

## Clinical Profile of Pericardial Diseases

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### Abstract

**Background:** Pericardial diseases represent a wide spectrum of clinico-pathological entities such as acute pericarditis, pericardial effusion, cardiac tamponade, and constrictive pericarditis. The study sought to summarise available data on spectrum of pericardial diseases. The aim of Study is to study the clinical spectrum of pericardial diseases. To study etiopathogenesis, clinical and echocardiographic profile of patients with pericardial disease.

**Material and Methods:** This observational study was conducted at Dayanand Medical College & Hospital, Ludhiana and duration of study was from January 2020 to June 2021. All patients admitted in Medicine/Cardiology department with diagnosis of pericardial diseases were included in the study. **Results:** A total of 170 patients with pericardial disease were included in this study (100 males and 70 females). The mean age of presentation was  $54.7 \pm 16.3$  years. Pericardial effusion was the most common manifestation i.e. in 71.8% followed by acute pericarditis, effusive-pericarditis and constrictive pericarditis in 19.8%, 7.1 % and 1.8% respectively. Shortness of breath, chest pain and fever were the most common presenting symptoms. The most common etiology of pericardial diseases came out to be tubercular. Cardiac tamponade was found in 20(11.8%) patients. **Conclusion:** Our study demonstrated tuberculosis as the most frequent etiology of pericardial diseases and also the leading cause of tamponade. High prevalence of tuberculosis in India is attributable to poor socio-economic status and overcrowding.

**Keywords:** Pericarditis, Tamponade, Pericardiocentesis, Constrictive, Effusion.

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### Introduction

The pericardium is a relatively avascular fibrous sac that surrounds the heart. It consists of 2 layers: the visceral and parietal pericardium. The visceral pericardium is composed of a single layer of mesothelial cells that are adherent to the cardiac epicardium. The parietal pericardium is a fibrous structure that is  $\leq 2$  mm thick and is composed primarily of collagen and a lesser amount of elastin. The 2 layers of the pericardium are separated by a potential space that can normally contain 15 to 35 mL of serous fluid distributed mostly over the atrial-ventricular and inter-ventricular grooves.<sup>[1]</sup>

**Diseases of the pericardium can present clinically in one of several ways:**

- Acute and recurrent pericarditis
- Pericardial effusion without major hemodynamic compromise
- Cardiac tamponade
- Constrictive pericarditis

- Effusive-constrictive pericarditis

### Methodology

All patients admitted in Medicine/Cardiology department of DMCH with diagnosis of pericardial diseases (confirmed by ECHO / ECG / Clinical findings) were included in the study. Further, these patients were included based on the following criteria's:

#### Inclusion Criteria

1. All patients age above 18 years.
2. All patients with findings suggestive of pericardial diseases (acute pericarditis, pericardial effusion, cardiac tamponade, chronic pericarditis, constrictive pericarditis, recurrent pericarditis, etc.) were included.

#### Exclusion Criteria

1. All patients less than 18 years.
2. Post CABG and post ICR (intra-cardiac repair) patients with post-operative effusions in primary hospital admission.

**Method of Collection of Data:** All the IPD patients fulfilling the inclusion criteria were included in this study. Their demographical profile (age / gender / co-morbidities), history, clinical findings, lab investigations, ECG findings, 2D ECHO findings, pericardial fluid analysis (if indicated), radiological findings, basic diagnosis were collected. The diagnostic criteria used to establish different pericardial diseases are as follows:

**Acute Pericarditis:** The diagnosis of acute pericarditis is made with presence of at least 2 of the 4 following criteria:(1) chest pain (2) pericardial rubs (3) new widespread ST-elevation or PR depression on ECG (4) pericardial effusion (new or worsening).<sup>[2]</sup>

**Pericardial Effusion:** Standard 2D-ECHO criteria was used to diagnose pericardial effusion and tamponade. According to the size of the echo-free region, pericardial effusion was classified as mild (<10mm), moderate (10–20 mm) or severe (>20 mm).<sup>[2]</sup>

Evaluation for the cause of pericardial effusion included hemogram, RFTs, ESR, Mantoux test, thyroid profile, antinuclear antibodies (ANA) test, rheumatoid factor test. Radiological investigations included chest x-ray and chest computed tomography. Pericardial fluid was analyzed for cells, proteins, lactate dehydrogenase (LDH), malignant cytology, ADA, gram staining, acid-fast bacillus (AFB) staining, CB NAAT (for *M. tuberculosis*) and cultures. Clinical history, examination, and specific laboratory investigations for tuberculosis, hypothyroidism, malignancy, uremia, and autoimmune disorders were used to make the final diagnosis of pericardial effusion. To diagnose tubercular pericardial effusion presence of lymphocytic predominance and a positive ADA (cut off value >40UL with sensitivity and specificity of 88% and 83%, respectively) or TB PCR/CB NAAT, as well as active tuberculosis elsewhere in the body, were used as diagnostic markers.<sup>[3]</sup>

Analyses of the pericardial fluid specific gravity (>1015), protein level (>3.0 g/dL), fluid/serum ratio >0.5, LDH >200 mg/dL, serum/fluid >0.6, and glucose can separate exudates from transudates, but are not directly diagnostic.<sup>[4,5]</sup>

**Cardiac Tamponade:** The diagnosis is confirmed by an echocardiographic demonstration of moderate or large circumferential pericardial effusion and in most instances, of right atrial compression, abnormal respiratory variation in right and left ventricular dimensions, and in tricuspid and mitral valve flow velocities usually associated with inferior vena cava plethora.

**Constrictive Pericarditis:** M-mode and 2D transthoracic and Doppler echocardiography are primary imaging modalities in the evaluation of constrictive pericarditis. Major findings include:<sup>[2]</sup>

1. Septal bounce.
2. Pericardial thickening and calcifications.
3. Respiratory variation of the mitral peak E velocity of >25% and variation in the pulmonary venous peak D flow velocity of >20%.
4. Colour M-mode flow propagation velocity (Vp) >45 cm/sec.
5. Tissue Doppler: peak e' >8.0 cm/s.

## RESULTS

A total number of 170 patients were enrolled in this study. There were 100 males (58.8%) and 70 females (41.2%). Most patients (n=68, 40%) in our study were in the age group between 41-60 years.

The common co-morbidities seen were diabetes mellitus (n=68, 40%), hypertension(n=64,37.6%) and CKD (n=34,20%) followed by hypothyroidism (n=19,11.2%), IHD(n=11,6.5%), autoimmune diseases (n=8,4.7%), COPD (n=6,3.5%), malignancy (n=5,2.9%), and tuberculosis (n=3,1.8%). Other co-morbidities like RHD, CLD, HCV, RA, etc. were present in about 16.5 % (n=28) cases.

In our study, most of the cases observed were of pericardial effusion (n=122, 71.8%) followed by acute pericarditis (n=33, 19.4%), effusive-constrictive pericarditis (n=12, 7.1%) and constrictive pericarditis (n=3, 1.8%) in that order [Figure 1].

Most patients presented with complaint of shortness of breath (66.5%), chest pain (22.9%) and fever (20%). Other presenting symptoms cough, generalized body weakness, pedal edema, decreased urine output, palpitations, pain abdomen, etc. were present in 38.8% of total patients. Chest pain was the predominant symptom in acute pericarditis cases (63.64%; p=0.001) and dyspnea was predominant symptom in cases with pericardial effusion (70.5%; p=0.007).

The most common sign observed on physical examination was tachycardia(n=81,47%) followed by raised JVP(n=70,41%), pericardial rub (n=23,13%), hypotension (n=20,11.7%), pulsus paradoxus (n=17,10%), lymphadenopathy (n=9,5%) and pericardial knock (n=2,1.1%).

The most common etiology of pericardial disease was tuberculosis (18.2%) followed by idiopathic (17.6%), uremic (14.1%), post MI (12.4%), HFrEF (11.7%), malignancy (10.6%), autoimmune diseases(4.1%), tropical fever(3.5%), hypothyroidism(3%), HFpEF (2.4%), and pyogenic(2.4%) [Figure 2]. Among cases of tropical fever mostly dengue fever cases (n=5,2.9%) were observed. The most common malignant etiology seen is breast carcinoma (n=5, 2.9%) followed by adenocarcinoma lung(n=4,2.4%) and Non-hodgkin lymphoma(n=2,1.2%). Autoimmune etiology included mostly cases of SLE (n=5,2.9%) followed by RA-SLE overlap syndrome(n=1,0.6%) and Sjogren's syndrome(n=1,0.6%).

Leukocytosis was seen in 51.1% (n=87) cases, raised ESR in 71.7%(n=122) cases, raised CRP in 21.1%(n=36) cases and positive quantitative troponin-T was seen in 13%(n=23) cases.

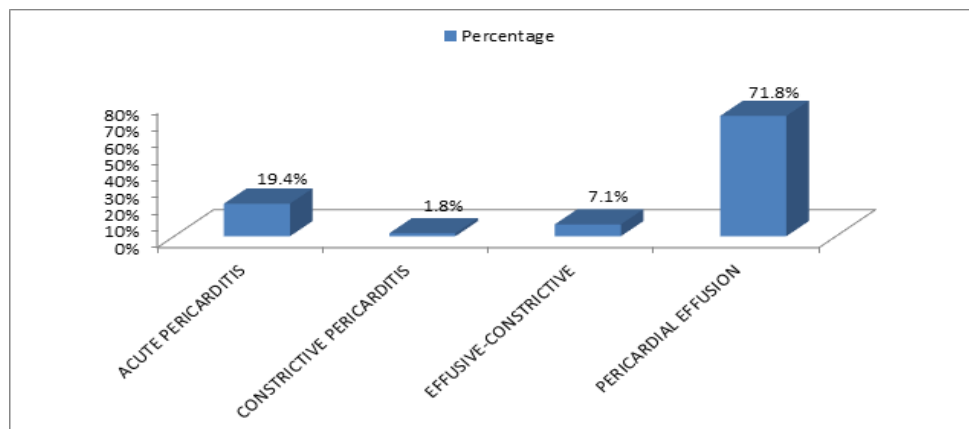
Specific ECHO findings reported were exudative strands/fronds (12.9%), cardiac tamponade physiology (11.8%), respiratory variation of mitral & tricuspid valve velocities (10.0%), effusive-constrictive physiology (7.1%) and pericardial thickening(3.5%). Exudative strands were observed in 5 cases with effusive-constrictive pathology and in 16 cases with isolated pericardial effusion(p=0.009). Annulus paradoxus was reported in 2 cases of constrictive pericarditis and 1 case of effusive-constrictive pericarditis. Pericardial thickening was reported in 2 cases each of constrictive pericarditis, effusive –constrictive pericarditis and

pericardial effusion respectively. Out of all cases 54.2% (n=90) had mild pericardial effusion, 30% (n=51) had moderate pericardial effusion and 15.1% (n=25) cases had severe pericardial effusion. Among cases of pericardial effusion 35.2% (n=43) patients were found to have severe left ventricular dysfunction.

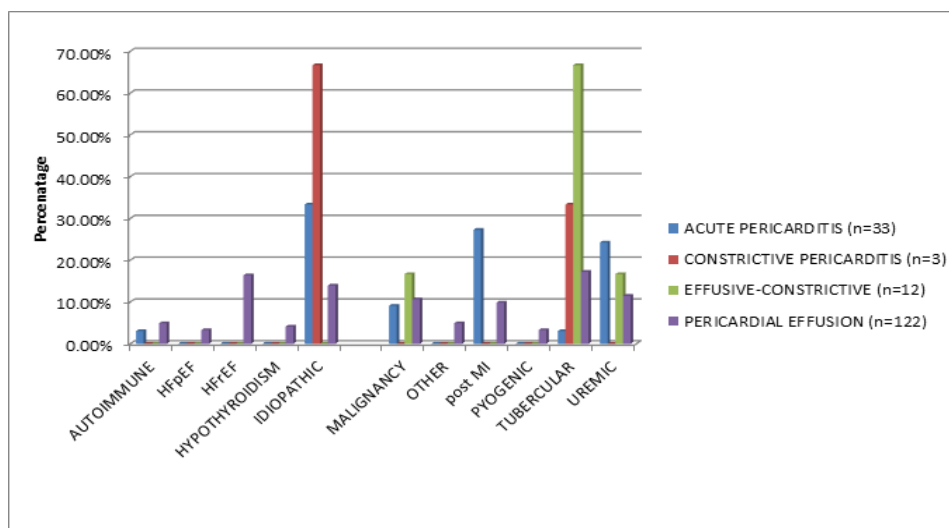
Most common etiology of cardiac tamponade was found to be tubercular(45%,n=9) followed by malignancy(15%,n=3), idiopathic (10%,n=2), autoimmune(10%,n=2), uremic (10%,n=2), post MI (5%,n=1) and pyogenic(5%,n=1) respectively. Cardiac tamponade was seen in 3 cases with moderate pericardial effusion and 11 cases with severe pericardial effusion (p=0.001).

In our study, pericardial fluid analysis results were available for 32 patients. Among 32 patients, 21 patients had severe pericardial effusion and 11 patients had moderate pericardial effusion. In 27 patients, the fluid was exudative in nature, out of which 15 were of infectious etiology (13 tubercular and 2 pyogenic), 4 of malignant and uremic each, 3 idiopathic and 1 of autoimmune etiology. Atypical cells on malignant cytology were observed in 12.5%(n=4) cases. Mtb complex was detected in 6.25%(n=2) cases on CBNAAT testing. ADA analysis of pericardial fluid came positive in 37.5% cases (n=12), 25% (n=8) cases detected as strong suspect and 9.3% (n=3) cases detected as suspect. Pericardial fluid culture showed growth of MRSA(n=1), *S. epidermidis*(n=2), *S. hemolyticus* (n=1), and *S. hominis*(n=1). Rest of the culture reports were negative.

Intervention like pericardiocentesis was done in 16.5% (n=28) cases including 23 cases with pericardial effusion and 5 cases with effusive-constrictive pericarditis. Surgical treatment like pleuro-pericardial window and pericardiectomy were done in 3.5% (n=6) cases and 1.2% (n=2) cases respectively.



**Figure 1: Spectrum of pericardial diseases seen in our study.**



**Figure 2: Etiological classification of various pericardial diseases**

## DISCUSSION

The present study shows that the mean age of presentation in pericardial diseases was  $54.7 \pm 16.3$  years and this number was in close range with the study conducted by Singh A et al,<sup>[6]</sup> in which the mean age of the patients studied was  $46.87 \pm 14.40$  years. Similarly, according to study done by Adler Y et al,<sup>[2]</sup> men aged 16–65 years were at higher risk for pericarditis (relative risk 2.02) than women in the admitted population. The age distribution in our study shows that 40% of patients in our study were in the age group of 41-60 years and 39.4% patients were above the age of 60 years.

Clinical manifestations in pericardial diseases vary significantly and range from asymptomatic to life-threatening presentations. The most common presenting symptoms was shortness of breath (66.5%). On further analysis, among cases of acute pericarditis, chest pain (63.6%) was seen in the majority of patients followed by shortness of breath (45.5%) and fever (21.2%). It was comparable to a study done by LeWinter et al,<sup>[7]</sup> in which the main symptom of acute pericarditis was chest pain in more than 90% of cases, often quite severe. Comparable to our study, breathlessness was seen in 51.4% of cases in the study done by Singh A et al,<sup>[6]</sup> stating it as the commonest symptom in cases of pericardial effusion. The most common etiology of pericardial diseases was tubercular in our study which was similar to results observed in the African study done by Noubiap JJ et al,<sup>[8]</sup> in which tuberculosis is the most frequent cause of pericardial diseases. According to Fowler,<sup>[9]</sup> tuberculosis is responsible for approximately 4% of cases of acute pericarditis, 7% of cases of cardiac tamponade, and, in older studies,<sup>[9]</sup> 6% of instances of constrictive pericarditis. In our study, the most common cause of acute pericarditis seen was idiopathic (n=11, 33%). Only 3 cases of constrictive-pericarditis were observed due to short duration of study, two cases had idiopathic etiology and one had tubercular constrictive pericarditis.

Total 16 (9.41%) patients were detected as COVID-19 cases, 11 were having positive SARS-COV2 antibodies and 5 were COVID RTPCR positive. Out of 5 positive COVID RTPCR patients 3 were diagnosed as idiopathic but the etiology of pericardial disease could be COVID 19 infection. Sauer F in a case series, reported three patients aged 51-84 who developed pericarditis related to COVID-19.<sup>[10]</sup>

The pericardium is electrically silent and the ECG changes were reported in no more than 60% of cases and more common (>90%) when concomitant with myocarditis.<sup>[7]</sup> In our study, most common ECG changes found were low voltage QRS complex (24.1%, n=41).

In our study, fronds were identified in 13% of patients, and the majority were caused by infectious aetiology. Frond-like or shaggy-appearing structures in the pericardial space

detected by echocardiogram imply clots, chronic inflammation, or neoplastic pericardial processes.<sup>[7]</sup> Cardiac tamponade was seen in 11.5 % of cases detected on echocardiography. In our study intervention like pericardiocentesis was done in 21(17.2%) cases and surgical treatment like pleuro-pericardial window and pericardiectomy was done in 6(4.9%) cases and 2(1.6%) cases respectively. Pericardial fluid analysis in our study yielded results in 19(59%) patients, 5 of whom have culture growth observed, 2 have positive CBNAAT testing and 12 showed positive ADA values.

## CONCLUSION

Our data suggested that tuberculosis, followed by idiopathic and uremic conditions, is the most common cause of pericardial illness. The increased prevalence of tuberculosis and uremic pericarditis likely reflects the range of illnesses prevalent in our region, where end-stage renal disease is widespread and tuberculosis is still widely prevalent. Due to the lack of viral diseases being detected, the most frequent cause of acute pericarditis in our investigation remained idiopathic, comparable to western nations. Additionally, it was observed that tuberculosis was the primary cause of cardiac tamponade, necessitating an early diagnosis. Particularly in distant places, this study will aid in the early diagnosis and fast treatment of patients with pericardial effusion.

## Limitations

1. Small sample size, single-centered study.
2. Patients less than 18 years of age were not taken in this study.
3. HsCRP was not included in this study.
4. Follow-up of patients was not included in our study so recurrent pericarditis cases were not detected.

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