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# Retrospective investigation of Spontaneous Pneumothorax in adult patients: An analysis of clinical Characteristics

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## A B S T R A C T

**Background:** Spontaneous pneumothorax (SP) typically manifests as persistent, intense, one-sided chest pain that worsens with deep breaths and adjustments in body position**.** It can manifest with breathlessness, or a combination of breathlessness and chest pain.

**Objective:** The objective of this study was to investigate the spontaneous pneumothorax in adult's patients.

**Methodology:** This retrospective study was conducted on 104 spontaneous pneumothorax adults' patients in the Department of Medicine, Shalamar Hospital, Lahore from January 2022 to September 2022. All individuals aged ≥18 years presented with spontaneous pneumothorax were included. Data regarding demographic characteristics, clinical details, radiological findings, and treatment approaches was collected from medical record.

**Results:** The overall mean age was 44.6±8.2 years. Patients were distributed based on age group as follows: 42 (40.4%) in 18-35 years, 52 (50%) in 36-50 years, and 10 (9.6%) in 51-65 years. Spontaneous pneumothorax (SP) was more prevalent among males. Smoking emerged as a significant risk factor, with 48.1% of all cases having a history of smoking. The most frequent symptom associated with SP was dyspnea, often accompanied by unilateral chest pain. Tuberculosis was identified as the leading cause of SP. Moreover, tube thoracostomy successfully managed 85% of the cases.

**Conclusion:** Spontaneous pneumothorax (SP) exhibited a higher prevalence among males and tended to occur more frequently during the third and fifth decades of life. Assessing the clinical profile of patients with SP was valuable in determining its underlying causes. Early screening for risk factors and identifying comorbidities played a crucial role in SP prevention.

**Keywords:** Spontaneous Pneumothorax; Adults patients; Risk Factors; Clinical Characteristics

## Introduction

Pneumothorax can arise either spontaneously or as a consequence of chest trauma.[1] The presence of abnormal air in the pleural cavity, creating a separation between the visceral and parietal pleura, is termed spontaneous pneumothorax (SP).[2] Traumatic pneumothorax, on the other hand, occurs as a result of either penetrating or non-penetrating injuries to the chest or lungs.[3] Spontaneous pneumothorax can be further categorized into primary and secondary forms. Primary spontaneous pneumothorax (PSP) develops in individuals with lungs that are clinically normal.[4] It is believed to occur due to the rupture of sub-pleural blebs or bullae, which are often found in the upper regions of the lungs. Risk factors for the development of PSP include smoking, tall stature, and a low body mass index (BMI).[5]

Pneumothorax is considered a medical emergency. The majority of patients typically present with a sudden onset of symptoms, including difficulty breathing (dyspnea) and sharp chest pain on the same side (ipsilateral pleuritic chest pain). Some patients may also experience a cough, fever, coughing up blood (haemoptysis), or difficulty breathing when lying down (orthopnea).[6] Physical examination often reveals signs such as rapid heart rate (tachycardia), rapid breathing (tachypnea), low blood pressure (hypotension), and a shift in the trachea's position. Patients with secondary spontaneous pneumothorax (SSP) tend to have a more severe clinical presentation compared to those with primary spontaneous pneumothorax (PSP).[7] Management of pneumothorax can involve various approaches, including observation and oxygen therapy, needle aspiration, or the placement of an intercostal drainage tube, with or without pleurodesis. In some cases, surgical intervention may be necessary. Spontaneous pneumothorax (SP) typically manifests as persistent, sharp, one-sided chest pain that worsens with deep breaths and changes in posture. It can also present with breathlessness (dyspnea) or a combination of dyspnea and chest pain.[8] The primary goal of this study was to provide an in-depth analysis of the demographic features, underlying causes, clinical presentation, treatment approaches, and outcomes of patients who were hospitalized with spontaneous pneumothorax.

## Objective

The present study was conducted with the aims to investigate the spontaneous pneumothorax in adult's patients.

## Methodology

This retrospective study was conducted on 104 spontaneous pneumothorax adults' patients in the Department of Medicine, Shalamar Hospital, Lahore from January 2022 to September 2022. All individuals aged ≥18 years presented with spontaneous pneumothorax were included. Data regarding demographic characteristics, clinical details, radiological findings, and treatment approaches was collected from medical record. The recorded data encompassed a wide range of information, including: Demographic details: This included age, gender, and smoking status, Co-morbidities: Any existing medical conditions or illnesses in the patients. Clinical presentation: Details about how the patients presented with their symptoms and complaints. Physical examination findings: Information collected during the physical examination of the patients. Treatment details: Information about the treatment approaches used for the patients. Outcome details: Information regarding the patients' responses to treatment and their overall outcomes. This comprehensive dataset was collected to provide a thorough understanding of the demographic, clinical, and diagnostic aspects of patients with spontaneous pneumothorax.

Patients were categorized into two primary groups based on their underlying pulmonary conditions. 1. Primary Spontaneous Pneumothorax (PSP): This classification was assigned to patients when no underlying pulmonary cause or etiology was identified after a comprehensive evaluation, including clinical, radiological, and other relevant investigations. 2. Secondary Spontaneous Pneumothorax (SSP): Patients who were found to have an underlying pulmonary cause or etiology for their pneumothorax were classified under this category. This classification allowed for a clear distinction between patients with spontaneous pneumothorax who had no apparent pulmonary cause (PSP) and those whose pneumothorax was associated with an underlying pulmonary condition (SSP).

A descriptive analysis of the collected data was conducted, which included calculating measures such as the mean, standard deviation, and percentages to provide a summary of the data. However, due to the small number of patients diagnosed with Primary Spontaneous Pneumothorax (PSP), it was not possible to perform a meaningful comparison between patients with PSP and those with Secondary Spontaneous Pneumothorax (SSP).

## Results

The overall mean age was 44.6±8.2 years. Patients were distributed based on age group as follows: 42 (40.4%) in 18-35 years, 52 (50%) in 36-50 years, and 10 (9.6%) in 51-65 years. Spontaneous pneumothorax (SP) was more prevalent among males. Smoking emerged as a significant risk factor, with 48.1% of all cases having a history of smoking. The most frequent symptom associated with SP was dyspnea, often accompanied by unilateral chest pain. Tuberculosis was identified as the

Table 1. Demographic and baseline characteristics (N=104)

| Parameters | N (%) |
|---|---|
| Age (years) | 44.6±8.2 |
| Gender<br>Male<br>Female | <br>81 (77.9)<br>23 (22.1) |
| Smoking Status<br>Smokers<br>Non-smokers | <br>50 (48.1)<br>54 (51.9) |
| Comorbidities<br>Diabetes<br>Hypertension<br>Coronary artery disease<br>No comorbidities | <br>18 (17.3)<br>12 (11.5)<br>6 (5.8)<br>68 (65.4) |

leading cause of SP. Moreover, tube thoracostomy successfully managed 85% of the cases. Among the comorbidities observed in the study, Diabetes Mellitus (DM) was the most prevalent, affecting 17.3% of the cases. Following DM, Hypertension (HTN) was the second most common comorbidity, present in 11.5% of cases, while Coronary Artery Disease (CAD) was observed in 5.8% of the cases. Dyspnea emerged as the predominant symptomatic presentation, affecting over 90.4% of cases. Additionally, chest pain was a common accompanying symptom, reported in 85.6% of cases, while cough was noted in 72.1% of cases. On the other hand, fever and hemoptysis were less frequent and sporadic in their occurrence among the patients studied. These findings underscore the importance of recognizing dyspnea as the primary symptom associated with pneumothorax, often accompanied by chest pain and cough, while fever and hemoptysis were less commonly observed. The demographic details and baseline characteristics are shown in Table 1. Age-groups are illustrated in Figure 1. Table 2 represents the various symptoms of spontaneous pneumothorax. Etiologies of spontaneous pneumothorax are shown in Table 3. Vital analysis and mode of management of spontaneous pneumothorax are shown in Table 4.

## Discussion

This hospital-based prospective study focused on investigating the causes, clinical profile, and management of pneumothorax, with a particular emphasis on comparing your findings with similar studies conducted worldwide. Spontaneous pneumothorax into two main types: primary spontaneous pneumothorax (PSP) and secondary spontaneous pneumothorax (SSP). SSP typically requires immediate medical intervention as it arises as a complication in patients with compromised pulmonary function. Epidemiological studies have

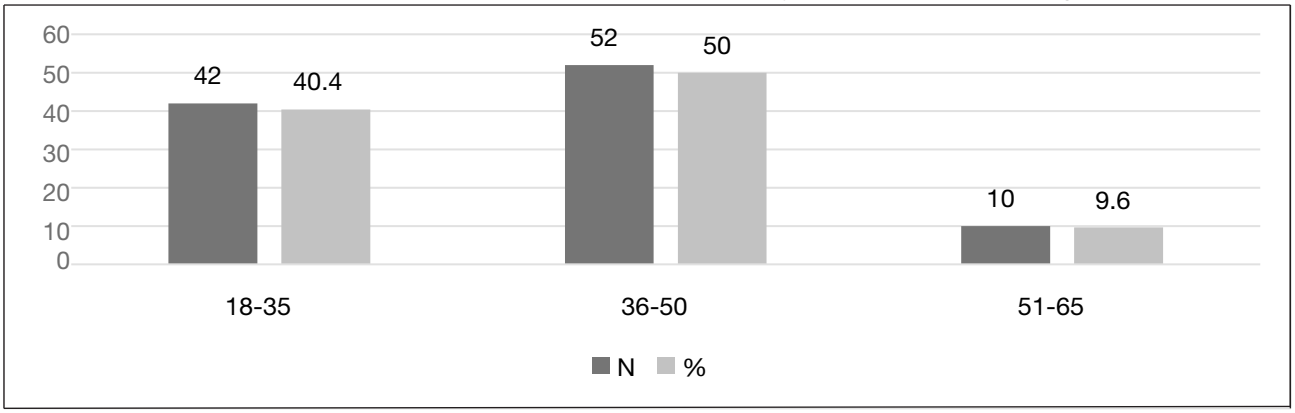


Figure 1. Age groups (n=104)

Table 2. Symptoms of Spontaneous pneumothorax

| Symptoms of SP | N (%) |
|---|---|
| Dyspnea | 94 (90.4) |
| Chest Pain | 89 (85.6) |
| Cough | 75 (72.1) |
| Fever | 13 (12.5) |
| Hemoptysis | 8 (7.7) |

reported varying prevalence rates of PSP and SSP in different regions. Previous studies reported that SSP was more common accounted for 92% of cases, whereas PSP was less common, seen in only 5% of cases.[9,10] This distribution contrasts with some other studies conducted in various parts worldwide, where PSP was found to be more prevalent, with an incidence ranging from 2.3% to 20%. This suggests regional variations in the occurrence of different types of spontaneous pneumothorax and highlights the importance of studying these variations to better understand the condition and tailor treatment strategies accordingly.[11-13]

Nagar et al.'s study conducted in England, which demonstrated a biphasic distribution of spontaneous pneumothorax (SP), found similar patterns in our study.[14] In both studies, there were distinct peaks in the age distribution, notably between 18–30 years and 40–50 years of age. These peaks in our study supported the observation that Primary Spontaneous Pneumothorax (PSP) tends to affect younger men.[15] However, there was a difference in the timing of the second peak in your analysis compared to other Western studies. This discrepancy can be attributed to the fact that a significant portion of Secondary Spontaneous Pneumothorax (SSP) cases were associated with tuberculosis rather than Chronic Obstructive Pulmonary Disease (COPD), which is a more common cause of SSP in Western populations and tends to occur later in life. These variations underscore the influence of regional factors and underlying conditions on the age distribution and etiology of spontaneous pneumothorax.[6-18]

In this study, dyspnea emerged as the most prevalent presenting symptoms of pneumothorax. Dyspnea pain was observed in a significant majority of cases, accounting for 90.4%, while chest pain was a close second, reported in 85.6% of cases. Other presenting symptoms included cough (72.1%), fever (12.5%), and hemoptysis (7.7%). It's worth noting that your findings align with those of other studies, which have also identified breathlessness and chest pain as the most common presenting symptoms of pneumothorax.[19]

Takahashi et al. conducted a meta-analysis of three randomized controlled trials, comparing the effectiveness of manual aspiration and drainage of chest tubes. Their analysis concluded that simple aspiration is beneficial in the initial treatment of Primary Spontaneous Pneumothorax (PSP), primarily because it leads to shorter hospitalization periods.[20]

In another study conducted by Yi E et al., involving 81 patients, it was observed that after several days of chest tube drainage, only a small percentage, specifically three patients (4%), experienced chronic air leaks. This finding suggests that the majority of patients responded well to chest tube drainage and did not develop prolonged air leaks, which is a positive outcome in the management of pneumothorax.[21]

The higher incidence of Secondary Spontaneous Pneumothorax (SSP) in the present study might be

Table 3. Etiologies of Spontaneous Pneumothorax (N=104)

| Etiology | N (%) |
|---|---|
| Tuberculosis | 56 (53.8) |
| Chronic Obstructive Pulmonary Disease | 39 (37.5) |
| Pneumonia | 8 (7.7) |
| Mass | 4 (3.8) |

Table 4. Vital analysis and mode of management of SP (N=104)

| Vital Signs | N (%) |
|---|---|
| **Blood Pressure** | |
| Normal<br>Hypo<br>Hyper | 60 (57.7)<br>39 (37.5)<br>5 (4.8) |
| **Pulse rate** | |
| Normal<br>Tachycardia | 41 (39.4)<br>63 (60.6) |
| **Respiratory Rate** | |
| Normal<br>Tachycardia | 37 (35.6)<br>67 (64.4) |
| **Mode of Management** | |
| Oxygen support<br>Aspiration<br>Tube thoracostomy with sclerosant<br>Tube thoracostomy | 4 (3.8)<br>6 (5.8)<br>9 (8.7)<br>85 (81.7) |

attributed to several factors, including the complexity of treatment and the presence of associated comorbidities. It's possible that some patients with SSP required specialized care and were referred to a chest hospital, resulting in a higher proportion of SSP cases. These variations highlight the importance of considering regional and clinical factors when assessing the incidence and etiology of pneumothorax in different populations.[22]

The earlier study mentioned found that dyspnea (93%) and pleuritic chest pain (83%) were the most common presenting symptoms in patients with spontaneous pneumothorax.[23] Similar findings were observed in another study. Dyspnea emerged as the most prevalent symptom, reported in 94% of cases in this study. These results corroborate the high frequency of dyspnea as a primary symptom in spontaneous pneumothorax as reported in earlier studies.[24-27]

Historically, tuberculosis (TB) was considered the leading cause of spontaneous pneumothorax until the description of Primary Spontaneous Pneumothorax (PSP) more than 70 years ago. Subsequently, research has shown that Chronic Obstructive Pulmonary Disease (COPD) is the most common etiological cause of Secondary Spontaneous Pneumothorax (SSP). These findings illustrate the evolving understanding of the causes and clinical characteristics of spontaneous pneumothorax over time.[28,29]

## Conclusion

Spontaneous pneumothorax (SP) exhibited a higher prevalence among males and tended to occur more frequently during the third and fifth decades of life. A noteworthy risk factor for SP was a history of smoking. Assessing the clinical profile of patients with SP was valuable in determining its underlying causes. Early screening for risk factors and identifying comorbidities played a crucial role in SP prevention.

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