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Research Article

# Tuberculous Pericarditis: Diagnostic, Therapeutic, and Prognostic Aspects in a Cardiology Department in Dakar – Senegal

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## Abstract

**Introduction:** The objectives of this study were to determine the frequency of tuberculous pericarditis and to describe its diagnostic, therapeutic, and prognostic aspects.

**Methodology:** We conducted a retrospective descriptive and analytical study over five years from January 1, 2015, to December 31, 2019, at the General Hospital Idrissa POUYE in Dakar. The study focused on patients aged over 18 years who were hospitalized for tuberculous pericarditis, with or without effusion, and treated with antituberculous drugs according to the protocol established by the National Tuberculosis Control Program (PNLT) of Senegal. This work was carried out in collaboration with the hospital management after obtaining approval from the cardiology department by signing the access form to patient records. Data were entered using Sphinx software version 5.1.0.2 and analyzed with SPSS (Statistical Package for Social Sciences) software version 18.

**Results:** We identified 108 cases of pericarditis from all causes, representing a hospital prevalence of 1.95%. Among these, 42 were of tuberculous origin, with a hospital prevalence of 0.76% and 38.89% of all pericarditis cases, with a male predominance (sex ratio of 1.33). The mean age was 28.6 ± 10 years, with a predominance in the 20-29 age group (57.1%). More than half of the patients (57.1%) had a low socio-economic status, and 42.85% had a history of contact with tuberculosis. Symptoms were mainly dyspnea and chest pain (78.57% each). Tachycardia (85.7%) and pericardial friction rub (42.9%) were frequently observed. The pericardial puncture fluid was sero-hematic in 66.7%, and the study showed a positive Rivalta test with lymphocytic predominance. The adenosine deaminase (ADA) level in the pericardial puncture fluid, performed in 12.5% of patients, was positive. HIV serology was positive in 10% of cases. Cardiac ultrasound showed effusion in all patients, with a large amount in 64.29% of cases. All patients received antituberculous treatment, with 35.7% also receiving corticosteroids. The average hospital stay was 11 days, with complication rates of pericardial constriction (14.3%) and deaths (7.1%).

**Conclusion:** Tuberculous pericarditis remains a significant health issue, particularly among patients of low socio-economic status and those with a history of contact with tuberculosis. Despite the availability of treatments, complication and mortality rates remain considerable, highlighting the need for early diagnosis and comprehensive management.

**Keywords:** tuberculous pericarditis; epidemiology; diagnosis; treatment;senegal

## Introduction

Tuberculous pericarditis is a significant complication of tuberculosis; its diagnosis can be challenging and often delayed or missed, leading to late complications such as constrictive pericarditis and increased mortality [1]. Tuberculous pericarditis occurs in approximately 1 to 2% of patients with pulmonary tuberculosis [2]. It constitutes a relatively common condition, representing an average of 7% of cardiovascular diseases in Africa [3]. In a series of 294 immunocompetent patients in Spain with acute pericarditis, tuberculous pericarditis accounted for 4% of cases [4]. The tuberculous etiology has seen a resurgence with the advent of HIV/AIDS, particularly in Africa [5, 6]. Countries with high HIV prevalence have observed a marked increase in tuberculous pericarditis. For instance, in a series of Tanzanian patients with

significant pericardial effusions in 1994, all HIV-infected patients had tuberculous pericarditis [7]. The incidence of tuberculous pericarditis in the United States has declined alongside the decreased prevalence of tuberculosis [8, 9]. However, in U.S. regions with large immigrant populations from endemic tuberculosis countries, extrapulmonary tuberculosis, including tuberculous pericarditis, is still observed with some frequency [10, 11].

In rare cases, the initial phase of tuberculous pericarditis is identified by biopsy or autopsy as isolated granulomas in the pericardium. Typically, the first recognizable phase of pericardial infection is the second phase, characterized by a lymphocytic effusion. The diagnostic yield of pericardial fluid and tissue for acid-fast bacilli smear and culture is generally highest during the effusion stage [12, 13]. Without treatment, effusion resorption and symptom resolution occur within two to four weeks in about 50% of cases [14]. Tuberculous pericarditis should be considered in the evaluation of patients with non-resolving pericarditis, especially in the context of tuberculosis exposure risk factors [4].

Antituberculous treatment has been shown to significantly reduce mortality in patients with tuberculous pericarditis, from 80 to 90% [15] to 8 to 17% in non-HIV-infected individuals [16, 17], and from 17 to 34% in HIV-infected individuals [18]. It has also been demonstrated to reduce the likelihood of constrictive pericarditis, from 88% to 10 to 20% of treated cases [19, 20].

In Senegal, many studies have focused on the epidemiological, clinical, and evolutionary aspects of pericarditis, but few have specifically addressed tuberculous pericarditis. Hence, our study aimed to determine the frequency of tuberculous pericarditis and describe its diagnostic, therapeutic, and evolutionary aspects.

### Methodology

This was a descriptive and analytical study with retrospective data collection. The study spanned a period of 5 years from January 1, 2015, to December 31, 2019. Included in the study were patients aged 18 years and above, hospitalized in the cardiology department of General Hospital Idrissa Pouye during the study period for tuberculous pericarditis with or without effusion, treated with antituberculosis drugs according to the protocol established by the Senegalese National Tuberculosis Control Program (PNLT). Tuberculous origin was presumed based on one or more suggestive signs, as specific signs of tuberculosis were absent. Presumptive signs included a history of tuberculosis contact with general health deterioration, an exudative pericardial fluid rich in lymphocytes, positive adenosine deaminase (ADA) or GeneXpert test in pericardial fluid, positive tuberculin skin test, and favorable response to antituberculous treatment.

We examined socio-demographic aspects, cardiovascular risk factors, clinical, paraclinical, therapeutic, and evolutionary data. Hospitalization duration was expressed in days, and circumstances of death were also noted. Data were collected using a structured questionnaire and recorded in an exploitation form. The survey form was validated by an expert committee comprising three cardiologists and one epidemiologist with at least 4 years of experience. This work was conducted in collaboration with hospital management following approval from the cardiology department by signing the patient records access form.

Data analysis was performed using Epi Info version 7 and R Studio version 4. Descriptive analysis presented qualitative variables as frequencies and percentages, and quantitative variables as means with standard deviations, ranges, and medians. Bivariate analysis involved correlating tuberculous pericarditis with other variables. Chi-square tests (Fisher and Pearson) and Yates' corrected Chi-square test were used to compare proportions. A relationship was considered statistically significant when the p-value was less than 0.05.

## Results

During the study period, we identified 108 cases of pericarditis, all causes combined, representing a hospital prevalence of 1.95%. Among these cases, 42 were of tuberculous origin, with a hospital prevalence of 0.76% and a prevalence of 38.89% among all pericarditis cases. The majority of patients were male with a male-to-female ratio of 1.33. The mean age of patients was 28.6 ± 10 years, with a predominance in the age group of 20 to 29 years (57.1%) (Figure 1). The distribution of patients by age and gender consistently showed a clear predominance in the 20 to 29-year age group, with a balanced sex ratio (1) for this age group. Housewives and students were the most represented professions. The majority of patients (51.1%) resided in downtown Dakar. More than half of the patients (57.1%) had a low socio-economic status (Figure 2).

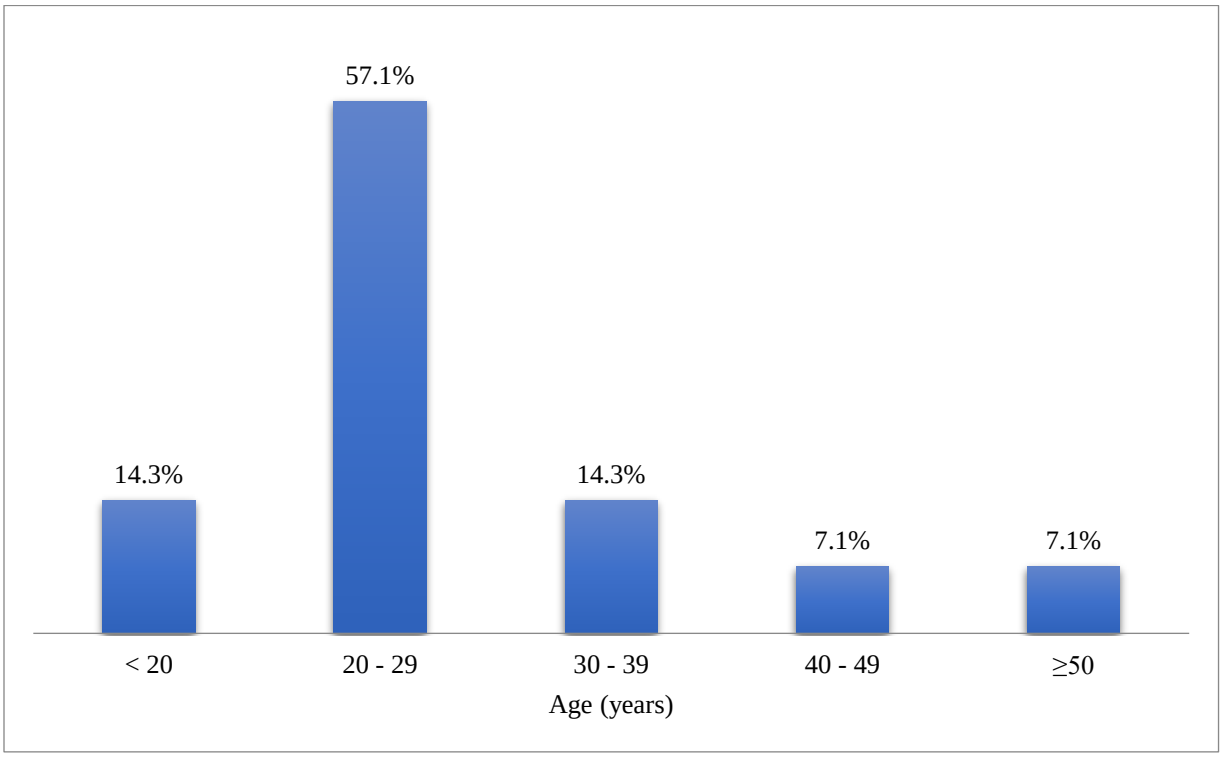


**Figure 1:** Distribution of the population by age group (n = 42).

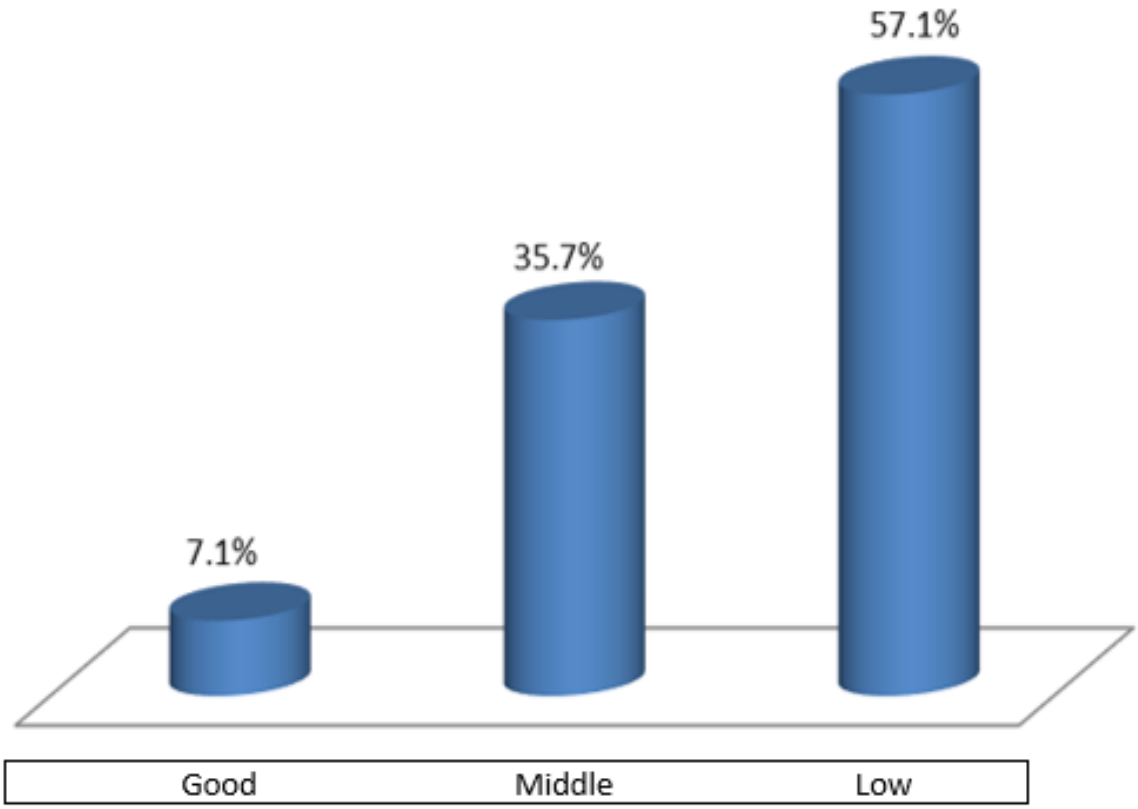


**Figure 2:** Distribution of patients by socio-economic level (n = 42).

In terms of medical history, a history of tuberculosis contact was found in 42.85% of patients and pulmonary tuberculosis in 7.14% of cases. Clinically, functional signs were dominated by dyspnea and chest pain (78.57% each), as well as cough (42.86%). Physical examination revealed tachycardia (85.7%) and pericardial friction rub (42.9%). Extracardiac signs included pleural effusion (71.4%) and spontaneous jugular vein distension (57.1%) (Table 1).

| Clinical Signs | Number of patients | Percentage (%) |
|---|---|---|
| Dyspnea | 33 | 78.57 |
| Chest pain | 33 | 78.57 |
| Cough | 18 | 42.86 |
| Tachycardia | 36 | 85.7 |
| Pericardial friction rub | 18 | 42.9 |
| Pleural effusion | 30 | 71.4 |
| Spontaneous jugular vein distension | 24 | 57.1 |
| Total | 42 | 100 |

**Table 1:** Distribution of Patients by Clinical Signs (n = 42)

Regarding diagnostic investigations, all patients had a positive tuberculin skin test. Pericardial tap, performed in 85.71% of patients, showed a predominance of serosanguinous fluid in 66.7% of patients (Figure 3). Major laboratory abnormalities included neutrophilic leukocytosis in 35.71% of patients, lymphocytosis in 21.4%, elevated erythrocyte sedimentation rate (42.9% with a mean of 62.3 mm, ranging from 11 to 97 mm), and elevated CRP in 92.86% of cases (average level of 65.17 mg/l ± 34) (Table 2). HIV serology, conducted in 71.14% of patients, was positive in 10% of cases. Pericardial fluid analysis, performed in 57.14% of cases, showed a predominance of lymphocytic exudate with a positive Rivalta test. Adenosine deaminase (ADA) testing in pericardial fluid, conducted in 12.5% of patients, was positive. GeneXpert MTB testing, performed in 42.9% of patients, was negative. Acid-fast bacilli (AFB) smear, conducted in 42.9% of cases, was also negative, as was pericardial fluid culture, performed in 78.57% of patients. No patient underwent pericardial biopsy.

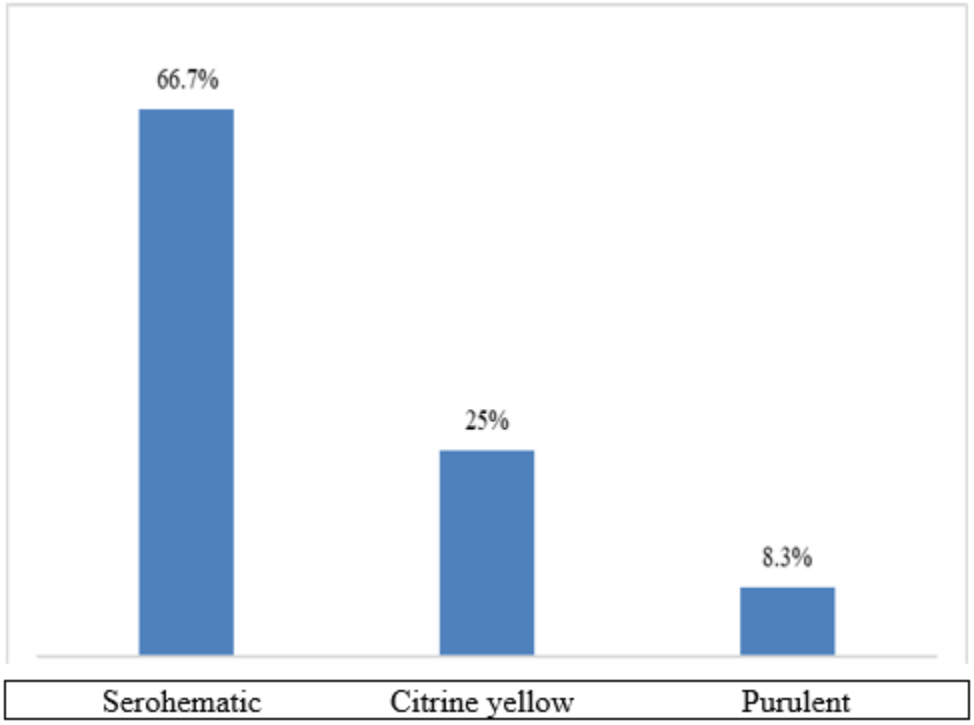


**Figure 3:** Distribution of patients according to the appearance of pericardial puncture fluid (n=36).

| Biological Abnormalities | Number of Patients | Percentage (%) |
|---|---|---|
| Hyperleukocytosis | 15 | 35.71 |
| Lymphocytosis | 9 | 21.4 |
| Accelerated erythrocyte sedimentation rate | 18 | 42.9 |
| Elevated CRP | 39 | 92.86 |
| Total | 42 | 100 |

**Table 2:** Main Biological Abnormalities (n = 42)

ECG findings included sinus tachycardia in 85.7% of patients, low voltage in 57.14%, and electrical alternans in 28.6% (Table 3). Radiological signs were dominated by cardiomegaly (64.3%) and pleural effusion (57.14%) (Table 4). Cardiac ultrasound revealed pericardial effusion in all patients, with large effusion in 64.29% and a "swinging heart" appearance in 21.4%. Right ventricular compression was noted in 21.43% of patients, and fibrin presence in 57.14% of cases (Table 5).

| Electrical Signs | Number of Patients | Percentage (%) |
|---|---|---|
| Sinus tachycardia | 36 | 85.7 |
| Negative T waves | 9 | 21.4 |
| Low voltage | 24 | 57.14 |
| Electrical alternans | 12 | 28.6 |
| Under PQ shift | 3 | 7.14 |
| Total | 42 | 100 |

**Table 3:** Distribution of patients according to electrical signs (n = 42)

| Radiological Signs | Number of Patients | Percentage (%) |
|---|---|---|
| Cardiomegaly | 27 | 64.3 |
| Fluid effusion | 24 | 57.14 |
| Systematized opacities | 9 | 21.42 |
| Cavities | 6 | 14.29 |
| Miliary | 3 | 7.14 |
| Total | 42 | 100 |

**Table 4:** Distribution of patients by radiological signs (n = 42)

| Echocardiography Results | Number of Patients | Percentage (%) |
|---|---|---|
| Effusion (all) | 42 | 100 |
| Large effusion | 27 | 64.29 |
| « Swimming heart » appearance | 9 | 21.7 |
| Right ventricular compression | 9 | 21.43 |
| Presence of fibrin | 24 | 57.14 |
| Total | 42 | 100 |

**Table 5:** Distribution of Patients by Echocardiography Results (n = 42)

In terms of therapy, all patients received antituberculous treatment according to the Senegalese National Tuberculosis Control Program (PNT) protocol, including two months of quadritherapy (RHZE: Rifampicin, Isoniazid, Ethambutol, and Pyrazinamide) followed by four months of bitherapy (RH: Rifampicin and Isoniazid). Oral corticosteroids were administered in 35.7% of cases, and aspirin in 14.3% of cases (Table 6). The average time between hospitalization and pericardial tap was 24 hours for most patients (64.3%). The average length of hospital stay was 11 days (range 3 to 24 days). Short- and medium-term outcomes were unfavorable in 21.4% of cases, with complications such as pericardial constriction (14.3%) and deaths (7.1%).

| Treatment Received | Number of Patients | Percentage (%) |
|---|---|---|
| Complete anti-tuberculosis treatment | 42 | 100 |
| Oral corticosteroids | 15 | 35.7 |
| Aspirin | 6 | 14.3 |
| Total | 42 | 100 |

**Table 6:** Distribution of Patients by Treatment Received (n = 42)

## Discussion

The findings of this study provide significant insights into the epidemiological, clinical, and therapeutic characteristics of pericarditis, particularly of tuberculous origin, in a Senegalese hospital setting. The hospital prevalence of pericarditis at 1.95% and tuberculous pericarditis at 0.76% underscore the importance of this pathology in our setting. Tuberculous pericarditis, caused by Mycobacterium tuberculosis, is found in approximately 1% of all autopsied cases of tuberculosis and in 1% to 2% of pulmonary tuberculosis cases [21]. It is the most common cause of pericarditis in Africa and in other countries where tuberculosis remains a major public health issue [22]. In a series from the Western Cape province in South Africa, tuberculous pericarditis represented 69.5% (162 out of 233) of cases referred for diagnostic pericardiocentesis [23], compared to 38.89% in our study and 36% in the study by Bouakez [24].

Most available data on tuberculous pericarditis (TBP) come from developing countries where the burden of tuberculosis is high and co-infection with M. tuberculosis and HIV is common [25]. The incidence of tuberculous pericarditis in sub-Saharan Africa is increasing due to the HIV epidemic, and this trend is likely to be seen in other parts of the world where HIV spread leads to a resurgence of tuberculosis [26, 27]. In the Western Cape, half of the patients with large tuberculous pericardial effusions are HIV-infected [23].

In these geographical regions, TBP accounts for 50 to 70% of effusive pericarditis cases in HIV-negative patients and over 90% in HIV-positive patients [8]. In developed countries, TBP is rare (4% of effusive pericarditis cases) [28, 29, 30].

The male predominance (male-to-female ratio of 1.33), relatively young mean age of patients (28.6 years), and high proportion of housewives and students indicate that pericarditis, especially tuberculous, mainly affects young adults who are often exposed to precarious living conditions, which has significant socio-economic implications. These findings were similar to those of Zabsonre [31] in Burkina Faso, who found male predominance (sex ratio 1.92), and Saïd [32] in France with a mean age of 45 years.

Our study found a low socio-economic status in over half of the patients (57.1%), whereas it was low in all patients in the study by Aimé Arsène Yaméogo [33], which could be an aggravating factor, highlighting the importance of living conditions in the emergence of this disease.

The history of tuberculosis contact (42.85%) and pulmonary tuberculosis (7.14%) among patients underline the strong association between tuberculosis and pericarditis in our study. This is consistent with the literature [34, 35, 36, 37], which indicates that tuberculosis is a major cause of pericarditis in regions with a high prevalence of tuberculosis.

Clinical symptoms, dominated by dyspnea and chest pain (78.57%), as well as cough (42.86%), are in line with typical manifestations of pericarditis as described in the literature [24, 32, 33]. The high prevalence of tachycardia (85.7%) and pericardial friction rub (42.9%) on physical examination confirms these observations. Extracardiac signs, such as pleural effusion (71.4%) and spontaneous jugular vein distension (57.1%), indicate systemic involvement and increased disease severity.

Diagnostic investigations showed biochemical disturbances, such as leukocytosis (35.71%) and elevated CRP (92.86%), which are markers of inflammation and infection typical in tuberculosis. Pericardial fluid analysis revealed a predominance of serosanguinous fluid (66.6%) and a positive Rivalta test with lymphocytic predominance, consistent with characteristics of tuberculous pericardial effusions.

The negativity of GeneXpert MTB and AFB testing in a significant proportion of cases underscores the diagnostic challenges of tuberculous pericarditis, despite suggestive clinical and biochemical signs. The negative pericardial fluid culture in 78.57% of cases reflects the low sensitivity of traditional culture methods for tuberculosis. Early diagnosis of tuberculous pericarditis (TBP) through microbiological methods is very challenging due to the low number of mycobacteria in pericardial fluid. Confirming mycobacteria in the sample through culture requires several weeks [38]. Advances in recognizing TBP rely on the introduction of molecular methods, which are based on amplifying specific genetic fragments of M. tuberculosis [37].

The antituberculous treatment protocol used, in line with national recommendations, appears appropriate given the nature of the disease. However, the administration of oral corticosteroids in 35.7% of cases and aspirin in 14.3% of cases indicates a combined therapeutic approach to manage inflammation and prevent complications.

The average hospitalization duration of 11 days, although relatively short, indicates effective hospital management. Nonetheless, the unfavorable short- and medium-term outcomes in 21.4% of cases, including complications such as pericardial constriction (14.3%) and deaths (7.1% in our study versus 13.3% in Saïd's study in Morocco [32]), highlight the severity of the disease and the need for rigorous patient follow-up after discharge.

This study has several important limitations that should be considered when interpreting the results. Firstly, the sample size was limited to 108 cases of pericarditis, including 42 of tuberculous origin. This small sample size may reduce the statistical power of the study and limit the generalizability of the results. The absence of pericardial biopsy to confirm the diagnosis is also a notable limitation. This study was conducted in a public hospital, which may introduce biases related to the studied population. Patients seeking care in public hospitals may have specific socio-economic profiles, often more disadvantaged, which could influence the prevalence and clinical presentation of tuberculous pericarditis. Additionally, the hospital where the study was conducted is located in the suburbs of Dakar. This location may affect the study's results in terms of representing the general population of Dakar and Senegal.

## Conclusion

This study highlights the significance of tuberculous pericarditis in our context and the associated diagnostic and therapeutic challenges. The diagnosis of tuberculous pericarditis remains complex in Senegal, largely due to limited resources available to patients. Sophisticated diagnostic tools, such as GeneXpert MTB and microbiological cultures, showed limited sensitivity in this study. Improving socio-economic conditions, preventing and early treating tuberculosis, along with appropriate medical follow-up, are crucial to reduce the incidence and morbidity associated with this condition.

While this study provides valuable insights into tuberculous pericarditis in a specific hospital setting, it has limitations that need consideration. Further future studies with larger sample sizes, improved diagnostic tools, and diverse study sites are necessary to confirm and extend these findings. These studies should refine diagnostic and therapeutic strategies to improve outcomes for patients with tuberculous pericarditis.

**Ethics approval and consent to participate:** This study was approved by the ethics committee of Cheikh Anta Diop University of Dakar and was carried out in collaboration with the hospital management after obtaining approval from the cardiology department by signing the access form to patient records.

**Consent for publication:** Not Applicable

Availability of data and materials: The data and materials of this study are available upon request and ready to be shared. For further information, please contact the corresponding author, Aliou Alassane NGAIDE.

**Declaration of Interests:** None of the other authors have any conflicts of interest or relevant disclosures.

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**Authors and Contributors:**

Ngone Diaba GAYE and Abdoul KANE designed the study protocol, participated in the data collection and writing of the draft manuscript.

Aliou Alassane NGAIDE and Malick BODIAN oversaw the execution of the study, participated in data analysis and critically revised the manuscript for important intellectual content.

Rougui DIOP and Maboury DIAO participated in study design and in data analysis.

Joseph Salvador MINGOU and Alassane MBAYE participated in statistical analysis and interpretation of results.

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