

# Purulent Pleurisy of Children: About 42 Cases in Senegal

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**Abstract:** *Introduction:* Purulent pleurisy refers to the presence in the large pleural cavity of a purulent, cloudy or lemon-yellow liquid, but containing altered polynuclear cells. It is a frequent pathology, the epidemiology of which is constantly changing in Africa and throughout the world. This is why we conducted this study with the aim of updating epidemiological, clinical, bacteriological and therapeutic data. *Methods:* This is a retrospective, mono-centric, descriptive study including the records of children aged 0 to 15 years old hospitalized during the period from 20 May 2014 to 26 March 2019 at the Children's Hospital of Diamniadio for purulent pleurisy. The data were entered and analyzed using sphinx, Excel under Windows 8 and SPSS software. *Results:* We counted 42 cases of purulent pleurisy, i.e. a hospital frequency of 0.7%. Most of the patients were aged between 2 and 12 years (48%). The average age at diagnosis was 46 months. The sex ratio was 2.5. Most of the children came from parents with a low socio-economic status (64%); fever was the most frequent reason for consultation (50%), followed by cough (33%) and respiratory difficulty (29%). In all cases, a liquid effusion syndrome was objectively diagnosed (100%), tachycardia in 36% of cases and a pulmonary condensation syndrome in 33% of patients. X-rays showed a predominantly right-sided effusion (62%) which was very abundant in 71% of cases. In bacteriology, staphylococcus aureus was the most frequently isolated germ (75%), followed by streptococcus pneumoniae (20%) and group D streptococcus (5%). Biology showed an average hemoglobin level of 9.2 and there was a predominantly neutrophilic hyperleukocytosis in 98% of cases. All patients had received antibiotic therapy and pleural drainage in 76% of cases. Mortality was 10%. *Conclusion:* In the light of this work, we insist on the importance of early diagnosis and adequate management of purulent pleurisy in order to avoid complications and after-effects. Thus, antibiotic therapy should be more closely monitored, and its administration better codified to reduce bacterial resistance and germ selection.

**Keywords:** Purulent Pleurisy, Children, Dakar

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## 1. Introduction

Purulent pleurisy is a respiratory infection characterized by the presence of a purulent, squiggly or citrine liquid containing altered polynuclear cells in the large pleural cavity [1]. Acute respiratory infections (ARI) are the leading cause

of morbidity and mortality in children under five years of age (5 years), especially in developing countries [2, 3]. They are dominated by pneumonia, of which pleurisy is one of the major complications. Pneumonia is the second leading cause of infant and child mortality after neonatal mortality [4]. In Senegal, it accounts for 16% of mortality among children under 5 years of age [4]. Its association with pleurisy is even

more serious. Since the 1990s, an increase in the incidence of purulent pleurisy has been observed in different countries around the world [5, 6]. In Africa, some studies in hospitals report prevalence rates of 0.7% in Burkina Faso [7] and 0.9% in Morocco [8]. In Senegal, the Ndiaye study carried out at Dakar University Hospital noted a prevalence of 0.8% [9]. This resurgence is thought to be due on the one hand to the virulence and resistance of bacteria to antibiotics and on the other hand to factors specific to the host such as young age, malnutrition, immunosuppression and poor vaccination coverage. As a result, the epidemiology is constantly changing, which justifies this work whose objectives were: to describe the epidemiological profile, to determine the morbidity factors associated with purulent pleurisy, to identify the germs responsible and to assess the antibiotic treatments currently in use.

## 2. Methods

This is a retrospective, descriptive and analytical study, lasting 4 years and 10 months (from 20 May 2014 to 26 March 2019), carried out at the Children's Hospital of Diamniadio, which is a level III hospital. The study included all children aged 0-15 years admitted for pleurisy purulent pleurisy during the study period. The diagnosis of purulent pleurisy was based on purulent, cloudy or citrus-yellow puncture fluid containing altered neutrophil polynuclear and/or the presence of a pyogenic germ in the pleural fluid. For each patient, we noted the following data: Socio-demographic data, clinical data, paraclinical data and evolution. The assessment of the socioeconomic level (SEL) was based on the cumulative income of the parent (s) in relation to the GMIS (Guaranteed Minimum Interprofessional Salary) which is 80 dollars per month in Senegal. Thus, the SEL was considered low if this income was less than or equal to the GMIS, medium if it was higher than the GMIS but less than 5 times the GMIS, and good if the income was higher than 5 times the GMIS. The data was collected from the patients' files, hospitalization registers on a pre-established collection sheet. The data were entered and analyzed using sphinx software, Microsoft office Excel 8 under Windows 8 and SpSS for impedance testing. The quantitative variables were analyzed by determining the maximum, minimum, mean and standard deviation, while for the qualitative variables the frequency and percentage were determined.

## 3. Results

1- Epidemiology and sociodemographic: We collected 42 cases of purulent pleurisy with a hospital frequency of 0.7%. The sex ratio was 2.5. The average age of our patients was 46 months and the age group 2 - 12 years was more represented (Figure 1) with 48% of the cases (n=20).

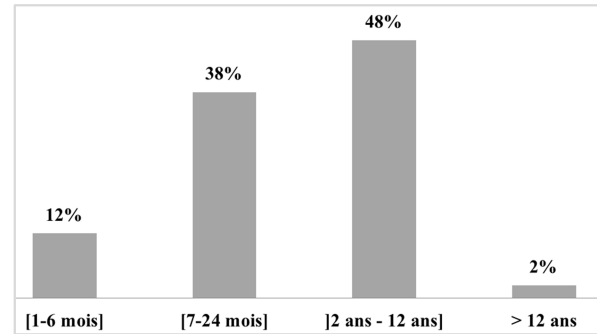


Figure 1. Distribution of patients by age group.

Most cases of purulent pleurisy occurred during the cooler period, with peaks in January, March, April and May. The year 2018 recorded a higher number of cases of purulent pleurisy with 28.57% (n=12). Most of the children came from the urban areas of Dakar (capital of Senegal). Sixty-four percent of them (n=27) had a low socio-economic level. The vaccination was specified for 22 patients (52%) and was complete for 21 (96%).

2- Clinical data: The average delay between the onset of symptoms and consultation was 8 days with extremes of 1 and 30 days; the main reasons were fever 50%, cough 33% and respiratory difficulty 29% (Figure 2). The functional and general manifestations present at admission were dominated by cough in 100% of cases, dyspnea in 93%, fever in 50% of cases, chest pain in 36%, and tachycardia in 36%. Physical examination revealed mainly pleural fluid effusion syndrome in 100% of cases, respiratory distress in 93% of cases (n=39), pulmonary condensation syndrome in 33% (n=14). Otolaryngology damage was found in 17% of cases (n=7). From the point of view of tolerance, severe hypoxia was found in 3 patients (4.8%), and moderate hypoxia in 16 patients (38.1%). Malnutrition, sickle cell disease and asthma were the main causes of purulent pleurisy.

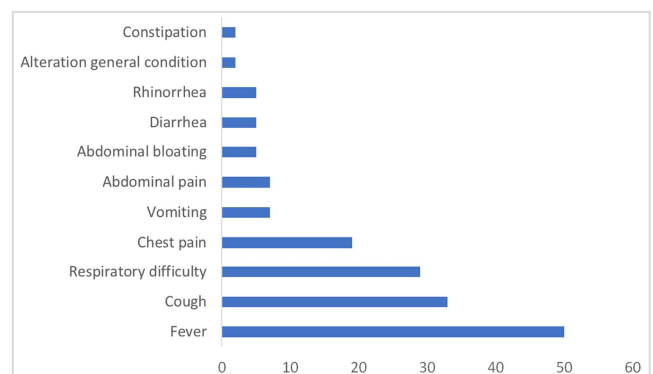
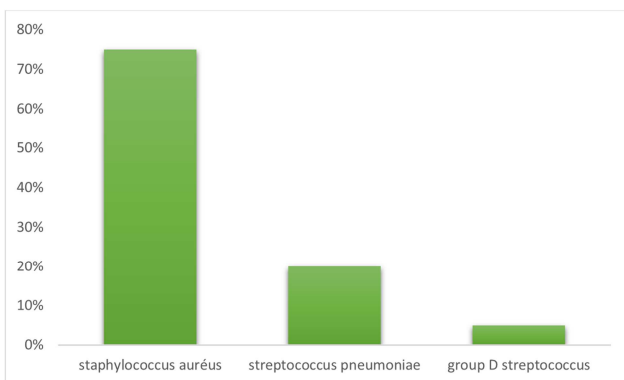


Figure 2. Distribution of patients by reason for consultation in percentage.

3- Complementary examinations: Chest X-ray showed bilateral effusion in all patients with a predominantly right-sided 62% (n=26). In addition to the effusion, pneumonia was present in 12% of cases (n=5). Thoracic ultrasound was performed in 14 patients and noted a partition in 3 cases, and an encysting in 2 cases. A thoracic CT scan was performed in 7 patients and noted in addition to the effusion, pachypleuritis in 2 cases,

pneumothorax in 2 cases and a cyst in 1 case.

Anemia was found in 40 patients (95%). A predominantly neutrophilic hyperleukocytosis was noted in 98% of cases (n=41), and thrombocytosis in 62% (n=26). The C-Reactive protein was positive in all our patients, with a mean of 158mg/l with extremes of 12mg/l and 384mg/l. Concerning the pleural fluid analysis: the effusion was exudative in all patients, with cellularity between 10 and 50 elements in 71% of patients (n=30) with a predominance of altered neutrophil polynuclear cells. The bacteriological study isolated one bacterium for 20 cases with a positivity rate of 48% in the pleural fluid. *Staphylococcus aureus* was the first responsible germ in 35% of cases (n=15), followed by *streptococcus pneumoniae* in 9% of cases (n=4) and finally group D *streptococcus* in 2% of cases (n=1) (Figure 3).



**Figure 3.** Distribution of patients by germ isolated in pleural fluid.

4- Treatment: Gentamicin was used in 67% of cases (n=28), ceftriaxone in 64% of cases (n=28), oxacillin in 55% of cases (n=23), ampicillin in 29% of cases (n=12). The average duration of intravenous antibiotic therapy was 21 days. Percutaneous pleural drainage was required in 32 patients (76%).

5- Evolution: The average length of hospitalization was 20 days, with extremes of 1-42 days, with a favorable evolution for 38 patients (90%). The main complications were septic shock 42% (n=18), empyema 17% (n=7), pneumothorax 17% (n=7) and pachypleuritis 15% (n=6) (Table 1). The lethality was 10% (n=4), including 3 deaths occurring beyond 72 hours of hospitalization.

**Table 1.** Distribution of patients according to complications.

Complications	Number	Percentage
septic shock	5	42%
enkystement	5	42%
pleural empyema	2	17%
pneumothorax	2	17%
deshydratation with shock	1	8%
drain obstruction	1	8%
Pachypleurite	1	8%
Hypokaliemia	1	8%

## 4. Discussion

During the twentieth century, the incidence of

pleuropneumonia worldwide, particularly in developed countries, fell sharply, mainly due to advances in antibiotic therapy and improved hygiene conditions [10]. In Africa, the incidence in hospitals is still high, at around 0.7 and 0.9% respectively in Burkina Faso [7] and Morocco [8]. Similar incidences were found in another study in Senegal and in our own study with 0.8% by Ndiaye et al. in 1994. As was the case in our work, purulent pleurisy can occur at any age, but infants and young children under five years of age are most affected [11]. The vulnerability of this age group is thought to be related to the immaturity of their immune system and the frequency of otorhinolaryngology and skin infections, which are the main entry points for severe respiratory infections [12]. Most studies report a male predominance without a rational explanation for this [13]. Families with a low socio-economic level have been highly represented in this work due to limited access to health services and probably less knowledge of basic preventive behaviors in addition to the often long therapeutic itinerary in our context. Thus, overcrowding and the nature of habitats are factors that favor acute respiratory infections. It should also be noted that, due to the geographical location of the structure that housed the study, most of our patients came from urban areas, where 67% of the cases were found to be in urban areas, where there is a deterioration in air quality with significant pollution peaks [14]. The limited resources in these areas, self-medication and recourse to traditional medicine were also the cause of significant delays in consultations, resulting in very abundant pleurisy pictures, which we found in most of our work (71%). In 17% of our patients there was an otorhinolaryngology entrance door. Most cases of purulent pleurisy remain a complication of bronchopulmonary and otorhinolaryngological infections. Bacterial colonization and adhesion to the nasopharynx is promoted by viral infections, which subsequently induce bacterial diffusion to the lower airways [15]. These severe respiratory infections are also promoted by the existence of a weakened environment, which are important promoting factors [16]. In our work we found anemia, malnutrition and sickle-cell anemia. HIV infection is also a major contributor, but we had not found any cases of HIV infection. However, as the search for it is not systemic, we cannot exclude the existence of undetected subjects. At the time of the clinical examination, the main complaint associated with pleural involvement was pneumonia. This association is frequent because of the anatomical reports as reported in most studies [17]. From the point of view of additional examinations, the chest X-ray, which is essential before any pleurisy, most often allowed the diagnosis to be made. The profile x-ray is useful to clarify the topography and the lateral decubitus front x-rays on the side of the effusion (Muller's incidence) help to visualize a low abundance effusion. We found a predominantly right-sided effusion (62% versus 38% on the left). This right-hand predominance has also been reported by several authors and could be explained mainly by the anatomical arrangement of the bronchi [9, 7, 8]. Ultrasound, in addition to X-ray images, is a valuable aid to management, as it allows guided echo punctures in the case of localized pleurisy, but also to establish the indication for surgical treatment in the case of

multiple septal defects [18]. Classically, the cytochemical examination allows the therapeutic indication to be established, but in certain cases the lack of means of exploration in our context reduces the importance of the contribution of this examination. The bacteriological diagnosis of the child's pleurisy is of paramount importance. It allows epidemiological surveillance and guides antibiotic therapy, especially in a context where bacterial resistance is becoming more and more frequent. A bacterium was isolated from the pleural fluid in 20 cases (48%) in our series. This low bacteriological yield could be explained by taking antibiotics before the pleural puncture. New techniques such as Polymerase chain reaction (PCR) could improve sensitivity as is the case in developed countries [13]. *Staphylococcus aureus* was the main germ responsible with 35.71%, which was the case in a previous study carried out in DAKAR in 1994 (50.7%) [9]. On the other hand, El Omrani [19] found *Streptococcus pneumoniae* as the predominant germ. The serotyping of pneumococcal strains isolated in our work (9.52%) was not available for comparison with the vaccine serotypes contained in the vaccine used in the Senegalese vaccination program. This is a limitation of our work. Therapeutically, antibiotic therapy has remained classical with ceftriaxone and gentamicin or oxacillin-ceftriaxone-gentamicin as the first line of treatment, secondarily adapted to the antibiogram. This therapeutic choice has always been adopted by Dakar prescribers for years, as shown by the work of NDIAYE in 1994 [9]. In our patients, the average duration of antibiotic therapy was 21 days, the duration recommended by the World Health organization [20]. The aim of corticosteroid therapy is to reduce pleural inflammation and consequently to limit the thickening of the pleural layers, thus improving the functional prognosis. In Dakar, we noted that its use decreased from 17.9% to 6.97% in 2007 and 2013 respectively, [9, 19] to a much lower rate in our study of 4.76%. In the work of NDIAYE, it was shown that patients who received corticosteroids had no benefit compared to children who did not receive them [9]. The LARROQUET team in France recommends pleural evacuator puncture as a first-line technique for uncomplicated effusions (no septum) [10]. However, in the Anglo-Saxon management guide, the use of repeated evacuator punctures is not recommended, and the authors prefer the use of a thoracic drain [8]. In our study, only 1 patient had benefited from a pleural evacuator puncture and 32 patients had percutaneous chest drainage (76%). The indication for pleural drainage remains controversial. For some authors it should be undertaken at the beginning of the collection, and the results can be excellent, as in the DEBESSE series [21], where healing was obtained in 100% of cases. The results become less good when the drain is placed late, as in the HASSAN series with 64% healing [22]. Sometimes thoracic drainage is not able to dry out the effusions and avoid after-effects, in which case other therapeutic modalities such as surgery and the use of fibrinolytics can be used [22, 8]. In general, the lethality of purulent pleurisy from all causes is low. Indeed, in our series we observed a mortality rate of 10%, higher than that reported by NDIAYE (6.5%) [9] in 1994 and EL Omrani (3.87%) in 2013 [19], although we have no

explanation for this, although antibiotic resistance and hospital superinfections could be possible. Even higher mortality rates have been reported by other authors: 21.4% Bekri [23], 27.8% SAWAGOGO [24].

## 5. Conclusion

This study shows that purulent pleurisy in children is still a frequent reason for hospitalization with significant lethality. Despite these results, we believe that prospective multicenter studies should be conducted to have nationally representative frequency and distribution. The prognosis could be improved thanks to the early recognition of the signs and to adapted prevention measures but also by a therapeutic strategy, above all symptomatic, rapid and based on protocols that will have to be established.

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