



ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE

RESIDENCY PROGRAM

DEPARTMENT OF INTERNAL MEDICINE

**PREVALENCE OF PERIPARTUM CARDIOMYOPATHY AND ITS
ASSOCIATED FACTORS AMONG REPRODUCTIVE AGE WOMEN
WITH DILATED CARDIOMYOPATHY IN THREE TERTIARY
HOSPITALS, ADDIS ABABA, ETHIOPIA**

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RESIDENT)**

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ADDIS ABABA, ETHIOPIA

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Abbreviations

AOR: Adjusted Odd Ratio

CI: Confidence Interval

COR: Crude Odd Ratio

DCM: Dilated Cardiomyopathy

DM: Diabetes Mellitus

EC: Ethiopian Calendar

EF: Ejection Fraction

EMR: Electrical Medical Record

ETB: Ethiopian Birr

GBD: Global Burden of Diseases

GC: Gregorian Calendar

HDP: Hypertensive Disorders of Pregnancy

HF: Heart Failure

IHD: Ischemic Heart disease

LV: Left Ventricle

LVIDd: Left Ventricle Internal Diameter at end Diastole

LVIDs: Left Ventricle Internal Diameter at end Systole

OR: Odd Ratios

PPCM: Peripartum Cardiomyopathy

PI: Principal Investigator

RVI: Retroviral Infection

SD: Standard deviation

SES: Socioeconomic Status

SPHMMC: St. Paul's Hospital Millennium Medical College

SPSH: St. Peter's Specialized Hospital

SPSS: Statistical Package of Social Sciences

TASH: Tikur Anbesa Specialized Hospital

Summary

Background: Peripartum cardiomyopathy causes dilated cardiomyopathy, which develops late in pregnancy or early after childbirth, primarily impacting African women. Patients frequently experience more frequent partial or complete recovery compared to other forms of dilated cardiomyopathy, emphasizing the crucial role of early diagnosis and management. Despite its global prevalence, there is currently a lack of comprehensive data on the disease's impact and contributing factors in Ethiopia.

Objective: The study aimed to assess the prevalence of peripartum cardiomyopathy and its associated factors among reproductive age women with dilated cardiomyopathy who were hospitalized or on cardiac follow-up at three tertiary hospitals in Addis Ababa.

Methods: An institution-based cross-sectional study was conducted using universal sampling method at three hospitals. Medical records of reproductive-age women with dilated cardiomyopathy who were hospitalized or attended followup from October 2021 to September 2023 at the three hospitals were reviewed. Both descriptive and analytical statistical methods were employed using SPSS version 29 for analysis, with a significant level set at p value <0.05 . Frequency tables, descriptive summaries, graphs, and charts were used for illustration.

Result: Three hundred-four women of reproductive age with dilated cardiomyopathy were participated. The prevalence of Peripartum cardiomyopathy was 22.7%. After conducting both bivariate and multiple variable logistic regression analyses, it was found that factors such as preeclampsia (AOR 13.740, 95% CI 1.120-168.509), multiparity (AOR 6.01, 95% CI 1.91-18.93), gestational diabetes (AOR 10.95, 95% CI 1.62-74.09), anemia during pregnancy (AOR 4.55, 95% CI 1.47-14.09), low socioeconomic status (AOR 6.83, 95% CI 2.06-22.68), and alcohol consumption during pregnancy (AOR 18.98, 95% CI 5.15-70.03) were associated with a higher risk of peripartum cardiomyopathy.

Conclusion: Peripartum cardiomyopathy stands out as a commonly encountered form of dilated cardiomyopathy among women of reproductive age. Multiple demographic and obstetric factors were associated with increased risk suggesting a need for appropriate risk assessment and further extensive research.

Key words: Peripartum cardiomyopathy, dilated cardiomyopathy, pregnancy, Ethiopia.

1. Introduction

1.1. Background of the study

Cardiomyopathy is a group of disorders in which the heart muscle is structurally and functionally abnormal in the absence of other cause and its main types are dilated, hypertrophic and restrictive cardiomyopathy(1). Dilated cardiomyopathy (DCM) is a condition where one or both ventricles of the heart become dilated and have impaired contraction. It can result from various causes, including stress, alcohol use, certain medications, infections (such as human immunodeficiency virus), genetic factors (both familial and non-familial), tachyarrhythmias, endocrine dysfunctions, and other less common causes like cirrhosis, end-stage renal disease requiring dialysis, systemic lupus erythematosus, celiac disease, sarcoidosis, obstructive sleep apnea, nutritional deficiencies (Thiamine, Selenium, and Carnitine), as well as cobalt and arsenic accumulation. In many cases, however, no etiology can be found and the cardiomyopathy is deemed idiopathic (2).

Peripartum cardiomyopathy (PPCM) is one of the causes of DCM that initially was described in 1849. It refers to a condition that occurs during the last month of pregnancy and up to 5 months postpartum in women without known cardiovascular disease (3). It is a distinct form of cardiomyopathy, associated with a high morbidity and mortality, but also with the possibility of full recovery. To date, its etiology is unknown, although several theories are under investigation in an effort to provide more information. Genetic predisposition, oxidative stress, excess anti-angiogenic signaling and the generation of a cardiotoxic subfragment of prolactin may play key roles in its pathogenesis (4, 5).

Patients with PPCM usually present with symptoms of heart failure, most commonly dyspnea, cough, orthopnea, paroxysmal nocturnal dyspnea, pedal edema, and hemoptysis. Physical signs can include an elevated jugular venous pressure, a displaced apical impulse, a third heart sound, and a murmur of mitral regurgitation. The diagnosis is based upon three clinical criteria: development of HF during the last month of, and up to 5 months after, pregnancy, absence of another identifiable cause of HF, and left ventricle ejection fraction (EF) <45% (3).

Since PPCM is a diagnosis of exclusion and there is currently no specific diagnostic test for PPCM, it is difficult to definitively diagnose PPCM even after comprehensive testing such as endomyocardial biopsy, genetic testing, family screening, anti-heart antibody testing, stress

testing, cardiac magnetic resonance, coronary angiography and others to rule out potential causes of DCM that may become apparent because of pregnancy-related hemodynamic changes. This fact has been a challenge in making a definitive diagnosis of PPCM and it has been reported as a limitation in the majority of PPCM studies. Treatment of PPCM is largely similar to treatment for HF with reduced ejection fraction due to other causes. Additional therapeutic issues for this population may include arrhythmia management, anticoagulation therapy, mechanical support, and investigational therapies such as Bromocriptine (6).

Peripartum cardiomyopathy occurs globally with widely variable incidence depending on geographical location and a number of risk factors are postulated to increase the risk of the development of PPCM; These include old age during pregnancy (7), multiparity (8), multiple gestation (7), concurrent gestational hypertension, preeclampsia or eclampsia (7, 9, 10), chronic hypertension and DM (10), gestational DM (7), tocolytics use (11), poor socioeconomic status (8, 12), African descent (8, 13, 14), lack of formal education (9), unemployment (9), being unmarried (8) and severe anemia during pregnancy (15). This study aimed to assess the prevalence of peripartum cardiomyopathy and its associated factors among reproductive age women with dilated cardiomyopathy who were hospitalized or on cardiac follow-up at St. Paul's Hospital, Millennium Medical College, St. Peter's Specialized Hospital and Tikur Anbesa Specialized Hospital from October 1, 2021 to September 30, 2023.

1.2. Statement of the problem

Globally, heart failure has been recognized as one of the major cardiovascular disorders and according to the Global Burden of Diseases, Injuries, and Risk Factors Study 2017, there are an estimated 64 million people with HF worldwide (16). American Heart Association estimated that there were 6.2 million people with HF in the United States between 2013 and 2016 (17). HF represents an escalating concern in Africa, especially within sub-Saharan Africa(18). Findings from a hospital-based observational study conducted in Ethiopia indicated that HF is one of the most common cardiovascular diseases, accounting for 23.9% of cases(19).

Dilated cardiomyopathy stands out as one of the leading contributors to HF. According to an analysis from the Italian Network on Congestive Heart Failure (CHF) Registry, DCM accounted for 36.0% of patients diagnosed with heart failure, serving as a prominent

underlying cause(20). Additionally the prevalence of DCM in HF patients was recorded to be 20.5% based on a Systematic Review of observational studies done in nine Sub-Saharan countries including Ethiopia(21). In a retrospective study conducted in 2020 at SPHMMC, comprising 60.3% female participants, dilated cardiomyopathy emerged as one of a significant contributor to cardiac diseases, accounting for 9.6% of the annual cardiovascular disease admissions(22). Moreover, DCM is notably one of the primary contributors to HF with reduced ejection fraction in women, as evidenced by a 5-year retrospective cohort study conducted at the University of Gonder Referral Hospital, where DCM was identified as a cause for 34.7% of HF cases with reduced EF in women (23). Additionally, a prospective cross-sectional study carried out at the same hospital in 2019, encompassing 59% female participants, found DCM accounting for 13.7% of patients admitted for acute HF (24).

Peripartum cardiomyopathy stands as one of the prevalent causes of DCM and HF in women of reproductive-age. This fact has been substantiated by multiple studies conducted in different regions. For instance, a comprehensive 15-year clinicopathological survey conducted at Johns Hopkins Hospital identified PPCM as the underlying cause in 11.3% of women diagnosed with DCM (25, 26). Population-based studies in the United States(13) have shown that PPCM is most commonly observed in individuals of African descent. In Nigeria, two separate studies showed a higher prevalence of PPCM in Africa. A 16-year review in Lagos reported a 19.18% prevalence of PPCM among women with DCM(27), while a retrospective analysis of echocardiographic patterns of heart diseases in Kano found that PPCM accounted for 38.7% of cases among women with DCM(28). Though there is a lack of specific studies on the prevalence of PPCM in Ethiopia, the Sub-Saharan Africa Survey of Heart Failure (THESUS–HF), covering 12 hospitals across 9 sub-Saharan African countries, including Ethiopia, observed that PPCM contributes to 15% of acute heart failure cases in women(29). Notably, from a random echocardiographic assessment of 398 pregnant women under antenatal care at SPHMMC in 2018, one case of PPCM was diagnosed. This finding signals the need for a closer examination of the condition's prevalence and incidence(30).

Women with PPCM have a higher risk for adverse obstetric and neonatal outcome. Different studies showed that a high rate of cesarean delivery, Preterm birth, placenta abruption, uterine arterial embolization, and peripartum hysterectomy in patients with PPCM. There is also a report of association with poor neonatal outcome such as small for date infant, congenital

anomalies and neonatal death (13). Several studies suggest that the risk of recurrence of PPCM with subsequent pregnancies is high with a greater risk of complications including recurrent heart failure, reduction of EF and death, particularly among women who do not have full recovery of LV function(31).

Peripartum cardiomyopathy has been recognized as one of the major cardiovascular disorders with high mortality. Two- and three-year mortality rates has been reported as 9% and 11% respectively from two studies conducted in US. (31, 32). Although The mortality exhibits regional variations, higher estimates observed among patients of African descent. In fact, a prospective analysis of black patients revealed mortality rates reaching as high as 28%. These fatalities are attributed to a spectrum of factors including ventricular arrhythmias, progressive heart failure, thromboembolic events, and sudden death. (32). On the other hand, PPCM is recognized to have a significantly better prognosis than other causes of DCM if it is identified and treated early. According to a study with a prospective follow-up of 1230 cardiomyopathy patients for the purpose of assessing the association between cause and outcome, patients with peripartum cardiomyopathy had the best prognosis of any other cause of DCM, with a 94 percent survival rate at five years(26). While the WHO and local antenatal and postnatal care guidelines include screening, risk stratification, and management protocols for cardiovascular diseases (33), peripartum cardiomyopathy (PPCM) has been identified as a significant contributor to maternal mortality in Ethiopia. A study utilizing data from the GBD Study 2013 revealed PPCM to be one of the top three causes categorized under 'other direct maternal causes,' responsible for 25.7% of maternal deaths in the country (34).

Although PPCM is recognized as a significant contributor to DCM and HF, increasing the risk of adverse outcomes for both mothers and newborns and contributing significantly to maternal mortality in various global regions, including Ethiopia, there remains a lack of information regarding the prevalence of PPCM and its related factors in Ethiopia. This knowledge gap poses a significant obstacle to the development of effective protocols for preventing and addressing this disease, despite the proven benefits of early detection and treatment(26).

1.3. Significance of the study

This study holds immense significance due to the scarcity of existing research on the prevalence and associated factors of PPCM in Ethiopia. The comprehensive assessment and documentation of this vital information serve as a crucial foundation for further research, serving as a stepping stone and catalyst for subsequent studies. The findings of this study will offer valuable insights for program planners, hospital leadership, and other relevant stakeholders, guiding the development of institutional or national strategies to address PPCM. Understanding the prevalence of PPCM will help direct necessary attention to this condition. Moreover, as various studies underscore the importance of early diagnosis and timely intervention to mitigate the negative impacts of the disease(35, 36), the associated risk factors identified in this study will contribute to the development of risk modification and intervention strategies. By continuing larger-scale studies and crafting risk modification and intervention strategies, we can ultimately reduce reported maternal deaths from PPCM in Ethiopia, thereby enhancing the overall quality of maternal and newborn health

The insights gained from this study will also contribute to a broader understanding of the PPCM globally, presenting vital information about its prevalence in Ethiopia and shedding light on the consistency of previously identified factors in this particular region. This broader understanding is paramount for the development of comprehensive strategies that can address this condition not just in Ethiopia, but also on a worldwide scale serving as a piece in the larger puzzle of combatting PPCM.

2. Literature review

2.1. Overview of Peripartum cardiomyopathy

Peripartum cardiomyopathy, also called pregnancy-associated cardiomyopathy, is defined as an idiopathic cardiomyopathy presenting with HF secondary to left ventricular systolic dysfunction towards the end of pregnancy or in the months following delivery, where no other cause of HF is found. It is a diagnosis of exclusion. The LV may not be dilated but the ejection fraction (EF) is nearly always reduced below 45%. However, the definition of the Workshop held by the National Heart Lung and Blood Institute and the Office of Rare Diseases (2000) states that it must develop during the last month of pregnancy or within 5 months of delivery (37), a position statement from the Heart Failure Association of the European Society of Cardiology Working Group on peripartum cardiomyopathy suggest that this time frame is arbitrary and may lead to under-diagnosis of PPCM and propose the above simplified definition with the possibility of inclusion of women within 6 months of delivery (3).

2.2. Prevalence of Peripartum cardiomyopathy

Peripartum cardiomyopathy is reported as one of the major underlying conditions that constitute DCM. On a nine-year clinicopathologic review of DCM patients at Johns Hopkins Hospital, a total of 673 consecutive patients were evaluated for congestive heart failure due to dilated cardiomyopathy and among the 250 women in reproductive age group 33 of them had PPCM, making the prevalence 13.2% (25). On the other hand, a retrospective case record analysis of patients admitted and diagnosed with PPCM at the University Malaya Medical Centre, Kuala Lumpur, over 5 years identified only eight PPCM patients and reported PPCM as a rare cause of DCM with a prevalence of 34: 100,000 live birth (38).

Peripartum cardiomyopathy occurs with the greatest frequency in blacks, which is identified in multiple studies. In a population-based study done in United States using a National Hospital Discharge Survey from 1990 to 2002, patients with PPCM were more likely to be black (32.2% vs 15.7%), while the percentage of African American mothers in the population was 15.7% (14). In a survey done among members of the American College of Cardiology with fewer black women (10%), 19% of the women in the PPCM group were black. In addition, a recently published case-control study on PPCM in Georgia shows that-American women had a 15.7-fold higher relative risk of peripartum cardiomyopathy than non-African

Americans (8). Additionally, a longitudinal study carried out in 22 centers across Nigeria, a total of 406 PPCM patients were consecutively recruited within 3–9 months and the incidence of PPCM was 1:96 live births (city of Kano), 1:104 (Zaria) and 1:102 (Sokoto) (9). Additionally, two long-term observational studies done in Nigeria found that PPCM contributes to a significant number of DCM cases, reporting a prevalence of 19.18% and 38.7% (27, 28).

2.3. Factors associated with Peripartum cardiomyopathy

2.3.1 Sociodemographic factors

Multiple risk factors of PPCM have been evaluated on different studies and different studies reported inconsistent association of the implicated factors with PPCM. A systematic review articles from MEDLINE (January 1966–September 2007), Ovid platform, and reference lists indicates the possibility of increased risk of the development of PPCM in advanced maternal age, poor SES, and prolonged tocolytic use with suggestion of need for large-scale multi-center epidemiological studies and registries (12).

However, advanced maternal age has been reported as a risk factor for PPCM, the relationship between PPCM and age is not clear. According to a population-based study of PPCM done using the Korea National Health Insurance Claims Database of the Health Insurance Review and Assessment Service, Age ≥ 35 years were correlated with PPCM (OR, 1.56; 95% CI, 1.32–1.83) (7). In addition, the large prospective study done in Northern California reported that Age ≥ 35 years were correlated with increased risk of PPCM (OR, 3.0; 95% CI, 1.3–7.0) (15). Furthermore, a retrospective case control study done in South Africa found that the mean age of the controls was lower than that of the patients with PPCM (Mean age 25 Vs 29), and concluded that PPCM is more likely to occur in older mothers (14). On the other hand, a longitudinal study carried out in Nigeria reported that older maternal age (≥ 30 years) decreased the odd of PPCM 0.745 (OR, 0.745 ; 95% CI, 0.475-1.167) (9).

The recently published case-control study on PPCM in Georgia indicates increased association of **poor socioeconomic status** (OR: 21.9, 95% CI: 3.2 to 147.5), **being unmarried during pregnancy** (OR: 4.2, 95% CI: 1.4 to 12.3), with PPCM. Additionally, this case-control study showed that **alcohol during pregnancy** (OR: 29.1, 95% CI: 3.8–221.3) increased the risk of PPCM (8). Every patient diagnosed with peripartum cardiomyopathy in

the retrospective study conducted in Kano, Nigeria, exhibited low socioeconomic status, with an income of less than \$76.9 Supporting the association of low SES with PPCM(28). On the longitudinal study carried out in Nigeria, **lack of formal education** (OR: 3.08, 95% CI: 1.71 to 5.53) and **unemployment** (OR: 3.28, 95% CI: 2.05 to 5.24) increased the risk of PPCM (9).

2.3.2. Obstetric factors

Different studies have reported that PPCM is associated with multiparity with mean parity ranging from 1.6 to 4.3; a large prospective study done in Northern California reported a higher risk of PPCM with multiparity (OR,2.1; 95% CI, 1.2–4.0)(15). In addition, a case-control study in Georgia indicates the association of having had >2 previous pregnancies (OR: 2.9, 95% CI: 1.1 to 7.4) with PPCM (12). On the other hand, a retrospective, nationwide survey of PPCM in 2007 and 2008 all over Japan reported a majority of cases (54%) occurring in primigravid women with a mean parity of 1.6 (39). In addition, on the longitudinal study carried out in Nigeria, Multiparity decreased the odds for PPCM (9).

Studies consistently shown an increased risk of PPCM in women with Pre-eclampsia; the population-based Korean, the large prospective study done in Northern California and the longitudinal Nigerian study reported that preeclampsia was significantly correlated (OR, 6.02; 95% CI, 4.94–7.34) (7), (OR,4.1; 95% CI, 1.9–8.5) (15), and (OR, 9.01, 95% CI: 2.18 -37.75) (9) respectively with PPCM.

However, the study done using the Korea National Health Insurance Claims Database of the Health Insurance Review and Assessment Service and the large prospective study done in Northern California identified multiple pregnancy as a risk factor for PPCM (OR, 2.19; 95% CI, 1.64–2.93)(7) and (OR,4.1; 95% CI, 1.9–8.5) respectively(15), the longitudinal study carried out in Nigeria reported decreased risk in twin pregnancy (OR:0.55, 95% CI: 0.32 to 0.9) (9). In addition, a review of data obtained from 123 women identified **tocolytic therapy** as a risk factor for PPCM (11).

2.2.3 Medical factors

Gestational DM is reported to be correlated with PPCM (OR, 1.70; 95% CI, 1.26–2.29) on the population-based Korean study (7). On the longitudinal study carried out in Nigeria, and on a case control study done in China, **chronic hypertension** and **DM** also increased the risk of PPCM (10). Furthermore, a large prospective study done in Northern California showed that **Anemia during pregnancy** is associated with higher risk of PPCM (OR 2.8, 95% CI: 1.6 to 4.7(15).

2.3. Conceptual framework

In light of the potential interplay between various factors independently, diverse sociodemographic, obstetric, and clinical variables have been documented to influence the risk of peripartum cardiomyopathy.

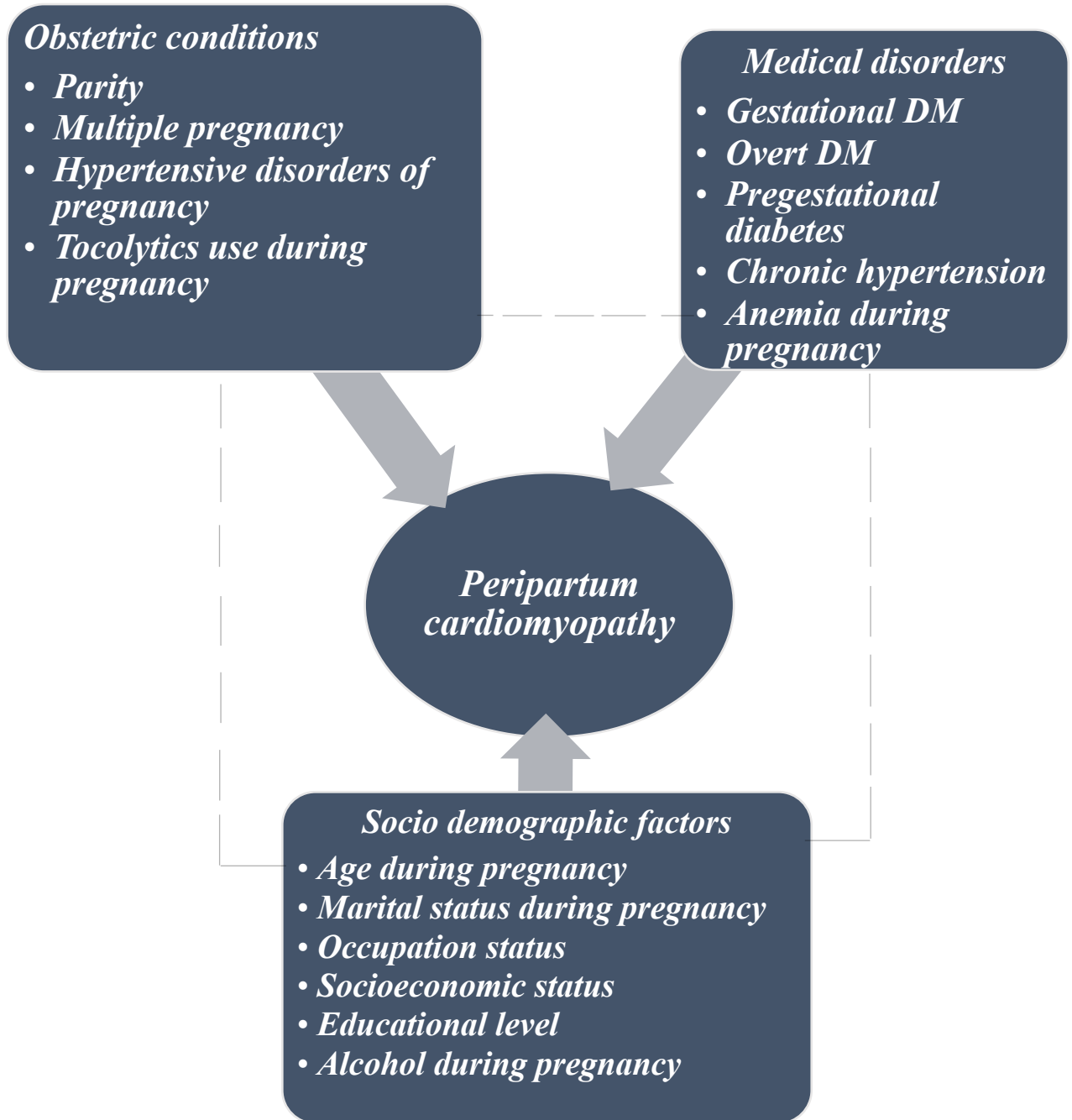


Figure1- Conceptual framework to assess of PPCM and its associated factors among reproductive age women with DCM, February 2024

3. Objectives of the study

3.1. General objective

The study aimed to assess the prevalence of peripartum cardiomyopathy and its associated factors among reproductive age women with dilated cardiomyopathy, who were hospitalized or on cardiac follow-up at selected tertiary hospitals in Addis Ababa, Ethiopia in 2023.

3.2. Specific objectives

1. To determine the prevalence of Peripartum cardiomyopathy in women of reproductive age with dilated cardiomyopathy who were hospitalized or received cardiac follow-up at selected tertiary hospitals.
2. To identify risk factors for Peripartum cardiomyopathy among reproductive age women with dilated cardiomyopathy who were hospitalized or received cardiac follow-up at selected tertiary hospitals.

4.. Methods and Materials

4.1. Study setting and period

Ethiopia is a country in the horn of Africa that shares borders with Eritrea, Djibouti, Somalia, Sudan, South Sudan and Kenya. With up to 120 million inhabitants, Ethiopia is the second most populous nation in the African continent. The study was conducted in three of the largest public hospitals in the country: St. Paul's Hospital Millennium Medical College(22), which houses a cardiac ward with eighteen beds and provides monthly cardiac clinic services to nine hundred fifty to one thousand patients, St. Peter's Specialized Hospital (40), featuring a cardiac ward with twelve beds and offering monthly cardiac clinic services to six hundred fifty to seven hundred patients, and Tikur Anbessa Specialized Hospital (41), with a cardiac ward of twenty beds and monthly cardiac clinic services for twelve hundred to thirteen hundred patients. They are located in Addis Ababa, the capital city of Ethiopia. all of them are tertiary level hospitals serving more than 4 million for each. The reason these three hospitals are chosen is that they provide comprehensive inpatient and outpatient cardiac care, including Echocardiography services. Additionally, they offer prenatal, intrapartum, and postpartum Obstetric care. The study is conducted from November to December 2023. Chart/EMR review and data collection checklist filling were carried out during the first month, followed by the re-filling of incomplete questionnaires and conducting telephone interviews with patients to fill in any missing data over the subsequent month.

4.2. Study design

An institutional-based cross-sectional design was conducted among reproductive-age women with DCM in order to answer the study's descriptive and analytical questions.

4.3. Population

4.3.1. Source population

All reproductive age women with DCM who were hospitalized or on cardiac follow-up at SPHMMC, SPSH and TASH.

4.3.2. Study population

All reproductive age women with DCM who are hospitalized or on cardiac follow-up at SPHMMC, SPSH and TASH in the period between October, 2021 to September, 2023 and those who fulfill the inclusion criteria.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

All reproductive age women diagnosed with DCM and who are hospitalized or on cardiac follow-up at SPHMMC, SPSH and TASH in the period between October, 2021 to September, 2023.

4.4.2. Exclusion criteria

Those whose charts/EMR contain incomplete information that will fail to be filled out by telephone interviewing the patient and whose missing data in important variables (the top listed 12 independent variables) exceeds 10%.

4.5. Sample size and sampling technique

The minimum sample size required for the assessment of the prevalence of PPCM and its associated factors is calculated by using the single and double population proportion formula for respective objectives.

Single population proportion formula is used to obtain a sample size of 384:

$$n = Z^2 p(1-p) / d^2$$

n= required sample size

Z= confidence level at 95% (standard value of 1.96)

d= margin of error = 5%

P= estimated prevalence of PPCM among reproductive age women is not known in Ethiopia and 50% is taken as proportion of population to give maximum sample size.

So, when we substitute the values in the formula, it gives us a sample size of 384

$$n = (1.96)^2 * 0.5 * 0.5 / (0.05)^2$$

$$n = 384$$

Double population proportion formula is used to calculate sample size required to determine factors associated with PPCM.

$$n = (Z_{\alpha/2} + Z_{\beta})^2 * (p_1(1-p_1) + p_2(1-p_2)) / (p_1 - p_2)^2$$

where n is sample size, $Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$ (e.g., for a confidence level of 95%, α is 0.05 and the critical value is 1.96), Z_{β} is the critical value of the Normal distribution at β (e.g., for a power of 80%, β is 0.2 and the critical value is 0.84) and p_1 and p_2 are the expected sample proportions of the two groups.

Factors that are consistently reported to have significant association with PPCM on previous studies are used:

1. Preeclampsia (OR, 6.02, $P_1=97$, $P_2=84$) (7), calculated sample size=190
2. No formal education (OR, 3.08, $P_1=85$, $P_2=64$) (9), calculated sample size=160
3. Multiparity (OR: 2.9, $P_1=61$, $P_2=35$) (12), calculated sample size=160
4. Being unmarried (OR: 4.2, $P_1=51$, $P_2=20$) (8), calculated sample size=84

Since the sample size calculated on single population proportion formula is higher than the valued calculated for each of the factors using double population proportion formula, n is taken as 384.

Upon HMIS and chart/EMR review, it was found that 378 reproductive-age women with DCM were hospitalized or on active follow-up at SPHMMC, SPSH, and TASH in the time period between October 2021 and September 2023 G.C.

Because the source population is <10,000, there was a need to use population correction formula which is.

$$nf = ni \div \left(1 + \frac{ni}{N}\right)$$

ni = initial sample size=384

N = study population (Reproductive age women who are on active follow up or hospitalized at the three hospitals from October, 2021 to September, 2023) = 378

$$nf = 384 / \left(1 + \frac{384}{378}\right) = 190.48$$

By adding 10% contingency a minimum of 210 sample size is found.

Due to the limited number of study participants and the ability to thoroughly study each individual within the allocated time and budget, universal sampling method is employed ensuring maximum precision without overly burdening resources. All reproductive-age

women with DCM who were hospitalized or on active cardiac follow-up at the three hospitals in the specific time period are included, and a further comprehensive review of their medical chart and/or EMR was conducted.

4.6. Study variables

4.6.1. Dependent variables

- ✓ Peripartum cardiomyopathy (Yes/No)

4.6.2. Independent variables

Sociodemographic factors

- ✓ Age during pregnancy
- ✓ Formal education
- ✓ Socioeconomic status
- ✓ Marital status during pregnancy
- ✓ Occupation status during pregnancy
- ✓ Alcohol use during pregnancy

Obstetric factors

- ✓ Parity
- ✓ Multiple pregnancy
- ✓ Hypertensive disorders of pregnancy
- ✓ Tocolytics use

Clinical factors

- ✓ Chronic hypertension
- ✓ Pregestational diabetes
- ✓ Gestational DM
- ✓ Overt DM
- ✓ Anemia during pregnancy

4.7. Operational definitions

DCM: an echocardiographic diagnosis of DCM with a finding of left ventricular dilatation and/or systolic dysfunction unexplained solely by abnormal loading conditions (hypertension, valve disease, congenital heart disease) or coronary heart disease (42).

PPCM: a form of DCM, characterized by the onset of HF within the last month of pregnancy or within the 5 months following delivery, accompanied by echocardiographic evidence of left ventricular systolic dysfunction with an ejection fraction of less than 45%, in the absence of any other clearly identifiable cause of HF(43).

Reproductive age group: women who are in the age group between 15 to 49 years (44).

Parous women: a woman having given birth one or more times (45).

HIV-associated systolic dysfunction: a DCM, with or without heart failure symptoms, in an HIV-infected patient not taking ART with a CD4 count of less than 200 cells/ μ L, a viral load of more than 100,000 copies/ml or WHO stage 4 clinical condition (46, 47).

Drug-induced DCM: a DCM that develops in a patient who has taken a drug that is clearly associated with the development of cardiomyopathy in terms of timing, dose, and duration (48).

Hypertensive heart disease: structure and function abnormalities of the heart that occur due to sustained, poorly controlled hypertension (BP>140/90 mmHg that persist over time) (49, 50).

Alcohol-induced cardiomyopathy: a DCM that occurs in a patient with a history of heavy and prolonged alcohol use (>80 g per day over a period of at least five years) in the absence of other causes of DCM (51).

Tachycardia-Induced DCM: a DCM caused by a high and/or irregular ventricular rate that is completely or partially reversible after the normalization of heart rate (52).

Endocrinopathy-associated DCM: a DCM that develops in a patient who has established endocrine dysfunction, which is clearly associated with the development of cardiomyopathy in terms of severity and control (53, 54).

Familial dilated cardiomyopathy: idiopathic DCM that occurs in a patient with at least one first or second degree relative also diagnosed with idiopathic DCM or one first-degree relative with an unexplained sudden death under the age of 35 years(55).

Low socioeconomic status: yearly income less than 36,936ETB per person (56).

Formal education: a structured and systematic form of learning delivered according to country's educational standard (57).

Urban: a place where there is a continuous settlement, and the population density is at least 1,500 people per square kilometer(58).

Multiple pregnancy: a pregnancy with more than one fetus (twins, triplets, or more) (59).

Hypertensive disorders of pregnancy: disorders that present with hypertension and/or proteinuria during pregnancy including preeclampsia, eclampsia, gestational hypertension and superimposed preeclampsia (60).

Tocolysis: an obstetrical procedure carried out with the use of medications with the purpose of delaying the delivery of a fetus in women presenting with preterm labor (61).

Alcohol during pregnancy- consuming more than 32g of alcohol per week for one or more weeks during pregnancy(62)

Overt diabetes in pregnancy: hyperglycemia first recognized during pregnancy which meets the ADA diagnostic threshold of diabetes in non-pregnant adults (63).

Gestational DM: diabetes diagnosed for the first-time during pregnancy using the ADA 2020 GDM criteria (64).

Pregestational diabetes: type 1 or type 2 diabetes mellitus that is diagnosed before pregnancy (65).

Anemia during pregnancy: Hemoglobin levels less than 11.0 g/dl in the first and third trimesters and less than 10.5 g/dl in the second trimester (66).

4.8. Data collection tool, methods and procedures

The data was collected using a structured checklist. The checklist had been prepared by adapting data collection tool items from a case-control study titled 'Clinical characteristics and risk factors for peripartum cardiomyopathy,' which had been conducted at a tertiary teaching

hospital in Shandong Province, China (10). The adaptation was aimed at improving conceptual coverage, incorporating important variables aligned with the study's objectives, based on a literature review, and validated by the research advisors. It had been prepared in English. Trained internal medicine residents and general practitioners collected the data inside the hospital's card room by retrieving and recording the required information from patient charts and/or EMR system over a period of 2 months, from November 1 to December 30, 2023. Missing data had been filled through telephone interviews of patients using phone numbers from patient charts and/or the EMR system. The data was collected digitally using KoBoToolbox, ensuring efficient and standardized data capture methods(67).

4.9. Data quality control

The data collection checklist was pre-tested with 5% of the total study population to assess its variability, validity, clarity, length, and completeness. The data collectors had been trained ahead of data collection, and they were closely followed for the completeness and validity of the data by the investigator. The data collectors refilled incompletely filled checklists.

4.10. Data processing and analysis

All the collected information was checked, cleaned, coded, and entered using Kobo Toolbox, then analyzed with the Statistical Package of Social Sciences (SPSS) version 29. Categorical data were analyzed as frequencies with percentages and continuous data were analyzed as means with standard deviations. Among the selected cases of parous women with DCM simple binary logistic regression model and multi variable analysis was used to calculate the crude and adjusted odd ratios (ORs) with 95% confidence intervals (CI) to assess risk factors for PPCM. A P value < 0.05 was used to determine statistical significance. The results are being presented using charts, graphs, tables, and paragraphs.

4.11. Ethical consideration

Prior to conducting the research, permission was obtained from the three hospital's research office and the Institutional Review Board (IRB). Letters for cooperation were also obtained. In order to maintain patient confidentiality, names and other identifying information that could reveal patients' identities were kept confidential and anonymous. Verbal consent-taking, choosing convenient interview times for respondents, and providing respondents with privacy, respect, and empathetic inquiry were undertaken during telephone interviews. Furthermore,

the scientific objectivity of the study was maintained with honesty, and the information collected from charts and interviews was respected and used only for the purpose of the study.

4.12. Plan for dissemination of results

The result of this study will first be submitted and presented to Internal medicine and public health departments during the research defense presentation. It will also be submitted to the hospital's cardiology and obstetric units. Attempts will be made to publish the information in peer-reviewed journals such as Ethiopian medical journal, Ethiopian journal of health science and other international medical journals. Additionally, efforts will be made to present at scientific conferences.

5. Result

5.1 Socio- Demographic characteristics

A total of 304 patients are included, with 107 from SPMMC, 74 from SPSH, and 123 from TASH. Among these participants, 78.0% resided in urban areas. The average age was 32.8 years with standard deviation of 7.7. Moreover, 86.5% of the participants had been engaged in formal education, while 55% were part of the employed population. Notably, a substantial 63.5% of the patients belonged to the low SES classification. 79.3% of the patients were married and 78.9% were parous (Table-1).

Table 1 Socio-demographic characteristics of reproductive age women with DCM in three tertiary hospitals, Addis Ababa, Ethiopia, 2024 (n-304)

Socio-demographic characteristics	Subgroup	Frequency (n)	Percent (%)
Place of residency	Rural	67	22.0
	Urban	237	78.0
Age group	<25	57	18.8
	25-35	118	38.8
	>35	129	42.4
Occupation status	Employed	167	54.9
	Un employed	137	45.1
SES	Low SES	151	49.7
	Higher SES	153	50.3
Educational level	Formal education	263	86.5
	No formal education	41	13.5
Marital status	Married	241	79.3
	Unmarried	63	20.7
Parity	Parous	240	78.9
	Nulliparous	64	21.1

5.2 Prevalence of PPCM among reproductive age women with DCM

Among the 304 reproductive-age women with DCM, 69 participants were diagnosed with PPCM, resulting in a prevalence of 22.7%. As a result, PPCM emerges as the most prevalent cause following idiopathic DCM, which accounted for 47.0% of cases. Subsequently, endocrinopathy-associated cardiomyopathy attributed 10.8% of cases, primarily linked to hyperthyroidism - 35 cases and hypothyroidism - 2 cases. RVI-associated cardiomyopathy comprised 4.6% of cases, familial DCM accounted for 3.6%, and drug-induced DCM - 8 cases due to doxorubicin, 1 case due to Idarubicin, and 1 case due to Zidovudine, contributing to 3.3% of the cases. Alcoholic cardiomyopathy contributed an equal number of cases as drug-induced DCM. Tachycardia-induced DCM constituted 2.6% of the cases, whereas the remaining 2% of cases were attributed to takotsubo cardiomyopathy - 1 case, Systemic Lupus Erythematosus - 3 cases, Rheumatoid arthritis - 1 case, and End-stage renal disease - 1 case. Overall, these findings position PPCM as the most prevalent identifiable cause of DCM among reproductive-aged women.

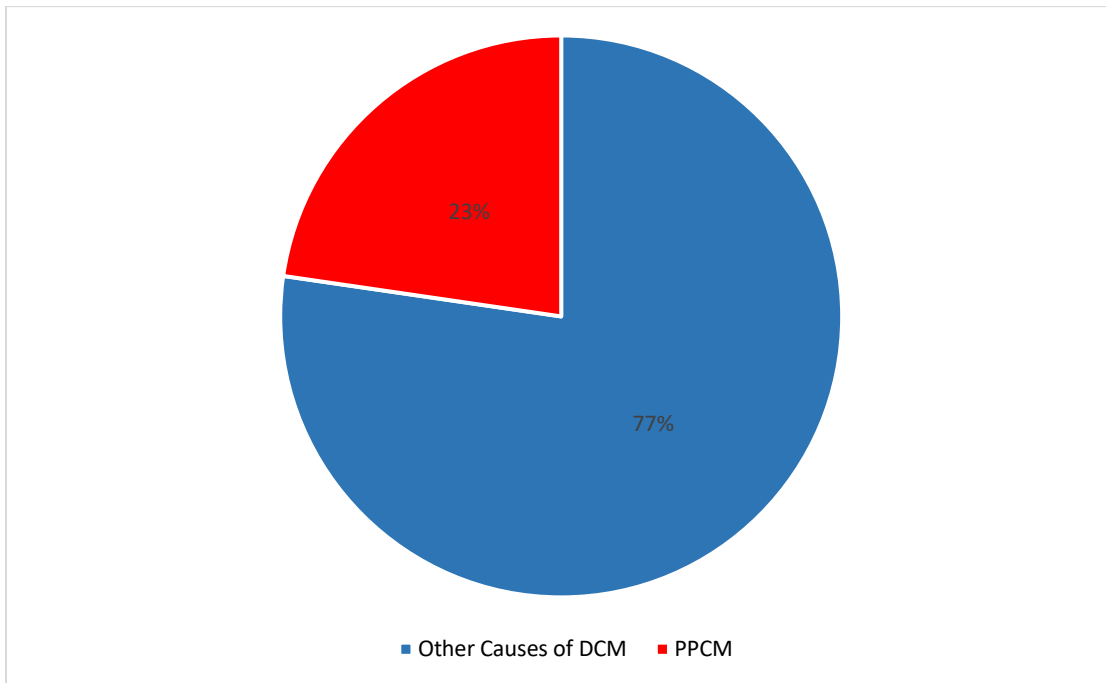


Figure 2- Prevalence of PPCM among reproductive age women with DCM in three tertiary hospitals, Addis Ababa, Ethiopia, 2024

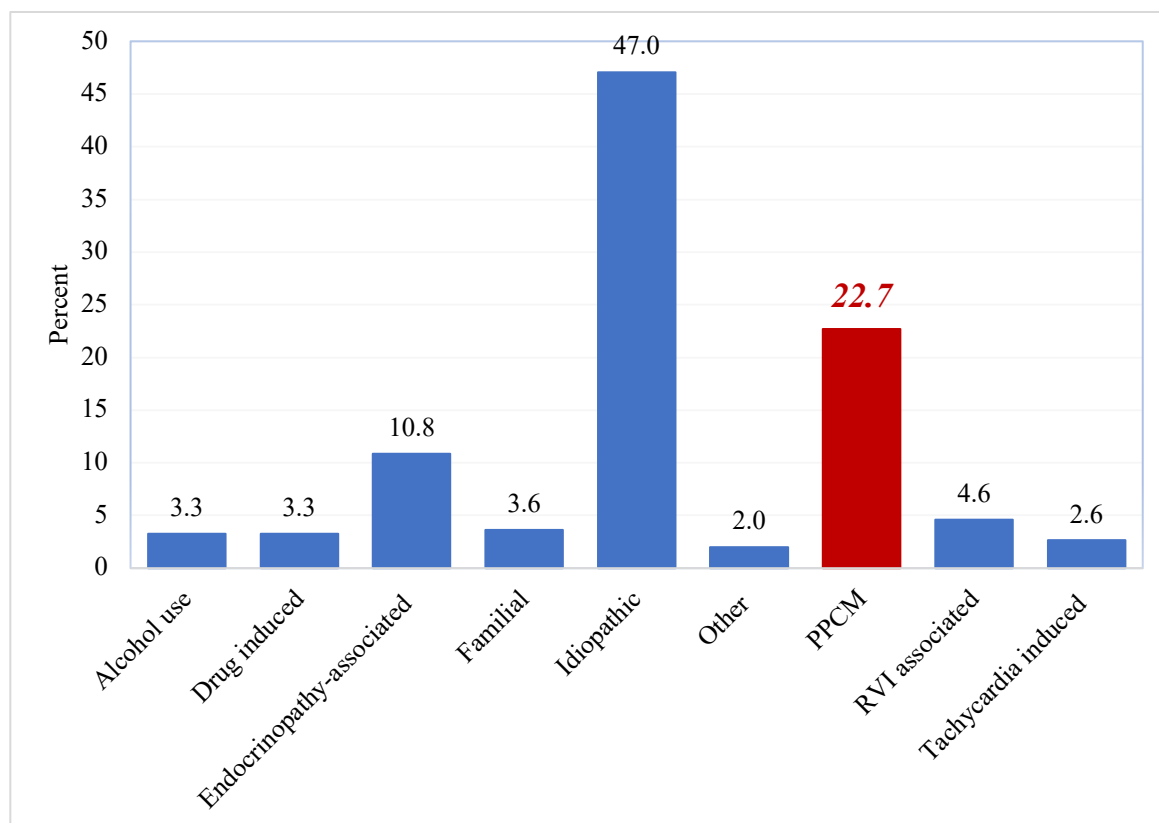


Figure 3- Causes of DCM among reproductive age women with DCM in three tertiary hospitals, Addis Ababa, Ethiopia, 2024

5.3 Factors associated with PPCM among parous women with DCM

5.3.1 Sociodemographic factors associated with PPCM among parous women with DCM

After employing a binary logistic regression model to analyze how different demographic factors —like age during pregnancy, occupational status, SES, education level, and marital status during pregnancy—affect PPCM, it was found that having a low SES and being unemployed demonstrated a statistically significant association with PPCM. Furthermore, mothers above the age of 35 during pregnancy displayed a lower risk of PPCM compared to those below 35. Although being unmarried and lacking formal education during pregnancy were associations with higher risk of PPCM, these associations didn't reach statistical significance.

Variables	PPCM		P- value	Crude OR	95% CI (COR)	
	Yes= 69(%)	No= 171(%)			Lower	Upper
Advanced maternal age (>35)	14(20.3)	57(33.3)	0.047	0.509	0.261	0.992
Unemployment	36(52.2)	62(36.3)	0.024	1.918	1.089	3.378
Low SES	46(66.7)	69(40.4)	<0.001	2.957	1.645	5.314
lacking formal education	14(20.3)	23(13.5)	0.187	1.638	0.787	3.409
Unmarried	8(11.6)	8(4.7)	0.060	2.672	0.960	7.434

Table 2- Sociodemographic factors associated with PPCM among parous women with DCM

5.3.2 Obstetric and clinical factors associated with PPCM among parous women with DCM

The analysis of obstetric and clinical factors using a binary logistic regression model revealed significant associations. Multiparity, HDP as a whole, Preeclampsia, tocolytics use, alcohol during pregnancy, Gestational diabetes, and Anemia during pregnancy were all associated to an increased risk of PPCM (table4). In the PPCM group, the mean parity was 2.57 with a SD of 1.32 and all patients diagnosed with anemia experienced it during the third trimester, with only one patient encountering concurrent anemia in the second and third trimester. Their mean lowest hemoglobin level was 8.24 with an SD of 1.50. Additionally, gestational hypertension and superimposed preeclampsia showed potential associations with PPCM, although not reaching statistical significance.

In the study, despite three mothers with multiple gestation being diagnosed with PPCM, a statistical association couldn't be established. Furthermore, one participant experienced overt diabetes during pregnancy, and another had chronic hypertension during pregnancy, all within the PPCM group. In contrast, two participants had pregestational diabetes and were in the

non-PPCM group. Nevertheless, similar to the situation with multiple gestation, the statistical association could not be determined due to prominent statistical insignificance.

Table 3- Bivariate logistic regression analysis of obstetric and clinical factors associated with PPCM in three tertiary hospitals, Addis Ababa, Ethiopia, 2024

Variables	PPCM		P- value	Crude OR	95% CI (COR))	
	Yes=69(%)	No=171(%)			Lower	Upper
Multiparity	55 (79.7)	91(53.2%)	<0.001	3.454	1.787	6.676
HDP	34 (49.3)	5 (2.9)	<0.001	32.251	11.781	88.290
Preeclampsia	31 (44.9)	2 (1.2)	<0.001	68.934	15.809	300.583
Superimposed preeclampsia	3(4.3)	1 (0.6)	0.079	7.727	0.790	75.619
Gestational hypertension	2(2.9)	3 (1.7)	0.578	1.672	0.273	10.229
Tocolytics use	9 (13.0)	1 (0.6)	0.002	25.500	3.164	205.515
Gestational DM	16 (23.2)	2 (1.2)	<0.001	25.509	5.680	114.555
Anemia during pregnancy	21 (30.4)	16 (9.4)	<0.001	4.238	2.050	8.764
Alcohol during pregnancy	18 (26.1)	9 (5.3)	<0.01	6.353	2.689	15.010

Additionally, the results indicated that the period with the highest risk for PPCM diagnosis is the first postpartum period, constituting the majority of cases at 52%. In comparison, the last month of pregnancy accounted for 20% of cases. Subsequently, the frequency of diagnoses decreased as the timeframe moved beyond the initial postpartum period.

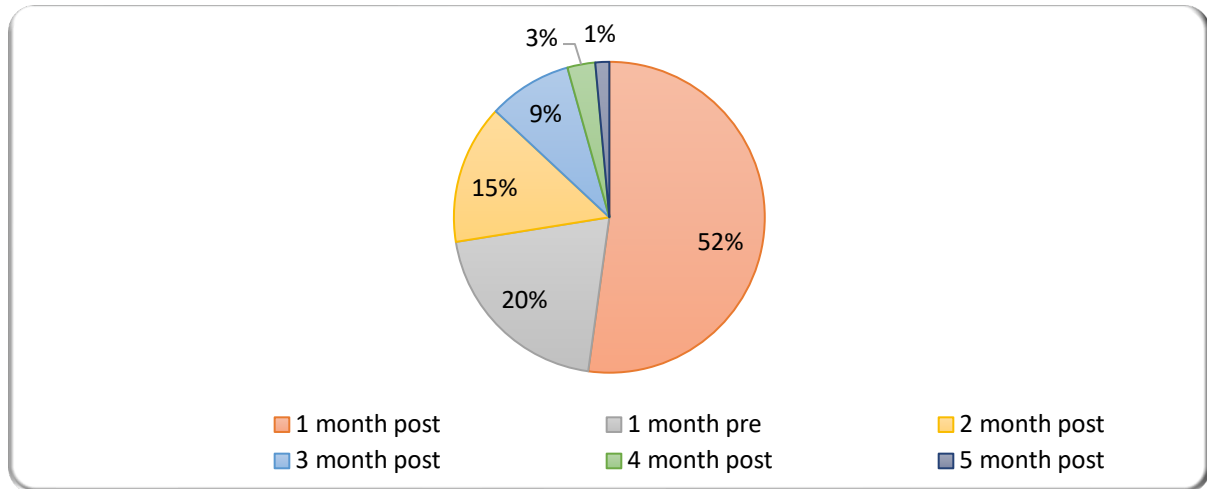


Figure 4- Timing of PPCM diagnosis relative to delivery in three tertiary hospitals, Addis Ababa, Ethiopia, 2024

5.3.3 Multiple variable analysis of factors associated with PPCM among parous women with DCM

After adjusting for other variables using multiple variable binary logistic regression, factors with a P-value less than 0.025 were assessed. This stricter criterion was used to enhance the reliability of the final findings regarding their association with the risk of PPCM. The analysis revealed that low SES exhibited a statistically significant association with an increased risk of PPCM (AOR 6.834, 95% CI 2.059-22.682), alongside multiparity (AOR 6.013, 95% CI 1.910-18.935), preeclampsia (AOR 13.740, 95% CI 1.120-168.509), gestational DM (AOR 10.946, 95% CI 1.617-74.095), anemia during pregnancy (AOR 4.551, 95% CI 1.470-14.094), and alcohol consumption during pregnancy (AOR 18.985, 95% CI 5.147-70.035). Conversely, unemployment (AOR 0.299, 95% CI 0.094-0.952) was found to be significantly associated with a reduced risk of PPCM. Notably, the association of HDP and tocolytic use was found to be statistically insignificant.

Table 4- Multiple variable logistic regression analysis of factors associated with PPCM in three tertiary hospitals, Addis Ababa, Ethiopia, 2024

Variables	Adjusted OR (95% CI)	P- value (AOR)
Unemployment	0.299 (0.094-0.952)	0.041
Low SES	6.834 (2.059-22.682)	0.002
Multiparity	6.013 (1.910-18.935)	0.002
HDP	7.013 (0.957-51.384)	0.055
Preeclampsia	13.740 (1.120-168.509)	0.040
Tocolytics use	9.442 (0.258-345.273)	0.221
Gestational DM	10.946 (1.617-74.095)	0.014
Anemia during pregnancy	4.551 (1.470-14.094)	0.009
Alcohol during pregnancy	18.985 (5.147-70.035)	<0.001

6. Discussion

The study aimed to assess the prevalence of peripartum cardiomyopathy and its associated factors among reproductive age women with dilated cardiomyopathy, who were hospitalized or on cardiac follow-up at selected tertiary hospitals in Addis Ababa, Ethiopia in 2023. In this study, 69 out of 304 cases of DCM were attributed to PPCM, representing 22.7% of the cases. Considering the variations in the definition of cardiomyopathy over time and difference in the mean age of the participants as a limitation for perfect comparison, it's important to note that the prevalence rate of PPCM in this study exceeds the prevalence rates reported at Johns Hopkins Hospital, which reported 11.3% of PPCM among women diagnosed with DCM (25, 26). When comparing this study's PPCM prevalence rate of 22.7% with previous African studies, it is found to be comparable to the 19.2% prevalence reported in a 16-year review in Lagos, Nigeria(27). However, it falls short of the figure reported in a retrospective analysis of echocardiographic patterns of heart diseases in Kano, Nigeria, which found PPCM accounted for 38.7% of cases among women with DCM(28). Furthermore, when PPCM is compared with the other causes of DCM, this study found that PPCM is the most identifiable cause of DCM in reproductive-age women, a finding consistent with studies conducted in Nigeria (27, 28). Overall, this finding emphasizes the continued significance of PPCM as a health concern for reproductive-age women especially in Africa.

When we see the findings of this study in regard with the association of different factors with PPCM, several factors appeared to increase the risk. Notably, the study uncovered that multiparous mothers exhibited a 9.5 times higher likelihood of developing PPCM (OR 6.013, 95% CI 1.910-18.935) than primiparous mothers. This aligns with the results of a large prospective study conducted in Northern California, which also highlighted an increased risk associated with multiparity (OR 2.1; 95% CI, 1.2–4.0)(15), as well as a case-control study in Georgia that indicated an association of having had more than two previous pregnancies (OR: 2.9, 95% CI: 1.1–7.4) with PPCM(12). Furthermore, gestational DM was found to elevate the risk of PPCM in this study (AOR 10.946, 95% CI 1.617-74.095),

consistent with findings reported in the population-based Korean study (OR, 1.70; 95% CI, 1.26–2.29) (7). While hypertensive heart disease as a whole, chronic hypertension, and superimposed hypertension did not show statistical significance in the multiple variable and bivariate analysis of this study, preeclampsia exhibited a notable and statistically significant correlation with an elevated risk of PPCM (AOR 13.740, 95% CI 1.120-168.509). This finding is consistent with results from other studies, including a population-based Korean study (OR, 6.02; 95% CI, 4.94–7.34) (7), a large prospective study in Northern California (OR, 4.1; 95% CI, 1.9–8.5) (15), and a longitudinal Nigerian study (OR, 9.01, 95% CI: 2.18 to 37.75) (9), all of which reported a significant correlation between preeclampsia and a higher risk of PPCM. Additionally,

In addition to the previously mentioned associated factors, anemia during pregnancy was found to be linked with PPCM (AOR 4.551, 95% CI 1.470-14.094), demonstrating alignment with a large prospective study conducted in Northern California (OR 2.8, 95% CI: 1.6 to 4.7) (15). Similarly, this study's finding that low SES (AOR 6.834, 95% CI 2.059-22.682) and alcohol consumption during pregnancy (AOR 18.985, 95% CI 5.147-70.035) are associated with an increased risk of PPCM is supported by a case-control study on PPCM in Georgia which also indicated an elevated association of low SES (OR: 21.9, 95% CI: 3.2 to 147.5) and alcohol consumption during pregnancy (OR: 29.1, 95% CI: 3.8-221.3) (12). Moreover, a retrospective study in Kano, Nigeria revealed that every patient diagnosed with peripartum cardiomyopathy exhibited low socioeconomic status, with an income of less than \$76.9, further reinforcing the association of low SES with PPCM (28).

Although this study found a lower risk of PPCM associated with unemployment during pregnancy (AOR: 0.299, 95% CI: 0.094 to 0.952), a longitudinal study in Nigeria suggested an increased risk of PPCM in the case of unemployment during pregnancy (OR:3.28, 95% CI: 2.05 to 5.24) (9). Additionally, while advanced maternal age has been identified as a reported risk factor for PPCM, the relationship between PPCM and age remains unclear. Surprisingly, this study revealed that maternal age during pregnancy of 35 years or older was associated with a lower risk of PPCM (COR, 0.310; 95% CI, 0.110 - 0.879). This finding is in line with a longitudinal study in Nigeria, which reported that older maternal age

(>30 years) decreased the odds of PPCM (OR, 0.745; 95% CI, 0.475-1.167)(9). However, population-based studies of PPCM in Korea and a large prospective study in Northern California found that maternal age of 35 years or older was linked to an increased risk of PPCM (OR, 1.56; 95% CI, 1.32–1.83) (7) and (OR,3.0; 95% CI, 1.3–7.0)(15), respectively. These contradictory results create uncertainty regarding the correlation between employment status and maternal age during pregnancy with PPCM.

In previous studies, lack of formal education (OR: 3.08, 95% CI: 1.71 to 5.53) (9) and being unmarried during pregnancy (OR: 4.2, 95% CI: 1.4 to 12.3) (8) were identified as correlated with PPCM. However, in contrast to this finding from studies in Nigeria and Georgia, this current study did not find a statistically significant association between formal education or marital status during pregnancy and PPCM, despite observing 1.5 times and 2.5 times higher odds, respectively.

7. Strength and Limitations of the study

This study excels by being conducted across three different settings over an extended period, allowing for the capture of statistically significant associations related to various factors for PPCM. The data collection process was characterized by carefulness and thoughtful precision, as validated tools were utilized to gather information while safeguarding the utmost confidentiality of the collected data. The challenge of definitively diagnosing PPCM due to its nature as a diagnosis of exclusion, coupled with the absence of a specific diagnostic test, makes it inherently difficult to confirm PPCM, even with comprehensive testing to rule out potential causes of DCM, which can emerge due to pregnancy-related hemodynamic changes. In addition, the study's retrospective design and reliance on secondary sources inevitably restrict the quality of the data and limit control over the data collection process. However, despite these constraints, the study offers valuable insights that enrich the existing knowledge of PPCM, highlighting the vital need for further research to address and alleviate the impact of PPCM.

8. Conclusion and Recommendations

8.1 Conclusion

Peripartum cardiomyopathy stands out as a commonly encountered form of dilated cardiomyopathy among women of reproductive age. Factors such as preeclampsia, multiparity, gestational diabetes, anemia during pregnancy, low socioeconomic status, and alcohol consumption during pregnancy are linked to a heightened risk of developing peripartum cardiomyopathy among reproductive age women with dilated cardiomyopathy. Conversely, unemployment during pregnancy is associated with a reduced risk of peripartum cardiomyopathy.

8.2. Recommendations

For researchers:

To conduct a larger prospective study on the prevalence, incidence, and associated factors of PPCM, decreasing the limitations of this study with the objective of determining the per livebirth burden and precisely pinpointing its risk factors.

For policy makers:

To give PPCM with the necessary attention, take into account mothers who are at high risk for the condition in the ANC and obstetric risk assessment instruments and guidelines, and assist in risk modification and early diagnosis.

For medical professionals working in clinical settings:

To carefully identify which mothers are at risk for PPCM and to make every effort to address modifiable risk factors and diagnose PPCM at an early phase.

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ANNEXES

ANNEX I: Information sheet and verbal consent form for telephone interview

Dear respondent, my name is _____. I am collecting data for a study entitled “*Prevalence of Peripartum cardiomyopathy and its associated factors among reproductive age women with dilated cardiomyopathy in three tertiary hospitals*”. It is being conducting by Dr. Ermiyas Berehanu who is an Internal medicine resident at SPHMMC. The telephone interview will require about **15 to 25** minutes to be completed.

As a study participant you will be benefited when the result is utilized. The study does not cause any harm to you. The result will be displayed in general form not in individual. To achieve the study, your honest and genuine participation by responding to the question prepared is very important and highly appreciated. You have also a right to continue or to discontinue as a participant and there is no influence that insists you to participate unless you permit.

We will proceed to the interview after you understand the following points

Objective of the study: To assess the prevalence of PPCM and its associated factors among reproductive age women with DCM who are hospitalized or on cardiac follow-up at SPHMMC and TASH from October, 2021 to August, 2023 G.C.

Benefit: The information generated from the study help policy makers and program planning, to improve the quality of maternal and newborn health.

Harm: The participants do not have any harm by participating to the study.

Duration of telephone interview: The interview may take **20- 25 minutes**.

Alternatives to participation: You do not have to take part in this research if you do not wish to do so. You have the right to terminate from the study by any reason, related to the study or personal reason.

Confidentiality: We would like to assure you that the privacy will strictly be maintained throughout. Your responses to any of the questions will not be given to anyone else and no reports of the study will ever identify you. If a report of the results is published, only information about the total group will appear.

Persons to contact: If you have any question, you can contact the investigator at the following address and you may call and ask at any time you want: Name: Dr. Ermiyas Berehanu Tel: +251922075500

Verbal consent: “It has been read to me by the data collector as I can understand all conditions stated above.”

1. Agree.

2. Disagree

ANNEX II: Data collection checklist

Part I- Identification of the Patient			
1	Chart/MRN No.		
2	From which hospital is the patient?	1-SPHMMC	2-SPSH 3- TASH
2	Name.		
3	Phone No.	1-	2-
Part II- Evaluation for diagnostic accuracy of DCM			
		Initial diagnostic Echocardiography	Follow up Echo confirming the persistence of DCM (only if the diagnostic Echo is performed before Oct, 2021)
4	Age (#)		
5	Date		
6	LVEF (%)		
7	LVIDd (mm)		
8	LVISd (mm)		
9	Other abnormal finding/s		
10	Conclusion		
11	Timing of Dx: Pre- or Post-Delivery (in months/Years)		
12	Diagnosed Ischemic Heart Disease	1. Yes 2. No	
13	Chronic uncontrolled HTN	1. Yes 2. No	
14	Known congenital heart disease	1. Yes 2. No If yes, Specify.....	
Part III- Evaluation for possible causes of DCM			
15	Alcohol use	1. Yes 2. No If yes, Specify Drink type..... Average amount (ml/day) Duration.....	
16	Drug use or substance abuse before or during the diagnosis of DCM	1. Yes 2. No If yes, Specify Drug/s name..... Dose..... Duration.....	
17	Serology for RVI	1. R 2.NR. If R Has she been taking ART? 1. Yes 2. No Specify HIV disease status during DCM diagnosis CD4 count.....Viral load..... WHO stage.....	

18	Diagnosed Tachyarrhythmia either at the time of or prior to DCM diagnosis	1. Yes 2. No If yes, Tachyarrhythmia type..... Timing of diagnosis (in months prior to DCM diagnosis) Baseline ventricular rate..... Has the rate been controlled after treatment? 1. Yes 2. No If yes, Has the ventricular function been improved after rate control? 1. Yes 2. No
19	Diagnosed endocrine dysfunction at the time of or prior to DCM diagnosis	1. Yes 2. No If yes, Specify..... Base line <i>hormonal tests</i> Has the endocrine dysfunction control been achieved after treatment? 1. Yes 2. No
20	Is there a family history of cardiac disease (idiopathic or familial) or sudden death under the age of 35 years?	1. Yes 2. No If yes, Relation.....
21	Are there any other comorbidities?	1. Yes 2. No If yes, Specify
22	What is considered as the possible cause for DCM?	1. PPCM 2. Drug induced 3. Tachycardia induced 4. Alcohol use 5. RVI associated 6. Endocrinopathy-associated 7. Familial 8. Idiopathic 9. Other Specify.....
Part IV- Socio-demographic Factors during the Index/Nearest Pregnancy or the first diagnostic echocardiography		
22	Age at pregnancy (#)	
23	Place of residency	1- Urban 2- Rural
24	Yearly income (ETB/year/person)	
25	Occupation status	1- Employed 2- Un employed
26	Educational level	1- Formal education. 2- No formal education
27	Marital status	1- Married 2- Unmarried
Part V- Obstetric and medical conditions during index/ nearest pregnancy		
28	Parity (#)	
29	Number of fetuses (#)	
30	Tocolytics use	1. Yes 2. No
31	Diagnosed hypertensive disorder of pregnancy	1. Yes 2. No If yes, Specify

		1- Preeclampsia 2- Eclampsia 3- Gestational hypertension 4- Chronic hypertension 5- Superimposed preeclampsia
32	Gestational DM	1. Yes 2. No
33	Overt DM	1. Yes 2. No
34	Pre gestational diabetes	1. Yes 2. No
35	Anemia during pregnancy	1. Yes 2. No If yes, Time of Diagnosis (Trimester)..... Lowest Hemoglobin (g/dl)
36	Alcohol during pregnancy	1. Yes 2. No

Declaration

I the undersigned resident that this thesis is my original work, in partial fulfillment of the requirement for certificate of specialty in internal medicine. I also declare that it has never been presented in this or any higher institution and all the resources and materials used in the research work have duly acknowledged.

Name of the Resident: **DR. ERMIYAS BEREHANU**

Signature: _____

Date: _____

Approval of Advisors

Name of the public health advisor: **MR. TAKELE GEZAHEGN**

Signature: _____

Date: _____

Name of the clinical advisor: **DR. SEIFU BACHA**

Signature: _____

Date: _____