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Etiological profile of spontaneous pneumothorax at rural tertiary care centre in Northern India

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Abstract
Background: Spontaneous Pneumothorax (SP) is one of the common acute respiratory condition. Etiological profile of SP is not so well studied in rural scenario in India.
Objective: To investigate the Etiological Profile of Spontaneous Pneumothorax at Rural Tertiary Care Centre of north India.
Materials and Method: A descriptive cross-sectional study was conducted on 124 patients, between June 2014 to January 2016 in the Department of Pulmonary Medicine of a rural tertiary care hospital of north India. After obtaining informed written consent the patients undergoes detailed history, clinical examination and relevant investigations for making diagnosis. Patients who did not have any underlying pulmonary disease were classified as Primary Spontaneous Pneumothorax (PSP) and those having an underlying pulmonary disease were classified as Secondary Spontaneous Pneumothorax (SSP).
Results: Total 124 patient of Spontaneous Pneumothorax were studied. Out of 124 patient 18 (14.51%) patients diagnosed as Primary Spontaneous Pneumothorax and 106 (85.48%) patients as Secondary Spontaneous Pneumothorax. Among secondary spontaneous pneumothorax 71 (66.98%) patients were of pulmonary tuberculosis, 22 (20.75%) patients belongs to COPD and 6 (5.66%) to interstitial lung disease, 4 (3.77%) patients to bronchial asthma and 2 (1.8%) patients to lung malignancy and 1 (0.94%) patient diagnosed as a case of HIV Pulmonary TB co-infection.
Conclusion: Our study shows that Pulmonary Tuberculosis is the leading cause of Secondary Spontaneous Pneumothorax followed by COPD in rural Indian population. Primary spontaneous pneumothorax occurs mostly in tall and thin young male, having history of smoking.

Keywords: Spontaneous Pneumothorax, Primary Spontaneous Pneumothorax, Secondary Spontaneous Pneumothorax

1. Introduction
Pneumothorax is defined as air in the pleural space—that is, between the lung and the chest wall while Spontaneous Pneumothorax (SP) is defined as the presence of air in the pleural cavity with the consequent collapse of the respective lung without an identified precipitating cause, namely a direct or indirect trauma, or iatrogenic [1]. Spontaneous pneumothorax (SP) is subdivided into Primary Spontaneous Pneumothorax (PSP), occurring in otherwise healthy individuals and Secondary Spontaneous Pneumothorax (SSP), which occurs in patients with an underlying lung disease [2]. Primary Spontaneous Pneumothorax (PSP) results from a rupture of the subpleural blebs that are usually located in the apices of the lung [3]. Tuberculosis has remained the dominant cause of Secondary Spontaneous Pneumothorax (SSP) in all earlier studies on adults from India [3]. A well-known risk factor for PSP incidence regarding both genders is smoking [4]. There are limited data regarding the etiology of Pneumothorax in India especially in rural set up. This study was aimed to describe the various etiologies of spontaneous Pneumothorax at rural tertiary care centre of India.

2. Materials and Methods
A descriptive cross-sectional study was conducted between June 2014 to January 2016 in the Department of Pulmonary Medicine of a rural tertiary care hospital in north India. All patients having features of SP whether detected clinically and/or radiologically, attending to the pulmonary medicine department were included in the study and Patients having history suggestive of traumatic and iatrogenic pneumothorax, clinically and radiologically detected hydropneumothorax and pyopneumothorax, hemodynamic instability, semiconscious/ unconscious patients, recent history of myocardial infarction, and unwilling patients were excluded from the study.
Data were collected from consecutive patients who got admitted in pulmonary medicine ward. After obtaining informed written consent the patients undergoes detailed history, clinical examination and relevant investigations for making diagnosis. Patients were interviewed with a predesigned and pretested questionnaire for gathering information pertaining to the socio-demographics (age, sex, occupation, residence), past morbidity etc. Then thorough clinical examination including the anthropometry [e.g. measuring height, weight as per standard guidelines and determining body mass index (BMI)] was carried out for each and every patient. Moreover, the relevant information in connection with addiction including smoking habit, exposure to biomass fuel smoke, and activity during the onset of symptoms etc. were also explored. Depending upon the results of the initial clinical evaluation and chest radiography, all

patients subjected to detailed investigations like pulmonary function test, sputum acid fast bacilli (AFB) smear and culture, human immunodeficiency virus (HIV) status, high resolution computed tomography (HRCT) thorax, fiber optic bronchoscopy, and analysis of bronchoalveolar lavage fluid, to establish the underlying cause of spontaneous pneumothorax. Patients who did not have any underlying pulmonary disease were classified as primary spontaneous pneumothorax (PSP) and those having an underlying pulmonary disease were classified as secondary spontaneous pneumothorax (SSP). All patients with SSP were managed with intercostals drainage chest tube drainage. All patients with PSP were initially managed with simple needle aspiration. The outcome of this procedure was universally good, except in 4 patients with PSP who required placement of intercostals chest tube following failed needle aspiration. No treatment related complications were recorded in patients with PSP. However, 3 patients with SSP had developed empyema after intercostal tube placement.

3. Results

The patients studied had a mean age of 36.5 years (range 19-74). Patients with PSP were significantly younger as compared to patients with SSP (mean age 24.0 years vs 47 years, $p<0.05$). The age distribution of patients showed a biphasic pattern. The first peak occurred between 20 and 30 years of age, and was mainly contributed by PSP, while the second occurred between 40 and 50 years, and was mainly contributed by SSP.

Out of 124 patients 96 were male and 28 were female, with an overall male to female ratio of 3.42: 1. The male preponderance was even more dominant in PSP as compared to SSP.

There were 16 male and 2 female in 18 cases of primary spontaneous pneumothorax and 80 male and 26 female in 106 cases of secondary spontaneous pneumothorax (male to female ratio 8:1 and 3.07: 1 respectively). Average Body mass index of patients were 23.25 kg/m^2, patients who were diagnosed as PSP having BMI 21.50 kg/m^2 and BMI of patients of SSP was 25 kg/m^2. Out of 124 patients 76 (61.29%) patients were smoker, and 34 (27.41%) patients were exposed to biomass fuel smoke. In PSP 16 (88.89%) were smoker and 2 (11.11%) patients were exposed to biomass fuel smoke and in SSP 60 (56.60%) were smoker and 32 (30.18%) were exposed to biomass fuel smoke. Sputum smear examination for Acid Fast Bacilli were positive in 16 (15.09%) cases of SSP and negative in all the cases of PSP. History of taking anti tubercular treatment present in 55 (55. 18%) cases of SSP. On HRCT thorax, there were fibrosis and honeycombing present in 4 cases suggestive of Idiopathic pulmonary fibrosis (IPF)

Among secondary spontaneous pneumothorax 71 (66.98%) patients were of pulmonary tuberculosis. These patients had either previous history of pulmonary Tuberculosis [old treated pulmonary tuberculosis 55 (51.89%)] or having active pulmonary Tuberculosis [16 (15.09%)] and 22 (20.75%) patients belongs to COPD and 6 (5.66%) to interstitial lung disease, 4 (3.77%) patients to bronchial asthma and 2 (1.8%) patients to lung malignancy and 1 (0.94%) patient diagnosed as a case of HIV Pulmonary TB co-infection.

4. Discussion

The aetiology of such bullous changes in otherwise apparently healthy lungs is unclear, undoubtedly, smoking plays a role. The lifetime risk of developing a pneumothorax in healthy smoking men may be as much as 12% compared with 0.1% in non-smoking men this trend is also present, though to a lesser extent, in women. [5-7] PSP is not a common disease, and has an incidence of 7.4-18 cases per 100,000 population per year among men and 1.2-6 cases per 100,000 population per year among women. [8] Despite the absence of underlying pulmonary disease in patients with primary pneumothorax, subpleural blebs and bullae are likely to play a role in the pathogenesis since they are found in up to 90% of cases of primary pneumothorax at thoracoscopy or thoracotomy and in up to 80% of cases on CT scanning of the thorax. [9, 10] Patients with primary pneumothorax tend to be taller than control patients [11, 12] The gradient in pleural pressure increases from the lung base to the apex, thus alveoli at the lung apex in tall individuals are subject to significantly greater distending pressure than those at the base of the lung and, theoretically, are more predisposed to the development of subpleural blebs.[13] As per the study on SP in India conducted by Gupta D *et al*, the SP showed a bimodal age distribution, the 1st peak being in the age group of 20 – 30 years and the 2nd peak occurring in the age group of 40 – 50 years. [14]

Table 1: Demographic Characteristics of Study Population

S/N	Total Number of Cases (N= 124)	PSP (N=18)	SSP (N=106)
Age (Years)	36.5	24	47
Sex(M/F)	96/28	16/2	80/26
BMI (Kg/M^2)	23.25	21.5	25
Smoker	76 (61.29%)	16 (88.89%)	60 (56.60%)
Biomass Fuel Smoke Exposer	34 (27.41%)	2 (11.11%)	32 (30.18%)
Sputum Smear For AFB	16 (12.09%)	0	16 (15.09%)
History Of ATT Intake	55 (44. 35%)	0	55 (55.18%)
Fibrosis And Honeycombing On HRCT Thorax	4 (3.2%)	0	4 (3.7%)

PSP: Primary Spontaneous Thorax, Ssp: Secondary Spontaneous Thorax,
AFB: Acid Fast Bacilli, Att: Anti Tubercular Treatment

Table 2: Etiological Distribution of Secondary Spontaneous Pneumothorax

Diagnosis	Number 106 (100%)
Pulmonary Tuberculosis	71 (66.98%)
Ia. Old Treated Pulmonary Tuberculosis	55 (51.89%)
Ib. Active Pulmonary Tuberculosis	16 (15.09%)
Chronic Obstructive Pulmonary Diseases	22 (20.75%)
Interistial Lung Disease	6 (5.66%)
Bronchial Asthma	4 (3.77%)
Lung Malignancy	2 (1.8%)
HIV-Pulmonary Tuberculosis Co- Infection	01 (0.94%)

5. Conclusion

Our study shows that SSP is far more common than PSP and pulmonary tuberculosis is the leading cause of Secondary Spontaneous Pneumothorax followed by COPD in rural Indian population. Primary spontaneous pneumothorax occurs mostly in tall and thin young male, and in smokers. Simple Needle Aspiration was the mainstay of treatment in PSP, however Intercostal tube drainage in SSP.

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