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## Clinical, Aetiologic, And Evolution-Related Aspects Of Pleurisy In Children

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### ABSTRACT

**Objectives:** Establishing the frequency of pleurisy from the total number of admissions in the Paediatrics Department, as well as the frequency of pleurisy from the total number of respiratory ailments that required hospitalization; evaluating age group distribution and determining the influence of environmental factors; describing clinical manifestations, laboratory, radiologic, and bacteriological investigations in patients with pleurisy; quantifying clinical manifestations and investigations so as to establish an appropriate therapeutic approach; identifying clinical aspects that indicate a favourable/ unfavourable evolution; analyzing the evolution of cases after treatment as revealed by radiologic imaging.

**Method:** Retrospective study on 47 patients diagnosed with pleurisy and admitted in the Paediatrics Department of Constanta Clinical Emergency Hospital, over a span of 3 years (2011-2013), based on data collected from observation sheets.

**Results:** A downward trend in what regards the frequency of pleurisy can be observed from 2011 to 2013. Rural provenience and other environmental factors continue to play an important role. Clinical manifestations tend to be more significant for younger patients and they are directly related to the specific pathogen identified

during laboratory investigations.

**Conclusion:** Following an early diagnosis and a subsequent adequate treatment, evolution tends to be favourable in most cases, although certain post-hospitalization measures still need to be implemented in order to ensure full recovery and restitution ad integrum.

**Keywords:** pleurisy, child

### Introduction

Given the potentially serious evolution and the possibility of developing long term side effects, pleural pathology remains an important and current health issue. Research of clinical and evolution-related aspects of pleurisy carries a major importance, even the more so in a clinical context where the clinical manifestations of the ailment can lead to more serious repercussions, due to anatomical, physiological, and immunologic differences between children and adults [1].

Through the study we have performed, our purpose has been to indentify the frequency and current trends of evolution of pleurisy in children, as well as to observe the risk factors associated with respiratory disturbances. As it will be observed throughout the paper, the prognosis of pleurisy is related to age, earliness and adequacy of treatment, and the emergence of complications. Currently, under a correctly guided therapy, full recovery can be obtained [2]. Although rare, the presence of

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complications can lead to an unfavourable prognosis and it is well documented that mortality rates are higher in the under 1 year age group.

## Method

A retrospective clinical study was conducted on a cohort of 47, diagnosed with pleurisy and admitted to the Paediatrics Department of the Constanta Clinical Emergency Hospital, on a span of 3 years (2011 - 2013). The following data was collected from observation sheets: contact details (first name, surname), age, gender, environment (rural/urban), clinical manifestations, laboratory and radiologic examinations, treatment, and evolution.

## Results

Between January 1st 2011 and December 31st 2013, there were a total of 22285 hospitalizations in the Paediatrics Department, out of which 47 cases were diagnosed with pleurisy (0.21%). Out of the total number of hospitalizations, 3883 children were diagnosed with disorders of the inferior respiratory tract, amounting to approximately one quarter of the total number of admissions. Pleurisy amounted to 1.2% of all disorders of the inferior respiratory tract.

*Table 1. Number of hospitalizations for the duration of the study*

	2011	2012	2013	TOTAL
Total no. of hospitalizations	6827	7654	7804	22285
Disorders of the inferior respiratory tract	1312	1297	1274	3883

*Table 2. Age group distribution*

PATIENT'S AGE	NO. OF CASES
< 1 y.o.	1
1-3 y.o.	13
4-6 y.o.	14
7-10 y.o.	9
11- 16 y.o.	10

Out of the total of 47 patients, one case was under one year of age, 13 cases between 1-3 years, 14 cases between 4-6 years, 9 cases between 7-10 years, and 10 cases between 11 and 16 years of age. In what regards gender distribution, 17 of the patients were female (36%) and 30 male (64%).

In what regards the patients' environment, 13 cases were living in rural settings, while 34 cases in an urban environment. 16 cases were reported to be living in adequate conditions, while 31 cases originated from unclean and overcrowded living conditions.

In what regards reasons for admission, the predominant clinical manifestations were: coughing (40 cases), fever (38 cases), and dyspnea (35 cases). Out of the total of 47 patients, only 7 came in with an uncharacteristic clinical presentation, including abdominal pain, vertigo nausea, and vomiting.

Clinical examination upon admission revealed: an evident pleuritic syndrome (44 cases), fever (38 cases), mediocre or severe general state (34 cases), pallor (31 cases), tachycardia (26 cases), altered nutritional status (17 cases), cyanosis (14 cases), toxic facies (12 cases).

Laboratory investigations revealed: infectious hypochromic anaemia (31 cases), leukocytosis with neutrophilia and left shift (26 cases), leukocytosis with lymphocytosis (10 cases), and leukopenia (3 cases). Mantoux test (intradermal reaction to tuberculin) – 2 units over 10 mm, with a Palmer I or II reaction, suggestive for tuberculosis, was positive in 10 cases. Inflammatory tests (C-Reactive Protein, fibrinogen, and ESR) were positive for all patients.

Radiologic imaging revealed: unilateral pleurisy as sole radiologic modification (27 cases), unilateral pleurisy accompanied by pneumonia (16 cases), unilateral pleurisy accompanied by hilar

adenopathy (4 cases), and no cases of bilateral pleurisy.

For evaluation of pleuritic scars, a control X-Ray was performed for 11 of the 47 patients. This revealed: pleuropulmonary fibrosis, latero-thoracic thickening of the pleura, with a favourable evolution in most cases.

In what regards the radiologic aspect of the pleurisy, the following patterns were identified: pleurisy of large cavity (34 cases), indurative pleurisy (13 cases), post-pleurisy scars (11 cases).

According to the affected hemithorax, radiology showed a higher frequency of pleurisy in the right lung (28 cases), compared to those affecting the left lung (15 cases).

Examination of pleural fluid revealed: transudate (3 cases – 7%), exudate (43 cases – 93%). Rivalta was positive in all cases.

*Table 3. Characteristics of pleural fluid*

EXUDATE	TRANSUDATE	
TOTAL PROTEINS	> 3 g/dl	< 3g/dl
DENSITY	> 1016	< 1016
LDH	> 200 UI	< 200 UI

The cytological analysis of the pleural fluid revealed: neutrophilia in 37 cases, suggesting an increased frequency of bacterial, non-tuberculosis infections. Lymphocytosis, suggestive of tuberculosis, was present in cases.

The bacteriological analysis of the pleural fluid revealed: confirmation of bacterial infection was possible only in 17 cases, due to the fact that patients had received prior antibiotic treatment and resulting cultures were negative.

The aetiology was bacterial in 34 cases (74%), tuberculosis-related in 10 cases (21%), and associated with tumours in 3 cases (7%). For the 10 tuberculosis-related cases, contact with an ill relative was confirmed in 6 cases, through anamnesis.

In what regards therapy, all patients were given empiric antibiotherapy for 7 days, as follows:

- Cephalosporins – 31 cases. Third generation – 21 cases (Ceftriaxona 50-100 mg/kg/day iv, Cefobid

50- 100 mg/kgc/day) and second generation – 4 cases (Axicef 50-100 mg/kg/day)

- Betalactamins – Carbapenems – 6 cases (Meronem 10-20 mg/kg every 8 hours), associated with Vancomicine 40/mg/kg/day.

- Ampicilline 100mg/kg/day + Gentamicine 5 mg/kg/day – 10 cases

Antitubercular treatment was commenced following transfer to a specialized department, as per medical recommendations.

Pleural drainage was required in 28 cases, between 4 and 7 days, and was stopped when the patient became asymptomatic and the radiologic signs had disappeared, confirmed through a second chest X-ray.

Evolution was favourable for all patients. Patients required between 5 and 21 days of hospitalization, with the exception of the 10 cases that required transfer to a special department for specific treatment for tuberculosis. All patients were recommended follow up by general practitioner. Only 27% of all cases depicted signs of pachypleuritis.

## Discussions

This paper represents a retrospective study, which approaches various clinical aspects, diagnostic circumstances, and treatment methods of pleurisy in children, and is based on the observation sheets of a cohort of 47 hospitalized throughout 3 years (January 1st 2011 – December 31st 2013), in the Paediatrics Department of Constanta Clinical Emergency Hospital. This number represented a total of 0.21% of all admissions in this time span (22285) and 1.2% of all admissions on grounds of disorders of the inferior respiratory tract (3883).

It can be observed that there the frequency of pleurisy is on a downward trend, as a result of increased access to health care services and an easiness of diagnosis. In what regards yearly distribution, it can be observed that the highest frequency was registered, a frequency that decreased

in the following years. This decrease was also due to the fact that patients with large cavity pleurisy were transferred to a special Pneumology department.

The vast majority of patients originate from an urban setting, which can be explained through the fact that tuberculosis is more frequent in such places, due to crowding and improper sanitary living conditions [3]. Out of all 47 cases, only 16 confirm proper living conditions, the vast majority reporting improper, unsanitary, and overcrowded living conditions. Patients originating from unsanitary living conditions and overcrowded families are associated with a higher risk of developing respiratory disorders, including pleurisy [4].

The highest frequency of pleurisy was observed in the 1-6 years old age group (27 cases), amounting to more than half of all admissions, followed by the 11-16 years old age group (10 cases).

Laboratory investigations were important in pinpointing the aetiology of the pleurisy, the study revealing 10 cases of tuberculosis-related pleurisy, 34 cases of infectious aetiology, and 3 cases of neoplastic aetiology. The vast majority cases were associated with infectious anaemia and positive inflammatory tests. Alteration of laboratory investigations (inflammatory tests, leukocytis, decreased haemoglobin and haematocrit levels) plead for an infection; infection is the most frequent cause of pleurisy in children [5]. Leukopenia is often associated with a more serious prognosis. In cases where there is a positive intradermal reaction to tuberculin, collaboration with a specialized physician has a great importance in establishing the diagnosis.

In what regards the localization of the pleurisy, it can be observed that unilateral pleurisy has a much higher frequency as sole radiologic lesion – 27 cases – followed by pneumonic unilateral pleurisy in 16 cases. Unilateral pleurisy is often accompanied by pneumonia, which can be explained by the fact that pleurisy can appear throughout the evolution of a bacterial pneumonia [6]. From a radiologic point of view, when evaluating the pleurisy, it is important to note the location, quantity, and sometimes the evolution of the fluid, the status of the subjacent parenchyma, but also modifications of the nearby structures, as a consequence of the primary disease [7]. A hilar adenopathy was revealed in 4 cases.

Bilateral pleurisy, which tends to have a more serious prognosis, was not present in any cases.

From the total of 47 cases, 34 presented, from a radiologic point of view, with pleurisy of the large cavity compared to only 13 cases of indurative pleurisy. The pleural fluid, free in the large cavity, inundates the entire pleural cavity, leading to an homogenous opacity, with a decreasing intensity towards the peak [1]. The diaphragm is lowered and the mediastinum is pushed towards the healthy side. The appearance of indurative pleurisy is caused by an increased accumulation of fibrin, polymorphonuclears, and bacteria in the pleura. The proliferation of fibroblasts leads to the formation of membranes. This translates to a homogenous and well limited opacity, with varying locations. After the pleurisy has healed, thickenings can appear, which are collectively known as pachypleuritis, a phenomenon which was also observed in 27% of our patients. Sometimes, post-pleurisy scars can include multiple calcifications or a fibrothorax.

Analysis of pleural fluid, obtained through thoracentesis, has an undeniable value in determining the type of pleurisy and excluding non-inflammatory fluid collections, such as hydrothorax, haemothorax, or chylothorax. Rivalta was positive in all cases included in our study, with 43 patients with exudates and only 3 cases with transudate. However, this does not exclude a bacterial aetiology at the onset of the disease [8]. Bacteriologic confirmation was possible only in 17 cases, because most patients had received antibiotic treatment prior to the culture analysis.

Pathogens associated with pleurisy in children are mostly represented by bacteria and viruses. Tuberculosis-related pleurisy is becoming increasingly rare in children and usually appears after 5 years of age, at a period of several months after contact with an affected individual [9]. Taking into account the increased virulence of the pathogens involved in uncomplicated pleurisy, special attention must be given to treatment with the use of newer generation antibiotics, which have a higher potency. It has been observed that evolution tends to be favourable in patients treated early with targeted antibiotherapy, in the absence of associated pathologies.

Therapeutic measures target the aetiological

treatment of the primary ailment, the symptomatic, general, and respiratory treatments, as well as the treatment of any ensuing complications. Although rare, complications worsen the prognosis of the disease, requiring prompt intervention and proper treatment in order to obtain full recovery [10]. Reduction of the hospitalization period and restitution ad integrum are the primary goals of pleurisy treatment, both for reducing costs associated with therapy and for ensuring a favourable long-term prognosis.

### Recommendations for practice

The patient must be hospitalized in a specialized Paediatrics department, for a careful monitoring of his status and evolution in the course of receiving treatment. The duration of hospitalization varies according to the particularities of the case, but it must be long enough in order to be able to confirm a full recovery.

Identifying the aetiology of the pleurisy is a crucial moment in care planning, often leading to satisfactory evolutions.

Preventing and rapidly treating complications, should they appear, is one of the steps of adequate care.

For children with smoking parents, it is recommended that they are exposed to cigarette smoke as little as possible, removing any factors that can lead to irritations of the respiratory tract. Maintaining adequate hygiene and avoiding contact with people with infectious potential, as well as flu vaccinations should be taken into account.

Appropriate measures for preventing diseases associated with young children and periodic medical follow-ups are recommended.

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