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RESEARCH ARTICLE

Clinical characteristics and hospitalization factors in pneumothorax patients: Clinical and therapeutic perspectives from Souss Massa Region

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ABSTRACT

Introduction: This study aims to investigate the clinical characteristics, therapeutic approaches, and factors influencing length of hospital stay of pneumothorax (PNO) cases.

Materials & methods: This study employed a retrospective approach. Data were collected from January 2019 to April 2023, encompassing sociodemographic information, toxic habits, medical history, clinical signs, PNO characteristics, treatment modalities, evolution, and complications.

Results: The study encompassed 158 PNO cases, predominantly males (89.2%) with a median age of 51 years [33-62]. Primary spontaneous pneumothorax accounted for 62.0% of cases, while secondary spontaneous pneumothorax (PSS) constituted 33.5% with chronic obstructive pulmonary disease as the leading cause (34.0%), followed by tuberculosis (20.8%). Drainage was the primary treatment (91.8%), with favorable outcomes in 84.2% of cases. PSS cases were associated with unfavorable evolution and longer hospital stays. Factors associated with prolonged hospitalization included female gender, PSS, total PNO, and surgical treatment.

Conclusions: This study provides valuable insights into factors influencing prolonged hospitalization of PNO cases in Souss Massa Region. Understanding these factors can aid healthcare professionals in optimizing patient management and improving outcomes.

Keywords: spontaneous pneumothorax, chest tubes, tuberculosis, pulmonary

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INTRODUCTION

Pneumothorax (PNO) presents a significant clinical challenge globally, characterized by the presence of air in the pleural cavity and a spectrum of clinical manifestations ranging from asymptomatic to life-threatening [1]. Spontaneous PNO, occurring without preceding trauma, further categorizes into primary spontaneous pneumothorax (PSP) and secondary spontaneous pneumothorax (PSS). Traumatic PNO follows injury, classified as blunt or penetrating trauma to the chest wall, or iatrogenic if arising from an invasive medical procedure [2].

Recurrence after the initial episode is prevalent, particularly in PSP, ranging from 16.0% to 52.0% in long-term follow-ups [5]. PSS exhibits an even higher recurrence rate, ranging from 40.0% to 56.0% [1], with smoking identified as a primary risk factor for both initial occurrence and recurrence [3, 4].

In Morocco, studies of PNO have been carried out in several cities. In Rabat, 138 cases were reported over a three-year period, with an average of 46 cases per year. This study revealed a favorable outcome in 89.0% of cases; a recurrence rate (11.0%) and concluded that recurrence is present whatever the proposed treatment, needle aspiration or drainage [3]while in Marrakech 203 cases were recorded, with a predominance of PSS, mainly due to chronic obstructive pulmonary disease (COPD) and tuberculosis [6].

While studies in various Moroccan cities provide insights into PNO epidemiology,

data from the Souss Massa Region are lacking. Thus, this study aims to delineate the clinical, therapeutic, and evolutionary characteristics of PNO in Souss Massa Regional Hospital's pneumology department and identify potential risk factors for prolonged hospitalization.

MATERIALS & METHODS

This descriptive retrospective study was conducted at the Souss-Massa Hospital's pneumology department in Agadir, Morocco.

Data Collection

Clinical data of PNO patients admitted from January 2019 to April 2023 were retrieved from hospital records, prescription sheets, radiological and operative reports, even liaison letters. Trained research assistants accessed the hospital's electronic database and extracted relevant information. Inclusion criteria encompassed hospitalized patients with confirmed PNO by standard radiography, whether initial or recurrent. Exclusion criteria included patients with hydropneumothorax, pyopneumothorax, hemothorax, or incomplete/unusable medical records.

Recorded data comprised sociodemographic data (age, sex), toxic habits (tobacco, cannabis, alcohol), hospitalization season, medical history, clinical signs, PNO characteristics (type and abundance of PNO), treatment, evolution and complications.

Statistical Analysis

Continuous variables were presented as median (interquartile range) for non-normal distributed variables or as mean (M) ± standard deviation (SD) for normally distributed variables. Discrete variables are expressed as absolute values and percentages.

Characteristics were compared between primary and secondary pneumothorax using the $\chi 2$ test (or Fisher's exact test if small frequencies expected [<5]) and the association between length of hospital stay and different characteristics (sociodemographic, clinical, and therapeutic) are assessed by the non-parametric Mann-Whitney test. For all tests, a p-value <0.05 was considered statistically significant. All data were analyzed with Jamovi project (Jamovi version 2.3 computer software).

Informed consent was not required due to the retrospective nature of this study. Respect for anonymity and patient confidentiality was taken into consideration when collecting data.

RESULTS

Epidemiological Profile

A total of 158 cases of PNO were collected during the reporting period, and their socio-demographic data are shown in **Table 1**.

Table 1. Socio-demographic profile

Variable		n (%)
Gender	Male	141 (89.2)
	Female	17 (10.8)
Age	15-24	15 (9.5)
	25-34	31 (19.6)
	35-44	21 (13.3)
	45-54	23 (14.6)
	55-64	37 (23.4)
	65-74	25 (15.8)
	75 and over	6 (3.8)
Hospitalization season	Winter	48 (30.4)
	Spring	38 (24.1)
	Summer	36 (22.8)
	Autumn	36 (22.8)
Smoker	Non-smoker	48 (30.4)
	Active smoker	68 (43.0)
	Weaned smoker	42 (26.6)
Cannabis consumption		31 (19.6)
Alcohol consumption		16 (10.1)

The sex ratio (male/female) was 8.29. The median age was 51 [33-62], and the age groups most affected by PNO were 55-64 years (23.4%) and 25-34 years (19.6%). The least affected age group was 75 and over, with 3.8% of cases. Winter was the season with the highest percentage of PNO cases at 30.4%, followed by spring at 24.1%, summer at 22.8% and autumn at 22.8%.

70.0% (n=110) of patients had a current or past history of smoking, 43.0% of whom were active smokers, 19.6% (n=31) of cases were cannabis users and 10.1% (n=16) were alcohol users.

Clinical Profile

Common symptoms included stabbing chest pain 130 (82.3%) and dyspnea 127 (80.4%), followed by cough 61 (38.6%) and fever 24 (15.2%). Most cases 151 (95.5%) were spontaneous PNO, with PSP accounting for 98 (62.0%), PSS for 53 (33.5%), and iatrogenic PNO for seven (4.4%). The location of PNO was unilateral in 98.1% of cases, with total PNO predominating at 65.2%, and compressive PNO in 16.5% of cases (**Table 2**).

Etiological Profile of Secondary Spontaneous Pneumothorax

Among the cases of PSS (53), COPD accounted for 34.0% of cases, while tuberculosis was identified as the etiology in 20.8% of cases. Neoplastic pathology was noted in 15.1% of cases, emphysema in 13.2%, diffuse interstitial lung disease and pulmonary infection each accounted for 5.7% of cases, asthma was present in 3.8% of cases, and silicosis was

Table 2. Distribution of cases by location, abundance, & type of pneumothorax

Characteristics of pneumothorax	n (%)
Types of pneumothorax	
Primary spontaneous pneumothorax	98 (62.0)
Secondary spontaneous pneumothorax	53 (33.6)
Iatrogenic pneumothorax	7 (4.4)
Location	
Right	78 (49.4)
Left	77 (48.7)
Bilateral	3 (1.9)
Abundance	
Partial	55 (34.8)
Total	103 (65.2)

Table 3. Distribution of cases of PSS by etiology

Etiologies of PSS	n (%)
Chronic obstructive pulmonary disease	18 (34.0)
Tuberculosis	11 (20.8)
Emphysema	7 (13.2)
Neoplastic pathology	8 (15.1)
Diffuse interstitial lung disease	3 (5.7)
Asthma	2 (3.8)
Lung infection	3 (5.7)
Silicosis	1 (1.9)
Total	(100)

observed in a single case, representing 1.9% of the total (**Table 3**).

Therapeutic & Evolutionary Profile

Drainage was the most commonly used treatment for PNOs in 91.8% of cases, with few complications reported. Therapeutic abstention with bedrest was indicated in 6.3% of cases, exsufflation in two cases and surgery in just one patient. Regarding to associated medical treatments, oxygen therapy and analgesics remained the most widely used, with percentages of 93.7% and 92.4%, respectively (**Table 4**).

The outcome was favorable in 84.2% (n=133) of cases after first-line treatment, while it was unfavorable in 15.8% (n=25). Among these unfavorable cases, eight (32.0%) failed treatment, nine (36.0%) experienced persistent PNO, five (20.0%) resulted in mortality, and three patients were discharged against medical advice.

Out of the 17 cases in which treatment failed or PNO persisted after initial intention treatment, 14 (82.4%) underwent surgery, while the remaining three (17.6%) underwent re-drainage (**Table 4**).

Table 4. Therapeutic & evolutionary profile

Treatment components		n (%)
1st line treatment	Drainage	145 (91.8)
	Therapeutic abstention w. lily rest	10 (6.3)
	Exsufflation	2 (1.3)
	Surgery	1 (0.6)
Drainage complications	No complications	143 (98.6)
	Loco-regional infection	1 (0.7)
	Subcutaneous emphysema	1 (0.7)
Associated medical treatments	Oxygen	148 (93.7)
	Analgesics	146 (92.4)
	Antibiotics	57 (36.1)
	Bronchodilators	18 (11.4)
	Antituberculosis drugs	11 (7.0)
	NSAIDs	6 (3.8)
	Respiratory physiotherapy	17 (10.8)
Progression of 1st line treatment	Favorable	133 (84.2)
	Unfavorable	25 (15.8)

Note. NSAIDs: Non-steroidal anti-inflammatories

Comparison Between Primary & Secondary Pneumothorax

The median age of PSS patients was higher than that of PSP patients (54 [39-65] vs. 44.5 [31-60], p=0.033). The proportion of men was significantly higher for PSP than for women (93 (94.9%) vs. five (5.1%) p=0.001). Unfavorable evolution was significantly associated with PSS (15 [62.5%] vs. nine [37.5%], p=0.002) (**Table 5**).

Factors Associated with Duration of Hospitalization

Length of hospital stay was significantly higher in women (p=0.006), in cases of PSS (p=0.006), in cases of total PNO (p<0.001) and in cases of first-line surgical treatment (p<0.001) (**Table 6**).

DISCUSSION

According to the results obtained, 158 cases were collated, including 98 PSP, 53 PSP and seven iatrogenic pneumothoraxs. The age of the population studied ranged from 15 to 89 years, with a median of 51 [33-62] years and a predominance of the 55-64 age group (23.4%), followed by the 25-34 age group (19.6%). In the literature, a peak has already been reported over the age of 55, associated with underlying chronic lung diseases (mainly COPD). These results are close to those reported in the study carried out in England [12], which found a bimodal age distribution, with one group aged 15-34, and another over 60.

The study showed that males predominated at 89.0%, with a male/female sex ratio of 8.29. This male predominance has been reported in numerous studies [3, 4] and may be explained by the high frequency of smoking (tobacco and

Table 5. Comparison between PSP & PSS

	PSP (n=98)	PSS (n=53)	p-value
Age	44.5 [31-60]	54 [39-65]	**0.033***
Gender			**0.001****
Men	93 (94.9)	41 (77.4)	
Woman	5 (5.1)	12 (22.6)	
Smoking	72 (73.5)	31 (58.5)	0.059**
Cannabis consumption	26 (26.5)	3 (5.7)	**0.002****
Season			0.686**
Winter	32 (32.7)	15 (28.3)	
Spring	25 (25.5)	11 (20.8)	
Summer	21 (21.4)	12 (22.6)	
Autumn	20 (20.4)	15 (28.3)	
Pneumothorax location			0.728***
Right	52 (53.1)	24 (45.3)	
Left	44 (44.9)	28 (52.8)	
Bilateral	2 (2.0)	1 (1.9)	
Evolution after 1er intention treatment			**0.002****
Unfavorable	9 (9.2)	15 (28.3%)	
Favorable	89 (90.8)	38 (71.7)	

Note. *Mann-Whitney U test; **$\chi 2$ test; & ***Fisher's exact test

Table 6. Factors associated with duration of hospitalization

Variables	Length of hospital stay	p-value
Gender		**0.006***
Men	6.0 [4.0-10.0]	
Woman	13.0 [6.0-17.0]	
Tuberculosis	11.0 [9.5-14.5]	**0.025***
Type of pneumothorax		**0.006***
Primitive spontaneity	6.0 [4.0-9.0]	
Secondary spontaneous	8.0 [5.0-13.0]	
Abundance		**<0.001***
Partial	5.0 [3.0-7.0]	
Total	7.0 [5.0-12.5]	
Treatment of 1er intention		**<0.001****
Therapeutic abstention	2.5 [2.0-3.0]	
Drainage	7.0 [4.0-11.0]	
Exsufflation	5.0 [4.0-6.0]	
Surgery	13.0 [13.0-13.0]	

Note. *Mann-Whitney U test & **Kruskal-Wallis test

cannabis) in men more than women, but biological differences may also play a role [2]. Smoking was considered the main risk factor for the occurrence of PNO and essentially PSP, indeed in this series, patients smoked more (70.0%) than the general population (13.4%). If in this study the p-value of the association between smoking and PSP was marginal (p=0.059), this may be due to the limitation of the sample size.

On the other hand, there was an association between cannabis use and PSP (p=0.002). Larger studies may help confirm the significance of cannabis use as a potential risk factor for PNO, warranting comprehensive assessments and interventions targeting both tobacco and cannabis smoking habits in at-risk populations.

The seasonality of PNO remains a matter of debate. It has previously been reported that PNO occurs in clusters, and that these clusters are thought to be related to changes in atmospheric pressure.

On the other hand, a possible seasonality could be explained by the resurgence of respiratory infections in winter rather than by changes in atmospheric pressure, on the other hand and in agreement with [7] in the present study, no significant difference in the seasonal distribution of hospitalizations was observed between PSP and PSS.

In agreement with our findings, the clinical picture in the studies is dominated by chest pain in 90.0% to 95.0% of cases, followed by dyspnea in 60.0% to 85.0% [3, 12, 13] Chest radiography in several studies [4, 6, 10] shows a high frequency of unilateral total PNO followed by partial, with rare cases of bilateral PNO, for an equal rate between the right and left seats, which is in line with the results of our study.

PSS is associated with manifest structural lung disease, the most common underlying cause of which is COPD [14], indeed in this study the etiologies of PSS are dominated by COPD at 34.0%, followed by tuberculosis at 20.8% these results are comparable to those of the study carried out in Rabat, Morocco [3], Tunisia [4], and Senegal[9]. In Germany [8], COPD is also the leading etiology, followed by pneumonia, while in Asian countries, tuberculosis remains the most common cause of PSS [11]. These insights can inform targeted screening and preventive strategies, particularly among high-risk populations.

Therapeutically, the choice of treatment was thoracic drainage in 91.8%; this is consistent with previous observational data [4, 9] also noting the low popularity of aspiration. In this study, abundance of PNO and 1er intention treatment were highlighted as risk factors for prolonged hospital stay, indeed a systematic review found that simple aspiration was associated with shorter hospital stay and might have resulted in fewer adverse events. Another previous study [16] suggested that larger pneumothoraxes are associated with a higher risk of treatment failure. emphasizing the need for careful consideration in treatment selection and patient management strategies.

The influence of age and gender on the characteristics of spontaneous PNO was demonstrated, suggesting that PNO in men and women are largely different diseases. In

concordance with [15], in this study secondary PNO also presents specific characteristics from an epidemiological point of view (older age) and results in terms of length of stay and longer drainage time, especially in the case of PSS due to tuberculosis.

CONCLUSIONS

The 20.8% of spontaneous PNO cases are due to pulmonary tuberculosis, meaning that tuberculosis is one of the main etiological factors in PSS, and smoking (tobacco and cannabis) the main risk factor in PSP. Hence the importance of smoking cessation as a step-in treatment, and in preventing recurrence. Spontaneous PNO was more common in men than in women, with a bimodal age distribution. Ather studies are needed to determine whether such a conservative approach is well tolerated, prevents long hospital stays and PNO recurrence, and whether initial PNO size has an impact on outcome.

Author contributions: FE: conceived and designed the study; **NE, ZI** and **GE:** collected the data; **FE** and **SM:** performed the statistical analysis of study data; **FE, AL** and **HB:** wrote the first manuscript draft; **MO:** directed the project and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

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Ethics statement: The authors stated that the study is retrospective & approved by the regional directorate of health and social welfare, Souss-Massa region (N: 2471 on 03 mai 2023); no approval is mandatory. To ensure data security and anonymity, encryption was implemented, anonymized identifiers were used, and data access was restricted to authorized personnel only.

Declaration of interest: No conflict of interest is declared by the authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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