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Peripartum Cardiomyopathy in Pakistan: A Systematic Review of Clinical Outcomes, Maternal and Obstetric Characteristics

Elios Kwarteng Asare
Elioskwartengasare6@gmail.com

University of Ghana
Abeeha Asim
Akbar Niazi Teaching Hospital
Catherine H. Cummings
Saint Louis University
Lauren Jackson
Kaiser Permanente Bernard J. Tyson School of Medicine
Chidubem Stanley Okeke
Chukwuemeka Odumegwu Ojukwu University
Tyler Lackland
Indiana University

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Abstract

Background

Peripartum cardiomyopathy (PPCM) is an important cause of maternal cardiovascular mortality, particularly in low- and middle-income countries due to limited access to specialized cardiac care. This systematic review aims to synthesize evidence on the proportions of mortality, recovery of left ventricular function, cardiovascular complications, and maternal and obstetric characteristics among women with PPCM in Pakistan.

Methods

A systematic review was conducted according to PRISMA guidelines. PubMed, Google Scholar, PakMediNet, and the Cochrane Library were searched from January 2000 to May 2026 for studies reporting PPCM outcomes in Pakistan and registered with PROSPERO (ID: CRD420261403054). Eligible studies included observational studies and case series involving women diagnosed with PPCM. Extracted data included study design, sample size, mortality, recovery of left ventricular systolic function, cardiovascular complications, and obstetric characteristics. Pooled proportions were calculated descriptively using aggregate study data. The quality of study was assessed using the Joanna Briggs Institute checklist.

Results

Seven studies were included. Mortality outcomes were reported in six studies including 315 patients, with 49 deaths recorded, yielding an overall mortality proportion of 15.6%. Recovery of left ventricular systolic function was reported in four studies including 160 patients, of whom 97 achieved recoveries, corresponding to an overall recovery proportion of 60.6%, predominantly defined by improvement in left ventricular ejection fraction during 6–12 months of follow-up. Pulmonary edema was the most frequently reported cardiovascular complication (21.6%), while thromboembolic events (17.9%), cardiogenic shock (13.1%), ventricular tachycardia (9.9%), and atrial fibrillation (9.4%) occurred less frequently. Among the reported maternal characteristics, obesity was the most common (62.9%). Multiparity was the predominant obstetric characteristic (69.1%), whereas pregnancy-related hypertensive disorders, primigravidity, and multiple gestation were reported in 34.1%, 22.9%, and 9.7% of women, respectively.

Conclusion

PPCM in Pakistan remains associated with considerable mortality and a substantial burden of cardiovascular complications. Obesity, multiparity, and pregnancy-related hypertensive disorders were the predominant maternal and obstetric characteristics, highlighting the importance of early recognition, timely cardiac assessment, and multidisciplinary care to improve maternal outcomes.

Clinical trial registration

Not applicable.

1.0 Introduction

In Pakistan, cardiovascular diseases including peripartum cardiomyopathy (PPCM) is one the leading cause of hospitalization, pregnancy-related complications, and deaths [1]. Peripartum cardiomyopathy (PPCM) is defined as an idiopathic cardiomyopathy characterized by heart failure resulting from left ventricular systolic dysfunction [2].It commonly develops toward the end of pregnancy or within the months following delivery, in the absence of another identifiable cause,

characterizedas left ventricular ejection fraction less than 45% [3]. Affected women are typically young and, often at the beginning of their reproductive lives, which raises profound concerns about long-term prognosis and the safety of future pregnancies [4]. The etiology of PPCM is multifactorial, with proposed mechanisms including genetic predisposition, hemodynamic stress, elevated prolactin levels, viral infection, autoimmune activation, and toxins [5]. Several risk factors have been consistently associated with increased susceptibility, such as multiparity, African descent, multiple gestation, and hypertensive disorders of pregnancy including preeclampsia and postpartum hypertension [6–9]. In addition, nutritional deficiencies, especially iron, folate, and vitamin D deficiency, may impair myocardial function and reduce cardiac resilience, thereby increasing susceptibility to PPCM, particularly in resource-limited settings [10]. Maternal age of 30 years or more is also a well described independent risk factor for PPCM[11], with an adjusted odds ratio of 1.7–1.8 compared with women less than 30 years [12].

Management of PPCM is largely based on guideline-directed heart failure therapy, including diuretics, beta blockers, vasodilators, and angiotensin-converting enzyme inhibitors in the postpartum period [13]. In recent years, bromocriptine has attracted attention as a potential disease-specific therapy because of its ability to inhibit prolactin secretion and reduce formation of cardiotoxic prolactin fragments implicated in myocardial injury [14]. Overall management requires a multidisciplinary approach to address the broad spectrum of clinical issues associated with PPCM, including labor and delivery, lactation, contraception, and future pregnancy planning [15]. Recovery of left ventricular systolic function remains one of the most important prognostic indicators in PPCM and is commonly defined by improvement in left ventricular ejection fraction (LVEF) to ≥ 50% [16, 17]. Although early recovery is frequently reported, recovery beyond six months postpartum has also been increasingly recognized [18]. Despite recovery, women remain at risk of recurrent heart failure during subsequent pregnancies, particularly in the last month of gestation or within five months postpartum [19]. PPCM is also associated with serious maternal complications, including pulmonary edema, cardiopulmonary arrest, and neurological injury [20].

Hospital-based studies from Pakistan have reported PPCM prevalence estimates of 28.8% among women older than 30 years, increasing to 44.4% among multigravida women [21]. Other studies have reported a PPCM prevalence of 15.2%[22] and incidence of 1.18 per 1,000 deliveries, highlighting the growing clinical relevance of the condition within the country [23]. Mortality associated with PPCM varies widely based on the country and risk factors leading to PPCM. While international multicenter studies have reported mortality rates ranging from 18% to 56%, studies from Pakistan have shown comparatively lower mortality estimates between 4% and 10% [17]. Within the Pakistani cohorts of PPCM, some studies have been conducted, yet differences in study design, patient populations, reported complications, and outcome definitions make direct interpretation challenging. To the best of our current knowledge, no systematic review has yet been undertaken to comprehensively assess mortality and recovery rates, obstetric and maternal risk factors, and the burden of complications in this setting. Addressing this gap is essential to provide clinicians and policymakers with a clearer understanding of PPCM in Pakistan and to guide future research and management strategies. Therefore, within Pakistan, this systematic review seeks to:

1. To estimate the overall mortality and recovery proportions among women diagnosed with peripartum cardiomyopathy.
2. To estimate the prevalence of cardiovascular complications associated with peripartum cardiomyopathy.
3. To identify maternal and obstetric characteristics associated with peripartum cardiomyopathy.

2.0 Method

2.1 Protocol and registration

This systematic review was carried out following PRISMA guidelines [24]. This systematic review was registered at PROSPERO (ID: CRD420261403054).

2.2 Data Sources and Search Strategy

We conducted comprehensive literature searches in PubMed, Google Scholar, PakMediNet, and Cochrane Library from January 2000 to May 2026 to identify studies reporting peripartum cardiomyopathy (PPCM) in Pakistan. Search terms were applied individually and in combination using Boolean operators (“AND”, “OR”). Our search included the following Medical Subject Headings (MeSH) and keywords: (“peripartum cardiomyopathy” OR “pregnancy associated cardiomyopathy” OR “PPCM” OR “maternal heart failure” OR “left ventricular dysfunction” OR “cardiac dysfunction” OR “echocardiography”) AND (“outcomes” OR “mortality” OR “survival” OR “recovery” OR “prognosis” OR “complications” OR “pulmonary edema” OR “cardiogenic shock” OR “arrhythmia” OR “ventricular tachycardia” OR “atrial fibrillation” OR “thromboembolism” OR “stroke” OR “left ventricular thrombus” OR “systemic embolism”) AND (“obstetric characteristics” OR “multiparity” OR “primigravida” OR “multiple pregnancy” OR “obesity” OR “overweight” OR “hypertensive disorders of pregnancy” OR “gestational hypertension” OR “pregnancy induced hypertension” OR “pre-eclampsia” OR “neonatal outcomes” OR “stillbirth” OR “intrauterine fetal death” OR “miscarriage” OR “perinatal death”) AND (“Pakistan”). Only peer-reviewed articles published in English were considered.

2.2 Eligibility Criteria

Studies were eligible for inclusion if they reported original data on women of reproductive age diagnosed with peripartum cardiomyopathy (PPCM) in Pakistan. PPCM was defined as an idiopathic cardiomyopathy characterized by heart failure secondary to left ventricular systolic dysfunction that develops toward the end of pregnancy or within the months following delivery, in the absence of another identifiable cause of heart failure, with a left ventricular ejection fraction usually less than 45% [2]. Only observational studies, including prospective studies, retrospective studies, cohort studies, cross-sectional studies, descriptive studies, and case series reporting original data on PPCM were considered. Studies were required to report at least one relevant outcome, including maternal mortality, recovery of left ventricular function, obstetric characteristics, or maternal complications associated with PPCM. Only peer-reviewed articles published in English were included. Studies conducted outside Pakistan, case reports, editorials, conference abstracts, review articles, or studies that did not report PPCM outcomes separately were excluded.

2.3 Data Extraction

Following the literature search and study selection, all eligible records were exported into a reference management system to standardize data handling. Screening was conducted using the Rayyan platform to identify duplicates and apply predefined inclusion and exclusion criteria, after which full texts of potentially relevant studies were retrieved and reviewed in Mendeley (version 2.148.0). Any disagreements regarding study eligibility were resolved through discussion and consensus, with a fourth reviewer consulted when agreement could not be reached.

Data extraction was performed independently by the same three reviewers using a standardized data extraction form developed for this review. Following completion of data extraction, all extracted information was cross-checked for accuracy and consistency. Discrepancies were resolved through discussion between the reviewers, and where necessary, a fourth reviewer was consulted to ensure accuracy of the final dataset. Extracted variables included the first author’s name, year of publication, study design, total number of women with PPCM, and reported maternal outcomes. Specific outcomes of interest included maternal mortality, recovery of left ventricular function, maternal and obstetric characteristics, and major maternal cardiovascular complications. Recovery of left ventricular function was extracted according to each study's predefined criteria.

Maternal characteristics extracted included obesity or overweight status. Obstetric characteristics included multiparity, primigravida status, twin pregnancy, multiple pregnancy, preeclampsia, eclampsia, and pregnancy-induced hypertension, as reported by the individual studies. For data synthesis, twin pregnancy and multiple pregnancy were grouped under the category of multiple gestation, while pregnancy-induced hypertension, preeclampsia, and eclampsia were combined under the category of pregnancy-related hypertensive disorders. Major maternal cardiovascular complications extracted included pulmonary edema, cardiogenic shock, ventricular tachycardia (VT), atrial fibrillation (AF), and thromboembolic events. Thromboembolic events comprised ischemic stroke, left ventricular thrombus, and systemic embolic events where reported.

2.4 Data Analysis

Data were synthesized descriptively. For maternal outcomes, obstetric characteristics, and cardiovascular complications, pooled proportions were calculated by summing the number of reported events across studies and dividing by the total number of women assessed for the respective outcome or characteristic. Due to substantial heterogeneity in study design, follow-up duration, and outcome definitions across the included studies, a formal meta-analysis was not performed. The findings are therefore presented as a narrative synthesis, with pooled proportions summarized in tables to facilitate comparison of mortality, recovery outcomes, maternal characteristics, obstetric characteristics, and major cardiovascular complications across studies.

2.5 Quality Assessment

The quality of each study was evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Tools Checklist for prevalence studies [25]. The checklist comprised nine questions, with each question receiving a score of 1 for a "yes" response and 0 for a "no" or "unclear" response, yielding a maximum score of 9. Studies scoring 7–9 were considered high quality, 4–6 moderate quality, and 0–3 low quality (Supplementary Table 1).

3.0 Results

3.1 Study Selection

The electronic data sources and study selection processes are presented in Fig. 1. Initially, a total of 137 records were identified from PubMed, Google scholar, PakMediNet, and Cochrane databases. After removing 32 duplicate records, the remaining 105 studies were screened based on their titles and abstracts. An additional 63 records were excluded due to the wrong study population, reviews, full text unavailable, publications in languages other than English and those outside of outside Pakistan. Following this, 42 studies were subjected to full-text screening. During full-text review, 35 studies were excluded for the following reasons: 23 studies described complications but did not provide extractable data on PPCM patients, and 12 studies did not report prevalence, mortality, or recovery outcomes for PPCM. Ultimately, 7 studies conducted in Pakistan met the eligibility criteria and were included in the qualitative and quantitative synthesis.

3.2 Characteristics of Included Studies

The seven studies included in this review were conducted across different regions of Pakistan and comprised one retrospective case series and prospective observational studies (n = 1, 14.3%) each, cohort studies (n = 2, 28.6%), and cross-sectional studies (n = 3, 42.9%). A total of 360 women diagnosed with peripartum cardiomyopathy (PPCM) were included, with sample sizes ranging from 22 to 91 participants. Reported outcomes included maternal mortality, recovery of left ventricular function, obstetric characteristics, major maternal complications, and neonatal outcomes (Table 1).

Table 1
Study characteristics, mortality, recovery, complications, and maternal and obstetric characteristics of included studies.

Study	Study design	PPCM Patients (n)	Mortality n (%)	Recovery definition	Recovery	Major complications n (%)	Maternal and obstetric characteristics n (%)
Laghari et al. [17]	Retrospective case series	45	Not reported	EF ≥ 50% at 6 months	32 (71.1)	VT 3 (6.6), LV clot 2 (4.4), thromboembolic stroke 4 (8.8)	Primigravida 25 (55.5), twin pregnancy 3 (6.6), pre-eclampsia 4 (8.8%), eclampsia 1 (2.2%)
Shah et al. [8]	Cohort	61	20 (32.8)	EF ≥ 45–50% with symptom improvement at 12 months	32 (52.5)	Pulmonary edema 7 (11.5%), cardiogenic shock 8 (13.1), thromboembolism 13 (21.3), VT 8 (13.1), AF 8 (13.1)	Multiparity 58 (95.1), obesity 33 (54.1), multiple pregnancy 5 (8.2), primigravida: 3 (4.9), pre-eclampsia 12 (19.7)
Perveen et al. [21]	Cohort	22	2 (9.1)	EF ≥ 50% at 6 months	14 (63.6)	Not reported	Multiparity 8 (36.4), primigravida 8 (36.4), pre-eclampsia 2(9.1), twin pregnancy 2 (9.1)
Sultan et al. [26]	Cross sectional	32	4 (12.5)	Symptom improvement (not EF-based)	19 (59.4%)	Pulmonary edema 19 (59.1), AF 3 (9.3)	Multiparity 28 (87.5), Primigravida: 4 (12.5), pregnancy induced hypertension 9 (28), pre-eclampsia 1 (3.1)
Mukkaram et al. [9]	Cross sectional	63	15 (23.1)	Not reported	Not reported	Not reported	Primigravida: 11 (17.5), multiparity 29 (46.0), obesity 45 (71.4), pre-eclampsia 47 (74.6%), twin pregnancy 3 (4.8)
Razzaq et al. [1]	Cross sectional	91	7 (7.7%)	Not reported	Not reported	Not reported	Not reported
Khan et al. [23]	Prospective observational	46	1 (2.2%)	Not reported	Not reported	Pulmonary edema 4 (8.7), VT 4 (8.7), AF 2 (4.3)	Multiple pregnancy 10 (21.7%)

3.3 Overall prevalence for mortality and recovery outcomes

Across the seven included studies, mortality outcomes were reported in six studies comprising 315 women with PPCM [1, 8, 9, 21, 23, 26]. Across these studies, 49 deaths were recorded, corresponding to an overall mortality proportion of 15.6%.

Recovery of left ventricular systolic function was reported in four studies involving 160 women with PPCM [8, 17, 21, 26]. Among these patients, 97 achieved recoveries according to study-specific criteria, yielding an overall recovery proportion of 60.6%. Recovery of the left ventricular function within studies was defined by echocardiographic improvement in left ventricular ejection fraction (LVEF ≥ 45–50% or ≥ 50%) during follow-up periods ranging from 6 to 12 months, although one study relied primarily on symptomatic improvement. (Table 2).

Table 2
Mortality and recovery characteristics of PPCM patients across included studies.

Study	PPCM Patients (n)	Mortality n (%)	Recovery definition	Recovery n (%)
Laghari et al. [17]	45	Not reported	EF ≥ 50% at 6 months	32 (71.1%)
Shah et al. [8]	61	20 (32.8%)	EF ≥ 45–50% with symptom improvement at 12 months	32 (52.5%)
Perveen et al. [21]	22	2 (9.1%)	EF ≥ 50% at 6 months	14 (63.6%)
Sultan et al. [26]	32	4 (12.5%)	Symptom improvement (not EF-based)	19 (59.4%)
Mukkaram et al. [9]	63	15 (23.1%)	Not reported	Not reported
Razzaq et al. [1]	91	7 (7.7%)	Not reported	Not reported
Khan et al.[23]	46	1 (2.2%)	Not reported	Not reported
Overall	360	49 (15.6)		97 (60.6)

3.4 Prevalence of Cardiovascular complications among patients with peripartum cardiomyopathy

Several cardiovascular complications were reported among women with PPCM across the included studies. Pulmonary edema was the most frequently reported complication, occurring in 30 of 139 assessed patients, corresponding to a pooled proportion of 21.6%. Thromboembolic events were reported in 19 of 106 patients (17.9%), while cardiogenic shock was observed in 8 of 61 patients (13.1%). Arrhythmic complications were less common, with ventricular tachycardia occurring in 15 of 152 patients (9.9%) and atrial fibrillation reported in 13 of 139 patients (9.4%) (Table 3).

Table 3
Pooled prevalence of complications among women with PPCM across included studies.

Study	Complication	Total cases	Total accessed	Pooled proportion (%)
Shah et al. [8], Sultan et al. [26], Khan et al.[23]	Pulmonary edema	30	139	21.6
Laghari et al. [17], Shah et al. [8]	Thromboembolism	19	106	17.9
Shah et al. [8]	Cardiogenic shock	8	61	13.1
Laghari et al. [17], Shah et al. [8], Khan et al.[23]	Ventricular tachycardia	15	152	9.9
Shah et al. [8], Sultan et al. [26], Khan et al.[23]	Atrial fibrillation	13	139	9.4

3.5 Maternal and obstetric characteristics associated with peripartum cardiomyopathy

Maternal and obstetric characteristics were variably reported across the included studies. Obesity status, reported in two studies was the most prevalent characteristic and was present in 78 of 124 women (62.9%). Multiparity reported in four studies was present in 123 of 178 assessed women (60.5%). Pregnancy-related hypertensive disorders, primigravidity, and multiple gestation, were reported across five studies, with pregnancy-related hypertensive disorders documented in 76 of 223 women (34.1%), primigravidity in 51 of 223 women (22.9%), and multiple gestation in 23 of 237 women (9.7%) (Table 4).

Table 4
Distribution of maternal and obstetric characteristics among women with peripartum cardiomyopathy in included studies

Study	PPCM Patients (n)	Obesity n (%)	Multiparity n (%)	Pregnancy-related hypertensive disorders n (%)	Primigravidity n (%)	Multiple gestation n (%)
Laghari et al. [17]	45	Not reported	Not reported	5 (11.1)	25 (55.5%)	3 (6.6%)
Shah et al. [8]	61	33 (54.1%)	58 (95.1)	12 (19.7)	3 (4.9%)	5 (8.2%)
Perveen et al. [21]	22	Not reported	8 (36.4)	2 (9.1)	8 (36.4%)	2 (9.1%)
Sultan et al. [26]	32	Not reported	28 (87.5)	10 (31.2)	4 (12.5%)	Not reported
Mukkaram et al. [9]	63	45 (71.4%)	29 (46.0)	47 (74.6)	11 (17.5%)	3 (4.8%)
Khan et al. [23]	46	Not reported	Not reported	Not reported	Not reported	10 (21.7%)
Overall	269	78 (62.9)	123 (69.1)	76 (34.1)	51(22.9)	23 (9.7)

4.0 Discussion

Peripartum cardiomyopathy (PPCM) remains a major contributor to maternal morbidity and mortality worldwide, with outcomes varying substantially across regions and populations. [13]. In this review of Pakistani cohorts, the overall mortality proportion was 15.6%, indicating that PPCM continues to pose a substantial threat to maternal health despite advances in diagnosis and treatment. While this estimate is lower than those reported in several African cohorts [27, 28], it still represents a clinically significant burden considering that affected women are generally young [29, 30]. A notable finding of this review was the marked variation in mortality across studies, ranging from 2.2% to 32.8%. Such differences may reflect incomplete clinical documentation, misclassification of maternal deaths, and limited surveillance systems linking cardiovascular disease to pregnancy-related outcomes may contribute to underestimation of the true burden of PPCM in Pakistan [31].

Beyond survival, recovery of left ventricular systolic function remains a key determinant of long-term prognosis in PPCM [2]. Overall, recovery was observed in 60.6% of patients across the included studies, indicating that a substantial proportion of women experience improvement in cardiac function following diagnosis. This finding is comparable to reports from other African studies, where recovery rates approaching 69.6% have been described [32], but considerably higher than the 23% complete recovery reported in a retrospective study from the United States [33]. Most studies defined recovery using echocardiographic improvement in left ventricular ejection fraction (LVEF), commonly to ≥ 50% within 6–12 months. However, reported recovery proportions varied between studies (52.5%–71.1%), likely reflecting differences in recovery definitions and assessment criteria. For example, Sultan et al.[26] relied primarily on symptom improvement whiles Laghari et al.[17] and Perveen et al.[21] used objective echocardiographic parameters.

The burden of PPCM in Pakistan was further reflected in the frequency of cardiovascular complications reported across the included studies. Pulmonary edema was the most common complication, affecting 21.6% of assessed patients, followed by thromboembolic events (17.9%), cardiogenic shock (13.1%), ventricular tachycardia (9.9%), and atrial fibrillation (9.4%). These complications are consistent with the progressive myocardial dysfunction that characterizes PPCM, where impaired ventricular function may lead to pulmonary congestion, systemic hypoperfusion, intracardiac thrombus formation, and electrical instability [11, 34–37]. Notably, the prevalence of ventricular tachycardia and atrial fibrillation exceeded estimates reported from large United States cohorts, where ventricular tachycardia and atrial fibrillation occurred in 6.5% and 3.8% of patients, respectively [38, 39]. This may suggest differences in disease severity at presentation or variations in healthcare access and referral patterns among women with PPCM in Pakistan.

Maternal and obstetric characteristics identified in this review provide insight into the clinical profile of women with PPCM in Pakistan. Multiparity was reported in 69.1% of assessed women, supporting previous observations that repeated exposure to the hemodynamic demands of pregnancy may contribute to cumulative cardiovascular stress and reduced myocardial reserve in susceptible individuals [2, 40]. Obesity was the most frequently documented maternal characteristic, observed in 62.9% assessed women. The high proportion of obesity among women with PPCM may be related to the adverse cardiovascular effects of excess adiposity, including increased blood pressure, and greater left ventricular mass [41]. These alterations may promote unfavorable cardiac remodeling and increase myocardial workload during pregnancy. In Pakistan, increasing obesity among reproductive-aged women has been linked to sedentary lifestyles and urban dietary transitions [42], which may contribute to progressive cardiovascular strain during pregnancy [33]. Consistent with this observation, a recent meta-analysis reported an almost two-fold increase in PPCM risk among women with pre-pregnancy obesity [43].

The relationship between PPCM and pregnancy-related hypertensive disorders was also evident, with these conditions present in 34.1% of women. This observation supports growing evidence that hypertensive pregnancy complications and PPCM share common pathophysiological pathways involving endothelial dysfunction and angiogenic imbalance [44]. Primigravid women accounted for 22.9% of cases, a proportion comparable to that reported in other PPCM cohorts, indicating that although PPCM is more commonly observed among multiparous women, it is not uncommon in first pregnancies [45–47]. Multiple gestation was observed in 9.7% of women with PPCM. Twin and higher-order pregnancies impose greater hemodynamic demands through increased plasma volume expansion potentially increasing cardiovascular stress and predisposing susceptible women to the development or clinical manifestation of PPCM [48, 49]. An important implication of these findings is that the burden of PPCM in Pakistan may not be fully captured by mortality and recovery estimates alone. The diversity of clinical presentations, complications, and associated maternal characteristics observed across studies suggests a condition with potentially differing disease trajectories and prognoses. Greater consideration of this complexity may be necessary when interpreting outcomes and planning care for affected women.

5.0 Limitations

The limited number of published studies evaluating PPCM in Pakistan may restrict the representativeness of the available evidence and limit the generalizability of the findings to the broader Pakistani population. Available literature represented women with clinically apparent or more severe disease, potentially underestimating milder or subclinical presentations of PPCM. Furthermore, substantial variability was observed across studies regarding study design, sample size, follow-up duration, and definitions of recovery outcomes and complications, which may have influenced the comparability of reported findings.

6.0 Conclusion

This systematic review demonstrates that peripartum cardiomyopathy remains associated with substantial maternal morbidity and mortality in Pakistan. Despite moderate rates of left ventricular recovery, marked variation in outcomes persists across studies, with significant cardiovascular complications continuing to be reported among affected women. The frequent occurrence of obesity, multiparity, hypertensive pregnancy disorders, and multiple gestation further highlights the complex

clinical profile of women with PPCM in Pakistan. These findings provide important insights into the burden and characteristics of PPCM and underscore the need for high-quality evidence to better characterize the disease and its outcomes within the Pakistani setting.

Declarations

Ethics approval and consent to participate: Not applicable

Clinical trial number: Not applicable.

Clinical trial registration: Not applicable.

Consent for publication: Not applicable**.**

Availability of data and materials: All data generated or analyzed during this study are included in this published article and its additional files.

Competing interests: The authors declare no competing interests.

Authors' contributions: EKA, TL, and LJ contributed substantially to the conception, design, execution, and oversight of the study. EKA, AA, TL, CSO, and LJ conducted literature screening, study selection, and data extraction. EKA, TL, and LJ were responsible for data verification, synthesis, and interpretation of findings. EKA prepared the original manuscript draft. AA, CHC, LJ, and TL critically reviewed and revised the manuscript for important intellectual content. All authors reviewed, approved, and agreed to be accountable for the final version of the manuscript.

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Figures

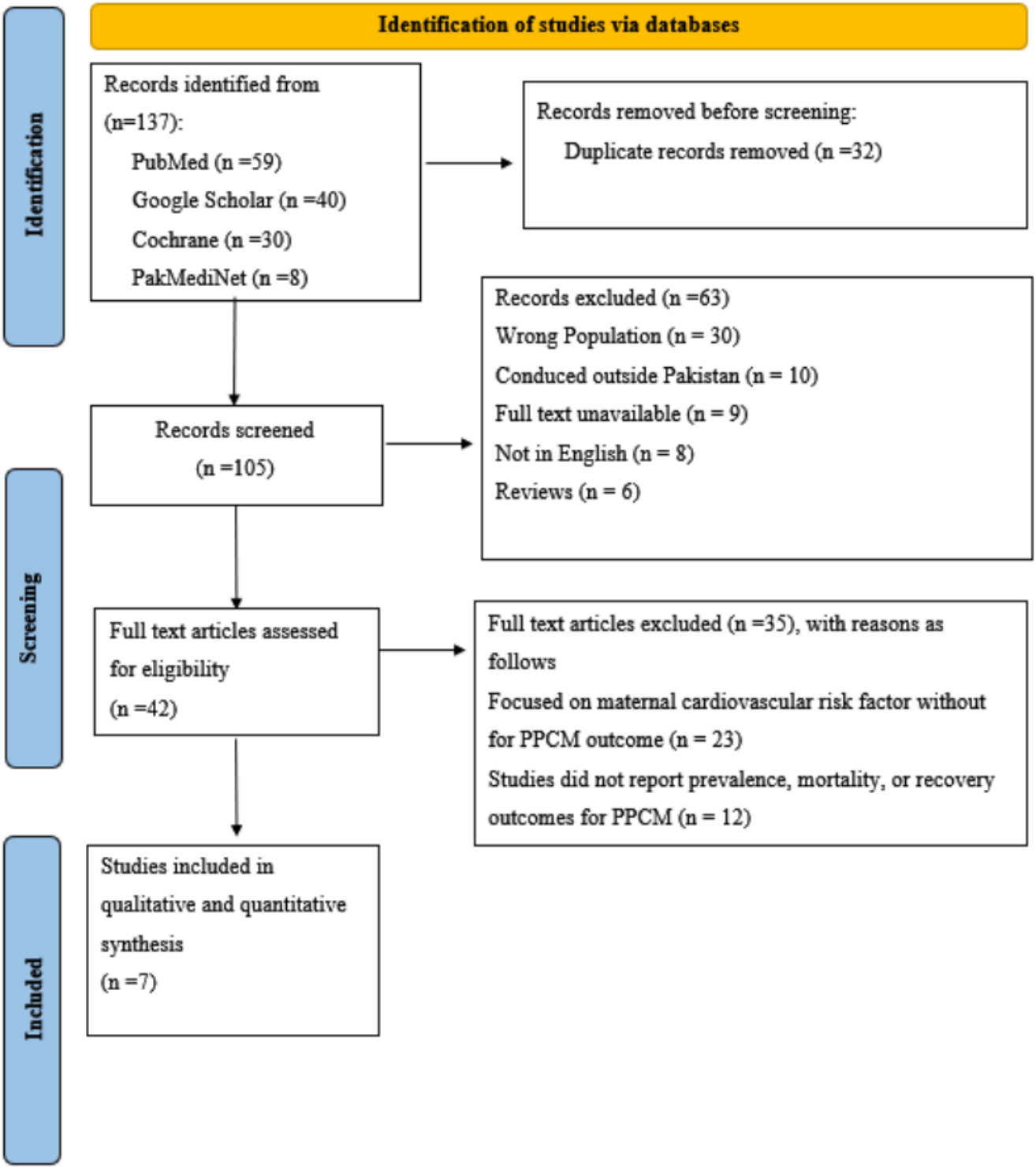


Figure 1

Flow diagram showing studies selection process implemented for this analysis

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