

# Spontaneous Pneumothorax: Follow up Treatment Outcome in a Tertiary Care Center of Eastern Nepal

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## ABSTRACT

### Background

Spontaneous pneumothorax is not an uncommon medical emergency in pulmonary practice. Related data are not available in our setting. In emergency departments, clinical presentation is often confused with other cardiopulmonary problems. Follow up outcome is important for better patient care.

### Objective

To study clinical profile and outcome after non surgical intervention in a tertiary care center.

### Method

This was a prospective observational study carried out in Nobel Medical College, Biratnagar over last 3 years. We enrolled consecutive spontaneous pneumothorax patients over 15 years of age. Each data related to individual patients were collected in predefined proforma. To study follow up outcome of management, we used OPD attendance or if not possible took, at least two telephone numbers from the patients. All patients were followed for recurrences. Data was statistically analyzed using SPSS software.

### Result

Over the last 3 years, we enrolled 65 spontaneous pneumothorax patients. Secondary spontaneous pneumothorax was more common (92.3%). Commonest presentations were acute pleuritic chest pain (92.3%), dyspnea (84.62%) and cough (92.3%). COPD (46.14%), PTB sequelae (15.38%), bronchiectasis (23.07%) and bullous lung disease (23.07%) were common risk factors. Tube thoracostomy (95.38%) with pleurodesis with iodopovidone (84.61%) led to lung expansion in 92.3% cases. During follow up, only 4.61% had recurrences of pneumothorax. There was one mortality.

### Conclusion

Spontaneous pneumothorax is a common pulmonary emergency. Meticulous and careful assessment of the patients may help reach the diagnosis even in primary care setting. Tube thoracostomy followed by pleurodesis with iodo-povidone suffices in most circumstances leading lower future recurrences.

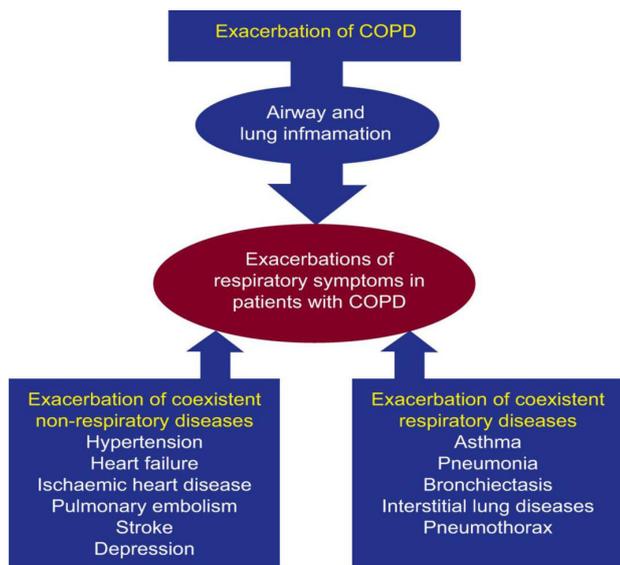
## KEY WORDS

*Nepal, Spontaneous pneumothorax, Treatment outcome*

**INTRODUCTION**

Pneumothorax is defined as the entry of air into the pleural space without any external cause and with secondary lung collapse. At times it is a cardio-pulmonary emergency needing urgent medical care.<sup>1</sup>

Pneumothorax is not uncommon among patients presenting with pulmonary disorders in emergency and outpatient care settings in Nepal. It may present as acute pulmonary problem alone or an incidental radiological finding in patients with acute exacerbation of chronic obstructive pulmonary disease, asthma, interstitial lung disease, bronchiectasis and other cardiopulmonary emergencies. Most of the times, clinically it becomes very difficult to differentiate exacerbation of the above diseases and other cardiopulmonary conditions from pneumothorax (Flow chart below).<sup>2</sup> In many patients simple aspiration and or tube thoracostomy with pleurodesis is adequate. Video assisted thoracic surgery (VATS) and open thoracotomy may not be tolerated by most of our patients or not available in all circumstances.<sup>3</sup> To our knowledge, no such studies have been carried out in Nepal till date. Our aim is to study clinical profile and treatment outcome of pneumothorax patients in a tertiary care center of Eastern Nepal.



**Flow Chart. Pneumothorax simulating COPD exacerbation**

**METHODS**

This was a prospective observational study conducted at the Department of Pulmonary, Critical Care and Sleep Medicine of Nobel Medical College and Teaching Hospital, Biratnagar, Nepal. The study was carried out between 30<sup>th</sup> January 2017 to 1<sup>st</sup> February 2020.

We included all the consecutive patients with age more than 15 years who were having clinical and/or radiological evidence of pneumothorax. Traumatic pneumothorax was excluded from study. Ethical approval was taken from

Institutional Review Committee before the study. Verbal and written consent was obtained before collecting the data from each patient. Detail demographics, clinical history, physical examination and relevant laboratory and radiological parameters of each patient were reviewed and filled in a preformed structured proforma. Study variables included oxygen saturation, pleuritic chest pain, dyspnea, cough, hemoptysis, cyanosis and ipsilateral shoulder pain. Vital signs like temperature, respiratory rate, blood pressure and pulse rate were recorded. History of smoking, exposure to biomass fuel, previous pneumothorax, tuberculosis, COPD, asthma or other lung diseases were also noted. Laboratory parameters including complete blood count, renal function test, liver function test, blood sugar, sputum for Tuberculosis PCR, AFB stain and Grams stain were recorded. All available tests for acute cardiopulmonary emergencies were carried out to rule out life threatening diseases other than pneumothorax. Chest radiograph and high resolution computed tomography (HRCT) of chest done in all patients because small pneumothorax is missed in chest X-ray. The bullas again compound the picture simulating pneumothorax. Also recorded were treatment modality, complications and treatment outcome. Treatment outcome included recurrences of pneumothorax and mortality. We did tube thoracostomy only in patients who underwent HRCT with confirmed symptomatic pneumothorax. Depending on underlying lung condition, pneumothorax was divided into primary spontaneous pneumothorax (PSP) and secondary spontaneous pneumothorax (SSP). Treatment plan was decided according to British Thoracic Society guideline (BTS) based on degree of acuteness of the pulmonary symptoms, clinical condition of the patient, extent of pneumothorax in chest radiograph.<sup>10</sup> PSP without dyspnea and pneumothorax less than 15% were treated with rest, oxygen inhalation and observation. Patients with less dyspnea, no cyanosis, hemodynamically stable and more than 15% pneumothorax were treated with oxygen inhalation, observation. Intercostal tube drainage (ICTD) was used, as and when necessary. Patients with severe dyspnea and cyanosis were treated with ICTD under water seal irrespective of the size of pneumothorax. After the ICTD done, time taken to re-expand the lung was recorded. If it took more than 4 to 6 weeks for lung expansion then they were referred for surgical intervention. Patients who had full lung expansion in less 1 week and had no bronchopleural fistula (BPF), underwent pleurodesis and closure of the tube drainage site. Patients with partial lung expansion were kept under water seal drainage for lung expansion. Patients with full lung expansion but had bronchopleural fistula were sent home. Good thoracostomy tube site care and good nutrition education causes faster fistula healing. These patients were called on weekly follow up for closure of fistula and other complications. If the fistula were not closed and healed in 6 weeks then these patients were considered for surgical intervention. After pleurodesis and

tube closure, all patients were followed up monthly for recurrences of pneumothorax and other late complications. We took mobile number of all patients and one or two relatives for making calls if needed. Collected data were entered in microsoft excel 2007 and converted it into Statistical Package for Social Science (SPSS) 11.5 Version for statistical analysis. For descriptive statistics percentage, mean, standard deviation, median and inter quartile range were calculated along with graphical and tabular presentation.

## RESULTS

Over the period of three years, there were total of 65 patients with pneumothorax. Most of them (92.30%) were secondary pneumothorax (Table 1). Although the number of patients with PSP was very less to compare than the patients with SSP, PSP patients have lesser average age, height, and weight and body mass index than SSP (Table 2). Most of our patients were smoker-males who presented in hospital within 24 hour of symptoms. Most of them have right sided pneumothorax occupying more than 15% in chest X-ray postero-anterior view (Table 3). Most of the pneumothorax patients presented to hospital with acute severe pleuritic chest pain, dyspnea and cough. Ipsilateral shoulder pain with all pulmonary symptoms in ipsilateral hemithorax is common in almost all of our patients. Acute on chronic dyspnea and orthopnea were common in patients who had COPD that is not well controlled (Table 4). COPD, asthma, PTB sequelae, bronchiectasis, bullous lung disease and renal impairment were common comorbidities (Table 5). Ultimately most of our patients required intercostal tube drainage and povidone iodine pleurodesis (Table 6). Persistent chest pain with cough troubled many patients immediately after tube thoracostomy. We manipulated the chest tube that led to decrease in chest pain. Surgical emphysema was next complication that was mild to symptomatic requiring needle thoracostomy and removal of the chest tube. Chronic infection and slippage of the chest tube from the pleural space were common in patients who were sent with chest tube (Table 7). Most of the time, tube thoracostomy was successful with full lung expansion and well functioning drainage system (Table 8). The minor air leakage was common that disappeared with time, generally within a week. Unfortunately one patient died because of cardiovascular collapse which came out to be dilated cardiomyopathy. During follow up, only 3 (4.61%) patients had pneumothorax recurrences.

**Table 1. Classification of pneumothorax.**

Spontaneous Pneumothorax (n-65)	Number (%) of patients
Primary spontaneous	5(7.69)
Secondary spontaneous	60(92.30)

**Table 2. Anthropometric parameters**

Characteristics	SSP	PSP
Age in yr (Mean±SD)	61.3±15.57	43.41±5.51
Height in cm (Mean±SD)	161.12±5.99	156.95±10.72
Weight in Kg (Mean±SD)	48.5±8.46	43.41±5.51
BMI in Kg/m <sup>2</sup> (Mean±SD)	19.37±3.48	17.86±3.42

**Table 3. Patient characteristics**

Characteristics(n-65)	Number (%)
Male	58 (89.23)
Smoker	50 (76.92)
Exposure to biomass fuel	48 (73.84)
Time of hospital visit in less than 24 hour of symptoms	50 (76.92)
Right sided pneumothorax	50 (76.92)
More than 15% pneumothorax with symptoms	55 (84.61)

**Table 4. Symptoms of Patients**

Presentation	Number (%)
New onset Acute ipsilateral pleuritic chest pain	60 (92.3)
New onset acute distressing cough	60 (92.3)
New onset acute dyspnea	55 (84.61)
Ipsilateral shoulder pain	55 (84.61)
Acute on chronic dyspnea	15 (23.07)
Orthopnea	10 (16.92)
Ipsilateral hemithorax pulmonary symptoms	60 (92.3)
Bilateral pedal edema	12 (18.46)
Oxygen saturation less than 90%	50 (76.92)

**Table 5. Associated Comorbidities**

Etiology and Comorbidity (n-65)	Number (%)
COPD	30 (46.14)
PTB sequelae	10 (15.38)
Bronchiectasis	15 (23.07)
Bullous lung disease with pneumothorax	15 (23.07)
SLE	1 (1.53)
DCM	1(1.53)
Pulmonary embolism	1 (1.53)
Asthma	15 (23.07)
Consolidation	5 (7.69)
Renal Impairment	15 (23.07)
Hypertension	5 (7.69)

**Table 6. Treatment Modalities of the patients**

Modalities of treatment (n-65)	Number (%)
Tube thoracostomy and high flow oxygen	62 (95.38)
Oxygen and aspiration	2 (3.07)
Oxygen and observation	1(1.53)
Pleurodesis (Iodine)	55(84.61)

**Table 7. Complications of Tube Thoracostomy**

Characteristics (n-65)	Number (%)
<b>Acute complications</b>	
Acute cough and chest pain	10 (15.38)
Reperfusion pulmonary edema	2 (3.07)
Cardiovascular collapse	1(1.53)
Surgical emphysema	5(7.69)
Tube manipulation due to persistent pain	20 (30.76)
<b>Chronic complications</b>	
Slipping out of chest tube requiring replacement	5 (7.69)
Pleural effusion after tube insertion	15 (23.07)
Secondary infection of pleural space	5 (7.69)
Chronic blockage of chest tube requiring removal	3 (4.61)

**Table 8. Treatment outcome of the patients**

Characteristics	Number (%)
Full lung expansion	60 (92.30)
Partial lung expansion	3 (4.61)
No lung expansion	1 (1.53)
ICU shift from ward	4 (6.15)
Death	1 (1.53)
Recurrence of pneumothorax in 1 year follow up	3 (4.61)
Referral	3 (4.61)

## DISCUSSION

There were 65 consecutive spontaneous pneumothorax patients in our study over the period of last three years. Spontaneous pneumothorax can be classified into primary or secondary. Primary spontaneous pneumothorax (PSP), although very rare, is defined as a pneumothorax without underlying clinical lung disease, predominantly occurs in young, thin, smoker males. Usually ruptured pleural blebs and/or bullae, mainly in the apical lung region, are the culprits.<sup>4,5</sup> Secondary spontaneous pneumothorax (SSP) is very common. It is seen in older people with underlying chronic lung diseases as a complication. The diseases are COPD or asthma, acute or chronic infections such as tuberculosis, lung cancer and other lung diseases.<sup>6,7</sup> Although this sample size is relatively small to compare age, height and weight with PSP and SSP patients. Our patients with PSP have relatively smaller age, height and weight. Our studies have similar results regarding PSP and SSP as reported by Hobbs et al. and Rami et al. and colleagues showed that pneumothorax was more common in right hemithorax that corroborated with our study.<sup>8,9</sup> Regarding presentation to the hospital, most of our patients presented to emergency department within very short time because of severe chest pain and dyspnea. From most of the catchment areas of our hospital, patients can reach to emergency department within 24 hours probably because of easy availability of ambulance services. Surprisingly some of them reached to hospital even within 6 or 12 hours. This

helped us to manage patients early symptomatic phase. Acute severe pleurotic chest pain, cough and dyspnea are the most common clinical symptoms of our pneumothorax patients. The chest pain radiated to ipsilateral shoulder and arm. New-onset ipsilateral hemithorax symptoms were common. Actually this was helpful for us to diagnose pneumothorax. These symptoms were consistent in most of our patients. Meticulous history taking is vital. Early symptom recognition and simple chest X-ray in peripheral health care facilities may be very helpful for ground level health workers.

Study done by Huang et al. found that the most common presenting symptoms were chest pain and shortness of breath (64 to 85%).<sup>10</sup> Chest pain was usually severe, sharp/stabbing, pleuritic and radiates to ipsilateral shoulder/arm. These above findings were similar to our studies. Some of the patients presented with acute on chronic dyspnea. These patients were taking medications for COPD but not controlled. They were not as symptomatic as the patients with new onset pulmonary symptoms who had no dyspnea before pneumothorax. These patients who had pedal edema and renal impairment had severe orthopnea requiring extra medical care. That was probably suggesting volume overload and or cor pulmonale. Regarding etiology and comorbidities, COPD, PTB sequelae, asthma and bullous lung diseases were common. Two new findings from our study were: no active pulmonary tuberculosis was detected and none of them were taking antitubercular drugs. We found clinically significant bullous lung disease in many patients. Significant renal impairment was present in 15% of our patients. Many Indian studies reported active tuberculosis as the aetiological association to pneumothorax. They did not find bullous disease and renal impairment in their studies.<sup>3,11</sup> These discrepancies between studies need further careful research. Most of our patients underwent tube thoracostomy. Majority of them had full lung expansion within a week without significant air leakage. We performed iodine pleurodesis in every cases who have full lung expansion. This finding encourages us to manage pneumothorax in the setting where there is no availability of thoracic surgical services. Thoracic surgery is performed only in special centers in our country. The majority guidelines also suggest the above management scheme. We approached according to the guideline published in clinical consensus statements and guidelines from the American College of Chest Physicians (ACCP), the British Thoracic Society (BTS), the European Respiratory Society (ERS), the Japanese Association for Chest Surgery (JACS) and others.<sup>12-15</sup> After tube thoracostomy, we recorded acute and chronic complications of chest tube placement that were similar with other studies.<sup>11</sup> Regarding survival and recurrences, we followed individual patients either with OPD based record or with telephone. Unfortunately one patient had cardiovascular collapse and died on the 3<sup>rd</sup> day of tube thoracostomy, a part from that no death

recorded. Regarding recurrences of pneumothorax that underwent iodopovidone pleurodesis, three patients (4.61%) developed recurrent pneumothorax till now. We are still following 11 patients till date and no recurrences occurred. Other studies showed recurrence rate of 6.2 to 7.4% after iodopovidone pleurodesis.<sup>16-19</sup>

This is a small study carried out in Eastern Nepal involving limited number of patients in a single tertiary care center.

## CONCLUSION

The spontaneous pneumothorax is common in pulmonary practice. Meticulous and careful assessment of the

patients may help reach the diagnosis even in primary care setting. Tube thoracostomy followed by pleurodesis with iodopovidone suffices in most of the circumstances with lower recurrence rate.

This type of study has not been carried out in our country. We need large multicenter prospective study that also includes a special centre where routine thoracic surgery is performed by qualified thoracic surgeons. With that we can enter into depth of our scenario of pneumothorax so that our guidelines can be produced. We need to conduct short term training for ground level health workers for early recognition and emergency management of pneumothorax from the government sector.

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