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Original Article

Clinical Profile of Pericardial Effusion in Adult Patients

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Abstract

Background
Pericardial effusion is an abnormal collection of fluid in the pericardial cavity, the main causes of which are idiopathic, neoplastic, autoimmune and infective. It can present incidentally or with life threatening tamponade physiology. The timely identification and management are paramount in improving patients' outcome.

Materials and Methods
A cross-sectional study was conducted in adult patients with moderate and large pericardial effusion with or without tamponade or mild effusion with cardiac tamponade. Clinical history, examination, laboratory investigations, echocardiographic findings, and pericardial fluid analyses were evaluated in 56 patients. The etiology was determined based on microbiological, cytological, biochemical and histopathological criteria.

Results
The mean age of the participants was 52.9 years. Shortness of breath (76.8%), cough (75%), and chest pain (71.4%) were the most common presentation. Mild, moderate and large pericardial effusions were noted in 3.6%, 58.9% and 37.5% of the participants respectively; whereas 51.8% of the patients had cardiac tamponade. The most common etiology was idiopathic (42.9%), tuberculosis (16.1%), and malignancy (14.3%). Hemorrhagic effusions correlated with malignancy ($p = 0.008$) and the presence of fibrin stands on echocardiography were noted in tubercular effusion ($p<0.001$).

Conclusion
Idiopathic pericardial effusion was the most frequent cause, although tuberculosis and malignancy remain significant contributors in eastern Nepal. Fibrin strands on echocardiography and hemorrhagic pericardial fluid on pericardiocentesis are valuable diagnostic clues suggestive of tuberculosis and malignancy, respectively.

Keywords: *Cardiac Tamponade, Echocardiography, Pericardial Effusion, Tuberculosis*

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Introduction

The normal pericardium is a fibroelastic sac made up of an inner serous and an outer fibrous pericardium containing the heart and the roots of the great vessels. The inner serosal layer has visceral and parietal components which contain pericardial fluid [1]. An abnormal collection of fluid in this cavity is termed as pericardial effusion [2]. Pericardial effusion is classified as mild (<1 cm), moderate (1-2 cm) and large (>2 cm) based on the size of echo free space [3]. Echocardiography also suggests evidence of tamponade physiology right atrial systolic collapse, right ventricular diastolic collapse, abnormal respiratory variation of transvalvular flow and distended inferior vena cava without respiratory variation [4].

The most common causes of pericardial effusion in developed countries are neoplastic, idiopathic and uremia whereas in developing country including Nepal, tuberculosis is the most common cause [2, 5].

This study was conducted to evaluate the clinical profile and underlying etiologies of pericardial effusion among adult patients. Given the high burden of infectious diseases, particularly tuberculosis, and the diagnostic limitations in resource-constrained settings, this research seeks to provide a clearer understanding of the regional etiology, clinical manifestations, and diagnostic utility of pericardial fluid analysis in guiding appropriate management strategies.

Materials and Methods

An analytical cross-sectional study was conducted among patients with pericardial effusion attending the cardiology department of Nobel Medical College Teaching Hospital from January 2025 to January 2026 after obtaining the ethical approval from the institutional review committee (Ref. no. 132/2024). The study included participants with moderate and large pericardial effusion with and without cardiac tamponade and mild or loculated pericardial effusion with cardiac tamponade. Participants with post-traumatic pericardial effusion and effusion developing in patients with known case of malignancy were excluded from the study. The minimum sample size was calculated based on Conchran's formula as 55 assuming 87.4% as the proportion of patient in whom the etiology was known with a 10% permissible error [6].

The echocardiography was used to estimate the size of the pericardial effusion and assess for the features of tamponade physiology. Complete blood count, inflammatory and autoimmune markers, thyroid function tests, renal function tests and relevant imaging were obtained based on the clinical profile. Pericardiocentesis was performed to evaluate for total and differential count; ADA level, malignant cytology and PCR for Mycobacterial tuberculosis. The final etiological diagnosis of pericardial effusion was made based on the clinical features and the laboratory investigations.

The obtained data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistic in the form of frequency, percentage, mean and standard deviation was used to describe the relevant data. Chi-square test was used to evaluate the association of etiology of pericardial effusion with various echocardiographic and pericardial fluid characteristics. A p-value of less than 0.05 was considered statistically significant

Results

The mean age of the 56 participants in this study was 52.9 ± 17.5 years. There were 32 (57.1%) male patients. Mild, moderate and large pericardial effusion occurred in 2 (3.6%), 33 (58.9%) and 21 (37.5%) patients respectively. Shortness of breath, cough and chest pain were the most common presenting complaints whereas tachycardia, muffled heart sound and raised jugular venous pressure were commonly identified signs (Table 1).

Table 1: Clinical profile of patients with pericardial effusion n=56

Variable	Frequency (N)	Percentage (%)
Presenting complaints		
Shortness of breath	43	76.8
Cough	42	75
Chest pain	40	71.4
Fever	27	48.2
Edema	25	44.6
Weight loss	14	25
Presenting signs		
Tachycardia	35	62.5
Muffled heart sound	17	30.4
Raised JVP	15	26.8
Hypotension	7	12.5
Pulsus paradoxus	3	5.4
Bradycardia	3	5.4

Table 2: Etiology of pericardial effusion n=56

Etiology	Frequency (N)	Percentage (%)
Idiopathic	24	42.9%
Tuberculosis	9	16.1%
Malignancy	8	14.3%
Hypothyroidism	7	12.5%
Systemic lupus erythematosus	4	7.1%
Chronic kidney disease	2	3.6%
Myocardial infarction	2	3.6%

The most common etiology of pericardial effusion was idiopathic noted in 24 (42.9%) patients, followed by tuberculosis and malignancy with 9 (16.1%) and 8 (14.3%) participants respectively. Amongst the cases with malignancy, lung was the most common site and was noted in half of the patients. There was one case each of lymphoma, leukemia, ovarian malignancy and unknown primary (Table 2). The echocardiographic cardiac tamponade physiology was noted more on large pericardial effusion, with statistically significant association between the amount of pericardial effusion and the presence of tamponade physiology (Table 3). Sinus tachycardia was the most common electrocardiography findings in these patients followed by low voltage QRS complex (Table 4).

Table 3: Pericardial effusion complicated with cardiac tamponade physiology (n=56)

Amount of pericardial effusion	Cardiac tamponade physiology		Total	p value (Fischer's exact test)
	Present n (%)	Absent n (%)		
Mild	2 (100%)	0 (0%)	2	<0.001
Moderate	7 (21.2%)	26 (78.8%)	33	
Large	20 (95.2%)	1 (4.2%)	21	
Total	29 (51.8%)	27 (48.2%)	56	

Table 4: Electrocardiography abnormalities in patients with pericardial effusion n=56

Electrocardiography findings	Frequency (N)	Percentage (%)
Sinus tachycardia	32	57.1%
Low voltage QRS	12	21.4%
Electrical alternans	1	1.8%
Arrhythmia		
Atrial fibrillation	2	3.6%
Ventricular tachycardia	1	1.8%

The study also evaluated the presence of fibrin strands in the pericardial effusion. Fibrin strands were detected in 9 (16.1%) cases among which 6 of them has tuberculosis as etiology of pericardial effusion (p-value <0.01) and 3 of them has idiopathic etiology. Hemorrhagic pericardial effusion was noted in half of the patients that underwent pericardiocentesis. It was noted in idiopathic, tuberculous, malignant and effusion associated with hypothyroidism. Malignant pericardial effusion was statistically more likely to be hemorrhagic (p-value =0.008). Elevated Pericardial fluid ADA (Values ≥40 U/L) was seen in 10 patients and their various etiology were tuberculosis in 4 cases (40%), malignancy in 3 cases (30%), idiopathic in 2 cases (20%) and hypothyroidism in 1 case (10%). However, the association was not statistically significant in any etiology.

Discussion

The mean age of presentation in our study of 56 adult patients with pericardial effusion was 52.9 years, with male predominance which was similar to the findings noted in different parts of the country [5,6]. The common clinical presentation of shortness of breath, cough, chest pain, fever and edema was also consistent with other studies in pericardial effusion [2,3]. Palpitation was notably rare in our cohort, probably reflecting the varied etiology across the study population.

On clinical examination, tachycardia was the most frequently observed sign, present in 35 patients (62.5%). Tachycardia is a compensatory mechanism in response to reduced stroke volume and is frequently seen in pericardial effusion, even before overt tamponade develops. Muffled heart sounds, a classical finding in large effusions or tamponade, were present in 17 patients (30.4%). Raised jugular venous pressure (JVP) was observed in 15 patients (26.8%), while hypotension was noted in 7 patients (12.5%). These findings align with the clinical features of evolving cardiac tamponade, although the classic Beck's triad (hypotension, raised JVP, and muffled heart sounds) was not universally present, highlighting its limited sensitivity [7]. These findings underscore the nonspecific nature of symptoms and signs associated with pericardial effusion and warrant a high index of clinical suspicion.

Cardiac tamponade physiology was noted in half of the patients on echocardiography. Most of these patients had large effusions, supporting the established correlation between effusion size

and the risk of hemodynamic compromise [8]. Similar rates of tamponade have been reported in local studies [5,6]. This study also showed an association between fibrin strands on echocardiography and tubercular effusion. This finding is highly consistent with previous studies conducted in Nepal and other tuberculosis-endemic regions [6].

Sinus tachycardia, low voltage QRS and electrical alternans were noted as major ECG abnormalities in the patients with pericardial effusion. The relative proportion of these ECG abnormalities varies between studies owing to the difference in effusion size, etiology or the timing of ECG acquisition relative to the progression of the effusion [9].

The most common etiology of pericardial effusion in the present study was idiopathic. Although this aligns with global data, national data reveals tuberculosis as the predominant cause [6, 10, 11]. These discrepancies may be attributed to differences in regional TB prevalence, diagnostic capabilities, or study populations. The predominance of lung carcinoma as the primary source of malignant pericardial effusion in our study aligns with global trends. All the patients with malignancy had hemorrhagic pericardial effusion. These findings are consistent with previous studies, which have reported a higher incidence of hemorrhagic fluid in malignancy-related pericardial effusion due to tumor invasion of the pericardium or associated neovascularization leading to capillary fragility and bleeding into the pericardial space [12].

Limitations

This study has several limitations. This study was conducted in a single tertiary care hospital, which may limit the generalizability of findings to broader populations or different healthcare settings. The small sample size limits the statistical power to detect fewer common abnormalities. Only patients admitted to the hospital and undergoing pericardiocentesis or evaluation were included, possibly excluding milder cases managed on an outpatient basis. Some cases labeled as idiopathic might actually be undiagnosed viral or autoimmune pericarditis, given the limited availability of viral serologies and autoimmune markers.

Conclusion

This study provides important insights into the clinical presentation and etiological spectrum of pericardial effusion in a tertiary care setting of eastern Nepal. Among the patients studied, the most common presenting symptoms were breathlessness, cough, and chest pain, while tachycardia and muffled heart sounds were frequent clinical signs.

Idiopathic pericardial effusion was the most common etiology, followed by tuberculosis, malignancy, and hypothyroidism. Tuberculosis remained a significant cause, consistent with endemic patterns in Nepal, and was strongly associated with the presence of fibrin strands on echocardiography. Echocardiography was essential in diagnosis, with more than half of the patients' showing features of cardiac tamponade. Malignancy was notably associated with hemorrhagic pericardial effusion and included primary cancers such as lung, ovary, and hematologic malignancies.

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Conflict of interest: None

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