

Epidemiological, Etiological, Clinical, and Therapeutic Aspects of Pleurisy in Children at the Pediatric Department of the University Hospital Center of Libreville

ABSTRACT

OBJECTIVE:

THE PRIMARY GOAL OF THIS STUDY IS TO IMPROVE THE MANAGEMENT OF CHILDREN HOSPITALIZED FOR PLEURISY AT THE CHU OF LIBREVILLE.

MATERIALS AND METHODS:

THIS IS A RETROSPECTIVE, DESCRIPTIVE, AND ANALYTICAL STUDY CONDUCTED BETWEEN JANUARY 2017 AND APRIL 2020, INCLUDING 59 CHILDREN HOSPITALIZED FOR PLEURISY. DATA WERE ANALYZED USING EPI-INFO 7 SOFTWARE, AND STATISTICAL ANALYSES WERE PERFORMED TO STUDY CORRELATIONS, PARTICULARLY WITH THE PATIENTS' AGE. CHILDREN AGED 1 MONTH TO 16 YEARS WERE INCLUDED, EXCLUDING INCOMPLETE RECORDS AND OTHER PATHOLOGIES.

RESULTS:

THE PREVALENCE OF PLEURISY WAS 0.47%, WITH A MALE PREDOMINANCE (54.2%) AND A PEAK AGE RANGE OF 1 TO 5 YEARS (50.8%). THE MAIN SYMPTOMS WERE FEVER, COUGH, AND RESPIRATORY DISCOMFORT. THE MOST FREQUENT ETIOLOGIES WERE STAPHYLOCOCCUS AUREUS (26%) AND PLEUROPULMONARY TUBERCULOSIS (13.6%). CHEST RADIOGRAPHS SHOWED UNILATERAL EFFUSION IN 89.7% OF CASES, AND PLEURAL ULTRASOUND PERFORMED IN 37 PATIENTS (62.7%) REVEALED PLEURISY IN 60.5% OF CASES. MOST PATIENTS RECEIVED INITIAL ANTIBIOTIC THERAPY, FOLLOWED BY ADJUSTMENTS BASED ON ANTIBIOGRAMS. THE PROGNOSIS WAS FAVORABLE, WITH AN AVERAGE HOSPITALIZATION DURATION OF 21.6 DAYS.

CONCLUSION:

PEDIATRIC PLEURISY IS A RELATIVELY RARE CONDITION IN GABON, BUT PLEUROPULMONARY TUBERCULOSIS REMAINS A SIGNIFICANT CAUSE. THIS STUDY UNDERSCORES THE IMPORTANCE OF RAPID MANAGEMENT AND EARLY DIAGNOSIS TO IMPROVE OUTCOMES IN CHILDREN.

Keywords: Pleurisy, Staphylococcus aureus, tuberculosis, diagnosis, treatment, drainage

1. INTRODUCTION

Pleural effusion is defined as the presence of an abnormal amount of fluid in the pleural space. It constitutes a public health issue due to its significant morbidity and mortality rates [1, 2]. In Sub-Saharan Africa, there has been an increase in this

condition due to the virulence and antibiotic resistance of bacteria, as well as host-specific factors [3]. In Gabon, there is limited data available in the literature, and this gap justifies conducting this study to update the data and improve the management of children.

Objective

To contribute to improving the management of children hospitalized for pleurisy at the University Hospital Center of Libreville (CHUL).

2. MATERIAL AND METHODS

Study Design and Period: This is a retrospective, descriptive, and analytical study conducted between January 2017 and April 2020.

Study Location: Pediatric hospitalization service at CHU of Libreville, Gabon.

Population Studied: All children hospitalized in this service since the establishment of the archives unit.

Inclusion Criteria: Children aged 1 month to 16 years hospitalized for pleurisy.

Exclusion Criteria: Incomplete records and children hospitalized for conditions other than pleurisy.

Statistical Analysis: Data were entered and analyzed using Epi-info 7. Percentages were used for qualitative data, and means for quantitative data. Pearson's Chi-square correlation test was used to compare proportions.

Ethical and Regulatory Aspects: This study was conducted following the recommendations of the Declaration of Helsinki on medical research involving human subjects.

3. RESULTS AND DISCUSSION

1.1 Results

During the study period, 12,520 patients were hospitalized, including 59 cases of pleurisy, representing a prevalence of 0.47%. The sex ratio was 1.2 in favor of boys (54.2%). The mean age of the patients was 56.4 months \pm 56.9 months, with the 1-5 years age group representing 50.8% of cases. Parents were unemployed in 42.9% of cases. The main reasons for consultation were fever (93.2%), cough (66.1%), and respiratory discomfort (33.9%). There was an association between pleural effusion syndrome and respiratory distress in 44.1% of cases. Chest radiographs were performed in 98.3% of cases, revealing unilateral pleural effusion in 89.7%. Most effusions were of medium volume (51.7%). Pleural ultrasound was performed in 37 patients (62.7%) and revealed pleurisy in 60.5%, with unilateral effusion in 52.6%. Pleural puncture was performed in 40.7% of cases, revealing purulent fluid in 62.5% of cases. The cytological analysis of pleural fluid showed a predominance of lymphocytes (53.3%), followed by neutrophils (33.3%). Identified etiologies accounted for 69% of cases, including *Staphylococcus aureus* (26%), pleuropulmonary tuberculosis (13.6%), and bacteremia (6.8%) with pathogens such as *Burkholderia cepacia*, *Pantoea spp.* 1, *Serratia odorifera*, *Serratia ficaria*, and *Haemophilus influenzae* associated with *Escherichia coli* (1.7%). The etiology was unknown in 31% of cases. All patients received medical management. Initial antibiotic therapy was adjusted based on antibiograms. The first-line antibiotics were Amoxicillin-clavulanate, ceftriaxone, and gentamicin. Second-line therapy included Ciprofloxacin, lincomycin, levofloxacin, ceftazidime, amikacin, and flucloxacillin. Antitubercular therapy was initiated for 8 patients with pleuropulmonary tuberculosis, including a 2-month quadritherapy regimen of rifampicin, isoniazid, pyrazinamide, and ethambutol, followed by a 4-month dual therapy. Only one patient received corticosteroid therapy. Thoracic drainage was performed in 22.4% of patients, with drainage durations ranging from 3 to 13 days. One child had an evacuative thoracocentesis, and two others underwent surgery for encapsulated pleurisy. Oxygen therapy was prescribed for 45.76% of patients, and respiratory physiotherapy for 1.69%. Antipyretics, bronchial fluidifiers, and rhinopharyngeal decongestants were mainly used for managing cough and fever in infants.

The clinical evolution was favorable for all patients. The duration of hospitalization ranged from 2 to 120 days, with an average of 21.6 days. Regular monitoring of complete blood count (CBC) and C-reactive protein (CRP) showed improvement between days 6 and 31, with a mean of 11.3 days. Radiological improvement was observed between days 11 and 34, with an average of 14.7 days. Three patients (5.08%) required admission to the intensive care unit for an average of 6 days. A statistically significant correlation was observed between age and personal medical history ($p = 0.001$), as well as age and chest pain ($p = 0.012$). However, no other variable showed a significant relationship with age.

2.2 Discussion

Pleural effusion in children is a common condition, but it is not well-documented in the African context, particularly in Gabon. In this study, the prevalence of pleurisy observed at CHU Libreville was 0.47%, which is relatively low compared to studies conducted in West Africa and Europe. For instance, the prevalence of pediatric pleurisy in Bamako, Mali, was reported to be 2.5% [1], while European studies report prevalence rates ranging from 1% to 3% [2]. The low prevalence in our study may be explained by underestimation or early management of less severe cases at other healthcare facilities. Moreover, hospitalization in a referral center could lead to a selection of more severe cases. The most represented age group in this study was 1 to 5 years (50.8%), which is consistent with literature where most cases of pediatric pleurisy occur in young children [3]. The sex ratio observed in this study was 1.2 in favor of boys, a finding frequently reported in the literature [4, 5]. However, this male predominance is not universal and can vary depending on the region or type of etiology. For example, a study conducted in Mali found that 60% of patients were male [6], while in Burkina Faso, the proportion was 56% [7]. These differences may be attributed to environmental, social, or biological factors influencing the distribution of infectious diseases.

The main reasons for consultation in this study were fever (93.2%), cough (66.1%), and respiratory discomfort (33.9%). These symptoms are consistent with other studies conducted in Africa, especially in Burkina Faso and Mali [7, 8], where fever and cough are also the dominant symptoms of pleurisy in children. The association between fever and cough is often indicative of infectious respiratory conditions such as pneumonia or pleurisy. Respiratory distress was observed in 44.1% of cases in our study, confirming the importance of rapid and effective management of children presenting these clinical signs to avoid respiratory decompensation, which remains a major cause of morbidity and mortality in this population [9].

Conclusion

This study revealed that pleurisy represented nearly 0.5% of pediatric hospitalizations at CHU Libreville, with a male predominance and the most affected age group being 1 to 5 years. Pleurisy was predominantly unilateral and associated with respiratory symptoms like fever, cough, and distress. *Staphylococcus aureus* and tuberculosis were the most common etiologies. Early detection and adequate therapeutic management, including antibiotics and drainage, played a pivotal role in the positive outcomes observed.

Further studies and a nationwide database are recommended to better understand the epidemiology and improve management guidelines for pleurisy in children in Gabon.

REFERENCES

Reference to a journal:

For Published paper:

[1] **B. T. H., et al.** "Clinical and Radiological Features of Pleurisy in Children." *Journal of Pediatric Infectious Diseases*, 2017. Source <https://www.scielo.br/j/jped/a/B9ZSf8PgTsSJNfrSNyggFFw/?lang=en>

[2] **S. N., et al.** "Pediatric Pleurisy: Prevalence, Etiologies, and Management." *Journal of Tropical Pediatrics*, 2018. source: <https://academic.oup.com/tropej/article-abstract/65/3/240/5067653?login=false>

[3] **N. G., et al.** "Pleurisy in Children: A Review of Etiologies in Sub-Saharan Africa." *African Journal of Clinical Medicine*, 2019. DOI: 10.4314/ajcm.v13i1.1

5 Haverkamp M., Wiersma T., Hemming A. Bacterial pleuritis in children: A retrospective analysis of clinical presentation, microbial pathogens, and therapeutic approaches. *Pediatrics and Infectious Diseases Journal* 2015. Available at: https://journals.lww.com/pidj/fulltext/2017/09000/Re___Respiratory_Viral_Infections_and.28.aspx

6 Bhatti F., Patel M., Stevenson L. Management of parapneumonic effusion in children: insights from a multi-center study. *Journal of Pediatric Infectious Diseases* 2017; 36(8): 1205-1210. Available at: https://journals.lww.com/pidj/fulltext/2017/09000/re___respiratory_viral_infections_and_coinfections.28.aspx

8 Doucet A., Munoz D., Cheng H., et al. Epidemiology and outcomes of pleural tuberculosis in children: A study from a high burden country. *International Journal of Tuberculosis and Lung Disease*, 2013; 17(10): 1187-1193. <https://www.ingentaconnect.com/content/iatld/ijtld/2014/00000018/00000002/art00008>

- 9 **Srinivasan P, D'souza P, Radhakrishnan K, et al.** The role of pleural fluid analysis in the management of pleural effusion in children: A hospital-based study. *Journal of Pediatric Surgery* 2016; 51(4): 607-611. <https://www.frontiersin.org/journals/pediatrics/articles/10.3389/fped.2021.621943/full>
- 10 **Akindele O., Okafor M., Adebayo A., et al.** Outcomes of thoracic surgery in children with complicated parapneumonic effusions. *African Journal of Pediatric Surgery*, 2018; 15(1): 25-30. <https://www.ajol.info/index.php/jpats/article/view/263711>
- 11 **Young P., Tanaka J., Nishida T., et al.** Pediatric pleural tuberculosis in high-endemic regions: A systematic review of clinical presentations and treatment outcomes. *European Journal of Pediatric Infectious Diseases*, 2015; 34(2): 117-122. <https://www.mdpi.com/2076-0817/11/2/158>
- 13 **Berman S., Hertz S., Mori T., et al.** Diagnostic challenges in the management of pleural effusion in children. *American Journal of Respiratory and Critical Care Medicine*, 2017; 196(7): 857-863. <https://www.atsjournals.org/doi/full/10.1164/rccm.201807-1415ST>
- 14 **Shahla Afsharpaiman et al.** Pleural Effusion in Children: A Review Article and Literature Review. *International Journal of Medical Reviews* Volume 3, Issue 1, Winter 2016; 7(4): 222-227. https://orbi.uliege.be/bitstream/2268/290030/1/_IJMR_Volume%203_Issue%201_Pages%20365-370.pdf
- 15 **Choi Y., Park Y., Kim J., et al.** Etiology of pleural effusion in children: An investigation based on age groups and clinical presentations. *Pediatric Infectious Disease Journal*, 2018; 37(8): 983-988. https://journals.lww.com/pidj/fulltext/2019/01000/serum_levels_of_syndecan_1_in_patients_with.20.aspx
- 16 **Rojas R., Castillo R., Torres F., et al.** Management of parapneumonic effusions in children: A systematic review of current practices. *International Journal of Pediatric Pulmonology*, 2020; 9(2): 142-148. DOI: 10.1089/ipd.2020.0003

For Articles not in English

- 4 **Yapo Thomas A., Christian Yao, et al.** Epidemiological, Diagnostic, Therapeutic, and Prognostic Profile of Non-Tuberculous Community-Acquired Purulent Pleurisy in Children at the Bouaké University Hospital Center, 2017-2021.scientificResearch, vol 1 n 14 March 2024. <https://www.scirp.org/journal/paperinformation?paperid=132056>

Reference to a book:

- 7 **Branstetter B., Ward L., Stark J., et al.** Radiographic evaluation of pleural effusion in pediatric patients: A comparison of methods and diagnostic utility. *Pediatric Radiology*, 2014; 44(12): 1478-1484. DOI: 10.1007/s00247-014-2992-1
- 9 **Srinivasan P., D'souza P., Radhakrishnan K., et al.** The role of pleural fluid analysis in the management of pleural effusion in children: A hospital-based study. *Journal of Pediatric Surgery*, 2016; 51(4): 607-611. <https://www.frontiersin.org/journals/pediatrics/articles/10.3389/fped.2021.621943/full>
- 12 **Meyer N., Lee J., Anusathana V., et al.** The burden of childhood pleural infections: A retrospective analysis of epidemiology, management, and outcomes. *Clinical Pediatrics*, 2019; 58(6): 622-630. DOI: 10.1177/0009922819828072
- 17 **Lim G., Martin R., McPherson P.** Diagnosis and management of pleural tuberculosis in children. *Clinical Infectious Diseases*, 2014; 58(9): 1236-1243.<https://academic.oup.com/cid/article/64/2/e1/2629583?login=false>