

## A PROSPECTIVE STUDY OF SPONTANEOUS PNEUMOTHORAX FROM A TERTIARY CARE CENTER, AHMEDABAD, GUJARAT

Jatin Nagar<sup>1</sup>, Meghna Patel<sup>2</sup>, Kaushal Bhavsar<sup>3</sup>, Kiran Rami<sup>4</sup>

Received : 08/04/2023  
Received in revised form : 24/05/2023  
Accepted : 08/06/2023

**Keywords:**

Pneumothorax, Tuberculosis, COPD, Tube thoracostomy.

Corresponding Author:

**Dr. Jatin G Nagar,**  
Email: jtnagar19@gmail.com

DOI: 10.47009/jamp.2023.5.3.336

Source of Support: Nil,  
Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2023; 5(3); 1673-1676



<sup>1</sup>Senior Resident, Department of Respiratory Medicine, GMERS Medical College and Civil Hospital, Sola, Ahmedabad, Gujarat, India

<sup>2</sup>Associate Professor, Department of Respiratory Medicine, GMERS Medical College and Civil Hospital, Sola, Ahmedabad, Gujarat, India

<sup>3</sup>Assistant Professor, Department of Respiratory Medicine, GMERS Medical College and Civil Hospital, Sola, Ahmedabad, Gujarat, India

<sup>4</sup>Professor and Head, Department of Respiratory Medicine, GMERS Medical College and Civil Hospital, Sola, Ahmedabad, Gujarat, India

### Abstract

**Background:** Spontaneous pneumothorax is one of the causes of visiting emergency department by the patient. It can occur due to underlying lung disease or can occur without underlying specific cause. This study was done for assessment of cases of spontaneous pneumothorax in central Gujarat. **Materials and Methods:** This prospective study was done for 2 years in a tertiary care hospital from July 2019 to June 2021. All patients aged  $\geq 18$  years presented with spontaneous pneumothorax were included in study and patients with age of  $< 18$  years and patients with traumatic pneumothorax were excluded from study. **Result:** Total 60 patients, who fulfilled inclusion criteria, were included in the study. Males were more affected than females, with male-to-female ratio of 4:1. The disease found more common in adults and middle aged patients. Mean age was  $45.3 \pm 16.7$  years. Chest pain was most common presenting symptom (91.7%). Pneumothorax was most commonly present on right side in our study. Secondary spontaneous pneumothorax was most common, in which pulmonary tuberculosis was the commonest cause. Majority patients were treated with tube thoracostomy (63%). Complete re-expansion was seen in 76.7% cases. Subcutaneous emphysema was the common side effect seen in 22.8% cases. **Conclusion:** Secondary spontaneous pneumothorax is more common than primary spontaneous pneumothorax. Pulmonary tuberculosis was the major cause of secondary spontaneous pneumothorax, followed by chronic obstructive pulmonary disease (COPD).

## INTRODUCTION

A pneumothorax can occur spontaneously or as a result of trauma to chest. The abnormal presence of air in the pleural cavity, separating the visceral from the parietal pleura is known as spontaneous pneumothorax (SP).<sup>[1]</sup> Traumatic pneumothorax occurs as a result of penetrating or non-penetrating trauma to chest or lung. Spontaneous pneumothorax is classified as primary or secondary. Primary spontaneous pneumothorax (PSP) develops in individual with clinically normal lungs. It is considered to be due to rupture of subpleural blebs or bullae; commonly present in apices of the lungs. Smoking, tall stature and low body mass index are risk factors for development of PSP.<sup>[2]</sup>

Secondary spontaneous pneumothorax (SSP) occurs as a result of complication of underlying lung disease. Chronic obstructive pulmonary disease

(COPD) is the most common cause of SSP. Pulmonary tuberculosis, interstitial lung diseases (ILDs), asthma, lung malignancy, acute bacterial pneumonia, connective tissue diseases, pulmonary infarction and cystic fibrosis are other causes of SSP.<sup>[3]</sup>

Pneumothorax is an emergency condition. Majority patients present with acute onset of dyspnoea and ipsilateral pleuritic chest pain. Patients may have cough, fever, haemoptysis or orthopnea. Patients may have tachycardia, tachypnoea, hypotension and tracheal deviation. Patients with SSP have more severe clinical presentation compared to patients with PSP.<sup>3,4</sup> Patient with pneumothorax can be managed by observation and oxygen therapy, needle aspiration or by insertion of intercostals drainage tube with or without pleurodesis. In some patients operative measures may require.<sup>[3]</sup>

In current study, we studied 60 patients of spontaneous pneumothorax, who admitted under

department of respiratory medicine of GMERS medical college and civil hospital, Sola, Ahmedabad.

## MATERIALS AND METHODS

### Study Design

The study was approved by the Institutional Ethics Committee (IEC) of GMERS medical college and civil hospital, Sola, Ahmedabad (IEC No.: GMERS/MCS/IEC/81/2019) and performed in accordance with the principles of the Declaration of Helsinki. Written informed consents were obtained from patients. This prospective study was conducted at the Department of Respiratory Medicine, GMERS medical college and civil hospital, Sola, Ahmedabad from July 2019 to June 2021.

### Study Population and Study Variables

This study included patient aged  $\geq 18$  years and more with spontaneous pneumothorax and those who gave informed consent. Patients with age of  $< 18$  years, those with traumatic pneumothorax, and those who refused consent were excluded from this study.

Detailed clinical presentation, demographic history and clinical examination of patients were carried out. Haematological investigations, chest radiograph, sputum microscopy for acid fast bacilli (AFB) were done to determine the aetiology and to estimate extent of pneumothorax. CBNAAT (Cartridge Based Nucleic Acid Amplification Test), Computed tomography (CT) of thorax and thoracic ultrasound were done, if required.

Patient was classified as PSP, if no underlying pulmonary aetiology was found after clinical and radiological and other relevant investigations. Patients with underlying pulmonary aetiology were classified as SSP. Pneumothorax was quantified as small or large according to British Thoracic Society (BTS) guidelines. Treatment plan of patient was decided on the basis of severity of symptoms and extent of pneumothorax. Patients were treated with oxygen therapy under observation alone or tube thoracostomy with or without chemical pleurodesis

according to severity of pneumothorax. Time required for re-expansion of lung was recorded.

### Statistical Analysis

Collected data were entered in to Microsoft excel 2019. Descriptive analysis of collected data in the form of mean, standard deviation and percentage was done. Comparison between patients of PSP and SSP was not possible as three patients were diagnosed as a PSP.

## RESULTS

Total 60 patients were enrolled in the study, who presented with spontaneous pneumothorax. Spontaneous pneumothorax was more common in male (48) compared to female (12) and male-to-female ratio was 4:1.

In present study, 10 (16.7%) cases of spontaneous pneumothorax belonged to age group of 18- 25 years of age group. 18 (30%) patients had age from 26 years to 44 years, 18 (30%) patients belonged to age group of 45 years to 59 years, while 14 (23.3%) patients had age of 60 years or more. Mean age was  $45.3 \pm 16.7$  years. The youngest patient was 18 years of age, while oldest one was 78 years old. [Table 1] Male preponderance was present in both PSP as well as SSP. In patients of spontaneous pneumothorax 55% patients were smoker. Chest pain (91.7%) was the commonest presenting symptom followed by Breathlessness (81.6%) followed by cough (55%). Other presenting symptoms were decreased appetite (25%), fever (15%), weight loss (10%), generalized weakness (6.7%) and haemoptysis (5%). Majority patients had sudden onset of symptoms. Recurrence was seen in 5% of patients.

30 (50%) patients had right sided pneumothorax, 28 (46.7%) patients had left sided pneumothorax, while 2 (3.3%) patients had bilateral pneumothorax. 80% (48) patients had large pneumothorax on presentation and 20% (12) patients had small pneumothorax. PSP was seen in 3 (5%) patients, SSP was seen in (95%) of patients. Three patients had prior history of ipsilateral pneumothorax.

**Table 1: Age and sex distribution (N=60)**

Age group	Male	Female	Total	%
18-25 years	7	3	10	16.7%
26-44 years	14	4	18	30.0%
45- 59 years	14	4	18	30.0%
$\geq 60$ years	13	1	14	23.3%

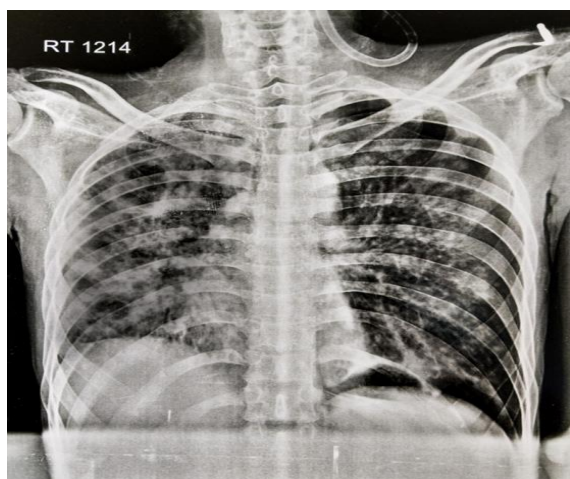
**Table 2: Aetiology in patients of SSP (n=57)**

Aetiology	No. of cases	%
PTB	30	52.6%
Active	25	
Old	5	
COPD	21	36.8%
COVID- 19	4	7.0%
ILD	1	1.8%
Bronchiectasis	1	1.8%

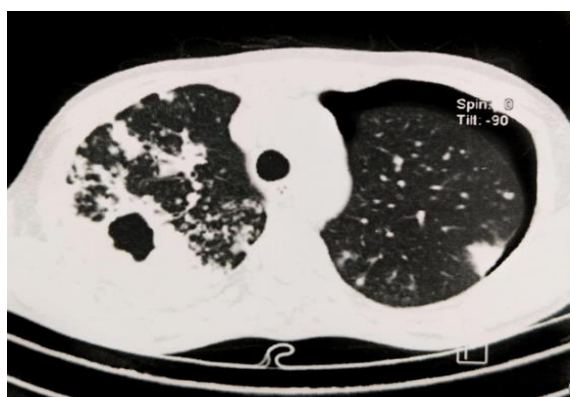
SSP: Secondary Spontaneous Pneumothorax; PTB: Pulmonary Tuberculosis; COPD: Chronic Obstructive Pulmonary Disease; COVID- 19: Corona Virus Disease; ILD: Interstitial Lung Disease.

In SSP group, tuberculosis (active or old) in 30 (52.6%) patients and COPD in 21 (36.8%) were most common aetiologies of SSP. Other causes of SSP were: recovered patients of COVID-19 (4 patients), interstitial lung disease (ILD) and bronchiectasis (1 patient each). [Table 2]

Management of pneumothorax was decided on the basis of severity of symptoms. Out of 60 patients, 5% (3) patients were managed conservatively with oxygen therapy alone. 57 patients (95%) managed with tube thoracostomy with underwater seal and oxygen therapy. Out of 57 patients, 46 (80.7%) patients were managed with tube thoracostomy with underwater seal alone, while chemical pleurodesis was done in 11 (19.3%) patients. All 3 patients of PSP managed with tube thoracostomy with underwater seal. Duration required for re-expansion in patients of PSP was  $10 \pm 5.9$  days, while in patients of SSP the duration was  $20.7 \pm 24.3$  days. Overall treatment success was seen in 76.7% patients. Subcutaneous emphysema was observed in 13 (22.8%) patients.



**Figure 1: Chest radiograph (postero-anterior view) showing multiple cavities in right lung field with consolidation, trachea pushed to right side and pneumothorax on left side with multiple scattered infiltrates.**



**Figure 2: HRCT thorax (axial section) of same patient showing cavity with consolidation in right upper lobe, consolidation in left upper lobe and multiple nodular lesions in both lungs in case of secondary spontaneous pneumothorax due to pulmonary tuberculosis.**

## DISCUSSION

Spontaneous pneumothorax can be primary spontaneous pneumothorax (PSP) or secondary spontaneous pneumothorax (SSP). Patients with SSP require urgent medical intervention as it occurs as a complication in patients with compromised pulmonary reserve.

Epidemiological studies done in United States, France and Japan have shown that PSP is more common entity than SSP; while in studies from United Kingdom and in Israel SSP was more common.<sup>[6-10]</sup> Comparing with Indian studies done in various parts of country; SSP is more common cause of spontaneous pneumothorax than PSP. In our study, SSP was seen in 93.3% of cases, while PSP was seen in 5% of cases. The incidence of PSP varies from 2.3% to 20% in studies done in various parts of India.<sup>[11-15]</sup>

Various studies from India,<sup>[12-14]</sup> as well as in studies from United States and United Kingdom have shown biphasic age distribution of pneumothorax patients,<sup>[6,9]</sup> in our study the peak was seen during adults (26 – 44 years) and middle aged patients (45 – 59 years). The Patients with PSP were younger than patients with SSP in our study. Male preponderance was seen in majority of studies. In our study male-to-female ratio was 4:1. Similar findings were seen in other Indian studies,<sup>[11-13]</sup> as well as in other parts of the world.<sup>[6-10]</sup> Higher incidence of pneumothorax in male found to be due to factors such as more prevalence of smoking among male,<sup>[16]</sup> difference in anthropometric characteristics,<sup>[17]</sup> and in mechanical properties of lung.<sup>[18]</sup>

Chest pain and breathlessness were the most common presenting symptoms in our study. Chest pain was seen in 92% followed by breathlessness in 82%. Other presenting symptoms were cough (55%), fever (15%) and haemoptysis (5%). Breathlessness and chest pain were commonest presenting symptoms in other studies as well.<sup>[11-15]</sup> Only right sided pneumothorax was seen in 50% of our cases and bilateral pneumothorax was seen in 3.3% patients. Similar findings were also seen in studies of Gayatri Devi et al and Gupta et al.<sup>[11,12]</sup>

In patients of SSP, pulmonary tuberculosis was the most common aetiology for spontaneous pneumothorax followed by COPD in our study. Similar findings were shown in studies from Visakhapatnam,<sup>[11]</sup> Chandigarh,<sup>[12]</sup> and Miraj,<sup>[15]</sup> while in the study done in Eastern part of India,<sup>[13]</sup> and in Sub-Himalayan region,<sup>[14]</sup> COPD was the most common cause of SSP. In other parts of world, COPD is found as the most common cause of SSP.<sup>[6-10]</sup>

In present study, 57 patients managed with tube thoracostomy with underwater seal, from which 11 patients required chemical pleurodesis. Three patients were managed by observation with oxygen support. In our study, a high rate of tube

thoracostomy with underwater seal was seen in patients of SSP. Complete re-expansion of lung was seen in 76.7% of cases. In other studies re-expansion of lung varies from 71% to 91.67%.<sup>[12,13,15]</sup> In patients with PSP treatment success was 100%. Treatment success was seen in 90% cases of COPD patients while; in patients of pulmonary tuberculosis success rate was 58.3%.

## CONCLUSION

Secondary spontaneous pneumothorax is more common compared to primary spontaneous pneumothorax. It is more common in male compared to female. Pulmonary tuberculosis and chronic obstructive pulmonary disease (COPD) remain the common aetiologies for secondary spontaneous pneumothorax. Tube thoracostomy remains main stay of treatment with better success rate and has good clinical outcome.

## REFERENCES

1. Costumbrado J, Ghassemzadeh S. Spontaneous Pneumothorax. [Updated 2022 Jul 25]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK459302/>
2. Hallifax R. Aetiology of Primary Spontaneous Pneumothorax. *Journal of Clinical Medicine*. 2022; 11(3):490. <https://doi.org/10.3390/jcm11030490>
3. Light RW. Pneumothorax. In: *Pleural diseases*. 6th ed. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2019. p. 363–495.
4. Noppen M. Spontaneous pneumothorax: epidemiology, pathophysiology and cause. *Eur Respir Rev*. 2010;19(117):217-219. doi:10.1183/09059180.00005310
5. MacDuff A, Arnold A, Harvey J; BTS Pleural Disease Guideline Group. Management of spontaneous pneumothorax: British Thoracic Society Pleural Disease Guideline 2010. *Thorax*. 2010;65 Suppl2:ii18-ii31. doi:10.1136/thx.2010.136986
6. Melton LJ, Hepper NG, Offord KP. Incidence of spontaneous pneumothorax in Olmsted County, Minnesota: 1950 to 1974. *Am Rev Respir Dis*. 1979 Dec;120(6):1379-82. doi:10.1164/arrd.1979.120.6.1379
7. Bobbio A, Dechartres A, Bouam S, et al. Epidemiology of spontaneous pneumothorax: gender-related differences. *Thorax*. 2015;70:653-658. doi:10.1136/thoraxjnl-2014-206577
8. Onuki T, Ueda S, Yamaoka M, et al. Primary and Secondary Spontaneous Pneumothorax: Prevalence, Clinical Features, and In-Hospital Mortality. *Can Respir J*. 2017;2017:1-8. doi:10.1155/2017/6014967
9. Hallifax RJ, Goldacre R, Landray MJ, Rahman NM, Goldacre MJ. Trends in the Incidence and Recurrence of Inpatient-Treated Spontaneous Pneumothorax, 1968-2016. *JAMA*. 2018;320(14):1471-1480. doi:10.1001/jama.2018.14299
10. Weissberg D, Refaely Y. Pneumothorax: experience with 1,199 patients. *Chest*. 2000;117(5):1279-1285. doi:10.1378/chest.117.5.1279
11. Gayatri Devi, Y., Usharani, N., Premkumar, A., Sambasivarao, G., Kumari, V. S., Joshua, S. (2015). Clinical Profile of Spontaneous Pneumothorax in Adults: A Retrospective Study. *The Indian journal of chest diseases & allied sciences*, 57(4):219–223. doi:10.5005/ijcdas-57-4-219
12. Gupta D, Mishra S, Faruqi S, Aggarwal AN. Aetiology and clinical profile of spontaneous pneumothorax in adults. *The Indian Journal of Chest Diseases & Allied Sciences*. 2006 Oct-Dec;48(4):261-264.
13. Dhua A, Chaudhuri AD, Kundu S, Tapadar SR, Bhuniya S, Ghosh B, et al. Assessment of spontaneous pneumothorax in adults in a tertiary care hospital. *Lung India* 2015;32:132-6. doi:10.4103/0970-2113.152622
14. Sharma A, Sharma A, Jaret P, Sarkar M, Sharma S. Clinical and aetiological spectrum of spontaneous pneumothorax in adults in Sub-Himalayan: a prospective study at tertiary care institute. *Int J Sci Rep* 2018;4(2):22-5 <http://dx.doi.org/10.18203/issn.2454-2156.IntJSciRep20180393>
15. Patil SV, Bhagwat RV, Mohite RV, Barphe SS. Clinical profile and treatment outcome of patients with spontaneous pneumothorax. *Int J Res Med Sci* 2017;5:944-8. <https://dx.doi.org/10.18203/2320-6012.ijrms20170641>
16. Shaikh, R., Janssen, F. & Vogt, T. The progression of the tobacco epidemic in India on the national and regional level, 1998-2016. *BMC Public Health* 22, 317 (2022). doi:10.1186/s12889-021-12261-y
17. Nakamura H, Konishiike J, Sugamura A, Takeno Y. Epidemiology of spontaneous pneumothorax in women. *Chest*. 1986;89(3):378-382. doi:10.1378/chest.89.3.378
18. Taussig LM, Cota K, Kaltenborn W. Different mechanical properties of the lung in boys and girls. *Am Rev Respir Dis*. 1981;123(6):640-643. doi:10.1164/arrd.1981.123.6.640