

Clinical-epidemiological characterization of patients with parapneumonic pleural effusion treated in acute respiratory disease wards

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ABSTRACT

Introduction: among the most frequent complications of acute respiratory infections is parapneumonic pleural effusion. It is associated with bacterial pneumonia, lung abscesses or bronchiectasis. Its right management is still a matter of discussion regarding its evolution, diagnosis, prognosis and treatment. **Objective:** to clinical-epidemiologically characterize patients with uncomplicated parapneumonic pleural effusion in acute respiratory disease wards of the "Vladimir Ilich Lenin" University General Hospital in the province of Holguín, in the period from May 2020 to May 2021. **Method:** an observational, descriptive, cross-sectional study was conducted at the "Vladimir Ilich Lenin" University General Hospital. The universe was composed of 50 patients with uncomplicated parapneumonic pleural effusion; they were all studied. Descriptive statistic was used. **Results:** female patients (56 %) and patients older than 61 years old (60 %) predominated. Smoking was present in 25 patients (50 %) as a risk factor. Arterial hypertension was the main personal pathological history in 20 patients (40 %). Seventy-two percent of the cases developed it from admission and 60 % presented a hospital stay of less than one week. Twenty-three patients were cured (46 %). **Conclusions:** this disease occurs more frequently since admission in older women, with history of arterial hypertension and smoking. The evolution and hospital stay depend on the risk factors and the personal pathological history of each patient.

Keywords: Pleural effusion; Epidemiology; Clinical Study; Respiratory System Infections; Bacterial pneumonia.

Acute respiratory infections (ARI) are the most frequent nosological entities during life¹. They comprise a wide range of diseases that can affect the upper and/or lower respiratory tract². Among the latter, pneumonia is among the leading causes of hospitalization and mortality^{3,4,5}.

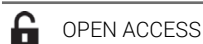
Pneumonia is an inflammatory process of the lung parenchyma, recognizable radiologically and by its clinical picture. In Cuba, it is positioned as the fourth cause of death in all ages. In 2019, there were 8 923 deaths in patients with influenza and

pneumonia, figures that dropped considerably to 7 011 in 2020^{6,7}.

Pneumonia complications occur when the infection becomes complex and spreads to neighboring areas of the lung parenchyma. Among the most common are: pulmonary empyema, pneumothorax, bronchopleural fistula, lung abscess, necrotizing pneumonia, pyopneumothorax, and parapneumonic pleural effusion (PPE)⁸. The latter constituted the object of study in this research.

Pleural effusion (PE) occurs when there is an imbalance between the mechanisms of fluid production and reabsorption in the pleural space, which produces a clinically evident accumulation^{9,10}. Any pleural effusion associated with bacterial pneumonia, lung abscess, or bronchiectasis is defined as parapneumonic, since infection of the lung parenchyma compromises the pleural space with increased fluid¹¹.

PPEs can be classified as complicated (they require drainage for their cure, in addition to antibiotics) and uncomplicated (only with antibiotics)¹². Its etiology is very diverse, but biological agents such as pyogenic cocci, acid-alcohol-resistant bacilli (AARB) and gram-negative bacilli stand out as its main causal agents^{11,13}.



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Conflict of interest

The authors declare no conflict of interest.

PPEs represent the most frequent cause of exudative-type effusions, and the third most frequent cause of PE, only surpassed by malignant effusions and heart failure. They occur in up to 20-57 % of hospitalized patients with pneumonia and have a high mortality rate (10-20 %) ^{12,14}.

Acute respiratory infections are one of the leading causes of death worldwide due to the complications they present. Among these, the PPE is one of the most frequent.

This study was carried out with the objective of characterizing the clinical-epidemiological behavior of patients with uncomplicated PPE in acute respiratory disease wards of the “Vladimir Ilich Lenin” University General Hospital of the province of Holguín, in the period from May 2020 to May 2021.

METHOD

Type of study: an observational, descriptive, cross-sectional study was conducted in patients with uncomplicated PPE in acute respiratory disease wards of the “Vladimir Ilich Lenin” University General Hospital of the province of Holguín, in the period from May 2020 to May 2021.

Universe and sample: the universe was composed of 50 patients with uncomplicated PPE, at the period and study site. The entire universe was studied. All patients admitted with a diagnosis of pneumonia or bronchopneumonia associated with PE on admission or during its evolution, with complete medical records, were included in the study. Patients who developed a complicated PE requiring surgical treatment or who were transferred to another hospital institution were excluded.

Variables and data collection: medical records were reviewed, from which data were collected according to the variables to be studied: age, sex, risk factors, personal medical history, diagnosis on admission, hospital stay and clinical evolution.

In relation to the risk factors, patients with smoking (cigarette consumption with more than one month of evolution), alcoholism (chronic behavioral disorder manifested by repeated excessive intake of alcohol), risk occupation (exposure to toxic substances in the work environment), chronic respiratory diseases (patients with a personal history of bronchial asthma, bronchiectasis, chronic bronchitis, pulmonary emphysema, chronic obstructive pulmonary disease) and immunosuppression (history of long-term steroid treatment or immunological disease) were identified. The personal medical history evaluated was: diabetes mellitus, arterial hypertension, ischemic heart disease, lung neoplasm, anemia, and others (liver cirrhosis, hyperthyroidism, and systemic lupus erythematosus).

Regarding the diagnosis on admission, a patient with pneumonia was defined as anyone with focal infection of the lung parenchyma, with bronchopneumonia, with diffuse infection of the lung parenchyma and pleuropneumonia, as well as with PE secondary to pneumonia or bronchopneumonia.

Regarding the clinical evolution, the healed patients were asymptomatic with a regular physical examination and evolutionary X-rays; the patients with a positive evolution presented some symptom or physical or radiological sign to a lesser extent with respect to admission; and the deceased corresponded to deaths during treatment and evolution of the disease in the hospitalization period.

Statistical processing: a model was created to collect the information, which was processed in a database in Microsoft Excel 2013. The analysis performed was descriptive, with absolute and relative percentage frequencies, obtained using the Epidat program version 4.0.

Ethical standards: this study was approved by the Medical Ethics Committee and the Scientific Council of the hospital institution. The ethical principles established in the II Declaration of Helsinki ¹⁵ were respected, as well as the bioethical principles of beneficence, non-maleficence, justice and autonomy.

RESULTS

Female patients (56 %) and patients older than 61 years old (60 %) predominated, as shown in Table 1.

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
18-40 years old	4	8	4	8	8	16
41-60 years old	4	8	8	16	12	24
61 years old or older	14	28	16	32	30	60
Total	22	44	28	56	50	100

Source: individual medical records.

Smoking was the main risk factor and was present in 25 patients, which is 50% of the studied subjects (Table 2).

Risk factors	No.	%
Smoking	25	50
Alcoholism	15	30
Risk occupation	6	12
Chronic respiratory diseases	15	30
Immunosuppression	19	38

There were 20 patients (40 %) with arterial hypertension as a personal pathological history (Table 3).

Personal medical history	No.	%
Diabetes Mellitus	12	24
Arterial hypertension	20	40
Ischemic heart disease	10	16
Lung neoplasm	5	10
Anemia	3	6
Others	9	18

72 % (n=36) presented the diagnosis of pleuropneumonia from the beginning (Table 4).

Diagnostics on admission	No.	%
Pneumonia	8	16
Pleuropneumonia	36	72
Bronchopneumonia	6	12
Total	50	100

Patients with a hospital stay of less than a week predominated, with a total of 30 patients (60 %). Twenty-three patients were cured, which represented 46 % (Table 5).

DISCUSSION

Age is a factor of great importance, from the point of view of diagnosis to the evolution of respiratory disease. This is because the immune system tends to weaken with age, and more comorbidities may occur, increasing the risk of respiratory complications.

In a study conducted in Mexico in 2019 by Villareal *et al.*¹⁶ about PE, a predominance of males and a mean age of 56 years old were observed, data

not similar to those of this study.

On the other hand, Bravo¹⁷ in his article describes a numerical superiority of the male sex and for the population over 65 years old. This one coincides in terms of age, but not with sex.

According to the authors' criteria, the predominance of females and the elderly in this study may be due to the demographic characteristics of Cuba and, above all, in the province of Holguín. It should be noted that 40 % of patients with respiratory complications of this magnitude were young adults. This forces to reflect on the effectiveness of immunization schedules in Primary Health Care against germs in the community, applied to older adults, such as anti-Haemophilus influenzae and anti-pneumococcal flu vaccines, which makes a 20% difference between young adults and older adults.

In the study by Villarreal *et al.*¹⁶ it was observed that, among the relevant medical records, 37 % of the patients had a history of smoking. Something similar happens with the investigation of Osma¹⁸, where 42 % of the patients had such history. This research agrees with both studies.

These results are related to the increase in smoking worldwide, even from early ages. Cuba is not an exception. The causes that favor this consumption among the youngest are the low price of cigarettes, the ease access, social acceptance and advertising campaigns, especially focused on young population, by associating tobacco with a certain lifestyle: independence, success, sexual freedom, and group and personal identification.

This risk factor leads, over time, to a faster decline in lung function than that observed in non-smokers. Irritant substances are the components of tobacco smoke that produce major pathophysiological disorders in the respiratory system and mucociliary function, and those that are capable of inducing inflammatory and immunological reactions in the bronchi and lung parenchyma. Likewise, they condition greater susceptibility to infections¹⁸.

Risk factors for the development of PPE differ in different studies. In some, an association has been found with extreme age, male sex, weakness, pneumonia requiring hospitalization and diseases such as diabetes, alcoholism, gastroesophageal reflux disease and chronic obstructive pulmonary disease¹⁸.

PE is a condition that frequently presents a high morbidity and mortality. Its incidence is increasing around the world at any age. Hence the importance of identifying the risk factors associated with this condition as the first step in improving its diagnosis and treatment¹⁸.

The great representation of patients with arterial hypertension and diabetes mellitus in the present study can be explained due to the high prevalence in Cuba of patients with chronic non communicable diseases, where these are among the first places. In addition, it

Table 5. Distribution of patients according to hospital stay and clinical evolution at discharge								
Clinical evolution at discharge	Hospital stay						Total	
	Less than a week		Between 1 and 2 weeks		more than 2 weeks			
	No.	%	No.	%	No.	%	No.	%
Cured	10	20	8	16	5	10	23	46
Better	15	30	5	10	2	4	22	44
Deceased	5	10	-	-	-	-	5	10
Total	30	60	13	26	7	14	50	100

is considered that the association of several diseases in a patient favors immunosuppression and infectious complications. In this study, there is a high number of subjects with metabolic, hepatic and immunological diseases that, together with other risk factors described above, make them candidates for the invasion of opportunistic germs.

These data coincide with those obtained in the study by Ozol *et al.*¹⁹, where of 107 patients with PPE, diabetes mellitus was one of the main concomitant diseases.

The high frequency of respiratory complications of the patients at admission in the study differs from what was stated in the study by Osma¹⁸, where 90 % of the patients were diagnosed with PE in the first 48 hours of the diagnosis of pneumonia.

It can be speculated that this is related to the research study period, coinciding with the increase in cases infected by SARS-COV-2, the coronavirus that causes COVID-19, which despite the management of our country and the Ministry of Public Health to carry out active investigations of acute respiratory conditions with their timely isolation, there is social indiscipline and low risk perception, which is why symptoms are sometimes hidden from health guardians and belatedly seek medical assistance with an inevitable complication.

This, together with other factors, leads to an unfavorable evolution of the disease. In addition, without dismissing the fact that most patients are older adults with comorbidities that lead to immunosuppression and, consequently, the invasion of opportunistic germs that develop complications such as the one addressed in the present study. It should not be forgotten that the pleural cavity can be infected by germs that come from the lung or from distant sites by hematogenous or lymphatic spread.

It differs from the research by Osma¹⁸, where the median duration of therapy was 10 days and half of the patients remained hospitalized between 6 and 14 days under antimicrobial treatment, since in the present study there was a stay of approximately 7 days.

Patients with PPE have a higher mortality compared to patients with pneumonia without this complication. Other studies, such as the one by Kim *et al.*²⁰, show a length of hospital stay that ranges between 16 and 18 days, with which they also differ.

The duration may vary depending on the patient and depending on the need to perform invasive procedures, the existence of uncontrolled comorbidities, the need for prolonged intravenous treatment and possible complications that arise during hospitalization¹⁸.

Among the factors associated with prolonged stay in patients with this entity, the presence of fever, empyema, COPE, diabetes mellitus, cirrhosis, heart failure, HIV or AIDS, alcohol abuse, mental retardation or dementia, epilepsy, quadriplegia, Parkinson's disease, cancer, bronchiectasis, malnutrition, immunosuppressive therapy, need of pleural drainage or decortication, unfavorable radiological course, presence of polymorphonuclear elastase in pleural fluid, elevated level of LDH (lactate dehydrogenase) in pleural fluid, low blood O₂ pressure, low hemoglobin level, high neutrophil count and positive microbiological isolation²⁰.

CONCLUSIONES

PPE occurs more frequently since admission in older women, with history of hypertension and smoking. The evolution and hospital stay depend on the risk factors and personal pathological history of each patient.

AUTORÍA

Shannon Elizabeth Carcasés-Lamorú: conceptualization, formal analysis, research, methodology, writing - original draft, writing-review and editing.
Ramona Lamorú-Turro: project administration, supervision, validation.

Alexander Rodríguez-Camacho: conceptualization, formal analysis, research, methodology, writing - original draft, writing-review and editing.

Frank Miguel Hernández-Velázquez: data curation, research, writing – original draft, writing-review and editing.

Alisandra Aballe-Betancourt: project administration, supervision, validation.

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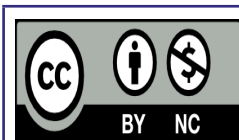
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Caracterización clínico-epidemiológica de pacientes con derrame pleural paraneumónico atendidos en salas de enfermedades respiratorias agudas

RESUMEN

Introducción: entre las complicaciones más frecuentes de las infecciones respiratorias agudas se encuentra el derrame pleural paraneumónico. Está asociado a neumonías bacterianas, abscesos pulmonares o bronquiectasias. Su correcto manejo es aún motivo de discusión en lo concerniente a su evolución, diagnóstico, pronóstico y tratamiento. **Objetivo:** caracterizar el comportamiento clínico-epidemiológico de los pacientes con derrame pleural paraneumónico no complicado en salas de enfermedades respiratorias agudas del Hospital General Universitario “Vladimir Ilich Lenin” de la provincia de Holguín, en el periodo comprendido entre mayo de 2020 y mayo de 2021. **Método:** se realizó un estudio observacional, descriptivo, de corte transversal en el Hospital General Universitario “Vladimir Ilich Lenin”. El universo estuvo compuesto por 50 pacientes con derrame pleural paraneumónico no complicado; todos fueron estudiados. Se utilizó la estadística descriptiva. **Resultados:** predominaron los pacientes del sexo femenino (56 %) y con edades mayores a 61 años (60 %). El tabaquismo estuvo presente en 25 pacientes (50 %) como factor de riesgo. La hipertensión arterial fue el principal antecedente patológico personal en 20 pacientes (40 %). El 72 % de los casos lo desarrolló desde el ingreso y el 60 % presentó una estadía hospitalaria inferior a una semana. Alcanzaron la curación 23 pacientes (46 %). **Conclusiones:** esta enfermedad se presenta con mayor frecuencia desde el ingreso en mujeres mayores, con antecedentes de hipertensión arterial y tabaquismo. La evolución y estadía hospitalaria dependen de los factores de riesgo y los antecedentes patológicos personales de cada paciente.

Palabras clave: Derrame pleural; Epidemiología; Estudio Clínico; Infecciones del Sistema Respiratorio; Neumonía bacteriana.



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