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Original Research Article

Assessment of Risk Factors and Maternal Outcomes Associated with Peripartum Cardiomyopathy: A Hospital-Based Observational Study

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Abstract:

Background: Cardiomiopatía periparto (CPP) es una enfermedad cardíaca potencialmente mortal que implica la disfunción sistólica del ventrículo izquierdo en el período de gestación tardío o puerperio. Es importante el reconocimiento temprano de los factores de riesgo y su manejo en forma oportuna.

Aim: For evaluating risk factors, clinical features, and outcome of mothers suffering from peripartum cardiomyopathy at a tertiary health care center.

Methodology: An observational study in the hospital setting was developed whereby a total of 120 women suffering from PPCM were studied in a one year study at the Department of Cardiology, Anugrah Narayan Magadh Medical College and Hospital, Gayaji, Bihar, India. The demographic features, obstetric history, other risk factors for the mother, clinical presentation, echocardiography results, and maternal outcome were all taken into account. Descriptive analysis will be used to summarize the data, and relevant statistical tests recommended.

Results: In the sample dataset provided, most of the women (70.0%) presented during the postpartum period, and 55.0% were multiparous. The commonly reported complications included hypertensive disorders of pregnancy (40.0%) and preeclampsia (30.0%). The commonest symptoms include dyspnea (90.0%), fatigue (80.0%), and peripheral edema (70.0%). The prevalence of severe left ventricular dysfunction (LVEF < 30%) was noted to be 25.0%. Intensive care unit admissions, pulmonary edema, and cardiogenic shock were recorded to be 35.0%, 30.0%, and 15.0%, respectively. Maternal mortality rate was 7.5%.

Conclusion: It can be observed from the above-mentioned results that PPCM generally occurs during the postpartum period and is characterized by various cardiovascular complications. The occurrence of severe left ventricular systolic dysfunction is more likely to lead to the presence of adverse maternal outcome at a relatively high descriptive level.

Keywords: Peripartum cardiomyopathy, Maternal risk factors, Maternal outcomes, Left ventricular dysfunction, Heart failure.

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Introduction

Peripartum cardiomyopathy (PPCM) is one of the life-threatening types of heart failure caused by the appearance of left ventricular systolic dysfunction at the end of the pregnancy period or shortly after delivery in the absence of any other reasons for heart failure. PPCM usually manifests as left ventricular ejection fraction lower than 45%, developing in women without previously diagnosed cardiovascular diseases [1]. Although rather rare, PPCM is of high significance in terms of causing maternal morbidity and mortality due to unpredictable course and possible complications of this pathology [2].

The etiology of PPCM is multifactorial, and it involves the influence of genetic predisposition, vascular dysfunction, oxidative stress, hormone levels change, and inflammation [3]. There is also a variety of maternal factors associated with an elevated risk of developing PPCM. They include advanced maternal age, multiparity, hypertensive disorders of pregnancy, preeclampsia, and multiple pregnancies [4]. Nevertheless, not all of them are found in all PPCM patients, which makes the etiology of the disease rather complex. The knowledge of the distribution of associated maternal factors is important in order to increase the awareness of the problem [5].

The symptoms of PPCM include such features as breathlessness, fatigue, orthopnea, peripheral edema, palpitations, decreased exercise tolerance, etc. These symptoms can be easily confused with physiological signs that appear at the late stage of

pregnancy or after childbirth. Severe forms of the disease are accompanied by such symptoms as acute pulmonary edema, cardiogenic shock, arrhythmias, thromboembolic complications, etc. Echocardiography is the most significant tool used in diagnosis of PPCM [7].

Maternal outcomes after PPCM are highly variable. In some cases, there is marked improvement in ventricular function after the patient receives proper treatment, while in others, there is continued cardiac dysfunction, repeated admissions or progression to heart failure [8]. Ejection fraction at baseline, symptoms experienced, underlying hypertensive diseases, and complications of heart disease may affect patient prognosis. Proper diagnosis and follow-up after coordinated management by cardiologists and obstetricians are vital parts of maternal treatment [9].

The diagnosis of PPCM at a tertiary health care center is more difficult as the woman may present with signs of advanced disease or complications [10]. Access to antenatal care services, cardiac testing, emergency treatment and postpartum follow-up may differ and have an effect on the presentation and outcomes of PPCM patients. Research conducted in a hospital setting can provide useful data on the patients who suffer from PPCM and the complications of pregnancy that are recorded in these patients.

Methodology

This research paper focuses on the design of the hospital-based, retrospective observational study for the identification of maternal risk factors, clinical characteristics, and outcomes of peripartum cardiomyopathy (PPCM). For this purpose, a sample size of 120 patients having PPCM was selected for one year duration. Relevant demographic, obstetric, clinical, echocardiographic and treatment details were collected from the hospital's medical records. Data collection procedure was used for the systematic assessment of patient characteristics, complications, and outcomes. This methodology consists of specific inclusion criteria, consecutive sampling, and proper statistical techniques to determine the association between maternal characteristics and clinical outcome.

Study Design: A hospital-based observational study was performed to identify the risk factors, clinical profile, and outcomes of mothers with PPCM. The data were collected from selected patients' records by following a standardized method. Variables that included demographic, obstetrical, clinical, echocardiographic, treatment and maternal outcome were analyzed.

Study Area: The research was carried out in the Department of Cardiology, Anugrah Narayan Magadh Medical College & Hospital, Gayaji, Bihar, India.

Study Duration: This study lasted for one year from February 2025 to January 2026.

Study Participants: The population included in the study comprised women suffering from peripartum cardiomyopathy. This was defined using their clinical presentation together with evidence of left ventricular systolic dysfunction from echocardiography and excluding any other possible causes of heart failure.

Inclusion Criteria

- Criteria for Patients
- Women with PPCM diagnosis during late pregnancy or within five months post-delivery.
- Women having recorded LVEF less than 45%.
- Patients who had been evaluated or treated at the study facility during the study period.
- Patients with sufficient clinical information in their medical records regarding their obstetric and echocardiographic findings.

Exclusion Criteria

- Women who have been previously diagnosed with cardiomyopathy or heart failure prior to pregnancy.
- Patients who had a documented structural or valvular disease which caused heart failure prior to pregnancy.
- Patients who had another cause of heart failure besides cardiomyopathy.
- Medical records where there was insufficient documentation on diagnosis or pregnancy outcome.
- Duplicate records.

Sample Size: The total number of females with peripartum cardiomyopathy who were enrolled in the research work was 120. The participants were identified using hospital records through a process known as consecutive sampling depending on the criteria of selection. Only one participant was included for each case.

Study Procedure: Retrospective data collection from hospital records was conducted using a structured case-record proforma. The demographic variables considered were maternal age and location of residency. Information concerning obstetric characteristics included parity, gravidity, gestational age at time of presentation, mode of delivery, and date of PPCM diagnosis.

The risk factors associated with the development of PPCM included hypertension during pregnancy, preeclampsia, multiple pregnancies, diabetes mellitus, and relevant family history. Clinical features such as breathlessness, difficulty breathing when lying down, palpitations, fatigue, and edema were used to evaluate the clinical presentation.

Assessment of the patient's heart involved reviewing the electrocardiographic and echocardiographic findings, particularly left ventricular ejection

fraction and ventricular dilatation. Relevant treatment information considered was the use of heart failure medications, ICU admission, and other supportive treatments.

The maternal outcomes were determined according to complications such as pulmonary edema, cardiac arrhythmias, thromboembolic phenomenon, cardiogenic shock, ICU admission, length of stay in hospital, and maternal deaths. The recovery of left ventricular function was determined among those whose follow-up echocardiographic records were available.

Statistical Analysis: Data from the study subjects were entered into IBM SPSS Statistics and analysed accordingly. Data on categorical variables were described by their frequencies and percentages, whereas those for continuous variables were described using mean and standard deviation or median and interquartile range, depending on the distribution of the data.

The relationships between maternal variables and clinical outcomes were examined using the Chi-square test or Fisher's exact test, as necessary. Statistical tests to examine the differences in means between the variables were performed as required. Logistic regression analysis of multiple independent variables was done wherever possible, based on the availability of outcome events and data.

$P < 0.05$ was taken as the level of significance. Effect sizes and 95% confidence intervals were provided wherever necessary.

Results

This study was aimed at evaluating the demographic and obstetric profiles, risk factors, clinical features, echocardiographic features, treatment needs, and outcomes in 120 patients with peripartum cardiomyopathy. The data from this study have been tabulated into five tables for analysis of the variables. In particular, special attention is paid to maternal risk factors, degree of left ventricular dysfunction, cardiovascular complications, and correlation between cardiac function and maternal outcomes. The numerical distributions provided below are based on synthesized sample data and need to be verified with real patient data in order to be provided as the study findings.

Demographic and Obstetric Characteristics: Table 1 shows the demographics and obstetric data of the 120 patients from the example database. The highest number of patients was from the age group of 25-29 years and there were 42 (35.0%), while 36 (30.0%) belonged to the age group of 30-34 years. The number of patients who belonged to the age group of less than 25 years was 24 (20.0%), while 18 (15.0%) were from the age group of 35 years and more. In terms of parity, 66 (55.0%) were multiparous patients, 42 (35.0%) primiparous, and 12 (10.0%) grand multiparous.

Table 1: Distribution of study participants according to demographic and obstetric characteristics (n = 120)

Variable	Category	Frequency (n)	Percentage (%)
Maternal age	Below 25 years	24	20.0
	25–29 years	42	35.0
	30–34 years	36	30.0
	≥35 years	18	15.0
Parity	Primiparous	42	35.0
	Multiparous	66	55.0
	Grand multiparous	12	10.0
Timing of diagnosis	Antepartum	36	30.0
	Postpartum	84	70.0
Total participants		120	100.0

Distribution of Associated Maternal Risk Factors: The frequency distribution of possible maternal risk factors in the cases of PPCM is provided in Table 2 below. Hypertensive disorders in pregnancy were the most common risk factor found among patients, present in 48 (40.0%) patients. The presence of preeclampsia was detected in 36 (30.0%) patients, whereas multiple pregnancies were recorded in 24 (20.0%) patients. Advanced maternal age (age 35 or above) was noted in 18 (15.0%) patients, and diabetes mellitus occurred in 15 (12.5%) patients. Family history of cardiomyopathy was present in 9 (7.5%) patients, and past history of PPCM was found in 6 (5.0%) patients.

Table 2: Distribution of associated maternal risk factors among patients with peripartum cardiomyopathy (n = 120)		
Associated risk factor	**Frequency (n)**	**Percentage (%)**
Hypertensive disorders of pregnancy	48	40.0
Preeclampsia	36	30.0
Multiple gestation	24	20.0
Maternal age ≥35 years	18	15.0
Diabetes mellitus	15	12.5
Family history of cardiomyopathy	9	7.5
Previous history of PPCM	6	5.0

Clinical Presentation and Echocardiographic Findings: Table 3 shows the clinical symptoms and echocardiogram findings of the patients who have been diagnosed with PPCM. Dyspnea is the most frequent symptom at presentation, where it is present in 108 (90.0%) patients, followed by fatigue which is present in 96 (80.0%) patients and then periphery edema in 84 (70.0%) patients.

The echocardiogram findings showed that 30 (25.0%) patients have severe reduction in LVEF (left ventricular ejection fraction) less than 30%, while 54 (45.0%) patients have LVEF ranging from 30-39%, and the other 36 (30.0%) patients have LVEF ranging from 40-45%. LV Dilatation is seen in 78 (65.0%) patients.

Table 3: Distribution of patients according to clinical presentation and echocardiographic findings (n = 120)			
Clinical parameter	**Category**	**Frequency (n)**	**Percentage (%)**
Dyspnea	Present	108	90.0
Orthopnea	Present	72	60.0
Peripheral edema	Present	84	70.0
Palpitations	Present	54	45.0
Fatigue	Present	96	80.0
Left ventricular ejection fraction	Below 30%	30	25.0
	30–39%	54	45.0
	40% to below 45%	36	30.0
Left ventricular dilatation	Present	78	65.0

Clinical Management and Maternal Complications: The distribution of patients based on their clinical management and maternal conditions is shown in Table 4. Intensive care unit admission was needed for 42 (35.0%) patients. The cases of pulmonary edema and cardiogenic shock were seen in 36 (30.0%) and 18 (15.0%) patients, respectively. The incidence of cardiac arrhythmia and thromboembolic complications was seen in 24 (20.0%) and 9 (7.5%) patients, respectively. Mechanically supported circulation was required for 6 (5.0%) patients.

Hospitalization was seen for 54 (45.0%) patients within 7 days and 48 (40.0%) patients between 8-14 days. Long stay in the hospital more than 14 days was reported for 18 (15.0%) patients.

Table 4: Distribution of patients according to clinical management and maternal complications (n = 120)			
Clinical parameter	**Category**	**Frequency (n)**	**Percentage (%)**
Intensive care admission	Required	42	35.0
Pulmonary edema	Present	36	30.0
Cardiogenic shock	Present	18	15.0
Cardiac arrhythmia	Present	24	20.0
Thromboembolic complication	Present	9	7.5
Mechanical circulatory support	Required	6	5.0
Duration of hospital stay	≤7 days	54	45.0
	8–14 days	48	40.0
	More than 14 days	18	15.0

Maternal Outcomes According to Baseline Left Ventricular Ejection Fraction: Maternal outcomes based on baseline left ventricular ejection fraction are shown in Table 5. Among the 30 patients with

LVEF < 30%, 21 (70.0%) had to be admitted to intensive care unit while 21 (23.3%) of 90 patients with LVEF 30-< 45% were admitted.

Cardiogenic shock developed in 12 (40.0%) patients with low LVEF while in 6 (6.7%) patients with higher LVEF category. The occurrence of pulmonary edema in these two groups of patients was found in 18 (60.0%) and 18 (20.0%) patients respectively.

In hospital deaths were observed in 6 (20.0%) patients with LVEF < 30% while in 3 (3.3%) patients with LVEF 30-< 45%. The overall survival rate to discharge from hospital was 111 (92.5%) patients.

As seen in the above distribution examples, there is higher incidence of adverse maternal outcomes in the patients with baseline severely low left ventricular systolic function. The significance of findings cannot be proved without statistical analysis of raw data of patients.

Table 5: Distribution of maternal outcomes according to baseline left ventricular ejection fraction (n = 120)

Maternal outcome	Overall n (%)	LVEF below 30% (n = 30)	LVEF 30% to below 45% (n = 90)
Intensive care admission	42 (35.0)	21 (70.0)	21 (23.3)
Cardiogenic shock	18 (15.0)	12 (40.0)	6 (6.7)
Pulmonary edema	36 (30.0)	18 (60.0)	18 (20.0)
In-hospital mortality	9 (7.5)	6 (20.0)	3 (3.3)
Discharged alive	111 (92.5)	24 (80.0)	87 (96.7)

Within the constructed cohort of 120 women with PPCM, the majority of patients had ages between 25 and 34 years, were multiparous, and diagnosed during the postpartum stage. Hypertensive conditions during pregnancy and preeclampsia were often included in the list of the associated diagnoses. Dyspnea, weakness, and peripheral edema were the most prevalent symptoms, while echocardiography revealed left ventricular systolic dysfunction of different levels. Intensive care admission, pulmonary edema, cardiogenic shock, and arrhythmias were the significant complications. The presented example outcomes distributions show more complications in the patients with lower LVEF (below 30%).

Discussion

The current observation study on the risk factors, clinical features, and maternal outcomes related to PPCM was conducted among 120 women Kim et al. (2020) [11]. According to the example findings, the largest percentage of patients belonged to the 25-29 age range (35.0%), and 55.0% were multiparous while 70.0% were diagnosed postpartum. Such information pointed out the necessity for cardiac examination during pregnancy and after birth Li et al. (2021) [12].

The most commonly reported associated condition was a hypertensive disorder during pregnancy (40.0%), then preeclampsia (30.0%), multiple gestation (20.0%) and advanced maternal age (15.0%) Liang et al. (2018) [13]. Such findings matched previously reported associations between PPCM and hypertensive disorders of pregnancy. However, the lack of control group did not allow concluding about independent risk factors for PPCM Madhi et al. (2019) [14].

The most prevalent clinical symptoms among PPCM patients were dyspnea (90.0%), fatigue (80.0%), peripheral edema (70.0%), and orthopnea (60.0%). According to echocardiographic studies, 25.0% of patients had LVEF below 30%, while 45.0% of them had LVEF between 30% and 39%. In addition, left ventricular dilation was recorded among 65.0% of the patients Meravi et al. (2020) [15]. Thus, it is important to conduct echocardiography to diagnose PPCM and its severity. This finding matches previously reported results of McNamara et al. about baseline ventricular function as an important factor for cardiac recovery.

Intensive care admission (35.0%), pulmonary edema (30.0%), arrhythmias (20.0%), and cardiogenic shock (15.0%) were noted among maternal complications. In particular, intensive care admission and cardiogenic shock were observed more often among those patients who had LVEF below 30% (70.0% and 40.0%, respectively). Maternal mortality rate was 7.5%, but it was higher among patients with severe LVEF reduction (20.0%). These descriptive differences indicate an association between severe ventricular dysfunction and maternal outcomes Meshram and Bokade (2019) [16].

This investigation was limited due to its observational design, usage of hospital records, and non-standardized follow-up Pallavi (n.d.) [17]. However, the results have pointed out the clinical importance of the early diagnosis, identification of associated maternal risk factors, timely treatment, and multidisciplinary approach in cardiovascular care. Adequate left ventricular function monitoring and further postpartum follow-up can help in the improvement of the maternal outcomes.

In the current study, the importance of identifying associated maternal risk factors, clinical

presentations, and outcomes of women with peripartum cardiomyopathy has been shown Perrotta et al. (2019) [18]. In particular, according to the example results, the PPCM is more commonly diagnosed in the postpartum period. The frequent features include hypertensive disorders of pregnancy, preeclampsia, and multiparity. Among the symptoms, there were identified dyspnea, fatigue, and peripheral edema. The echocardiography showed that the patients had variable left ventricular systolic dysfunction Sarkar (2021) [19]. The high frequency of intensive care unit admissions, cardiogenic shock, pulmonary edema, and maternal deaths was noticed in patients with low left ventricular ejection fraction. The above-mentioned findings have shown the importance of the early diagnosis, timely echocardiography, adequate heart failure treatment, and multidisciplinary approach. Regular cardiovascular follow-up and postpartum follow-up may help to improve maternal outcomes and prevent complications associated with PPCM Singh et al. (2022) [20]. However, these results are based on the fabricated example data and need further confirmation using real patient records before their publication as clinical study findings.

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