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Etiologies of Pleural Exudates after Cytology and Biopsies in Yaound é : Cameroon

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Abstract

Introduction: Very little is known about the frequency of the different etiologies responsible of pleural pathologies in Cameroon. The objective of this retrospective study was to identify the main etiologies of pleural pathologies based on the analysis of pleural fluid and pleural biopsy.

Methods: This was a one-year retrospective study that took place in Yaoundé (Yaounde, Cameroon). We reviewed the archived reports of cytological examinations of pleural fluids and histopathological reports of pleural biopsies done in 2009.

Results: A total of 547 pleural specimens were collected, of which 240 were female and 307 male. Tuberculosis was the most frequent pathology in both men and women and was found mainly between 20 and 49 years of age with a peak between 30 and 39 years.

One hundred and ninety-five patients performed both pleural cytology and pleural biopsy. The specific diagnosis was found in 177 (90.77%) of the cases. Overall, 152 (77.87%) specimens were diagnosed positive for tuberculosis by both tests, while 25 (12.82%) specimens were diagnosed positive for a tumor. Metastatic adenocarcinoma was by far the most frequent tumor in a total of 28 tumors, representing 89.3% of the cases

Conclusion: Tuberculosis is the most frequent etiology of pleural pathology in Yaoundé.

Keywords: Pleurisy; Etiology; Cancer; Infections; Tuberculosis; Cytology; Biopsy; Cameroon

Introduction

The emergence of HIV/AIDS infection in developing countries has resulted in the resurgence of tuberculosis and opportunistic diseases with an exponential progression of pleuro-pulmonary pathologies [1-6]. In addition to these specific inflammatory disorders, tumor and dystrophic lesions occupy an important place.

In developed countries, Video Assisted Thoracoscopy (VATS) allows multiple biopsies under visual control with diagnostic accuracy of about 95% [7-10]. On the other hand, in developing countries, the use of needle biopsy, blinded and cytopathologic analysis of pleural fluid is more widely used and the best way to do the diagnosis of pleural pathologies [4,6,8-14].

Current diagnosis in pleural pathology involves several techniques using medical imaging, including pleural biopsy guided by ultrasound, chest CT scan, PET scan or MRI, which help to better guide specimens by needle puncture with better diagnostic performance [15-18]. Histological diagnosis is more accurate with immuno histochemical techniques [19-22].

At the JAMOT hospital in Yaoundé, Cameroon, pleural biopsy using the ABRAMS'S needle, together with the cytology and the biochemistry of the effusion fluid are the only techniques available for the diagnosis of a clear pleural effusion. These various samples are generally treated at the laboratories of biochemistry and surgical pathology of the Pasteur's Center of Yaoundé. Very little is known about the frequency of the different etiologies responsible of pleural pathologies in Cameroon as no study has addressed this issue in this country. The objective of this retrospective study was to identify the main etiologies of pleural pathology based on the cytology, biochemistry or pathological analysis of the pleural fluid or specimen.

Materials and Methods

This was a one-year retrospective study that took place in the pathology Laboratory of the Pasteur's Center of Yaoundé in Cameroon.

We reviewed the archived data of the pathology laboratory of this Center during the year 2009.

This data consisted of reports of cytological examinations of pleural fluids and histopathological reports of pleural biopsies.

Included in this study were all records of patients with clinical and paraclinical expression of pleuropathy who underwent puncture and/or pleural biopsy in 2009; Regardless of race, age, sex or occupation.

Excluded from this study were patients with purulent or turbid pleural fluid, or a biologically established transudate.

The fresh liquid after needle aspiration was received in the laboratory and was the subject of a macroscopic study which re-read the volume, the color, the presence of suspended elements and its clarity. It was then centrifuged at 3000 rpm for five minutes. The pellets collected were used to make the thin smears which were colored according to the techniques of May Grunwald-Giemsa and Papanicolaou [2,3].

Biopsies were received attached to 10% neutral buffered formalin. All the samples obtained were treated according to the usual histological

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technique, including circulation (dehydration, lightening, and impregnation), coating, microtome cutting between 3 and 5 microns, staining with hematein-eosin followed by the examination under the ordinary microscope by the pathologist.

We analyzed: epidemiological factors such as distribution of pleural specimens per month, age and sex, morphological characteristics and cytology of pleural fluids.

The biopsies were read for diagnosis after histopathological exam. We determined the concordance between cytology report and biopsy report and the comparison between these 2 tests. Tuberculosis was suspected in the pleural fluid if it contained more than 500 cells in which more than 50% were lymphocytes. Cancer was suspected in the presence of malignant cells during cytopathological analysis.

The study received approval from the National ethic committee of Cameroon.

The data obtained were analyzed using the SPSS software version 14.0. The statistical test used was the independence test (chi-square test) with a threshold of significance $P<0.05$ and the confidence index of 95%.

Results

During the 12 months period, a total of 547 pleural specimens were collected, including 240 female subjects and 307 male subjects: the sex ratio was 1.28 in favor of men.

The distribution of pleural specimens exploited per month shows two frequency peaks in March, corresponding to the end of the great dry season-beginning of the small rainy season and a second peak in November, corresponding to the end of the great rainy season and the beginning of the great dry season (Figure 1)

The active population, between 20 and 49 years of age, with 62% of the total population, was the most affected by pleural disease as shown by the distribution by age groups (Figure 2). Ninety five (17.3%) patients were tested for human immunodeficiency virus in which 43 (45.3%) were found to be positive and 52 (54.7%) negative.

The number of specimens for cytology was 390 (73.5%), the macroscopic examination of pleural fluids revealed a predominance of hematic fluid in 51.30% of cases, while 43.90% of the fluids showed a citrine character. With an average albumin level of 58 g/l, all the fluids were exudates. All the values obtained after dosage of the Lactate Desy Hydrogenase were above 200 UI/l (the minimum was 215 UI/l for a

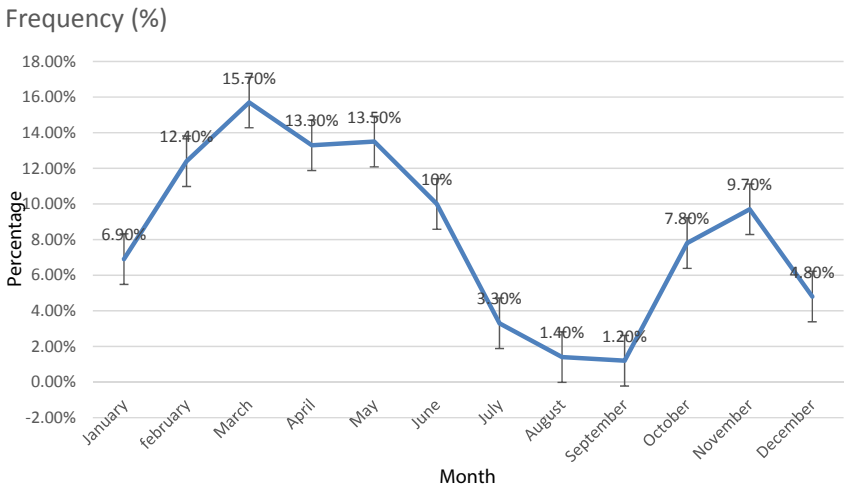

Figure 1: Distribution of pleural specimens per month: there are 2 peaks one in March and the other one in November.

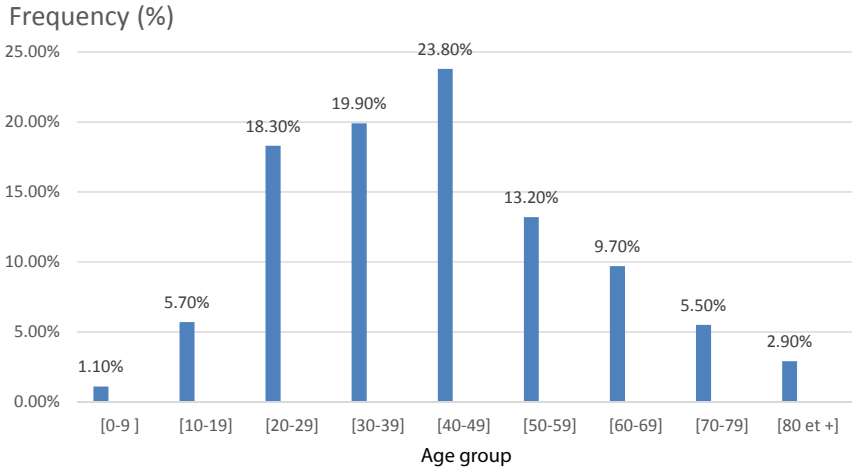

Figure 2: Distribution of pleural specimen according to age group.

maximum of 8249 UI/l) confirming the inflammatory character of the fluids.

The cell count of the pleural fluid showed a count of more than 500 cells/mm³ in 56% of cases, in which lymphocytosis, greater than 50% was found in 76.9% of these cases.

Diagnostic orientation towards specific inflammation or tumor process was possible in 73.7% of cases, whereas in 26.3% of cases non-specific inflammation was suspected.

The number of specimens for histological examination was 352 (64.3%) and the number of tissue fragments collected varied from 2 to 12. The analysis of these samples confirmed the cytological diagnosis in 72.5% of the cases, of which 64.20% of tuberculosis and 8.30% of cancers.

One hundred and ninety-five patients performed both pleural cytology and pleural biopsy. The specific diagnosis was found in 177 (90.77%) of the cases. Overall, 152 (77.87%) specimens were diagnosed positive for tuberculosis by both tests, while 25 (12.82%) specimens were diagnosed positive for a tumor (Figure 3). The tumor pathology was encountered especially in the age group of 40-49 years. It was absent before 30 years (Figure 4). The chi-square test applied to the frequency of diagnostic guidance in the cytology of pleural fluid compared to the frequency of diagnosis after histopathological examination found no statistically significant difference (p=0.71).

In both men and women, tuberculosis was found mainly between 20 and 49 years of age with a peak between 30 and 39 years. We noted a male predominance (Figure 5).

Twenty-two patients confirmed to be biopsy-positive did not have a tuberculosis orientation in cytology. In addition, 16 tuberculosis-positive patients at cytology were negative after biopsy.

Metastatic adenocarcinoma was by far the most frequent tumor in a total of 28 tumors, with 89.3% of the cases.

Discussion

In our context, the only methods of sampling are "blind". For the diagnosis of pleural tuberculosis, several studies combining pleural needle biopsy, cytology, and adenosine deaminase assay are similar to biopsies under thoracoscopy [7,10,23].

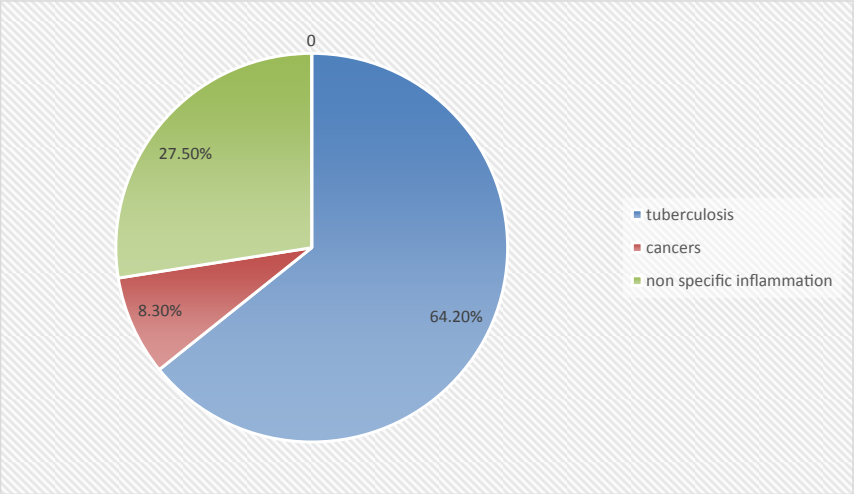

Figure 3: Frequency of the diverse etiologies after cytology histopathological analysis of the specimens.

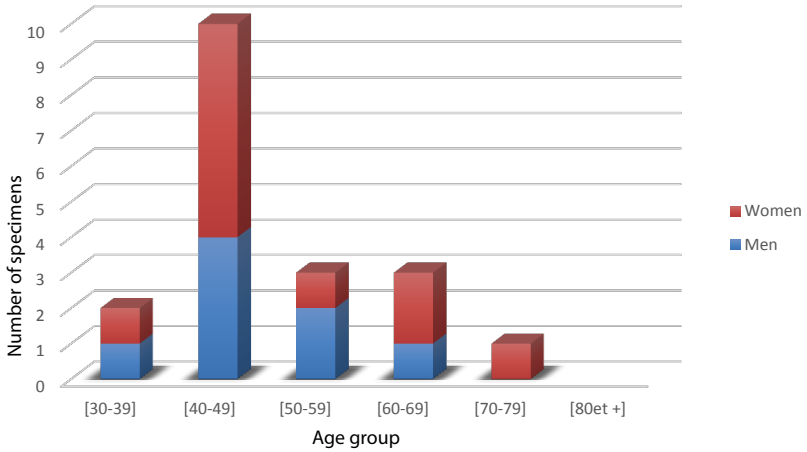

Figure 4: Distribution of tumor pathology according to age and sex after histopathological analysis of biopsied specimens.

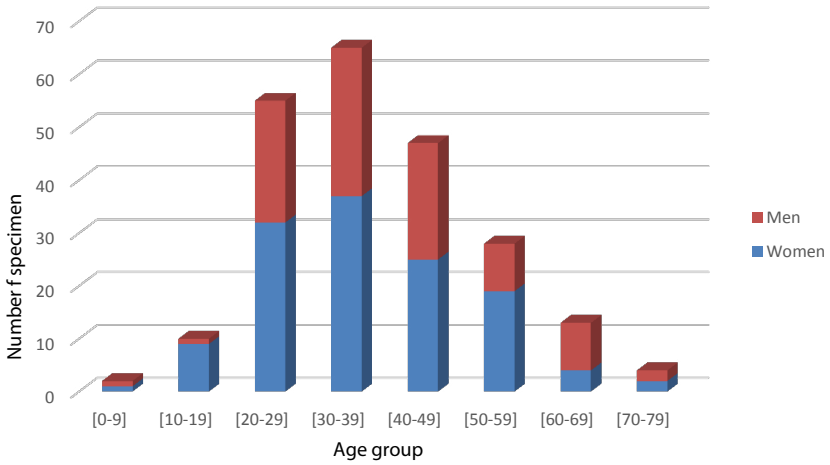

Figure 5: Distribution of cases of tuberculosis according to age and sex after histopathological analysis of biopsied specimens.

Other more expensive diagnostic means such as PCR and gamma interferon assay are also available [24-27].

The precision of the etiology of non-purulent pleurisy allows adequate management and avoids the abuse of drugs following the probabilistic treatment which is the prerogative of the countries not equipped with qualified personnel and for their insufficient technical plateau [12].

We noted an upsurge in pleurisy during the great dry season with a peak in March. During the great rainy season, characterized by the highest rainfall in August, September and October, we observed a lower rate of pleurisy consultations during the year (Figure 1). Mali et al. found a total of 67.7% of consultations during the dry season. This situation could be explained by the fact that in the dry season inhalation of dust and foreign bodies is greater; this results in more pleuropulmonary affections.

In our study the sex ratio is 1.28 in favor of men. It is higher in West Africa as evidenced by studies by Achi in Côte d'Ivoire [2] and Ouédraogo et al. in Burkina Faso [3], with respectively 1.49 and 1.88. Mali et al. with 2.6 in favor of men. This male predominance is due to the fact that men are more exposed to airborne toxins and inhalations than women who, in many African settings, are confined to domestic tasks [28-30].

The average age in our study was 42 years with extremes of 2 to 93 years. This average age seems to improve over the years as evidenced by the work of Ottou [31] in 1990 or Mali et al. in 2000 in Cameroon, who had an average age of 33 years and 37 years respectively. Similarly, Malli et al.; Keita et al. [30] find an average age of 37 years in 1990 while Diallo et al. [6] note an average age of 41 years in 2006 in the same country. This suggests an improvement in life expectancy.

Hematic fluid accounted for 51.3% of our samples. The heterogeneity of the liquid in this study cannot lead to a suspicion of cancer because of its retrospective nature and this may be due possibly to multiple or traumatic punctures. For Fenton and Richardson [30], 1/3 of the malignant effusions were hemorrhagic.

Tuberculosis or cancers were suspected for elements greater than 500 mm^3 as proposed by Light [1]. We found a cell count greater than 500 mm^3 in 56% of cases. Achi [2] found a cell count greater than 500 mm^3 in 97.1% of cases, in their study limited to tuberculous pleurisies [2,31,32].

The cytological analysis of the pleural fluid showed a lymphocytosis greater than 50% in 76.9% of the cases. In Cape Town, South Africa, Diacon et al. [9] found 86% for a lymphocyte count between 43 and 100%. Ouédraogo et al. found a lymphocytosis greater than 90% in 66% of the cases [3]. While Achi in Côte d'Ivoire found lymphocytosis in more than 60% in 97% of cases [2].

In this study, the diagnostic orientations of cytology were superimposed on the results of the pleural biopsy. Cytology oriented the diagnosis in 73.7% of cases for cancer or tuberculosis whereas biopsy alone confirmed the diagnosis in 72.5% of the cases for the same etiologies. We found no statistically significant difference between these two results. P=0.71. James et al. [10] in India found 62.2% for cancers and tuberculosis in a study that included pleurisy in general [33]. Awalé in Lomé in Togo [34] found 59.05% for tuberculous pleuritis and 11.40% for neoplastic etiology. In our study, the biopsy alone revealed a neoplastic etiology in 8.3% of the cases. Several other studies in Mali et al., Cote d'Ivoire [2,4], South Africa [10] and India [14,15] show a single biopsy efficacy varying between 60 and 80%. The American [5,10] and European [11,12] series show similar results but with a predominance of neoplastic pathology.

The number of tissue fragments collected varied from 2 to 12, with an average of 5 fragments, suggesting that biopsies were done by experienced practitioners. Specimens with 4 to 6 fragments accounted for nearly 70%. The high number of fragments facilitated the work of the pathologist and multiplied the probability of a positive result [34-36].

Tuberculosis occurred mostly between 20 and 49 years with a peak between 30 and 39 years. There was a male predominance. Mbang [32] found a similar result. In other African countries and Asia, tuberculous pleuritis was more common in young men with a male predominance [4,6,13-15]. On the other hand, in America and Europe [10-12] it was the prerogative of the elderly patient due to immunosuppression linked to corticosteroid therapy and co-morbidities in addition to HIV infection.

Tumor pathology occurred between 40 and 49 years of age in both sexes, In this case, our data did not allow us to know the primary tumor because the study was retrospective. After 60 years, it was mostly women who had cancer in our study. Amouzouvi [36] in Togo and Domoa et al. [37] found a male predominance in studies limited to hemorrhagic pleurisy. Of a total of 28 identified tumors, secondary adenocarcinoma was by far the most frequent (25 cases/28 or 89.3%).

In Togo, lymphoma was the first etiology with 36.3% followed by breast cancers 27.3%, skin, 18.2% and bronchus 9.1% [37]. In Côte d'Ivoire [38], bronchial cancer was the leading cause with 6 cases/16 followed by that of the prostate 3 cases/16. For Sahn [38], bronchial and gynecological cancers were the primary cause of secondary localization in neoplastic pleurisy.

Of the 195 patients who underwent both tests, the specific diagnosis was found in 90.77% of cases, which was statistically higher than the 72.5% found by histology alone. Tumor pathology accounted for 12.8% and non-specific inflammation, 9.23%. Other studies in Africa [13] and India [14,15] confirmed the efficacy of ABRAMS needle biopsy, coupled with cytology, especially in the diagnosis of tuberculosis. For the diagnosis of cancers, this yield would be reduced due to effusions in a neoplastic context without metastatic localization in the parietal pleura. Kuaban et al. [13] in Cameroon found a sensitivity of 88.9% for the diagnosis of cancers in hemorrhagic pleurisy while Domoa et al. in Abidjan [38] found 66.6% for metastatic sites of cancer, 23.8% for tuberculosis and in 8% of cases the diagnosis was not made. In Africa, patients benefit from biopsy when the disease is very advanced. Indeed, patients consult late and the management of cancers runs up against the financial limits; Care is essentially palliative. Cytology suspected tuberculosis only when confirmed by biopsy in the presence of an epithelioid and gigantocellular granuloma centered by caseous necrosis. There was synergy between the two tests for the diagnosis of tuberculosis. In countries where it is available, the assay of adenosine deaminase associated with these two tests yielded results tending toward those of thoracoscopy in the diagnosis of tuberculous pleuritis in other studies [10,12,13,30]. Twenty-five specimens of those who had undergone both tests have been diagnosed positive for tumors. Our results showed the same efficacy for cytology and biopsy. These tumors were mainly represented by adenocarcinomas of metastatic localization. This result did not match with some data from literature [9,38] which showed a high profitability of cytology compared to the biopsy. This observation could be explained by the long delay and the poor conditioning of the samples before their treatment; since these were in our context deposited at the Pasteur Center by patients themselves. The superiority of the performance of the cytology of the pleural fluid in literature was attributed to the fact that the cell population present in the sediment was representative of a larger pleural surface compared to the cell population obtained by a blinded biopsy. The yield of needle biopsy depends on the tumor invasion of the parietal pleura.

Conclusion

It results from this work that the pleuro-pulmonary pathology in our context is more frequent during the dry season. Although tuberculous pleuritis is the most frequent etiology, reaching mainly young subjects aged 20 to 49 years, the tumor pathology dominated by adenocarcinoma of metastatic localization, is nonetheless negligible. The needle biopsy of ABRAMS coupled with the cytological analysis of the pleural fluid constitutes a powerful means of diagnosis and gives satisfactory results in our environment. These results could be improved in the case of metastases by introducing biopsies under thoracoscopy.

Ethics

The study received approval from the National Ethic committee of Cameroon.

Authors Contributions

JJZ: Did the pleural fluid aspiration and biopsies in patient and wrote the manuscript.

PJA: Did the histopathological analysis of the specimen and help in writing the manuscript.

MCBE: Contributed in pleural fluid aspiration for cytology and biopsy and read the manuscript for corrections

EAZ: Read the manuscript for corrections.

BNN: helped in writing the manuscript, read it for correction and supervised the paper writing

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