

The Clinical Profile and Outcome of Treatment of Spontaneous Pneumothorax in Adults

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Abstract

Introduction: Spontaneous pneumothorax (SP) is characterized by the presence of air in the pleural space without trauma, leading to varied clinical manifestations and requiring timely intervention. It is classified into primary and secondary types, with the latter associated with underlying pulmonary diseases such as tuberculosis (TB) and chronic obstructive pulmonary disease (COPD). This study aimed to assess the clinical profile and treatment outcomes of SP in adults at a tertiary care hospital in Gauhati.

Methods: A cross-sectional study was conducted from October 2023 to October 2024 at Gauhati Medical College Hospital. Sixty adult patients (>14 years) diagnosed with spontaneous pneumothorax were included using a convenience sampling method. Data were collected through a pretested semi-structured proforma and included clinical presentation, radiographic findings, bronchoscopy and sputum studies, and outcomes. Statistical analysis was performed using SPSS version 25. Chi-square and ANOVA tests were applied to assess associations.

Results: Among the 60 participants, the mean age was 48.80 ± 13.84 years, and 90% were male. Smoking (71.7%), TB (35.0%), and COPD (20.0%) were major risk factors. The most frequent presenting symptoms were chest discomfort and dyspnoea. Imaging revealed varied pneumothorax sizes and underlying lung pathology. Treatment outcomes included partial reexpansion (43.3%), complete reexpansion (28.3%), and recurrent pneumothorax (23.3%). Significant associations were observed between symptom onset, comorbidities, smoking status, and outcomes.

Conclusion: Spontaneous pneumothorax primarily affects middle-aged male smokers with underlying pulmonary diseases. Early recognition, radiologic evaluation, and risk-based interventions, including pleurodesis, are critical to improving patient outcomes and reducing recurrence.

Keywords: Chronic obstructive pulmonary disease (COPD), Tuberculosis, Bronchiectasis, Secondary Spontaneous Pneumothorax (SSP).

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Introduction

Spontaneous pneumothorax (SP) is a prevalent but potentially fatal lung disease marked by the accumulation of air in the pleural cavity without an identifiable external source. [1] It is categorised into two principal types: primary spontaneous pneumothorax (PSP), occurring in individuals devoid of underlying lung pathology, and secondary spontaneous pneumothorax (SSP), emerging in patients with pre-existing pulmonary disorders such as chronic obstructive pulmonary disease (COPD), tuberculosis, bronchiectasis, and

interstitial lung diseases. The distinction between PSP and SSP is essential as it affects clinical presentation, therapy, and prognosis. PSP is frequently seen in young, tall, slender male smokers, but SSP is more common in elderly adults with chronic pulmonary conditions. [2-4] The incidence and frequency of spontaneous pneumothorax varied among various demographics and geographic areas. Research indicates that the illness primarily impacts males, with a male-to-female ratio between 4:1 and 9:1. [5] The clinical

manifestation of spontaneous pneumothorax (SP) often features abrupt unilateral pleuritic chest pain and dyspnoea; however, symptom intensity may fluctuate based on the degree of lung collapse and the existence of concomitant conditions. Some occurrences resolve spontaneously, while others need medical intervention, which may include simple monitoring, tube thoracostomy, or surgical care in repeated or serious instances. [6-8]

Secondary spontaneous pneumothorax is more prevalent than initial spontaneous pneumothorax, especially in areas with a significant incidence of TB and smoking-related pulmonary conditions. Research indicates that TB and COPD are primary contributors to SSP, significantly affecting illness progression and treatment approaches. Underlying pulmonary illness elevates the likelihood of recurrence and complicates care, necessitating tailored therapeutic strategies to enhance patient outcomes. [9-10]

The prognosis of spontaneous pneumothorax is contingent upon several variables, including comorbidities, treatment response, and recurrence rates.

PSP has a more favourable prognosis with decreased recurrence rates in contrast to SSP, which correlates with heightened morbidity attributable to underlying pulmonary conditions. Recurrence is a notable issue, with research demonstrating recurrence rates between 2% to 50%, contingent upon the treatment method and patient attributes. Lifestyle adjustments, particularly smoking cessation, are emphasised as a crucial preventative measure for diminishing the risk of recurrence. [13-15]

This study aims to analyze the clinical profile and treatment outcomes of spontaneous pneumothorax in adults admitted to a tertiary care hospital in Gauhati. By evaluating the demographic

distribution, clinical presentation, risk factors, and therapeutic interventions, this research seeks to provide insights into the disease burden and effectiveness of various management strategies. Identifying key factors influencing prognosis and recurrence can help in formulating targeted approaches to improve patient outcomes.

Aim: The aim is to study the clinical profile & outcome of spontaneous pneumothorax in adults in a tertiary care hospital in Gauhati.

Objectives:

- To study the clinical profile of spontaneous pneumothorax in adults in a tertiary care hospital in Gauhati.
- To study the outcome of treatment of spontaneous pneumothorax in adults in a tertiary care hospital in Gauhati.

Materials and Methods

This was a cross-sectional study conducted in Gauhati Medical College & Hospital from October 2023 to October 2024. All patients 14 years and above with clinical and radiological features suggestive of Pneumothorax was included.

Results

Age: The mean age of the participants was 48.80 ± 13.84 years. Eight participants (13.3%) were from the 21 to 30 years age group, and a similar proportion (13.3%, $n = 8$) belonged to the 31 to 40 years group. Fourteen participants (23.3%) were aged between 41 and 50 years, while the highest proportion was seen in the 51 to 60 years group with 18 participants (30.0%). Twelve participants (20.0%) were in the 61 to 70 years age group.

Gender of the participants: Among the 60 participants, fifty-four participants (90.0%) were male, and six participants (10.0%) were female. The male: female ratio was 9:1.

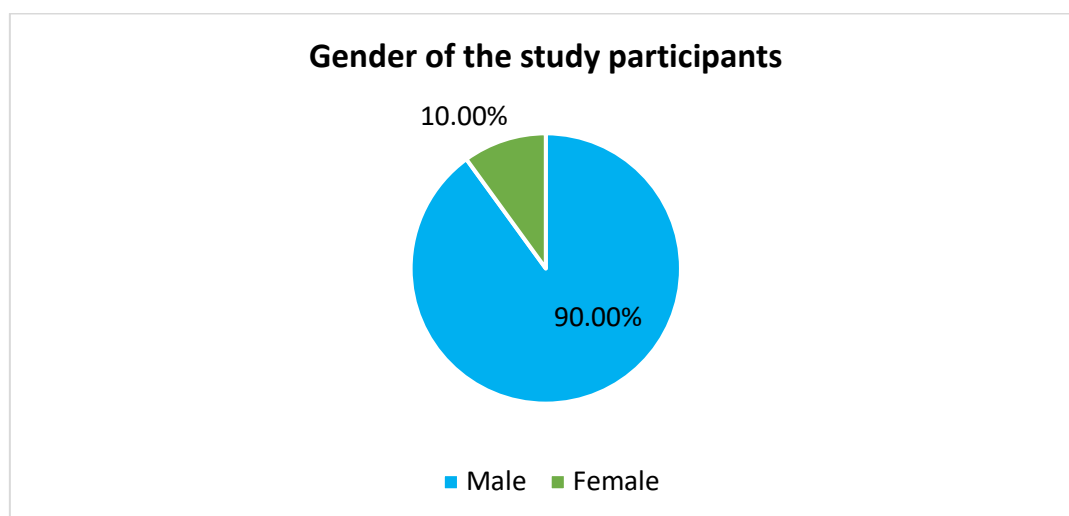


Figure 1:

Complaints among the participants: Among the participants, 14 (23.3%) presented with chest discomfort, 11 (18.3%) with cough, and 12 (20.0%) with dyspnoea. Thirteen participants (21.7%) reported both chest discomfort and dyspnoea, while six (10.0%) had both chest discomfort and cough. A smaller proportion of participants, four (6.7%), reported all three symptoms.

Clinical History of the Patients: In terms of clinical history, 14 participants (23.3%) had an abrupt onset of symptoms, while 8 participants (13.3%) had a gradual onset. A history of chronic obstructive pulmonary disease (COPD) was noted in 12 participants (20.0%), and 21 participants (35.0%) had a history of tuberculosis. Five participants (8.3%) reported no significant medical history.

Smoking among the participants: Regarding smoking history, among the 60 participants, 43 participants (71.7%) were smokers, while 17 participants (28.3%) were non-smokers. The smoker: non-smoker ratio was 2.5:1.

Examination findings among the participants: On clinical examination, 17 participants (28.3%) presented with tachypnoea, and 15 participants (25.0%) had decreased breath sounds. A

hyperresonant note was observed in 11 participants (18.3%), and decreased chest expansion was noted in 6 participants (10.0%). Additionally, all examination findings were present in 11 participants (18.3%).

Chest X ray among the participants: Chest X-ray findings revealed that 18 participants (30.0%) had a large pneumothorax, while 15 participants (25.0%) showed a small pneumothorax. A collapsed lung was noted in 10 participants (16.7%). Right-sided pneumothorax was seen in 9 participants (15.0%), and left-sided pneumothorax was observed in 8 participants (13.3%).

CT chest among the participants: CT chest findings showed that 14 participants (23.3%) had bullous disease, while 12 participants (20.0%) had emphysematous changes. Fibrotic changes and TB lesions were each observed in 11 participants (18.3%). Additionally, 12 participants (20.0%) had normal CT chest findings

Sputum investigations among the participants: Sputum investigation results revealed that 28 participants (46.7%) had gram-positive cocci, while 11 participants (18.3%) were AFB positive. Ten participants (16.7%) had negative results, and in 11 participants (18.3%), it was not performed.

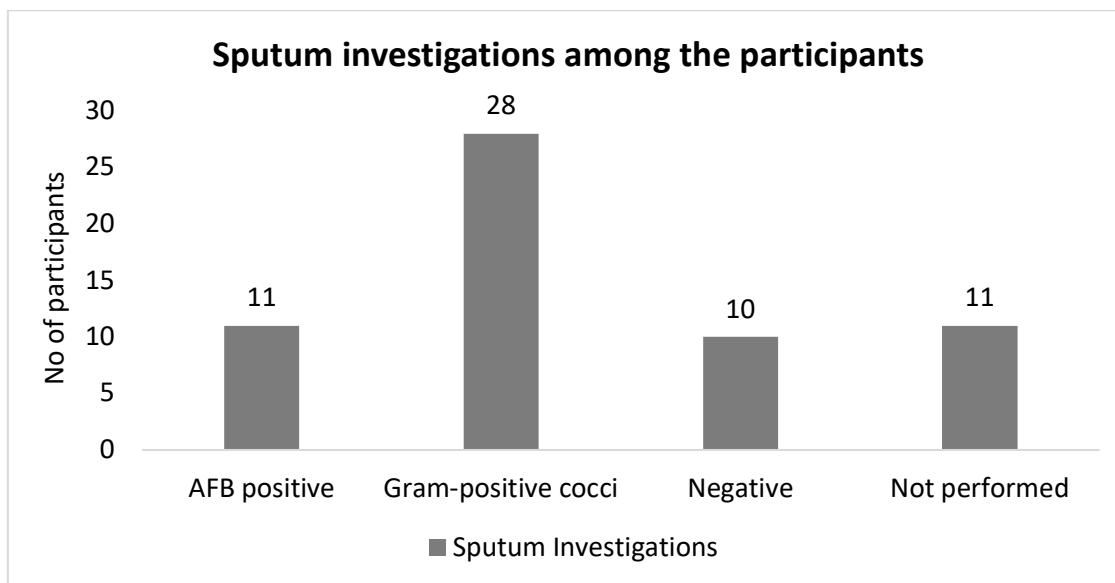


Figure 2:

Sputum CBNAAT among the participants: Cbnaat came positive in 40.80% of patients.

Bronchoscopy findings: Bronchoscopy findings showed that 18 participants (30.0%) had inflammatory changes and 12 participants (20.0%) had endobronchial lesions. Normal bronchoscopy findings were observed in 12 participants (20.0%). The procedure was not performed in 9 participants

(15.0%), and purulent secretions were noted in another 9 participants (15.0%).

Bal Afb and CBNAAT: Bal afb was positive in 27.40 % patienys, CBNAAT was positive in 41.1% patients

Outcome among the participants: In terms of clinical outcomes, 26 participants (43.3%) experienced partial reexpansion, while 17 participants (28.3%) had complete reexpansion.

Recurrent pneumothorax was observed in 14 participants (23.3%), and 3 participants (5.0%) developed subcutaneous emphysema.

Association between age and outcome: In the 21 to 30 years age group, 3 participants (37.5%) had complete reexpansion, 3 (37.5%) had partial reexpansion, 1 (12.5%) had recurrent pneumothorax, and 1 (12.5%) developed subcutaneous emphysema. In the 31 to 40 years group, the majority had partial reexpansion (75.0%, $n = 6$), while one participant each (12.5%) had complete reexpansion and recurrent pneumothorax. Among those aged 41 to 50 years, outcomes were distributed more evenly, with 4 (28.6%) showing complete reexpansion, and 5 each (35.7%) experiencing partial reexpansion and recurrent pneumothorax. In the 51 to 60 years group, 6 participants (33.3%) had complete reexpansion, 8 (44.4%) had partial reexpansion, and 2 participants each (11.1%) experienced recurrent pneumothorax and subcutaneous emphysema. Among those aged 61 to 70 years, partial reexpansion was observed in 4 participants (33.3%), complete reexpansion in 3 (25.0%), and recurrent pneumothorax in 5 (41.7%). The association between age and outcome was not statistically significant.

Association between gender and outcome: Among female participants ($n = 6$), 2 (33.3%) had complete reexpansion, 3 (50.0%) had partial reexpansion, and 1 (16.7%) developed subcutaneous emphysema, with no cases of recurrent pneumothorax reported.

Among male participants ($n = 54$), 15 (27.8%) had complete reexpansion, 23 (42.6%) had partial reexpansion, 14 (25.9%) experienced recurrent pneumothorax, and 2 (3.7%) had subcutaneous emphysema. The association between gender and outcome was not statistically significant.

Association between smoking and outcome: Among the 43 participants who were smokers, 12 (27.9%) experienced complete reexpansion, 18 (41.9%) had partial reexpansion, 12 (27.9%) developed recurrent pneumothorax, and 1 (2.3%) had subcutaneous emphysema. In comparison, among the 17 non-smokers, 5 (29.4%) had complete reexpansion, 8 (47.1%) had partial reexpansion, 2 (11.8%) had recurrent pneumothorax, and 2 (11.8%) developed subcutaneous emphysema. These findings indicate a significant association between smoking status and clinical outcome.

Association between chest x ray and outcome: Among participants with a collapsed lung ($n = 10$), outcomes were distributed as follows: 3 (30.0%) had complete reexpansion, 4 (40.0%) had partial reexpansion, and 3 (30.0%) experienced recurrent pneumothorax. In those with a large pneumothorax

($n = 18$), 2 (11.1%) had complete reexpansion, 11 (61.1%) partial reexpansion, 4 (22.2%) recurrent pneumothorax, and 1 (5.6%) subcutaneous emphysema. For participants with left-sided pneumothorax ($n = 8$), 3 (37.5%) had complete reexpansion, 4 (50.0%) partial reexpansion, and 1 (12.5%) developed subcutaneous emphysema. Among those with right-sided pneumothorax ($n = 9$), 1 (11.1%) had complete reexpansion, 6 (66.7%) partial reexpansion, and 2 (22.2%) recurrent pneumothorax. In participants with a small pneumothorax ($n = 15$), the majority (53.3%, $n = 8$) experienced complete reexpansion, while 5 (33.3%) had recurrent pneumothorax, and 1 each (6.7%) had partial reexpansion and subcutaneous emphysema. These results indicate a significant association between chest X-ray findings and clinical outcomes.

Association between CT chest and outcome

Among participants with bullous disease ($n = 14$), 7 (50.0%) experienced complete reexpansion, 3 (21.4%) had partial reexpansion, 3 (21.4%) had recurrent pneumothorax, and 1 (7.1%) developed subcutaneous emphysema. In those with emphysematous changes ($n = 12$), 3 (25.0%) had complete reexpansion, 6 (50.0%) had partial reexpansion, 2 (16.7%) had recurrent pneumothorax, and 1 (8.3%) developed subcutaneous emphysema. Participants with fibrotic changes ($n = 11$) showed predominantly partial reexpansion (63.6%, $n = 7$), with one participant (9.1%) each having complete reexpansion and subcutaneous emphysema, and two (18.2%) having recurrent pneumothorax. Among those with TB lesions ($n = 11$), 4 (36.4%) had complete reexpansion, 5 (45.5%) had partial reexpansion, and 2 (18.2%) had recurrent pneumothorax. In participants with normal CT findings ($n = 12$), 2 (16.7%) had complete reexpansion, 5 (41.7%) had partial reexpansion, and 5 (41.7%) had recurrent pneumothorax. Overall, no significant association was found between CT chest findings and clinical outcomes.

Discussion

The findings of the study were compared with relevant studies and findings were well correlated with other studies.

Limitations: This study is limited by its single-center design, which may restrict the generalizability of the findings to broader populations. Additionally, long-term follow-up data on recurrence and complications could not be done.

Conclusion

This study provides a comprehensive overview of the clinical profile and treatment outcomes of

spontaneous pneumothorax in adults managed at a tertiary care hospital in Gauhati.

The condition was found to predominantly affect middle-aged males, with smoking, tuberculosis, and chronic obstructive pulmonary disease (COPD) emerging as common associated factors. Most patients presented with chest discomfort, dyspnoea, and cough, and the majority were managed with tube thoracostomy. While partial lung reexpansion was the most common treatment outcome, a notable proportion experienced recurrent pneumothorax, underlining the need for vigilant follow-up and risk stratification.

The study revealed several statistically significant associations. Patients with abrupt symptom onset were more likely to experience complete lung reexpansion, while those with gradual onset had a higher risk of recurrence. A history of tuberculosis or COPD was linked with partial reexpansion and increased complications, whereas patients without comorbidities demonstrated better recovery. Smoking status also significantly impacted outcomes, with smokers having higher rates of recurrence.

Additionally, radiographic findings, particularly the size and laterality of the pneumothorax, were associated with different recovery patterns, suggesting their utility in prognostication. Based on these findings, it is recommended that clinicians adopt a risk-based approach to managing spontaneous pneumothorax.

Patients with known pulmonary comorbidities or smoking history should be monitored more closely and considered for early surgical intervention or pleurodesis where appropriate.

Emphasis should also be placed on early detection, smoking cessation, and routine imaging to guide management decisions. Further multicenter studies with larger populations and long-term follow-up are needed to refine clinical guidelines and optimize patient outcomes.

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