

# Clinical and Etiological Profile of Patients with Moderate to Large Pericardial Effusion in a Tertiary Care Centre: An Observational, Prospective Study

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**Abstract:** *Background:* Pericardial effusion is a common disease of the heart that can have a number of aetiologies. Effective diagnosis and treatment of pericardial effusion depend on an understanding of its clinical and etiological features. *Methods:* This is a prospective, observational study. Aim of this study was to evaluate the pericardial effusion clinical and etiological profile at a tertiary care hospital. 48 patients were enrolled between 01/01/2022 and 31/05/2023. We gathered information on the patient's demographics, clinical presentation, lab tests, electrocardiogram results, echocardiography reports, and pericardial fluid analysis. *Results:* In our study, there were 48 patients with pericardial effusion, and the most prevalent cause was tuberculosis (44%), followed by idiopathic cases (17%). Breathlessness (83.3%) and tachycardia (75%) were prevalent symptoms and signs, respectively. Low voltage complexes and sinus tachycardia were among the electrocardiographic abnormalities (79%) and 75%, respectively. Analysis of the pericardial fluid showed variable protein concentrations, cell counts, and lymphocytic predominance (52%). *Conclusion:* Tuberculosis emerged as the primary cause of pericardial effusion, highlighting the significance of taking infectious aetiologies into account when developing a diagnostic strategy. The many clinical manifestations and accompanying symptoms underscore the necessity of a thorough evaluation of pericardial effusion patients. Analyses of the pericardial fluid and electrocardiographic anomalies were essential components of the diagnosis. These results emphasise the significance of early detection, effective care, and additional multicenter research to advance our knowledge and increase patient outcomes.

**Keywords:** Pericardial effusion, tuberculosis, pericarditis, tertiary care

## 1. Introduction

The pericardium is a double-walled sac made up of an inner visceral pericardium and an outer fibrous parietal pericardium. Immediately outside of the myocardium, there is a significant form of membrane called the inner visceral pericardium. An ultra filter of plasma produced by the visceral pericardium fills the pericardial space, which is located between the parietal and visceral pericardium. The pericardium and the heart are lubricated by pericardial fluid. When there is an excessive buildup of fluid or blood in the pericardial cavity, it is known as a pericardial effusion.(1) (2)

One of the frequent illnesses seen in the emergency and outpatient departments of a tertiary care facility is pericardial effusion. However, more crucially, pericardial effusion is linked to an increased risk of cardiac respiratory failure, mortality, and death. Pericardial effusion can result in substantial symptoms and reduced quality of life. Depending on the population and geography, pericardial effusion's aetiology has altered over time. Because of underreporting, there is insufficient information on the prevalence and incidence of pericardial effusion in India.

For a precise diagnosis, suitable care, and improved patient outcomes, it is imperative to have a thorough understanding of the clinical and etiological profile. In this investigation, we seek to thoroughly examine the clinical signs, underlying causes, and contributing elements of pericardial effusion in a tertiary care hospital context.

Infectious, inflammatory, autoimmune, neoplastic, and iatrogenic pathological diseases can all result in pericardial

effusion. (3) To determine the underlying cause of pericardial effusion, a rigorous review of the differential diagnosis is required because quick and precise diagnosis is essential for effective intervention. Additionally, a thorough comprehension of the clinical presentation and etiological aspects unique to the population in a tertiary care hospital setting can help medical professionals create efficient diagnostic algorithms and treatment plans.

This study seeks to contribute to the body of knowledge by conducting a thorough examination of the clinical and etiological features of pericardial effusion and to advance our understanding of this complicated medical condition. In order to determine the most common aetiologies, examine the clinical and demographic correlations between them, and review the diagnostic techniques used in this tertiary care hospital context, our research aims to identify the most common aetiologies. Such information will not only facilitate better management decisions but also guide future research and advancements in pericardial effusion management.

The study's conclusions will ultimately help improve clinical decision-making procedures, diagnostic methods, and patient care for patients presenting with pericardial effusion in tertiary care hospital settings.

## 2. Methods

### Study Design

This study was conducted as a prospective, observational study.

### Study Setting:

Volume 13 Issue 5, May 2024

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

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The study was conducted in department of cardiology at Government general hospital, Guntur, Andhra Pradesh, India.

**Study Population:**

The study included consecutive patients who were diagnosed with pericardial effusion and presented to the hospital between 01/01/2022 and 31/05/2023.

**Inclusion Criteria:**

- Patients diagnosed with moderate (10-20mm echo free space in diastole) to large pericardial effusion (>20mm echo free space in diastole) based on 2D-echocardiography
- Age range between 18-75 years
- Patients who provided informed consent to participate in the study.

**Exclusion Criteria:**

Patients with mild pericardial effusion  
Patients who did not provide informed consent for participation in the study

**Data Collection:**

a. Patient Records: The following information was collected from patients:

- Patient demographics (age, gender)
- Clinical presentation (symptoms, signs)
- Laboratory investigations
- Electrocardiographic findings
- Echocardiography reports
- Pericardial fluid analysis

**3. Results**

Our study included 48 patients with age ranging from 18-75 years. Out of 48, 20 patients were males and 28 were females. The most common symptom with which patient presented was breathlessness (83.3%) followed by fever (52%), chest pain and cough (Table 1). The most common sign was tachycardia (75%) followed by muffled heart sounds (41.6%), bradycardia (8.3%) and hypotension (8.3%) (Table 1)

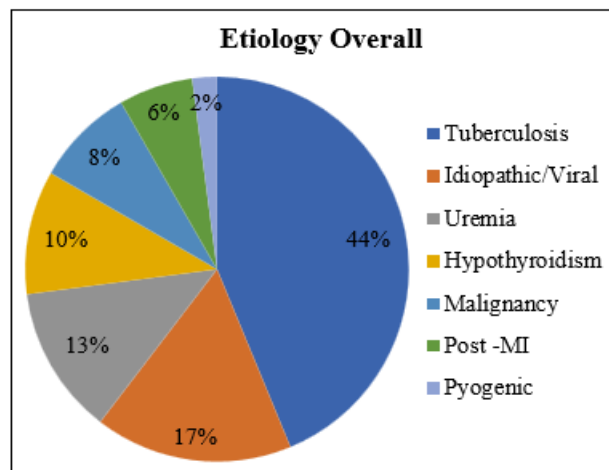
**Table 1:** Distribution of clinical manifestation frequency among patients with pericardial effusion

Clinical Symptoms	Frequency	Percentage
Breathlessness	40/48	83.3
Chest pain	14/48	50
Cough	13/48	27
Fever	14/48	29.16
Asymptomatic	5/48	10.4
Tachycardia	36/48	75
Bradycardia	4/48	8.3
Hypotension	4/48	8.3
Muffled Heart Sound	20/48	41.6

The most common cause of pericardial effusion in our study has been found to be tuberculosis (44%) followed by idiopathic (17%), uremia (13%), hypothyroidism (10%), malignancy (8%), post myocardial infarction (6%), pyogenic (2%). (Figure 1) (Table 2)

**Table 2:** Etiological profile of patients with pericardial effusion

Number of patients (48)	Number of patients	Males (20)	Females (28)
Tuberculosis	21 (43.75%)	10 (50%)	11 (39%)
Idiopathic/Viral	8(16.6%)	3 (15%)	5 (18%)
Uremia	6 (12.5%)	2 (10%)	4 (14%)
Hypothyroidism	5 (10.4%)	0	5 (18%)
Malignancy	4 (8.3%)	3 (15%)	1 (4%)
Post -MI	3 (6.2%)	1 (5%)	2 (7%)
Pyogenic	1 (2%)	1 (5%)	0



**Figure 1:** Etiological profile of patients with pericardial effusion

In males, the most common cause of pericardial effusion in our study was found to be tuberculosis (50%) followed by idiopathic (15%), malignancy (15%), uremia (10%), post myocardial infarction (5%), pyogenic (5%). (Table 2)

In females, the most common cause of pericardial effusion was found to be tuberculosis (39%) followed by idiopathic (18%), hypothyroidism (18%), uremia (14%), post myocardial infarction (7%), malignancy (4%). (Table 2)

There were 4 cases of pericardial effusion in which malignancy was found to be the cause. Out of 4, 2 cases were found to be due to small cell carcinoma of lung, 1 case was secondary to metastasis of breast cancer and 1 case was due to hodgkin’s lymphoma.

Electrocardiogram (ECG) of patients in our study showed low voltage complex in 38 patients (79%), sinus tachycardia was seen in 36 patients (75%), electrical alternans was seen in 10 patients (20.8%), PR segment depression was seen in 10 patients and sinus bradycardia in 4 patients (8.3%). In 8 patients, ECG was normal. (Table 3)

**Table-3:** ECG profile of patients with pericardial effusion in female patients

ECG Profile	Number of patients	Percentage
Low voltage ECG	38/48	79
Sinus Tachycardia	36/48	75
Electrical alternans	10/48	20.8
Sinus Bradycardia	5/48	8.3
Normal	8/48	16.6

The severity of pericardial effusion on echocardiography was

noted. 36 patients had moderate pericardial effusion whereas 12 patients had large pericardial effusion.

In our study, Pericardial fluid analysis was sent for all the patients (Table 4). Out of 48, 14 patients had proteins of <3gm/dl and remaining had >3gm/dl. Cell count was found to be >100 cells/ $\mu$ L in 22.9% patients and was <100 cells/ $\mu$ L in remaining. 52% patient had predominant lymphocytic pattern and remaining were having neutrophilic pattern. ADA was elevated (>40units/l) in 37.5% patients. Pericardial fluid cytology was suggestive of tuberculosis in 8 patients and showed malignant cells in 4 patients.

**Table 4:** Pericardial fluid analysis

		Number of patients	Percentage
Proteins	<3gm/dl	14	29.16
	>3gm/dl	34	70.83
Cell count	<100 cells/microL	11	22.9
	>100 cells/microL	37	77.1
Cell type	Lymphocytosis	25	52.1
	Neutrophils	23	47.9
ADA level	<40 units/L	30	62.5
	>40 units/L	18	37.5

Gm: Gram, dl: Deci-litre, L-Litre

Tuberculosis was diagnosed based on CB-NAAT in 8 patients, based on cytology in 6 patients and in remaining it was started empirically based on pericardial fluid analysis and clinical findings.

#### 4. Discussion

In our investigation, TB was found to be the most prevalent etiological factor for pericardial effusion, accounting for 44% of cases. This result is consistent with earlier research done in comparable circumstances, highlighting the substantial burden of pericardial effusion related to tuberculosis. The role of tuberculosis in pericardial effusion emphasises the need for potent tuberculosis control and preventive programmes in our area, where it is a serious public health concern.

In our analysis, idiopathic reasons, which accounted for 17% of cases, were the second most frequent etiological factor. Idiopathic pericardial effusion describes situations in which a thorough diagnostic examination cannot pinpoint a single underlying cause. The difficulties in pinpointing the precise aetiology of pericardial effusion are highlighted by this finding, which emphasises the significance of extensive examinations to rule out probable aetiologies.

In our investigation, uremia (13%), hypothyroidism (10%), cancer (8%), post- myocardial infarction (6%), and pyogenic causes (2%), among other significant etiological factors, were also found. These results are in line with the diseases' recognised correlations with pericardial effusion. Advanced kidney disease can lead to uremic pericardial effusion, and fluid dynamics changes brought on by hypothyroidism have been associated to pericardial fluid buildup. In contrast to post-myocardial infarction pericardial effusion, malignancy-associated pericardial effusion might be caused by direct tumour infiltration or metastasis.

Among the cases of malignancy-associated pericardial effusion, small cell carcinoma of the lung was responsible for

2 cases. In one case, pericardial effusion was secondary to metastasis of breast cancer. Additionally, we observed one case of pericardial effusion due to Hodgkin's lymphoma.

The one case of pyogenic effusion was in a patient with retroviral disease who presented with recurrent effusion and on aspiration was found to have thick pus drainage, however organism couldn't be isolated in this patient event on repeated cultures. Although less common, pyogenic causes emphasise the value of taking infectious aetiologies into account in some circumstances.

In order to give a thorough analysis, we compared the results of our study with pertinent prior research on pericardial effusion. The distribution of the etiological causes was comparable according to a study done in the Kosi region of Bihar, India by Md. Uddin et al(4), with tuberculosis being the main contributor. The validity and generalizability of our findings within our region are strengthened by this similarity.

The most frequent cause of pericardial effusion was likewise tuberculosis, according to a single-center experience study conducted in India by Akshyaya Pradhan et al(5). This information lends credence to the idea that tuberculosis continues to be a key etiological factor in pericardial effusion across various populations in India. In the study conducted by Alkhalifa et al. (6) tuberculosis (29.4%) was the most common etiology followed by malignancy (17.6%).

The results of our investigation are consistent with the thorough evaluation of pericardial effusions by Vakamudi et al.(7). The review highlighted the significance of taking tuberculosis into account as a significant etiological component and the variety of aetiologies connected to pericardial effusion, including infectious, inflammatory, neoplastic, and iatrogenic causes.

Breathlessness was the symptom that patients with pericardial effusion most frequently reported in our study, accounting for 83.3% of the cases. This finding was consistent with the study by Md.Uddin et al(4).

In addition to shortness of breath, the patients in our study also frequently experienced fever (52%), chest pain (41.6% of patients), and cough (35.4%). Except cough, the remaining findings were consistent with studies by MD.Uddin et al (4) and Pradhan et al (5). The underlying infectious cause of fever, such as tuberculosis or a pyogenic infection, can cause the pericardium to become inflamed. Although less frequently seen, coughing may occur as a result of irritation of nearby structures like the pleura or bronchial tree.

Additional diagnostic hints can be obtained from clinical indicators seen in pericardial effusion patients. In our study, tachycardia was the most prevalent symptom and was seen in 75% of cases. In the presence of decreased effective ventricular filling, tachycardia develops as a compensatory mechanism to maintain cardiac output. The body raises heart rate in an effort to make up for the compromised cardiac function.

It is important to note that bradycardia rather than tachycardia was seen in cases when hypothyroidism was determined to be

the underlying cause of pericardial effusion. It is well recognised that hypothyroidism lowers basal metabolic rate, which lowers heart rate. Therefore, bradycardia should be regarded as a significant clinical symptom in patients with pericardial effusion related to hypothyroidism.

Another often seen clinical sign (reported in 41.6% of patients) is muffled heart sounds. This is due to the pericardial fluid's insulating action, which reduces the sound's ability to travel from the heart to the chest wall.

In our investigation, we found four instances of cardiac tamponade among the pericardial effusion patients. Cardiac tamponade happens when the pericardial fluid rapidly builds up and places a large amount of pressure on the heart, impairing cardiac function. It is regarded as an urgent medical situation that needs attention. In our investigation, post-myocardial infarction in one instance, malignancy in two cases, and tuberculosis in one patient were the causes of cardiac tamponade.

The existence of cardiac tamponade highlights the significance of taking pericardial effusion seriously as a potentially fatal condition that needs immediate medical intervention. Depending on the underlying reason and the patient's clinical stability, prompt diagnostic procedures, including echocardiogram, can confirm the diagnosis and provide suitable therapy techniques, such as pericardiocentesis or surgical intervention.

Healthcare professionals must always be on the lookout for cardiac tamponade, especially in patients with recognised risk factors including cancer, a recent myocardial infarction, or infectious diseases like tuberculosis. The morbidity and mortality linked to cardiac tamponade can be decreased and patient outcomes can be greatly impacted by early detection and care.

In our investigation, we noticed a range of electrocardiographic abnormalities in the pericardial effusion patients. It is possible that the presence of pericardial fluid, which limits the amplitude of electrical signals, is the cause of the low voltage complexes that were found in 79% of the patients. Seventy-five percent of the patients experienced sinus tachycardia, which was a compensatory reaction to the hemodynamic stress brought on by pericardial effusion. Electrical alternans, a common symptom of cardiac tamponade, were seen in 20.8% of the patients, indicating a considerable buildup of pericardial fluid. 8.3% of the patients experienced sinus bradycardia, which was particularly noticeable in those who had hypothyroidism as an underlying cause. These results concur with those of Vakamudi et al (7) study, which identified comparable electrocardiographic abnormalities in its patient group.

Analysing the pericardial fluid is a critical diagnostic procedure for determining pericardial effusion. Different protein levels were found in our investigation, with 14 patients having proteins of less than 3 g/dl and the remaining patients having more than 3 g/dl. In 22.9% of the patients, the cell count was found to be greater than 100 cells/L, indicating a strong inflammatory response in these circumstances.

According to Akshyaya Pradhan et al (5), which similarly documented a lymphocytic predominance in their patient sample, the predominant lymphocytic pattern was seen in 52% of the patients. Adenosine deaminase (ADA) levels that are elevated (>40 units/l) in 37.5% of the patients point to a possible tuberculosis diagnosis. Pericardial fluid cytology results from 8 patients also support this possibility.

Akshyaya Pradhan et al (5) found comparable lymphocytic predominance patterns and increased ADA levels in their research sample, further confirming the diagnostic use of these parameters when comparing our findings with the reference studies. Md.Uddin et al (4) also emphasised the significance of pericardial fluid analysis in determining the cause of pericardial effusion, emphasising its function in identifying tuberculosis and cancer.

Our patients' cases of tuberculosis were identified using a variety of factors. In 8 individuals, CB-NAAT was used to confirm the diagnosis, and in 6, cytology was used. Based on pericardial fluid investigation and clinical results in the remaining patients, empirical treatment for tuberculosis was started. These diagnostic strategies are in keeping with the advice given in Vakamudi et al (7), which highlights the value of cytology and molecular tests in the identification of tuberculosis-related pericardial effusion.

## 5. Limitations

- **Single-Center Setting:** Our study was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to other healthcare settings and populations.
- **Sample Size:** The relatively small sample size of 48 patients might affect the statistical power and precision of our results.
- **Geographic Limitation:** Our study focused on a specific geographic region, and the etiological distribution may differ in other regions or countries.

## 6. Conclusion

In our study, tuberculosis was the most common cause of pericardial effusion, followed by idiopathic causes, uremia, hypothyroidism, cancer, post-myocardial infarction, and pyogenic causes. The most frequent clinical signs were tachycardia and muffled heart sounds, whereas breathlessness was the most frequent symptom.

The results of our study are consistent with those of other research done in various parts of India, highlighting the importance of tuberculosis as a significant etiological component in pericardial effusion.

The electrocardiographic anomalies that have been seen, such as sinus tachycardia, electrical alternans, low voltage complexes, and sinus bradycardia helps to characterise the pericardial effusion. In determining the aetiology, particularly in cases of tuberculosis, the pericardial fluid examination, which includes protein levels, cell count, lymphocytic predominance, and increased ADA, is extremely important. These results add to our knowledge of pericardial effusion

and are consistent with the body of current literature.

## References

- [1] Grogan, M. (2017) Pericardial Effusion: What Are the Symptoms? <https://www.mayoclinic.org/diseases-conditions/pericardial-effusion/symptoms-causes/syc-2035372>
- [2] Chang, S. and Maharaj, S. (2014) Brief Images: Massive Pericardial Effusion. *Images in Paediatric Cardiology*, 16, Article ID: PMC4521324 .
- [3] Vakamudi, Sneha et al. "Pericardial Effusions: Causes, Diagnosis, and Management." *Progress in cardiovascular diseases* vol. 59,4 (2017): 380-388. doi:10.1016/j.pcad.2016.12.009
- [4] Uddin M, Singh M, Mehdi M. Study of etiological and clinical profile of pericardial effusion in a tertiary care hospital in Kosi region of Bihar, India. *International Journal of Advances in Medicine*. 2016;514–8.
- [5] Pradhan A, Pravesh Vishwakarma, Bhandari M, Sethi R, Bhattacharjee Snigdha, Varun Shankar Narain, et al. Demographic, clinical and etiological profile of pericardial effusion in India: A single centre experience. 2021 Aug 1;
- [6] Alkhalifa, M.S., Elnima, M. and Ismaeel, S.A. (2019) Echocardiography in Helping to Determine the Causes of Pericardial Effusion in the Sudanese Patients. *Sudan Journal of Medical Sciences*, 4, 63-69. <https://doi.org/10.4314/sjms.v4i1.44882>
- [7] Raja Khanal, Ratna Mani Gajurel, Sahi R, Shrestha H, Chandra Mani Poudel, Surya Devkota, et al. Study of Etiological Profile, Clinical Profile and Short Term Outcome of Patients Presenting with Pericardial Effusion in a Tertiary Care Center, Nepal. 2019 Jan 1;09(12):879–90.