Prevalence, Clinical Manifestations and Mortality Rate in Patients with Spontaneous Pneumothorax in Thammasat University Hospital

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Background: *Spontaneous pneumothorax (SP) can be a medical emergency requiring early diagnosis and treatment to prevent subsequent respiratory failure and death. SP epidemiologic and clinical data are limited in Thailand.*
Objective: *To study the prevalence, clinical manifestations, and mortality rate of SP in Thai patients.*
Material and Method: *A retrospective case study was conducted between July 2004 and December 2010 in patients with a confirmed diagnosis of SP. Demographic, etiologic, clinical, radiographic, and outcome data were collected.*
Results: *One hundred patients with SP were identified (66 primary, 34 secondary SP), for a prevalence of 76.3 per 100,000 hospital admissions. Males numbered 83. Male to female ratios were 7.5:1 and 4.1:1 for primary and secondary SP, respectively. Mean (± standard deviation) age and body mass index were 35.3±20.3 years and 18.0±2.2 kilogram/meter^2. The common presenting symptoms were dyspnea (73%), chest pain or discomfort (68%), pleuritic pain (46%), cough (20%), and fever (13%). Causes of secondary SP were pulmonary tuberculosis (19/34, 55.9%), chronic obstructive pulmonary disease (14/34, 41.2%), and pneumonia (8/34, 23.5%). There were 12 deaths (12%), 11 with secondary SP.*
Conclusion: *Spontaneous pneumothorax was relatively common with typical clinical features. Almost all of mortality cases rate suffered secondary SP. Prospective studies are needed to develop evidenced based algorithms, especially for secondary SP patients.*

Keywords: *Spontaneous pneumothorax, Prevalence, Mortality rate*

J Med Assoc Thai 2013; 96 (10): 1290-7
Full text. e-Journal: *http://jmat.mat.or.th*

Pneumothorax is defined as the presence of air in the pleural cavity. It may present as a medical emergency, which can potentially lead to respiratory failure and death, necessitating prompt diagnosis and early treatment[1-3].

Pneumothorax is classified into three types, spontaneous pneumothorax (SP), which occurs without trauma or any obvious precipitating factors, traumatic pneumothorax, which occurs following trauma to the chest, and iatrogenic pneumothorax, which is caused by complications following treatment. Spontaneous pneumothorax is categorized into primary spontaneous pneumothorax (PSP), which occurs in individuals with healthy lungs, and secondary spontaneous pneumothorax (SSP), which occurs in patients with underlying lung diseases[1].

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In the United States, the annual incidence of PSP is 7.4 per 100,000 for men and 1.2 per 100,000 for women, and the incidence of SSP is 6.3 per 100,000 for men and 2.0 per 100,000 for women[4]. In Sweden, the annual incidence of first SP was 18.0 per 100,000 for men and 6.0 per 100,000 for women[5]. In India, the annual incidence of SP was 99.9 per 100,000 hospital admissions and male to female ratio was 5:1[2]. Reported male to female ratios are 6.2: 1 for PSP and 3.2: 1 for SSP in the United States[4]. Most patients with PSP were tall, thin males aged between 10 and 30 years old[6]. Smoking is a major risk factor for SP especially PSP[5,7-9]. The most common causes of SSP are chronic obstructive pulmonary disease (COPD) and pneumocystis pneumonia (PCP) related to human immunodeficiency virus infection (HIV)[1]. The common clinical presentations of SP include chest pain, pleuritic pain, and dyspnea[10]. The treatment of SP depends on its size and clinical effects. Clinically insignificant SPs can be treated with observation alone[11]. In one series of PSP, 21% failed to resolve on observed treatments and needed the further

treatment[12]. Even with these treatments, the mean recurrence rate of PSP is 30% (ranging 16 to 52%)[8]. For SSP patients, the air leak is less likely to resolve spontaneously[13], and most patients will require active intervention[11].

Treatment for recurrent SP includes medical or surgical pleurodesis, the latter by open thoracotomy, or the less invasive video-assisted thoracoscopic surgery (VATS). In one series, the VATS associated operative mortality rate for SP was 1.3%[14] and was three fold higher in SSP patients. In a series of 107 elderly COPD patients were treated with surgical management of SSP, the mortality rate was 4.7%[15].

Given the limited data on SP in Thailand, we conducted a retrospective review of SP at Thammasat University Hospital (TUH).

Material and Method

Study design and population

A retrospective case study was conducted at TUH in Thailand between July 2004 and December 2010. All patients aged 15 years or more who were admitted to TUH with a diagnosis of pneumothorax were included. The eligible patients were identified by using the International Classification of Diseases, tenth revision (ICD-10) codes associated with pneumothorax including J93 (pneumothorax), J93.0 (spontaneous tension pneumothorax), J93.1 (other spontaneous pneumothorax), J93.8 (other pneumothorax), and J93.9 (pneumothorax, unspecified). Chart review was conducted to verify a diagnosis of pneumothorax. Demographic and clinical data including age, gender, smoking history, height, weight, body mass index (BMI), underlying lung diseases, clinical manifestations, chest radiography results, recurrent episodes of pneumothorax, and treatment outcomes were obtained from patient's medical records.

The present study was approved by the Ethic Committee of Faculty of Medicine, Thammasat University.

Statistical analysis

Comparisons between patients with PSP and SSP were performed using Chi-square test for categorical data and unpaired t-test for continuous data. A two-side p-value of less than 0.05 was considered statistically significant. Logistic regression (SPSS 15.0, SPSS Inc., Chicago, IL, USA) was used to assess independent risk factors for mortality using a backward - stepwise selection to leave those variables with p-value less than 0.05.

Results

Between July 2004 and December 2010 (4.5 years), 313 patients were diagnosed with a pneumothorax. Of these 313 patients, 11 who were younger than 15 years were excluded. Three hundred two patients were eligible for further analysis. Of these, 100 patients (33.1%) had SP, 90 patients (29.8%) had traumatic, and 112 patients (37.1%) had iatrogenic pneumothoraces. Based on the total number of patients aged 15 years or more admitted to TUH during the study period (131,123 admissions), the prevalence of SP was 76.3 per 100,000 hospital admissions and the annual incidence was 16.9/100,000 admissions.

Of the 100 SP patients, 66 (66%) and 34 (34%) had PSP and SSP, respectively; 83% were males (Table 1). Male to female ratios were 7.5: 1 for PSP and 4.1: 1 for SSP. Overall, patients were young (mean age 35 years), relatively tall (mean height 168.1 cm) and lean with the mean BMI falling within the WHO definition of mild thinness (BMI 17-18.49).

The SP was considered the first episode in 82 patients (82%) and a recurrent episode for 18 (18%) patients. The mean time interval between the current and antecedent episodes was 8.4 (±10.9) months.

Patients with PSP were significantly younger, taller and with a lower mean body mass index than SSP patients. They also smoked fewer cigarettes, came to the hospital earlier and more likely to be admitted to a surgical ward compared to SSP patients (Table 1).

Lung pathologies in the 34 SSP patients were [22 (64%) had >1 pathology] pulmonary tuberculosis (TB) 19 (55.9%), COPD 14 (41.2%), bacterial pneumonia 8 (23.5%), bronchiectasis 5 (14.7%), HIV-related PCP 2 (5.9%), lung cancer 2 (5.9%), interstitial lung diseases 2 (5.9%), and one each (2.9%) for asthma, silicosis, post-fungal infection, post-radiation therapy, and post-lobectomy.

Common presenting symptoms of patients with SP included dyspnea, chest pain, and pleuritic pain (Table 2). When compared to SSP patients, PSP patients were more likely to have chest pain but were less likely to present with dyspnea, cough, and fever.

The physical examination of the SP patients showed that six patients (6%) had normal physical examinations. Of these six patients, three (50%) had pneumothoraces >15% of the hemithorax. The right chest was slightly more commonly affected (52%). Only one patient had simultaneous bilateral pneumothoraces. Patients with PSP had significantly smaller size of pneumothorax, less concurrent pleural

Table 1. Baseline characteristics of 100 patients with spontaneous pneumothorax

Baseline characteristics	PSP (n = 66)	SSP (n = 34)	Total SP (n = 100)	p-value[a]
Male, n (%)	53 (80.3)	30 (88.2)	83 (83)	0.310
Age, years*	23.1±5.6	59.1±17.3	35.3±20.3	<0.001
Height, cm*	169.9±4.7	164.5±4.8	168.1±5.3	<0.001
Weight, kg*	50.7±5.5	51.1±7.4	50.8±6.2	0.770
Body mass index**, kg/m^2	17.6±1.9	18.9±2.6	18.0±2.2	0.013
Episode of event[+]				0.230
1st	52 (78.8)	30 (88.2)	82 (82)	
2nd	9 (13.6)	4 (11.8)	13 (13)	
3rd	5 (7.6)	0 (0)	5 (5)	
Recurrent interval, months*	8.5±12.4	8.0±3.9	8.4±10.9	0.940
Onset of symptoms, hours*	36.2±60.8	66.9±77.7	46.6±68.2	0.050
Type of ward[+]				<0.001
Medical	38 (57.6)	33 (97.1)	71 (71)	
Surgical	28 (42.4)	1 (2.9)	29 (29)	
History of diving[+]	1 (1.5)	0 (0)	1 (1)	0.470
Family history of SP[+]	1 (1.5)	0 (0)	1 (1)	0.470
HIV infection[+]	0 (0)	2 (5.9)	2 (2)	0.047
Smoking[+]	18 (27.3)	25 (73.5)	43 (43)	<0.001
Smoking, pack year[#]*	1.0±2.3	22.9±32.0	8.4±21.3	<0.001

[a] Comparison between PSP and SSP
* Mean ± SD
** Body mass index = weight (kilogram)/height^2 (meter)
[+] n (%)
[#] Pack-year = (number of cigarettes smoked per day x number of years smokes)/20
PSP = primary spontaneous pneumothorax; SSP = secondary spontaneous pneumothorax; SP = spontaneous pneumothorax

effusion, and higher oxygen saturation compared to patients with SSP.

Patient treatments are shown in Table 3. Only seven SP patients (7%) were successful in the conservative treatments (observed treatment alone). Observation with only oxygen supplementation was more treated and less failure in patients with PSP (6/13, 46%) than those with SSP (1/1, 100%). Patients with SSP were more likely to require tube thoracostomy and had longer duration of tube insertion than PSP patients. However, PSP patients were more likely to require surgical pleurodesis than patients with SSP. The length of hospital stay, SP-related complications, and mortality were less in PSP patients compared to SSP patients. Overall, the mortality rate of SP was 12%; 11 of these deaths occurred in SSP patients.

Complications during hospital admission in the 25 SP patients [10 (40%) had >1 complication] were hospital acquired pneumonia [14 (56%)], bronchopleural fistula [11 (44%)], subcutaneous emphysema [5 (20%)], empyema thoracis [3 (12%)], myocardial infarction [3 (12%)], and lung abscess [2 (8%)].

On bivariate analyses, risk factors for death included SSP type, age more than 60 years, previous underlying lung diseases, dyspnea on presentation, oxygen saturation less than 95%, tachycardia, tachypnea, fever, size of pneumothorax more than 50%, bilateral pneumothorax, no treatment with pleurodesis, duration of tube thoracostomy more than 14 days, complications occurring during hospitalization, and length of hospital stay more than 30 days (Table 4).

However, by logistic regression, only two factors were found to be independent predictors of death, namely, size of pneumothorax more than 50% and complications during admission (Table 5).

Discussion

The present study reports our experience of primary and secondary spontaneous pneumothoraces at a university teaching hospital in the Bangkok conurbation. SP was relatively common, accounting

Table 2. Clinical manifestations and signs of 100 patients with spontaneous pneumothorax[@]

Presenting symptoms and signs	PSP (n = 66)	SSP (n = 34)	Total SP (n = 100)	p-value[a]
Dyspnea	44 (60.6)	33 (97.1)	73 (73.0)	<0.001
Chest pain	59 (89.4)	9 (26.5)	68 (68.0)	<0.001
Pleuritic pain	34 (51.5)	12 (35.3)	46 (46.0)	0.120
Cough	6 (9.1)	14 (41.2)	20 (20.0)	<0.001
Fever*	4 (6.1)	9 (26.5)	13 (13.0)	0.004
Tachycardia**	9 (13.6)	17 (50.0)	26 (26.0)	<0.001
Tachypnea***	29 (43.9)	26 (76.5)	55 (55.0)	0.002
Decreased breath sounds	61 (92.4)	32 (94.1)	93 (93.0)	0.750
Hyperresonance on percussion	43 (65.2)	19 (55.9)	62 (62.0)	0.360
Decreased vocal or tactile fremitus	27 (40.9)	12 (35.3)	39 (39.0)	0.580
Normal chest examination	4 (6.1)	2 (5.9)	6 (3.0)	0.970
Affected side of lung				0.190
Right	32 (48.5)	20 (58.8)	52 (52.0)	
Left	34 (51.5)	13 (38.2)	47 (47.0)	
Both	0 (0)	1 (2.9)	1 (1.0)	
Size of pneumothorax, %[+#]	31.7±18.7	41.9±23.3	35.2±20.7	0.030
Concurrent pleural effusion	0 (0)	4 (11.8)	4 (4.0)	0.004
Initial oxygen saturation, %[#]	96.8±2.7	88.9±17.6	94.1±11.0	0.014

[@] Data are n (%) unless otherwise stated
[a] Comparison between PSP and SSP
* Fever defined as body temperature more than 37.8°C
** Tachycardia defined as heart rate more than 100 beats per minute
*** Tachypnea defined as respiratory rate more than 20 beats per minute
[+] Estimated as a% of the lung field
[#] Mean ± SD

Table 3. Treatment and outcomes of spontaneous pneumothorax among the 100 patients[@]

Treatment and outcomes	PSP (n = 66)	SSP (n = 34)	Total SP (n = 100)	p-value[a]
Observation with oxygen therapy alone	13 (13.7)	1 (2.9)	14 (14.0)	0.022
Failure to observed treatments*	6 (9.1)	1 (2.9)	7 (7.0)	0.048
Simple needle aspirations	12 (18.2)	3 (8.8)	15 (15.0)	0.380
Tube thoracostomy	49 (74.2)	32 (94.1)	81 (81.0)	0.016
Duration of tube thoracostomy, days	6.9±6.6	18.5±19.1	10.9±13.5	0.001
Thoracotomy	25 (37.9)	9 (26.5)	34 (34.0)	0.250
Pleurodesis				0.019
Medical	2 (3.0)	6 (17.6)	8 (8.0)	
Surgical	22 (33.3)	6 (17.6)	28 (28.0)	
Duration of hospital admission, days (mean ± SD)	9.7±6.8	19.8±17.9	13.1±12.7	0.003
Complications during admission[#]	7 (10.6)	18 (52.9)	25 (25.0)	<0.001
Died	1 (1.5)	11 (32.4)	12 (12.0)	<0.001

[@] Data are n (%) unless otherwise stated
[a] Comparison between PSP and SSP
* Defined as observation with oxygen therapy alone which required additional further interventions to correct the pneumothorax
[#] Defined as hospital acquired pneumonia, bronchopleural fistula, subcutaneous emphysema, empyema thoracis, myocardial infarction, and lung abscess

Table 4. Risk factors for mortality in spontaneous pneumothorax among the100 patients

Risk factors	Survival (n = 88)	Dead (n = 12)	p-value
SSP	23 (26.1)	11 (91.7)	<0.001
Age >60 years	11 (12.5)	6 (50.0)	0.001
Female	13 (14.8)	4 (33.3)	0.100
Body mass index <18.5 kg/m^2*	60 (68.2)	5 (41.7)	0.070
Onset of symptoms >24 hours	26 (29.5)	3 (25.0)	0.740
Smoking	37 (42.0)	6 (50.0)	0.600
HIV infection	1 (1.1)	1 (8.3)	0.090
Recurrent pneumothorax	17 (19.3)	1 (8.3)	0.350
Underlying lung disease	30 (34.1)	11 (91.7)	<0.001
Chest pain	65 (73.9)	3 (25.0)	0.001
Dyspnea	61 (69.3)	12 (100)	0.025
Oxygen saturation <95%	19 (21.6)	9 (75.0)	<0.001
Tachycardia[#]	17 (19.3)	9 (75.0)	<0.001
Tachypnea[##]	44 (50.0)	11 (91.7)	0.006
Fever[¶]	8 (9.1)	5 (41.7)	0.002
Size of pneumothorax >50%	25 (28.4)	7 (58.3)	0.030
Bilateral pneumothorax	0 (0)	1 (8.3)	0.006
Concurrent pleural effusion	4 (4.5)	0 (0)	0.450
Surgical treatment[+]	32 (36.4)	2 (16.7)	0.170
Thoracostomy tube insertion >14 days	19 (21.6)	6 (50.0)	0.033
No pleurodesis	52 (59.1)	12 (100)	0.006
Complications during admission[++]	16 (18.2)	9 (75.0)	<0.001
Length of hospital stay >30 days	5 (5.7)	4 (33.3)	0.002

* kg/m^2 = kilogram per square meter
[#] Defined as heart rate more than 100 beats per minute
[##] Defined as respiratory rate more than 20 beats per minute
[¶] Defined as body temperature more than 37.8°C
[+] Defined as open thoracotomy or video-assisted thoracoscopic surgery with or without surgical pleurodesis
[++] Defined as hospital acquired pneumonia, bronchopleural fistula, subcutaneous emphysema, empyema thoracis, myocardial infarction, and lung abscess

Table 5. Logistic regression analysis of risk factors for mortality in SP patients

Risk factors	Adjusted odds ratio (95% CI)	p-value
SSP	2.760 (0.05-149.26)	0.610
Age >60 years	1.708 (0.12-24.54)	0.690
Underlying lung disease	13.470 (0.26-711.58)	0.190
Initial oxygen saturation <95%	20.250 (0.55-742.33)	0.100
Tachycardia	9.250 (0.88-96.71)	0.060
Size of pneumothorax >50%	162.420 (1.52-17,370)	0.033
Thoracostomy tube insertion >14 days	0.024 (0.00-1.72)	0.080
Complications during admission	71.260 (1.47-3,464)	0.031
Length of hospital stay >30 days	32.460 (0.79-1,333)	0.060

for 17/100,000 hospital admissions per year. This figure is higher than studies from the US[4], much lower than in one Indian study[2], and about the same as data from Sweden[5]. The risk of SP and SSP was higher in men compared to women, consistent with the US and Swedish data. Men also dominated the SSP group, which may be explained by high rates of pulmonary TB and COPD in Thai men[16-18].

Certain characteristics were significantly different between PSP and SSP patients. PSP patients were significantly younger, taller, had lower BMIs, and consumed fewer cigarettes than SSP patients, similar to other studies[2].

Pulmonary TB was the leading cause of SSP in the present study (60%). This is consistent with a study from India[2] but contrasting with a study from the US that found HIV-related pneumothorax and COPD were common causes[19]. This is likely due to the fact that both Thailand and India are TB endemic countries[20]. Pulmonary TB result in airway or lung parenchymal destruction such as bronchiectasis, cavities, or blebs, which may rupture allowing air to pass into the pleural cavity and cause SSP[21].

One of the important risk factors for SP is smoking especially PSP[5,7-9]. The present study showed that 43% of SP patients smoked but the SSP patients were almost three times more likely to be smokers. Smoking leads to the development of subpleural blebs and bullae. However, it is thought that smoke induced inflammatory changes results in weakening of the bleb and bullae walls that rupture when intrapulmonary pressure increases[9].

The clinical presentations and physical signs of PSP patients in the present study were typical of SP patients[1,2,8]. Dyspnea was the most common symptom while the most common physical sign was decreased breath sounds on the ipsilateral side of the affected chest. It should be noted that even in patients with very small pneumothoraces, dyspnea is still the most common complaint but physical signs may be undetectable in pneumothoraces up to 50% of SP patients in the present study.

Compared to PSP patients, SSP patients were significantly more likely to have severe symptoms and signs like dyspnea, cough, fever, tachypnea, and tachycardia. These differences may be related to more underlying lung diseases and other comorbid conditions, older age, lower cardiopulmonary reserve, larger pneumothorax size, and concurrent pleural effusion. Disease severity in SSP patients probably explains their higher failure rates with conservative therapy, greater use of tube thoracostomy, higher complication rate, and longer hospital stay, compared to PSP patients. However, these symptoms and signs did not predict mortality.

Overall, 18% of our patients presented with a recurrent SP with no significant difference between PSP and SSP patients. Previous studies report overlapping recurrence rates of 16 to 52% for PSP[8] and 39 to 47% for SSP[8,22-25].

The mortality rate in our series was high (12%) and was seen almost exclusively in the SSP group (32%). The main independent risk factors for death were size of pneumothorax >50% and complications during admission. These findings had never been demonstrated in any previous studies[2,6-8,10,22,24]. Mortality may be improved by prompt diagnosis and treatment of the pneumothorax, the development of algorithms that target those patients most at risk with criteria that trigger an escalation of treatment, speedy recognition, and management of specific underlying diseases, and close monitoring.

Selection of surgical treatment for pneumothorax in the present study may depend on the physicians' experiences and the medical technologies during that period of time. If the physicians had more surgical experiences, VATS would have been performed more for SP patients while the physicians who had less experience, conservative treatment would be pursued. Thus, difference in treatment option selection might have an impact on the patients' outcomes.

The present study was limited by its retrospective nature. Recall and misclassification of diseases may occur during the medical record review process and data are more likely to be incomplete compared to prospective studies. The small sample size limited the detection of other factors that could be associated with mortality and differences between PSP and SSP in regards to demographics, clinical manifestations, treatments, and outcomes. Given the multitude of statistical tests, some significant findings may have occurred by chance.

Conclusion

Spontaneous pneumothorax was relatively common whose clinical features were typical of pneumothoraces reported by others. Patients with SSP had more severe clinical manifestations, required more invasive treatment and suffered almost all of mortality rate. Prospective studies are needed to develop evidenced based algorithms, especially for SSP patients.

Acknowledgement

The authors gratefully acknowledge the financial support provided by Thammasat University under the TU New Research Scholar, Contact No. 22/2551. The authors wish to thank all research officers of Faculty of Medicine, Thammasat University who provided resources to support the present study.

Potential conflicts of interest

None.

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ความชุกอาการทางคลินิกและอัตราตายของภาวะลมในช่องเยื่อหุ้มปอดชนิดเกิดเองในผู้ป่วยในโรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติ

ณรงค์กร ซ้ายโพธิ์กลาง, อภิชาติ คณิตทรัพย์

ภูมิหลัง: *ภาวะลมในช่องเยื่อหุ้มปอดชนิดเกิดเองเป็นภาวะฉุกเฉินอย่างหนึ่งจำเป็นต้องได้รับการวินิจฉัยและรักษาอย่างรวดเร็วเพื่อป้องกันภาวะหายใจล้มเหลวและเสียชีวิต ข้อมูลด้านระบาดวิทยาและข้อมูลทางคลินิกของผู้ป่วยที่มีลมในช่องเยื่อหุ้มปอดชนิดเกิดเองในประเทศไทยยังมีข้อมูลจำกัด*

วัตถุประสงค์: *เพื่อศึกษาความชุก อาการทางคลินิกและอัตราตายของภาวะลมในช่องเยื่อหุ้มปอดชนิดเกิดเองในผู้ป่วยคนไทย*

วัสดุและวิธีการ: *การศึกษาแบบย้อนหลัง ช่วงเดือนกรกฎาคม พ.ศ. 2547 ถึง เดือนธันวาคม พ.ศ. 2553 ในผู้ป่วยที่ได้รับการวินิจฉัยภาวะลมในช่องเยื่อหุ้มปอดชนิดเกิดเองโดยรวบรวมข้อมูลด้านลักษณะประชากร สาเหตุของโรค อาการ ภาพถ่ายรังสี*

ผลการศึกษา: *ผู้ป่วยที่มีลมในช่องเยื่อหุ้มปอดชนิดเกิดเองรวม 100 ราย (แบบปฐมภูมิ 66 ราย แบบทุติยภูมิ 34 ราย) คิดเป็นความชุก 76.3 ราย ต่อผู้ป่วยที่รับไว้รักษาในโรงพยาบาล 100,000 ราย เป็นชายร้อยละ 83 อัตราส่วนชายต่อหญิงเท่ากับ 7.5 ต่อ 1 สำหรับแบบปฐมภูมิและ 4.1 ต่อ 1 สำหรับแบบทุติยภูมิ ค่าเฉลี่ย ± ส่วนเบี่ยงเบน มาตรฐานของอายุ ส่วนสูง น้ำหนัก และดัชนีมวลกายเท่ากับ 35.3±20.3 ปี 168.1±5.3 เซนติเมตร 50.8±6.2 กิโลกรัม และ 18.0±2.2 กิโลกรัมต่อตารางเมตร ตามลำดับ อาการที่พบบ่อยคือ เหนื่อย (ร้อยละ 73) เจ็บแน่นหน้าอก (ร้อยละ 68) เจ็บหน้าอกสัมพันธ์กับการหายใจ (ร้อยละ 46) ไอ (ร้อยละ 20) ไข้ (ร้อยละ 13) สาเหตุที่พบบ่อยของแบบทุติยภูมิ ได้แก่ วัณโรคปอด (19/34, ร้อยละ 55.9) โรคปอดอุดกั้นเรื้อรัง (14/34, ร้อยละ 41.2) และปอดอักเสบ (8/34, ร้อยละ 23.5) ผู้ป่วยเสียชีวิตจำนวน 12 ราย (อัตราตาย ร้อยละ 12) 11 ราย เสียชีวิตเป็นแบบทุติยภูมิ*

สรุป: *ภาวะลมในช่องเยื่อหุ้มปอดชนิดเกิดเองพบได้บ่อย มักมีลักษณะอาการทางคลินิกเป็นแบบฉบับ ผู้ป่วยที่มีภาวะลมในช่องเยื่อหุ้มปอดชนิดเกิดเองแบบทุติยภูมิมักมีอัตราตายสูง การศึกษาไปข้างหน้ามีความจำเป็นเพื่อพัฒนาแนวทางการปฏิบัติอย่างเป็นขั้นตอนโดยยึดหลักฐานเชิงประจักษ์ในการวินิจฉัยและรักษาผู้ป่วยโดยเฉพาะแบบทุติยภูมิ*