 40% (12 case of 30 total) followed by COPD (26.22%). Spontaneous pneumothorax has a biphasic pattern of age distribution, is more common in males, most common symptom is dyspnoea followed by unilateral chest pain and cough. SSP is more common than PSP. The commonest etiological factor of SSP in our country is still Tuberculosis followed by COPD but SSP due to active tuberculosis is declining. Recurrence and complication are more common in SSP.

**Keywords:** Spontaneous pneumothorax (SP); Primary Spontaneous Pneumothorax (PSP); Secondary Spontaneous Pneumothorax (SSP); Tuberculosis; COPD; ICD.

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### INTRODUCTION

The term 'Pneumothorax' was first used by the French physician Jean Marc Gaspard Itard in the year 1803[1]. It is defined as the accumulation of air in the pleural cavity with collapse of the surrounding lung. Pneumothorax is classified into Spontaneous and Traumatic Pneumothorax. Spontaneous Pneumothorax is sub divided into Primary and Secondary spontaneous pneumothorax (PSP and SSP). PSP occurs in healthy young person without known lung disease. On the other hand, SSP occurs as a complication of underlying lung disease mostly Tuberculosis and COPD. Over a period of time etiological factors and modality of treatment have changed considerably. The present study was carried out in S.M.S Hospital and medical college, Jaipur to re-evaluate and identify the common aetiologies, complications and the modalities of

management in patients with spontaneous pneumothorax.

### MATERIALS AND METHODS

This study was carried out from June 2014 to May 2015. After taking ethical clearance (2295/MC/EC/2016) and consent from patients, the patients admitted to the hospital with a diagnosis of SP as per inclusion and exclusion criteria were included. Patients with age less than 18 years and history of trauma was excluded from study. The sample size required to verify the lowest proportion of 6.6 % for different etiological factor responsible for spontaneous pneumothorax at 95% confidence and 80% power will be 70 cases. Continuous data is summarized in the form of mean and SD. Count Data is summarized in form of proportions. Significance level for tests were determined as 95% (P< 0.05).

A predesigned performa that had sections on demographic information (age, sex, residence, smoking habit), anthropometry [height, weight, body mass index (BMI)], clinical presentation and examination, chest radiography, and details of other relevant investigations, was used to collect information.

All patients underwent additional detailed investigations (CT chest, sputum examination serological test, spirometry etc.) to ascertain the underlying aetiology for SP. Group comparison was done among patients with PSP and SSP. Risk factor analysis was done for variables like age, sex, smoking, BMI, height.

**RESULTS**

In the total of 70 cases of SP studied, 61 (87.14%) of them had underlying lung pathology and diagnosed as SSP while only 9 (12.85%) had no demonstrable lung pathology and diagnosed as PSP. Of the total, the highest number of cases were in the age

group of 40-50 years (40%), followed by the age group of 20-30 years (31.42%).

Males were more commonly affected comprising 57 of the total 70 cases studied (81.42%) while females comprised of the rest 13 cases (18.57%). Male: Female Ratio for SP was 4.3:1, for PSP 8:1 and for SSP 4.08:1.

Patients with PSP were taller with a mean height of 172.22 cm compared to patients with SSP who had a mean height of 163.59 cm with p value < 0.05 p. However weight and B.M.I. were lower in patients with SSP with a mean weight of 54.93 and mean B.M.I. of 20.48 compared to patients with PSP with a mean weight of 61.11 and mean B.M.I. of 20.71.

History of smoking was present in 39 of the 70 cases studied (55.71%). This history was even more significant in the patients affected with PSP as compared as a history of smoking was elicited in 7 of the 9 cases (77.77%) compared 32 of the 61 cases in SSP (52.45%).

**Table 1: Demographic and anthropometric data in patients presenting with spontaneous pneumothorax**

	PSP	SSP	P Value
<b>Number of cases (70)</b>	9 (12.85%)	61 (87.14%)	
<b>Sex Ratio</b>			
Male : Female	8 : 1	4.08 : 1	
<b>Smoking</b>	7 (77.77%)	32 (52.45%)	
<b>Height (cm)</b>			
Range	165-181	152-172	< 0.05
Mean	172.22	163.59	
<b>Weight (kg)</b>			
Range	52-66	40-69	< 0.05
Mean	61.11	54.93	
<b>BMI(kg/m<sup>2</sup>)</b>			
Range	18.92 - 22.95	17.09 - 26.14	> 0.05
Mean	20.71	20.48	

The most common symptomatic presentation was Dyspnoea seen in 66 of the 70 cases (94.28%) followed by Chest pain on the side of pneumothorax in 58 cases (82.85%) followed by Cough in 53 cases (75.75%). Fever was seen in 13 cases (18.57%) while Hemoptysis in only 6 cases (8.57%). Out of 9 cases of PSP 1 patients (11%) had prior history of pneumothorax whereas 9 patients of SSP(14.7%) had prior history of pneumothorax.

T.B. was found to be the leading cause of SSP, responsible for 30 of the 61 cases of SSP (49.18%) out of which 12(40% of total 30) had active lesion and 18 (60% of total 30) had old fibrocavitary and brochiectatic lesion with history of ATT in past, followed by COPD accounting for only 16 cases (26.22%). Pulmonary infections other than T.B. were responsible for 7 cases (11.47%) while HIV associated infections accounted for 4 cases (6.55%).

Table 2: Showing aetiology of SSP

Causes of SSP	Number of cases (Percentage)
Tuberculosis	30(49.18%)
Active TB	12(19.6%)
Old TB	18(29.5%)
COPD	16(26.22%)
Bacterial Pneumonia	7(11.47%)
HIV Associated : Tuberculosis	4(6.55%)
Silicosis	3(4.91%)
Lung Malignancy	1(1.63%)

In the present study majority of the patients were managed with Tube Thoracostomy alone in 82.25% (58 cases) of cases, while injection of a sclerosant through the tube drain to achieve pleurodesis was attempted in 4.28% (3 cases). Open Thoracostomy with resection of the bullae along with mechanical pleural abrasion was done in 2.85% (2 case). The rest were managed by simple aspiration 5.71% (4 cases) and conservatively 4.28% (3 cases). Average duration of hospitalization in PSP was 4(range 2-6days) day whereas 8 days (range 3-16days) in SSP with average duration of ICD was 5 days. 4 patients of SSP(6.5%) required ICU care.

## DISCUSSION

Even though the pneumothorax has been well known entity since 9<sup>th</sup> century, few studies are available, particularly from India. The most commonly referred incidence of SP was conducted in Olmsted County, Minnesota [2]. 141 cases were spontaneous in onset of which 77 were primary and 64 secondary to an underlying lung disease [2]. The reported incidence of PSP have been widely variable in the few studies available from India [3, 4]. In our study, the underlying aetiology could be found in 61 patients (87.14%), leaving only 9 (12.85%) in the PSP group.

The Gupta D *et al* [5] in England found that Pneumothorax showed a biphasic age distribution. The maximum rates for men were in the 20-24 and 80-84 years age groups. Our study also shows a biphasic pattern where 1<sup>st</sup> and 2<sup>nd</sup> peaks occur in the age group of 20-30 years and 40-50 years respectively. Classically, these two age peaks correspond to PSP and SSP correspondingly, where PSP is mainly a disease of younger men. The second peak occurred a little earlier (40-50 years) as a large number of the SSP cases were due to tuberculosis and not COPD, which is the most important causes of SSP in the West and occurs relatively later (60-65 years) [2, 5].

The ratio of male to female incidence was 6.2:1 for PSP and 3.2:1 for SSP in Minnesota [2] study, similarly Gupta D *et al* [5] found that the M: F ratio was 2.7:1 of SP. In our study male: female ratio of 4.3:1, this male preponderance was even more pronounced in PSP. This is likely due to higher

smoking rates in men, body habitus and different mechanical properties of the lungs [6]. Patients with PSP are relatively taller because the gradient in pleural pressure is greater from the lung base to the lung apex, which could lead to the formation of subpleural blebs in taller individuals who are genetically predisposed to bleb formation [8]. However weight and B.M.I. were lower for patients suffering from SSP due to chronic illness.

Smoking is an important risk factor for development of SP, which is more significant in the patients affected with PSP. The pathogenesis of subpleural blebs is probably related to airway inflammation secondary to smoking [9]. When the smoking habits of 505 patients from four separate studies were analysed [10, 11, 15, 16]. 461 of the patients (91%) were smoker.

In the study conducted by Dines DE, Clagett OT *et al* [18] on 57 patients with COPD in Mayo clinic, all complained (100%) of shortness of breath, whereas 42 (74%) had chest pain on the side of the pneumothorax. Dheeraj Gupta *et al* [7] found that dyspnoea was the commonest symptom at presentation in 56 (93%) patients, and was associated with pleuritic chest pain in 50 (83%) patients. In the present study the clinical presentation was largely similar irrespective of the category of SP. Dyspnoea was the most commonest presentation seen in 94.28% of the patients and chest pain in 82.85% of the patients while cough in 75.75% of patients.

Until the description of PSP by Kjaegard [17] more than 70 years ago, tuberculosis was thought to be the leading cause of SP. The scenario has changed over the years, and COPD has now emerged as leading cause of SSP in the literature from the West. In a recent series of 505 patients from Israel with SSP, the aetiologies were as follows: COPD, 348; Tumor, 93; Sarcoidosis, 26; other pulmonary infections, 16; miscellaneous, 13 [12].

Dheeraj Gupta *et al* [7] found T.B. accounting to 20 of 48 cases (42%), while COPD accounted to only 12 cases (25%). AIDS was responsible for 12.5% of cases of SSP.

In this study the commonest aetiology was found to be Pulmonary Tuberculosis (49.18% of the cases) out of which only 12 patient had active tuberculosis which is likely due to effective treatment and surveillance under DOTS, followed by COPD (26.22%). Thus, tuberculosis has remained the dominant cause for SSP in all studies in adults from India [13, 14] but active tuberculosis is declining. HIV associated infection is an emerging cause of SP, which was responsible for 6.55% cases in this study. Much higher figures are reported from the Western countries.

There is evidence of considerable variation in individual management of spontaneous pneumothorax. It should be emphasized that there is a lack of randomized controlled studies comparing the different treatment modalities. In the present study 3 of 70 cases were managed conservatively (4.28%) and manual aspiration done in 5.71% cases. One multicenter, prospective, randomized study compared manual aspiration versus chest tube drainage for the first episode of primary spontaneous pneumothorax and found that manual aspiration patients required less hospitalization [19].

Those cases of PSP with large pneumothorax were managed with Tube Thoracostomy. All cases of SSP presenting to us with 1<sup>st</sup> episode of SP were managed with Tube Thoracostomy. Recurrent cases of SSP were managed with Tube Thoracostomy with instillation of a sclerosing agent 3 cases (4.28%) and 2 cases (2.85%) were managed surgically to create a pleurodesis. Resolution of uncomplicated pneumothorax occurs in average 10 days, PSP has a benign course [20]. In our study PSP patients require less hospitalization as compared to SSP. Recurrence are more common in patients with COPD (with emphysematous changes on chest CT) and smokers [20].

## CONCLUSION

Spontaneous pneumothorax has a biphasic age distribution with the 1<sup>st</sup> peak in the 3<sup>rd</sup> decade of life and the 2<sup>nd</sup> in the 5<sup>th</sup> decade of life corresponding to incidence of PSP and SSP respectively; it is more common in males. The most common symptom is dyspnea followed by chest pain and cough. SSP is more common than PSP. Smoking history and taller height are significant risk factor for the development of PSP. The commonest etiological factor of SSP in our country is still Tuberculosis followed by COPD but SSP due to active tuberculosis has a declining trend. Majority of the cases were managed effectively by Tube Thoracostomy. Recurrence and complication is more common in SSP.

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