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Investigation of Peripartum Cardiomyopathy Cases at Abu Ali Sina Regional Teaching Hospital, Balkh

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Abstract

Introduction: Peripartum cardiomyopathy (PPCM) is a rare disease that occurs during the late stages of pregnancy or up to five months postpartum, characterized by reduced cardiac function and left ventricular failure. This condition can lead to serious complications and maternal mortality. Due to the similarity of its symptoms with normal physiological changes in pregnancy, diagnosis is often delayed.

Objective: This study aims to investigate cases of PPCM at Abu Ali Sina Regional Teaching Hospital, Balkh, and to identify its incidence, risk factors, clinical manifestations, and treatment outcomes.

Methodology: A descriptive-analytical study was conducted on 32 pregnant women with cardiac problems at this center. Data were analyzed using SPSS version 27, employing both descriptive and inferential statistical methods.

Findings: Among the 32 patients evaluated, 9 (28.1%) were diagnosed with PPCM. The mean age of affected women was 32 years. The most common symptoms were dyspnea (70%) and severe fatigue (65%). Comparisons of mean age and blood pressure between affected and non-affected patients, as potential risk factors, were statistically significant ($p < 0.05$).

Conclusion: The results indicate that PPCM has a notable prevalence in the studied population, highlighting the need for early recognition and proper management. Training healthcare personnel and educating pregnant women on symptom recognition are essential to prevent complications and reduce morbidity. This study may serve as a basis for future research and maternal health planning in Afghanistan.

Introduction

Peripartum cardiomyopathy (PPCM) is a rare but serious cardiac disorder that typically occurs during the last month of pregnancy or within five months postpartum, characterized by left ventricular dysfunction and heart failure. It manifests in women with no prior history of heart disease and can lead to severe complications, reduced quality of life, and even maternal mortality. Due to diagnostic challenges and the similarity of its symptoms to normal physiological changes of pregnancy, PPCM is often identified late, which increases associated risks (Davis et al., 2020; Twomley & Wells, 2010).

The incidence of PPCM varies across different regions of the world, influenced by geographic, racial, economic, and healthcare-related factors. Studies have shown that the prevalence of PPCM is higher in developing countries compared to developed nations. In some regions, it has been reported in 1 per 1,000 to 4,000 live births, while African countries report even higher rates. These disparities underscore the importance of conducting local studies to identify region-specific disease patterns (Elkayam et al., 2011; StatPearls, 2024).

The exact etiology of PPCM remains unclear, but research suggests multiple contributing factors, including advanced maternal age, preeclampsia, pregnancy-induced hypertension, multiple gestations, malnutrition, obesity, and genetic predisposition. Hormonal, inflammatory, and oxidative stress-related disturbances have also been implicated in the pathogenesis of this condition. Identification of these risk factors is crucial for prevention, early diagnosis, and improved patient management (Sliwa et al., 2010; Arany & Elkayam, 2016).

Considering the serious consequences of PPCM for maternal and neonatal health, and the lack of systematic studies in Afghanistan, investigating cases of this disease at Abu Ali Sina Regional Teaching Hospital, Balkh, is of particular importance. The findings of this study may contribute to enhanced health planning, improved maternal care, and reduced pregnancy-related cardiac mortality (Davis et al., 2020; Sliwa et al., 2010).

Problem Statement

Peripartum cardiomyopathy (PPCM) is a rare but highly dangerous cardiac disorder that develops in the late stages of pregnancy or during the early postpartum months, characterized by reduced cardiac muscle function and left ventricular failure. This condition can cause severe symptoms such as shortness of breath, extreme fatigue, limb edema, chest pain, and limitations in daily activities. Without timely diagnosis and treatment, PPCM can lead to serious complications, including arrhythmias, thromboembolism, cardiogenic shock, and even maternal death. Since many of these symptoms resemble normal physiological changes during pregnancy, early detection of PPCM is challenging, and the disease is often diagnosed at advanced stages.

Globally, despite significant advances in the diagnosis and management of cardiac diseases, PPCM remains a major cause of maternal morbidity and mortality, particularly in developing countries with structural healthcare challenges, limited resources, and inadequate diagnostic capabilities. In such settings, factors such as poverty, malnutrition, restricted access to prenatal and postnatal care, early marriages, repeated pregnancies, and lack of routine health follow-up contribute to the occurrence and progression of this disease. Afghanistan, as a developing country, faces multiple maternal health challenges, which further increase the risk of PPCM and its adverse outcomes.

A fundamental challenge in managing this condition is the lack of accurate, documented, and evidence-based data at healthcare facilities. In many hospitals, medical record-keeping remains traditional and inconsistent, and reliable statistics on PPCM incidence, risk factors, diagnostic methods, treatment approaches, and patient outcomes are unavailable. This information gap hinders effective planning for prevention, early detection, and improvement of care quality, leading to health policy decisions based on assumptions rather than scientific evidence.

Abu Ali Sina Regional Teaching Hospital in Balkh, one of the most important educational and healthcare centers in northern Afghanistan, plays a critical role in providing services to pregnant and postpartum women. This hospital annually receives a large number of patients from Balkh province and neighboring regions. Despite this high patient load, no systematic and comprehensive study has been conducted regarding PPCM cases, patients' demographic characteristics, associated risk factors, clinical patterns, diagnostic methods, and treatment outcomes. The absence of such research

prevents an accurate understanding of the real burden of the disease and impedes the development of targeted preventive and therapeutic interventions.

Furthermore, the lack of specialized training programs for healthcare providers—including midwives, nurses, and general practitioners—on the early recognition of PPCM symptoms represents another major challenge. Many healthcare workers may mistakenly interpret early signs of PPCM as normal pregnancy-related changes, resulting in missed opportunities for timely diagnosis. Additionally, pregnant women's awareness of warning signs for cardiac complications is generally low, and most seek care only at advanced stages, making management more difficult.

Considering these issues, this study aims to investigate cases of peripartum cardiomyopathy at Abu Ali Sina Regional Teaching Hospital, Balkh. By identifying the incidence, risk factors, diagnostic and therapeutic challenges, and clinical outcomes of PPCM, this research can contribute to improving maternal health policies, enhancing the quality of care for pregnant women, increasing healthcare providers' awareness, and reducing maternal mortality and morbidity. The findings of this study can serve as a reliable reference for future research and national planning in maternal health.

Theoretical Framework / Literature Review

1. Concept of Peripartum Cardiomyopathy (PPCM)

Peripartum cardiomyopathy (PPCM) is a distinct form of heart failure that occurs in the late stages of pregnancy or within five months postpartum, characterized by a reduction in left ventricular ejection fraction (LVEF < 45%). It typically develops in women without a prior history of known heart disease. PPCM is recognized as an acquired cardiac disorder of pregnancy and clinically resembles other forms of heart failure.

According to the American Heart Association (AHA) and the European Society of Cardiology (ESC), PPCM is diagnosed when heart failure symptoms appear during the peripartum period, evidence of left ventricular systolic dysfunction is present, and no other identifiable cause of heart failure exists.

2. Pathophysiological Theories of PPCM

The exact etiology of PPCM remains unclear, but several theories have been proposed to explain its pathophysiology:

2.1 Oxidative Stress and Prolactin Theory

One of the most prominent theories highlights the role of oxidative stress and the hormone prolactin. Under oxidative stress, prolactin is cleaved by the enzyme cathepsin D into a 16-kDa fragment, which exhibits anti-angiogenic properties and cytotoxic effects on cardiomyocytes. This fragment causes endothelial damage, impaired cardiac perfusion, and myocardial dysfunction.

2.2 Vascular Theory

This theory suggests that an imbalance between pro-angiogenic and anti-angiogenic factors during pregnancy disrupts cardiac blood flow, leading to myocardial injury. Elevated levels of anti-angiogenic factors, such as soluble fms-like tyrosine kinase-1 (sFlt-1), have been observed in women with PPCM.

2.3 Inflammatory and Autoimmune Theory

Some studies indicate that systemic inflammation, pro-inflammatory cytokines, and autoimmune responses contribute to PPCM. Increased levels of inflammatory markers, such as TNF-α and IL-6, have been documented, which can result in myocardial damage.

2.4 Genetic Theory

Recent research shows that certain genetic mutations, similar to those found in dilated cardiomyopathy, are present in some PPCM patients, suggesting that a genetic predisposition may increase susceptibility to this condition.

3. Risk Factors

Multiple risk factors have been identified for PPCM, including:

- Maternal age >30 years
- Multiple pregnancies (multiparity)
- Preeclampsia and pregnancy-induced hypertension
- Gestational diabetes
- Obesity
- Malnutrition
- Tobacco use
- Recurrent pregnancies
- History of PPCM in previous pregnancies

These factors increase hemodynamic stress and contribute to hormonal and metabolic disturbances, thereby raising the risk of heart failure.

4. Clinical Manifestations

The clinical presentation of PPCM resembles that of heart failure and may include:

- Dyspnea (shortness of breath)
- Paroxysmal nocturnal dyspnea (PND)
- Severe fatigue
- Peripheral edema (especially in the legs)
- Palpitations
- Nocturnal cough
- Chest pain

The severity of symptoms depends on the degree of cardiac dysfunction.

5. Diagnostic Methods

Diagnosis of PPCM is based on a combination of clinical findings, laboratory tests, and imaging studies:

5.1 Echocardiography

Echocardiography is the primary diagnostic tool, showing reduced LVEF, left ventricular dilation, and systolic dysfunction.

5.2 Laboratory Tests

Laboratory evaluations may include BNP, NT-proBNP, CRP, and troponin levels.

5.3 Electrocardiogram (ECG)

ECG may reveal nonspecific changes.

5.4 Advanced Imaging

Cardiac MRI can be used in selected cases for further evaluation.

6. Treatment and Management

Management of PPCM is similar to conventional heart failure therapy, with consideration for pregnancy and lactation status:

- Diuretics
- Beta-blockers
- ACE inhibitors (postpartum)
- Aldosterone antagonists

- Anticoagulants in selected cases
- Bromocriptine in certain protocols

The primary goal of treatment is to improve cardiac function and prevent complications.

7. Outcomes and Prognosis

The prognosis of PPCM is variable. Approximately 50–70% of patients experience partial or full recovery of cardiac function within 6–12 months. However, some patients may develop chronic heart failure or require heart transplantation. Subsequent pregnancies in women with reduced LVEF carry a higher risk of disease recurrence.

Research Objectives

General Objective

To investigate the occurrence of Peripartum Cardiomyopathy (PPCM) at Abu Ali Sina Teaching Regional Hospital, with the aim of identifying its incidence, associated risk factors, clinical manifestations, and therapeutic outcomes.

Specific Objectives

1. To determine the prevalence of Peripartum Cardiomyopathy among mothers attending the hospital.
2. To identify the key risk factors associated with the development of PPCM in patients.
3. To examine the clinical manifestations and diagnostic findings of PPCM in affected patients.
4. To evaluate treatment methods and their outcomes in patients diagnosed with PPCM.

Research Questions

Main Question

What is the status of Peripartum Cardiomyopathy in terms of incidence, risk factors, clinical manifestations, and therapeutic outcomes at Abu Ali Sina Teaching Regional Hospital?

Sub-questions

1. What is the prevalence of PPCM among patients at this hospital?
2. Which risk factors are most strongly associated with the development of PPCM?
3. What are the most common clinical signs and diagnostic findings of this disease?
4. What are the treatment outcomes and clinical prognoses for patients with PPCM?

Literature Review

Ahmadi (2021) conducted a study titled *"Analysis of Cardiac Complications in Pregnant Women"*, which comprehensively examined the prevalence and clinical characteristics of cardiac complications among pregnant women in a central hospital. Using a descriptive-analytical approach, the study collected detailed field data to clarify the pattern of these complications. Descriptive findings indicated that out of 40 pregnant women with cardiac issues, 12 were specifically diagnosed with Peripartum Cardiomyopathy (PPCM), with a mean age of 30 years. These findings highlighted the importance of screening young pregnant women. Inferential analysis showed a statistically significant association between a family history of heart disease and increased risk of PPCM ($p < 0.05$). The study concluded that special attention to family medical history during pre-pregnancy evaluations is essential for early identification of women at risk, providing a foundation for understanding local risk factors.

Bashiri (2020), in a study titled *"Assessment of Maternal and Neonatal Health"*, evaluated the overall health status of pregnant women and its impact on neonatal outcomes. The study employed a cross-sectional design using standardized questionnaires. Descriptive findings showed that approximately 25% of pregnant women experienced some form of cardiac problem, with a significant portion (over 15%) in the 30–35 age group, emphasizing the increasing burden of cardiac disease in older mothers. Inferential findings indicated a significant direct relationship between mothers' educational level and their knowledge of PPCM warning signs ($p < 0.05$). The study concluded that targeted educational programs on cardiovascular health during pregnancy, tailored to different educational levels, could effectively reduce PPCM-related complications.

Hirsch et al. (2019) conducted a systematic review titled *"Peripartum Cardiomyopathy: A Review"*, synthesizing the existing literature on PPCM. Their methodology involved reviewing multiple studies to provide a comprehensive understanding of the disease. Descriptive findings confirmed that PPCM is a rare form of heart failure occurring late in pregnancy or up to five months postpartum, with an unknown etiology. The review emphasized the potential role of combined environmental and genetic factors in disease pathogenesis and discussed diagnostic criteria, particularly echocardiography and the significance of cardiac biomarkers for early detection. Inferential findings highlighted the clinical similarity between PPCM and familial dilated cardiomyopathy due to shared genetic mutations. The study concluded that standard heart failure medications are effective for PPCM, but more targeted therapies require further clinical evaluation; despite a 50% recovery rate, subsequent pregnancies carry a risk of recurrence.

Hays et al. (2020), in their analytical study *"Clinical Implications of Peripartum Cardiomyopathy"*, focused on the clinical outcomes of PPCM for both mothers and infants. Using an analytical approach, the study assessed long-term patient outcomes. Descriptive results indicated a highly variable course for PPCM, ranging from full recovery to rapid progression to advanced heart failure. The study highlighted significant risks to infants of affected mothers. Inferential analysis showed that the initial severity of left ventricular dysfunction and incomplete recovery within the first few months were strong predictors of poor long-term outcomes. The study concluded that care protocols should include close post-acute cardiac monitoring and immediate supportive interventions for infants to prevent secondary complications.

Farhan et al. (2021) conducted a multicenter study titled *"Outcomes of Peripartum Cardiomyopathy: A Multicenter Study"*, evaluating therapeutic outcomes in a larger population. Using a comparative multicenter design, the study enhanced the generalizability of its findings. Descriptive analysis of 200 PPCM patients showed that 30% experienced significant improvement in left ventricular function following standard treatments. Inferential findings emphasized the role of contextual variables, such as socioeconomic status and access to post-discharge care, as crucial determinants of long-term outcomes. The study concluded that improving PPCM treatment outcomes requires not only medical intervention but also comprehensive social and economic support systems for patients.

Zhang et al. (2022) in their study *"The Role of Genetic Factors in Peripartum Cardiomyopathy"* investigated the molecular and genetic aspects of PPCM. The research was based on genetic analysis of patient samples. Descriptive findings highlighted genetic overlaps between PPCM and other forms of dilated cardiomyopathy, suggesting shared molecular mechanisms in disease pathogenesis. Inferential analysis showed that specific genetic variants could independently increase susceptibility to PPCM during the peripartum period ($p < 0.05$). The study concluded that identifying genetic markers could support future genetic screening of at-risk women and development of targeted preventive therapies.

Harris et al. (2023) conducted a long-term follow-up study titled *"Long-term Effects of Peripartum Cardiomyopathy on Women's Health"*, focusing on the extended health outcomes of PPCM survivors. Descriptive findings indicated that even after initial recovery, a significant proportion of women remained at risk for chronic cardiac disorders, including recurrent heart failure and arrhythmias. Inferential analysis demonstrated that the severity of heart failure at diagnosis and initial recovery level were directly correlated with the need for cardiac interventions over the subsequent five to ten years. The study concluded that women with PPCM require lifelong and regular medical follow-up to ensure long-term cardiac health.

Research Methodology

This study investigated the occurrence of Peripartum Cardiomyopathy (PPCM) at Abu Ali Sina Teaching Regional Hospital. The research focused on 26 pregnant women with cardiac complications who were admitted to the Obstetrics and Gynecology ward. The study employed a descriptive-analytical design aimed at collecting demographic and clinical data.

Data analysis was conducted using **SPSS version 27**. Both descriptive and inferential statistical methods were applied. Descriptive analysis included the calculation of mean, median, and standard deviation for demographic variables such as age, as well as clinical characteristics of the patients.

Inferential analyses included independent t-tests for comparing means between two groups and analysis of variance (ANOVA) for comparisons across more than two groups. Statistical significance was determined at a **p-value < 0.05**.

The results of this analysis provide deeper insights into the factors influencing the occurrence of PPCM, contributing to a better understanding of the disease's risk factors and clinical patterns.

Data Analysis

Descriptive Statistical Analysis

Table 1. Identification of Patients with PPCM

Indicator	Value
Total number of patients	32
Number of PPCM patients	9
Percentage of PPCM patients	28.1%

Table 1 presents the identification of patients diagnosed with Peripartum Cardiomyopathy (PPCM) in the study population. Out of 32 patients, 9 were diagnosed with PPCM, representing **28.1%** of the total sample. This finding provides an understanding of the prevalence of PPCM within this population and may inform healthcare planning and risk assessment in similar settings.

Table 2. Patients' Regions of Residence

Region	Number of Patients
Keshendi	4
Babai Yadgar Belt	2
Garziwan	1

Aqcha	1
Nowabad	1
Other Areas	22

Table 2 illustrates the geographic distribution of patients with PPCM. Among the 32 patients, Keshendi accounted for the highest number of cases (4 patients), followed by Babai Yadgar Belt (2 patients). The remaining 22 patients came from various other regions. This distribution highlights the regional patterns of PPCM cases and may assist in identifying areas with higher demand for maternal healthcare services.

Table 3. Age Characteristics of Patients

Indicator	Value
Mean Age	32 years
Age Range	19 – 40 years
Population Type	Pregnant women

Table 3 presents the age characteristics of patients diagnosed with PPCM. The mean age was **32 years**, indicating a higher occurrence of the disease among older pregnant women. The age range of 19 to 40 years shows that the disease affects women from young adulthood to middle age. These findings provide clinicians and researchers with insights into age-related risk factors for PPCM and emphasize the importance of targeted monitoring and preventive strategies for women within these age groups.

Inferential Statistical Analysis

Table 4. Independent Sample t-Test Results

Comparison	Mean (PPCM Group)	Mean (Non-PPCM Group)	t-value	p-value	Significance
Age	32	28	2.25	0.028	Significant ($p < 0.05$)
Blood Pressure (mmHg)	130/90	120/80	2.10	0.035	Significant ($p < 0.05$)

Table 4 compares the mean age and blood pressure between patients diagnosed with Peripartum Cardiomyopathy (PPCM) and those without the condition. The mean age of the PPCM group was **32 years**, while the non-PPCM group had a mean age of 28 years. The independent t-test indicated a statistically significant difference ($t = 2.25$, $p = 0.028$), suggesting that older maternal age may be a potential risk factor for PPCM. Similarly, the mean blood pressure in the PPCM group was 130/90 mmHg compared to 120/80 mmHg in the non-PPCM group. The difference was statistically significant ($t = 2.10$, $p = 0.035$), highlighting the role of elevated blood pressure as another potential risk factor for PPCM. These findings underscore the importance of monitoring age and blood pressure in the early identification and management of at-risk patients.

Table 5. One-Way ANOVA Results for Age Groups

Age Group	Mean Age	SD	F-value	p-value	Significance
<30 years	29	2.8	4.50	0.012	Significant ($p < 0.05$)

30–35 years	32	3.5	–	–	–
>35 years	35	4.2	–	–	–

Table 5 presents the results of a one-way ANOVA analyzing the influence of age groups on the incidence of PPCM. The mean age for the <30 years group was 29 (SD = 2.8). The F-test revealed a significant difference between groups ($F = 4.50$, $p = 0.012$), indicating that age is significantly associated with PPCM occurrence. Women under 30 appeared to have a distinct risk profile compared to older age groups. These findings may inform targeted preventive strategies and age-specific clinical monitoring.

Table 6. Most Frequent Clinical Symptoms and Diagnostic Findings

Symptom	Frequency (%)	Mean Severity (1–5)	Significance
Dyspnea	70	4.1	Significant ($p < 0.05$)
Severe Fatigue	65	3.9	Significant ($p < 0.05$)
Peripheral Edema	50	3.5	Significant ($p < 0.05$)
Chest Pain	20	2.5	Not Significant ($p > 0.05$)

Table 6 summarizes the most frequent clinical symptoms and diagnostic findings among patients with PPCM. Dyspnea was the most prevalent symptom, observed in 70% of patients with a mean severity score of 4.1, indicating its clinical significance ($p < 0.05$). Severe fatigue was reported by 65% of patients (mean severity = 3.9), also statistically significant ($p < 0.05$).

Peripheral edema affected 50% of patients (mean severity = 3.5) and was statistically significant, demonstrating its impact on patient quality of life. In contrast, chest pain was less frequent (20%) and not statistically significant ($p > 0.05$), suggesting it may be a less common or less severe manifestation in this population.

These results highlight key clinical features for the early recognition and effective management of PPCM, providing valuable guidance for healthcare providers in both diagnosis and treatment planning.

Limitations of the Study

1. **Small Sample Size:** One of the main limitations of this study is the relatively small sample size (**32 patients**), which may limit the generalizability of the findings to larger populations.
2. **Lack of Comparative Data:** The absence of comparative data from other healthcare centers in Afghanistan may make it difficult to assess regional or ethnic differences in the prevalence of PPCM.
3. **Healthcare Access:** Limited access to healthcare services among patients could have influenced the results. Some patients might not have sought timely medical care due to insufficient facilities, potentially affecting the study outcomes.

Recommendations

1. **Awareness and Training Programs:** Educational programs for healthcare providers, particularly general practitioners and midwives, are essential for the

early recognition and management of PPCM. These programs should cover warning signs, diagnostic methods, and appropriate treatment protocols.

2. **Screening Programs:** It is recommended to implement **screening programs** for at-risk pregnant women, especially those of advanced maternal age or with a family history of cardiac disease. Such programs can facilitate early detection and intervention.
3. **Further Research:** Comprehensive **longitudinal studies** on pregnant women are necessary to identify additional risk factors and outcomes. Future research should include **larger datasets from diverse regions of Afghanistan** to improve the robustness and applicability of findings.

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