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# Risk Factors of Peripartum Cardiomyopathy and the Important Role of Prenatal Care

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**Abstract** Peripartum cardiomyopathy (PPCM) is one of dilated cardiomyopathy of unknown cause. The aim of this study is to determine the risk factors and the importance of prenatal care (PNC). This is a descriptive and analytical study with Chi Square test of PPCM cases collected from medical records January 1, 2011 through December 31, 2013 in the Dr.Hasan Sadikin Central General Hospital as the top-referral hospital of West Java Province. We collected 57 PPCM cases (18.7%) of 305 pregnant women or 6 months postpartum with cardiovascular problems. Distribution of PPCM cases decreased significantly (p= 0.002) from 2011 (27 patients), 2012 (16 patients), and 2013 (14 patients), with average age 30.3 (±7.9) years, cesarean delivery (43.8%), pervaginal (37.5%), forceps (15%), and vacuum-extractor (3.8%). Regular prenatal care was 84.20%. Lower socioeconomic patients were 63.2%, therefore the issue of welfare can lead to vulnerability to PPCM. Confirmed diagnosis using echography made during postpartum was 52.63% and antepartum was 47.5%. Preeclampsia was 43.80% (p=0.007) mostly NYHA functional class IV (86.30%). Echocardiography was performed on 57 patients have average ejection fraction 34.8%, global hypokinetic in 98.27% patients, 39.6% with all cardiac chamber dilatation, left atrium and left ventricle dilation in 34.48%, and 25.86% with left ventricular dilatation. The hospital based prevalence was 18.68%, with the majority (84.20%) was NYHA functional class IV. The significant risk factors were age over 30 years, multiparous, low socioeconomic, and preeclampsia. This study is probably the first report mentioning a high prevalence of PPCM in Indonesia. This report provides an awareness of PPCM during PNC to prevent the morbidity and mortality. PPCM disorder requires regular and careful PNC by taking into account existing risk factors is the key that is required and must be held in every health centre.

***Keywords:*** *peripartum cardiomyopathy, risk factor, prenatal care, pregnant woman*

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## 1. Introduction

Peripartum Cardiomyopathy (PPCM) is one of the main forms of dilated cardiomyopathy with an unknown cause. Its prevalence in the United States 1 of the 2500-4000 live deliveries, higher in South Africa (1 in 1000 life-births) and in Haiti (1 in 300 life-births) [1,2].

The latest definition of PPCM by the Heart Failure Association of the ESC Working Group in 2010, is characterized by idiopathic cardiomyopathy heart failure secondary to left ventricular systolic dysfunction that occurs at the end of pregnancy or a few months after birth. Diagnosis of PPCM is done by eliminating other diagnoses. Echocardiography generally showed left ventricular dilatation accompanied by hypokinetic and low ejection fraction may less than 45% [1,3,4,5].

PPCM has various risk factors, but some studies suggest the risk factors that often arises is the age, multiparity, twin pregnancy, chronic hypertension, severe preeclampsia, eclampsia, and African race. [1,4,6] Etiology of PPCM is not known for certain, however one theory often mentioned is the excessive prolactin hormone accompanied by high oxidative stress in pregnant women that can cause damage to myocardial cells. [1,7,8] Cardiac function can return to normal in 23-41% of patients with early detection, intervention and treatment [3,6,9].

PPCM is a rare cardiomyopathy and documented research is still very rare, therefore the purpose of this study is conducted to study the prevalence and risk factors for PPCM-patients in Dr. Hasan Sadikin Central General Hospital (RSHS) in Bandung.

## 2. Methods

This research was conducted in the Department of Cardiology and Vascular Medicine of RSHS, Bandung. All PPCM cases were separated from cases with cardiovascular complication in pregnant woman and five months after delivery with diagnostic criteria: previous history of heart-healthy woman, symptoms and signs of heart failure appeared during pregnancy that had been proved using echography having cardiomyopathy, left heart failure, dilatation of all cardiac chambers. These

criteria have been found during last month of pregnancy or earlier presentation and 5 months after delivery. The method used was a retrospective descriptive review, and analytical in the form of data on the medical records from 1 January 2011 to 31 December 2013. This study has approved by the hospital ethical committee. The data were statistically analyzed using SPSS 19 and chi-square significance test. P value smaller than 0.05 considered significant.

## 3. Results

A total of 57 patients (16.28%) with PPCM were collected from 305 patients whom suffered cardiovascular complications during pregnancy and 5 months postpartum. The patient's distribution below shows a decline from January 1, 2011 to December 31, 2013 (Figure 1). Although many literatures suggested with high mortality in PPCM cases, there was no death in our PPCM cases.

Characteristics of PPCM patients in this study are shown in Table 1.

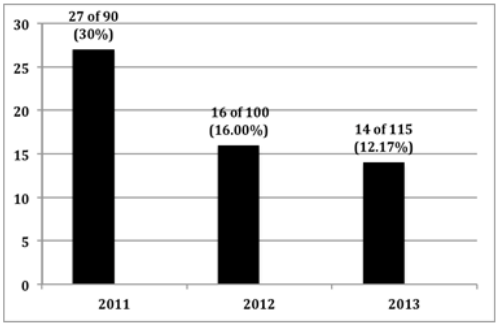


**Figure 1.** PPCM cases from 2011 to 2013. The percentages shown here is the number of cases of PPCM compared with the number of cases of pregnancy with cardiovascular abnormalities. The percentage of cases of PPCM to the number of pregnant women per year in 2011 as 1.12%, in 2012 as much as 0.66%, in 2013 as 0:58%

**Table 1. General Characteristics Data**

| Characteristics | ard devi N (%) | p Value |
|---|---|---|
| Age: | | 0.000 |
| < 20 year-old | 4 (7.0%) | |
| 20-30 year-old | 25 (43.90%) | |
| >30 year-old | 28 (49.10%) | |
| Delivery process: | | 0.000 |
| Cesarean operation | 22 (38,60%) | |
| per Vaginam | 23 (40,40%) | |
| Forceps | 10 (17.5%) | |
| Vacum extractor | 2 (3,50%) | |
| Twin: | | 0.000 |
| Single birth | 50 (87,70%) | |
| Twin | 7 (8,70%) | |
| Parity: | 23 (40.4%) | 0.001 |
| Single pregnancy | | |
| Multiple pregnancy | 27 (47.40%) | |
| Multigrandeparous | 7 (12.30%) | |
| Prenatal Care (PNC): | | |
| < 4 times | 9 (15,80%) | 0.001 |
| ≥ 4 times | 48 (84,20%) | |
| Socio-economy: monthly take home pay | | 0.000 |
| Less than 80 USD | 36 (63,20%) | |
| 80-400 USD | 13 (22.80%) | |
| > 400 USD | 8 (14,00%) | |

Preeclampsia: systolic ≥ 140 mmHg, diastolik ≥ 90 mmHg, proteinuria (+) > 20 mg; Eclampsia with convulsion; gestational hypertension diagnostic criteria: preeclampsia, proteinuria (-); chronic hypertension with systolic ≥ 140 mmHg, diastolic ≥ 90 mmHg pre-pregnancy or < 20 mg in pregnancy [2]

The time of diagnosis of postpartum PPCM is 52.63%, antepartum 47.36% (p=0.502) are shown in Figure 2. Clinical characteristics varied, with mostly heart failure (84.20% NYHA functional class IV, and 15.80% NYHA functional class III), with a significant difference (p <0.05) of precklampsia (35 patients, 43.8%) compared with 28 patients (35%) without hypertension. In this study did not find a kind of potential risks such as obesity, bad habits (alcoholism, smoking) in the case of PPCM.

**Table 2. Echographic examination**

| Echocardiography | N (%) |
|---|---|
| Cardiac dilatation: | |
| All chambers | 22 (38,6%) |
| Left Atrium and Left Ventricle | 20 (35,1%) |
| Left Ventricle | 15 (26,3%) |
| Global hypokinetic: | |
| Positive | 56 (98,2%) |
| Negative | 1 (1,8%) |
| EF(%): | |
| Mean | 34,7 (7,5) |
| Cardiac valves: | |
| Normal valves | 10 (17,2%) |
| Trivial Mitral Regurgitation | 9 (15,5%) |
| Trivial Pulmonal Regurgitation | 1 (1,7%) |
| Trivial Tricuspidal Regurgitation | 4 (6,9%) |
| Mild Atrial Regurgitation | 4 (6,9%) |
| Mild Mitral Regurgitation | 27 (46,6%) |
| Mild Pulmonal Regurgitation | 1 (1,7%) |
| Mild Tricuspidal Regurgitation | 14 (24,1%) |
| Moderate Mitral Regurgitation | 8 (13,8%) |
| Moderate Tricuspidal Regurgitation | 3 (5,2%) |
| Severe Mitral Regurgitation | 2 (3,4%) |
| Severe Tricuspidal Regurgitation | 2 (3,4%) |

Therapy in patients with PPCM has been in accordance with the therapy of heart failure of the guidelines of the ESC (European Society of Cardiology) in 2012.

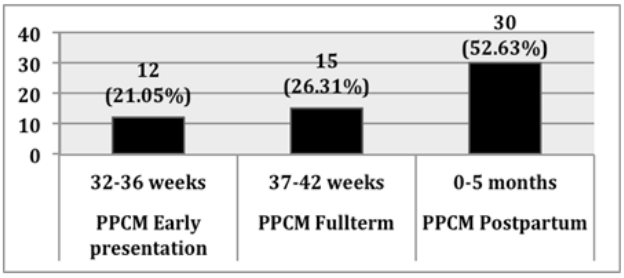


**Figure 2.** The time of diagnosis of PPCM. Its early presentation existed in 12 pregnant women (21.05 %)

| Echographic results | N (%) |
|---|---|
| Cardiac dilatation: | |
| All chambers | 22 (38.60%) |
| Left ventricle | 15 (26.30%) |
| Left Atrium and left ventricle | 20 (35.10%) |
| Global hypokinetic | 57 (100%) |
| Left Ventricle Ejection Fraction | 34.70 ± 7.5 |
| Valves: | |
| Normal | 10 (17.20 %) |
| Mitral regurgitation: Trivial | 27 (46.60%) |
| Mild | 9 (15.50%) |
| Moderate | 8 (13.80%) |
| Severe | 2 (3.40%) |
| Tricuspidal regurgitation: Trivial | 4 (6.90%) |
| Mild | 14 (24.10%) |
| Moderate | 3 (5.20%) |
| Severe | 2 (3.40%) |
| Pulmonal regurgitation: Trivial | 4 (6.90%) |
| Mild | 1 (1.70%) |

Medications that have been given in the antepartum period was furosemide, methyldopa, isosorbide dinitrate; in the postpartum was furosemide, angiotensine-

converting-enzyme inhibitor, bisoprolol, methyldopa, spironolactone, bromocriptine.

# 4. Discussion

The prevalence of PPCM is very rare, although it can be life-threatening. Data of the main hospitals in Southeast Asia showed PPCM occurs in 0.89 for every 1000 postpartum women [11] In our hospital there were around 200 live births per month (around 7,200 live births per 3 year), the hospital based prevalence of PPCM is around 1: 126 live births, which is higher compare with South Africa or Haiti. The figure mentions a geographical difference and also indicates pregnant women in Indonesia face a high risk of PPCM. The figure is also suggest to every health providers, in particular the obstetrician and midwives, should be more vigilant when checking the heart condition of pregnant women. Although PPCM is often difficult to diagnose, because the symptoms of heart failure resemble the physiological response of pregnancy [12,13,14]. The evaluation of the symptoms and signs of left heart failure is very important in PPCM suspected patients [6,7,10]. PPCM is a diagnosis of exclusion requires clinical examinations (ECG, thoracic imaging, and echocardiography) to rule out others [6] The results of echocardiography showed a low ejection fraction value (34.70%), with global hypokinetic, and dilatated cardiac chambers by valve regurgitation, therefore should focus on cardiac function. According ESC 2012, the management and optimization of therapy is vital to the prognosis of patients with PPCM reversibility of cardiac function [2,15] Certain medications need to be adjusted in patients with pregnancy and breastfeeding, because some drugs are harmful to the baby, such as ACE inhibitors that have fetal toxicity and for nursing mothers, because the drug is excreted through the milk can cause hypotension and renal impairment for neonates with low birth weight or premature. ACE-inhibitor class has been proven safe are captopril, enalapril, and quinalapril. Alternative vasodilators for pregnant and lactating women are methyldopa, or a combination of hydralazine and nitrate group. The beta-blockers that have been proven safe for pregnant women are metoprolol, however bisoprolol and carvedilol are not known with certainty [4,16,17] Bromocriptine is a new drug used in the treatment of PPCM that inhibit the production of prolactin, but it still need a larger study [18,19,20]. PPCM patients should be managed with holistic approach, covering education for the next pregnancy and contraception, since there are risk of recurrency [5,20,21].

## 4.1. PPCM Prevalence and Risk Factors

PPCM is associated with several risk factors, i.e. race, maternal age, multiparous, twins, hypertension in pregnancy, low socioeconomic, and ireregular PNC [6,13,14] In this study, majority of PPCM patients come from low-income families (63.20%), therefore it is important to consider the issue of welfare of the patient can lead to vulnerability to PPCM. In some literature, the age ranged from 16 to 44 years old (average 30) [6,13]. In this study, the average age of PPCM patient was 30.3 years and who are younger than 30 years as much as 50.90%, means younger age is able to be a risk factor that should be considered. A total of 47.40% of patients with PPCM in this study were multiparous. The data is supported by literature studies that stated 71% of patients with PPCM were multiparous [13,14,15] In this study 8.70% patients with twin, almost similar to other research showed 9-13% patients with twin [6.16] According the Working Group Of Heart Failure ESC 2010, the diagnosis of PPCM is starting at the last gestational month up to several months postpartum. In our data suggest that diagnosis of PPCM can occur earlier, i.e. during 17-36 weeks of pregnancy there was 21.05% of all PPCM cases that can be categorized as early presentation [1,6]. In this study PPCM patients diagnosed mostly in postpartum, but did not differ much with antepartum.

## 4.2. The Role of PNC for Early Detection of PPCM

Prenatal care (PNC) has a very strategic role to recognize the emergence of PPCM from the beginning. PNC became the most important factor in the handling of PPCM precisely, because it was found to appear earlier than the official time traditionally. In this study 84.20% of PPCM-patients have undergone PNC well as recommended by WHO. PNC becomes very important in the early detection of symptoms of PPCM for previously heart-healthy pregnant women. The Fett's self test for recognition of heart failure during pregnancy and after delivery would be very helpful when applied to every pregnant woman and also monitoring post-PPCM pregnancy [22]. Patients with PPCM in this study, 46.3% were from low socioeconomic, which is associated with malnutrition as a risk factor for the onset of PPCM [15,17,18]. Mothers who come from all socio-economic layers should get the same attention considering that they require an explanation of the PPCM and then must be widely disseminated. For that reason knowledge about PPCM should be disseminated to every doctor, nurse and pregnant women to report their suspicions and to refer the patient for further clinical examination to the cardiologist. The hospital based prevalence was 18.68%, with the majority (84.20%) was NYHA functional class IV. This study is probably the first report indicates a high prevalence of PPCM in Indonesia. This report can be used as a basis for more awareness of PPCM in order to prevent and to decrease the morbidity and mortality of pregnant women. The new literature states a plural associated predisposition including genetic, nevertheless clinical view to face the PPCM disorder requires regular and careful PNC by taking into account existing risk factors is the key that is required and must be held in every health centre.

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