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Clinical-epidemiological characterization of pneumonia, complicated with pleural effusion in children admitted to the "Pepe Portilla" Pediatric Hospital

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ABSTRACT

Introduction: acute respiratory infections are a serious health problem as they are the main cause of infant morbidity and mortality in the world, especially during the first year of life. Objective: to clinically and epidemiologically characterize complicated pneumonia with pleural effusion in children admitted to the Intensive Care Unit of the "Pepe Portilla" Pediatric Hospital. Method: an observational, descriptive, cross-sectional study was carried out that included a universe of 80 patients with complicated pneumonia with pleural effusion, admitted to the Intensive Care Unit of the "Pepe Portilla" Pediatric Hospital; the sample matched the universe. Results: children under 5 years of age were more affected for 77.5% and males predominated (60%). Fever and polypnea were present in 15% of the patients. Streptococcus pneumoniae (8.7%) was the predominant germ in the pleural fluid. The combination of antibiotics and fibrinolytics (91.3%) was the predominant therapeutic combination. Sepsis stood out as the most frequent complication (22.5%) and the predominant stay of patients in the Intensive Care Unit was 10 days or less, with 65 patients. Conclusions: the most affected age group was under 5 years old, the predominant sex was male and the most frequent symptoms were fever and polypnea. Streptococcus pneumoniae was the microorganism responsible for the appearance of this disease and the hospital stay in said unit was less than 10 days.

Keywords: : Pleural effusion; Respiratory system infections; Pneumonia; Pediatrics.

Acute respiratory infections are a serious health problem as they are the main cause of infant morbidity and mortality in the world, especially during the first year of life. These conditions are the main reason for consultation in pediatric emergency departments and a significant number of patients evolve without complications[1].

It is estimated that 150 million children develop the disease each year, 11 million are hospitalized due to pneumonia and almost all of them live in developing countries; for every child who dies of pneumonia in a developed country, more than 2 000 die in a developing country[2].

Paraneumonic pleural effusion (PPE) is associated with a pulmonary infection, usually pneumonia, abscess or infected bronchiectasis. Between 20 % and 57 % of bacterial pneumonias are accompanied by PPE during their clinical course, and about 40 % of these are complicated PPE or empyema[3].

PPE occurs more frequently at both ends of life, and two thirds of patients with complicated PPE or empyema have an associated risk factor such as pulmonary disease[4].

In Latin America and the Caribbean, more than 80 000 children under 5 years old die each year from respiratory tract infections, 85 % of them from pneumonia in 2007[4].

In Cuba, influenza and pneumonia occupy the fourth place among the causes of infant mortality and they are the main cause of death for infectious origin[5]. Mortality due to pneumonia has decreased considerably in recent years and in the different ages of childhood it has achieved rates, similar to those of developing countries, but in spite of this result, pneumonia continues to be a major health problem[6].

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Conflict of interest
The authors declare no conflict of interest.

Therefore, the aim of this article is to clinically and epidemiologically characterize pneumonia, complicated with pleural effusion in children admitted to the Intensive Care Unit of the "Pepe Portilla" Pediatric Hospital from September 2017 to April 2019.

METHOD

Type of study: an observational, descriptive, study was carried out in patients with a diagnosis of pneumonia, complicated with pleural effusion admitted to the Intensive Care Unit (ICU) of the "Pepe Portilla" Provincial Pediatric Hospital of Pinar del Río from September 2017 to April 2019.

Universe and sample: the universe was composed of 80 patients with diagnosis of pneumonia, complicated with pleural effusion in the aforementioned period admitted to the ICU of the "Pepe Portilla" Provincial Pediatric Hospital; the sample coincided with the universe.

Variables and data collection: the studied variables were: age, sex, symptoms and signs (fever, flank pain, polypnea, tugging, tachycardia, groaning, nasal flaring), microorganisms isolated in the pleural fluid, used therapeutic combinations (antibiotic therapy, fibrinolytics, pleurotomy, thoracotomy, videothoracoscopy), complications (pyopneumothorax, broncho-pleural fistula, atelectasis, pneumothorax, pneumatocele, empyema, septic empyema, sepsis) and hospital stay (less than 10 days, 10 to 20 days, more than 10 days). The information was extracted from medical records.

Statistical processing: for the processing and analysis of information, a database was created in the SPSS version 21.0 statistical package, which allowed the calculation of absolute and relative percentage frequencies. Descriptive statistics were used.

Ethical standards: the study was approved by the Scientific Council and the Ethics Committee of the "Pepe Portilla" Provincial Pediatric Hospital of Pinar del Río. No therapeutic intervention was performed during the study and the confidentiality of the obtained data was respected. The bioethical principles of the studies with human beings, established in the II Declaration of Helsinki and in the Cuban ethical norms, were kept as a premise.

RESULTS

Patients under 5 years old predominated (77,5 %) and 60 % were male (Table 1).

There was a predominance of fever and polypnea (15 % each) as the most frequent symptoms presented by patients, followed by tugging (14 %), tachycardia (14 %), groaning (11 %), nasal flaring (10 %), decreased vesicular breath (10 %), consciousness disorder (8 %) and flank pain (3 %).

Streptococcus pneumoniae was the most common microorganism found in the pleural fluid culture (8,7 %), no fungal growth was obtained. In 28 cases (35 %) there was no bacterial growth (Table 2).

Table 1. Distribution of patients according to age group and sex. Intensive Care Unit of the "Pepe Portilla" Pediatric Provincial Hospital, Pinar del Río. September 2017- April 2019

Age groups	Male Sex		Female Sex		Total	
	No.	%	No.	%	No.	%
< 5 years old	35	43,8	27	33,8	62	77,5
5 to 9 years old	9	11,2	1	1,2	10	12,5
10 to 14 years old	4	5	3	3,8	7	8,8
≥15 years old	0	0	1	1,2	1	1,2
Total	48	60	32	40	80	100

Source: medical records

Existió predominio de la fiebre y la polipnea (15 % cada uno) como síntomas más frecuentes presentados por los pacientes, seguido del tiraje (14 %), taquicardia (14 %), quejido (11 %), aleteo nasal (10 %), disminución del murmullo vesicular(10 %), alteraciones de la conciencia (8 %) y dolor en punta de costado (3 %).

El *Streptococcus pneumoniae* fue el microorganismo más encontrado en el cultivo del líquido pleural (8,7 %), no se obtuvo crecimiento de hongos. En 28 casos (35%) no existió crecimiento bacteriano (Tabla 2).

Table 2. Microorganisms isolated in the culture of the liquid plural

Microorganisms	No.	%
No bacterial growth	28	35
Streptoccocus pneumoniae	7	8,7
Staphylococcus aureus	5	6,2
Streptococcus pyogenes	2	2,5
Haemophilus influenzae	1	1,2
Total	43	53,6

Antibiotic therapy and fibrinolytics were used in 91,3 % of the cases and pleurotomy was the surgical procedure used in 42,5 % (Table 3).

Table 3. Used therapeutic combinations		
Therapeutic	No.	%
Conservative therapeutics		
Antibiotic therapy	80	100
Antibiotic therapy and fibrinolytics	73	91,3
Surgical therapeutics		
Pleurotomy	34	42,5
Thoracotomy	10	12,5
Videothoracoscopy	3	3,7

Sepsis was the most frequent complication, occurring in 22,5 % of patients (Figure 1).

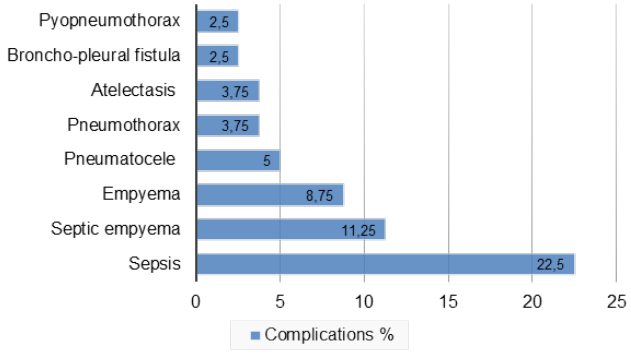

Figure 1. Complications in patients with pneumonia.

The predominant length of stay of patients in the ICU was 10 days or less, with 65 patients (Table 4).

Tabla 4. Distribution of patients according to hospital stay in the ICU		
Hospital stay	No.	%
≤ 10 days	65	81,3
11 to 20 days	12	15,0
> 20 days	3	3,7
Total	80	100

DISCUSSION

Community-acquired pneumonia (CAP) is a common disease in childhood, the diagnostic and therapeutic management of which involves the care of various pediatric specialties[7,8,9].

Studies in the communities of United States and Finland found an annual incidence of CAP between 34 and 40 cases per 1 000 children under 5 years old, higher than in any other age group, except the elderly over 75 years old. These rates are similar to those reported in two recent prospective investigations in Spain, which showed a range of 30,3 to 36 per 1 000 children under 5-6 years old[10].

The incidence of CAP is clearly lower in older children, with 11 to 16 cases per 1 000 children over 5 years old; in hospitalized children it is variable and ranges from 3 to 10,9 per 1 000 children under 5 years old according to contemporary European and North American studies. Within this range are the rates found in two Spanish studies, where 15,65 and 23 % of children with CAP required hospital admission[9,10].

Most studies find a discrete predominance of CAP in boys, both at a community and hospital level. The results obtained in the province of Pinar del Río, Cuba, coincide with previous data in terms of age and sex[10,11].

Typical bacterial pneumonia is characterized by high fever with chills, pleuritic and/or abdominal pain. There is usually a cough, although it may be mild, and pulmonary auscultation, which initially may be normal, it will later reveal hypoventilation, crackles and/or a bronchial breath. Atypical pneumonia is in most cases subacute and does not significantly affect the general condition[12].

Cough is the predominant symptom and it is usually accompanied by fever, myalgia, rhinitis, pharyngitis and/or myringitis. Flank pain is uncommon, although there may be generalized chest pain in association with repeated attacks of dry cough. It tends to affect older children, in whom a discrepancy is frequently observed between the copious respiratory semiology and the scarce affectation of the general condition[13]. These symptoms and signs coincide with those presented by the patients in this investigation.

Streptococcus pneumoniae is the main bacterial agent of CAP. The reported prevalence of pneumococcal etiology in CAP varies according to the diagnostic methods used and reaches 37-44 % in hospital studies using multiple specific techniques (serology, immunofluorescence, polymerase chain reaction). It affects all age groups and it is possibly overestimated in the hospital environment because it causes a more serious disease than atypical germs such as Mycoplasma pneumoniae and Chlamydia pneumoniae. The latter are identified in 6 to 40 % of CAP cases and they are more common in children between 5 and 15 years old[2,14].

The diagnosis of CAP is made on the basis of epidemiological (seasonality, child age), clinical and, if available, radiological and analytical data. In this way, a rational treatment can be established, avoiding the unnecessary use of antibiotics[14].

The implementation of a rational antibiotic use program in institutions is a practice that guarantees adequate management of antimicrobials, promoting their optimal selection to generate better clinical results for both, the patient and the institution[10,14].

The place of treatment (at home, in the hospital general ward or in the ICU) frequently determines the extent of diagnostic evaluation, the choice and route of administration of antimicrobial therapy, the intensity of clinical observation and the economic cost[11,12]. A wrong decision regarding ICU hospitalization can lead to severely ill patients not treated in a timely manner when necessary, or to patients being admitted to the ICU without criteria[13].

The consequences of this are, in the first case, a delay in the initiation of treatment or inadequate treatment, and in the second case, wasting resources on patients who do not need it. It should be taken into consideration that the cost of treating pneumonia in hospitalized patients is up to 25 times higher than that of outpatient treatment[15].

The appropriate choice of the patient's hospitalization place optimizes the use of intensive care resources, since it selects patients who will really benefit from ICU care or high-level monitoring; it avoids the delay in the transfer to ICU of patients, initially hospitalized in other units, a delay that is associated with increased mortality. The correct choice of a treatment place can optimize initial antibiotic therapy[16,17].

Álvarez-Andrade et al.[1] state that complications of pneumonias occur when the infection is not limited to the lung parenchyma, but extends to neighboring areas, or when the development of the infection is more complex than usual for different reasons. This modifies the clinical course of the initial pneumonia and constitutes a challenge in its management, since there are no totally unified criteria for its treatment.

The complications of community-acquired pneumonia (CAP) are: parapneumonic pleural effusion, pulmonary empyema, pneumothorax, bronchopleural fistula, lung abscess, necrotizing pneumonia and pyopneumothorax. These complications account for only 1 % of the complications, but this percentage increases to almost 40 % in the case of hospital admission, so it is considered a fundamentally hospitalized disease[5].

In the study carried out in Cuba by Álvarez-Andrade et al.[1], the main complication was pleural effusion; in the neutrophil count, erythrocyte sedimentation rate and positive C-reactive protein the values above the mean predominated, most patients presented hypoalbuminemia.

Álvarez-Andrade et al.[1] obtained a length of stay of more than seven days, which is in agreement with the results obtained in the present study. The length of stay can be considered as an indicator of the patient's evolution in intensive care and it plays an important role in the prognosis of the cases. Gónzalez et al.[5] reported in patients under five years old with pneumonia, that a longer length of stay was independently associated with mortality, with a longer hospital stay being a death indicator.

In developed countries mortality due to CAP is practically nil in pediatric patients, which contrasts with developing countries where CAP is the main cause of infant mortality, responsible for 2 million deaths in children annually (20 % of infant mortality)[11].

Mortality in healthy children with CAP complicated by effusion can be as high as 3 %[2]. Pneumonia is responsible for 15 % of all deaths in children under 5 years old worldwide[14]. In Cuba, mortality due to respiratory infections in children in 2017 was 23 per 10 000 inhabitants[14].

CONCLUSIONS

The most affected age group was children under 5 years old, the predominant sex was male and the most frequent symptoms were fever and polypnea. Streptococcus pneumoniae was the microorganism responsible for the appearance of this disease; antibiotics and fibrinolytics were used and sepsis predominated as the most severe complication. The predominant hospital stay in this unit was 10 days or less.

AUTHORSHIP

Eduardo Enrique Cecilia-Paredes: conception and study design, data acquisition, discussion and interpretation of the results, statistical analysis, drafting of the article final version.
Angel Echevarria-Cruz and Elizabeth Cecilia-Paredes: conception and study design, data acquisition, statistical analysis and interpretation of the results, approval of the article final version.
Ernesto Alejandro García-Peña: conception and study design, critical review of the study.
Freilim Moreno-Ramos: conception and study design, data acquisition, statistical analysis and interpretation of the results.
Adrían Ernesto Alvares-Gómez: conception, study design and approval of the article final version.

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Caracterización clínico-epidemiológica de la neumonía complicada en niños hospitalizados en el Hospital Pediátrico "Pepe Portilla"

RESUMEN

Introducción: las infecciones respiratorias agudas constituyen un grave problema de salud al ser causa principal de morbilidad y mortalidad infantil en el mundo, sobre todo durante el primer año de vida. Objetivo: caracterizar clínico y epidemiológicamente las neumonías complicadas con derrame pleural en niños ingresados en la Unidad de Cuidados Intensivos del Hospital Pediátrico "Pepe Portilla". Método: se realizó un estudio observacional, descriptivo, de corte transversal que incluyó un universo de 80 pacientes con neumonía complicada con derrame pleural, ingresados en la Unidad de Cuidados Intensivos del Hospital Pediátrico "Pepe Portilla"; la muestra coincidió con el universo. Resultados: fueron más afectados los niños menores de 5 años de edad para un 77,5 % y predominó el sexo masculino (60 %). La fiebre y la polipnea estuvieron presentes en el 15 % de los pacientes. El *Streptococcus pneumoniae* (8,7 %) fue el germen que predominó en el líquido pleural. La combinación de antibióticos y fibrinolíticos (91,3 %) fue la combinación terapéutica que predominó. La sepsis destacó como la complicación más frecuente (22,5 %) y la estadía predominante de los pacientes en la Unidad de Cuidados Intensivos fue de 10 días o menos, con 65 pacientes. Conclusiones: el grupo etario más afectado fue el de menores de 5 años, el sexo que predominó fue el masculino y los síntomas más frecuentes fueron la fiebre y la polipnea. El Streptococcus pneumoniae fue el microorganismo responsable de la aparición de esta enfermedad y la estadía hospitalaria en dicha unidad fue inferior a 10 días

Palabras clave: Derrame pleural; Infecciones del sistema respiratorio; Neumonía; Pediatría.