



Association of Peripartum Cardiomyopathy with Pre-eclampsia and Maternal Outcome

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Authors' contributions

This work was carried out in collaboration among all authors. Authors SA and SY were involved in conception of idea and study design. Authors FS and ST did data collection and performed bench work. Author NS performed the statistical analysis. Author NS managed the literature searches. All authors read and approved the final manuscript

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ABSTRACT

Objective: To determine the Prevalence of Pre-eclampsia in women with peripartum cardiomyopathy (PPCM) and to compare the maternal outcome in cases of PPCM who develop pre-eclampsia with those cases who are normotensive.

Study design: This is a prospective observational study.

Setting: Study carried out at department of Gynecology and Obstetrics, Liaquat university hospital Hyderabad from 20th February 2019 to 19th February 2020.

Materials and methods: This prospective observational study was conducted in department of Gynecology and Obstetrics and department of Cardiology Liaquat University Hospital Hyderabad. Inclusion criteria were patients admitted with a diagnosis of peripartum cardiomyopathy diagnosed clinically and confirmed by echocardiography. Exclusion criteria were cases with multiple pregnancies, smokers, those with chronic hypertension and chronic renal disease or diabetes. We

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assessed patients for pre-eclampsia. Outcome measures studied were serious maternal complications like Pulmonary oedema, Cardiogenic shock, intensive care unit admission, and death.

Results: During one year study period, there were 71 cases of peripartum cardiomyopathy. The mean age of patients was 29.77 ± 6.8 years. Pre-eclampsia was seen in 62% cases of Peripartum cardiomyopathy. Mean ejection fraction was 33.24 ± 6.49 . In patients of PPCM, serious maternal complications including cardiogenic shock 11(15.5%) cases, intensive care unit admission 10(14.1%) cases, pulmonary oedema 35(49.3%) cases and prolonged hospitalization 58(81.7%) cases.

Conclusion: We conclude that pre-eclampsia has high prevalence in patients with PPCM. Both when combined, significantly increase the chances of serious maternal complications including death.

Keywords: Peripartum cardiomyopathy; pre-eclampsia; serious maternal complications.

1. INTRODUCTION

Peripartum Cardiomyopathy (PPCM) is a potentially fatal condition that is specific to pregnancy and characterized by the occurrence of heart failure during the last month of pregnancy till 5 months postpartum with no demonstrable etiology [1]. It is a form of dilated cardiomyopathy with left ventricular dysfunction leading to poor ejection fraction and rapidly progress to end-stage heart failure [2]. It has very high morbidity and mortality, both maternal and perinatal. The incidence of PPCM varies widely across the globe. The incidence is quite high in areas with tropical climate as Nigeria and Haiti (1:100 to 1:300 live births) whereas it is quite rare in countries as the United States of America (1:3000-1:4000 live births) and Japan (1:6000 live births) [3].

The clinical presentation is also variable and initially mimics normal signs and symptoms of pregnancy as shortness of breath, dizziness, cough, and dependent edema. Echocardiography confirms the diagnosis with a left ventricular ejection fraction less than 45%. PPCM makes pregnancy very high risk, with adverse consequences for both mother and baby. The mother becomes exposed to the risk of cardiogenic shock, arrhythmias, intensive care unit admission, and death [4]. In the United States of America, 5% of the women are having heart transplantation because of PPCM, however, this option is not available in many countries [5]. International study reported perinatal complications include Live birth 38(97.4%), Still birth 1 (2.56%), Preterm 11(28.2%), IUGR 3(7.69%) and NICU admission 6 (15.3%) cases [6]. The etiology of this condition is unknown. There are several perinatal risk factors like smoking, malnutrition, cocaine abuse, African ancestry, socioeconomic status, twin

pregnancy, high parity, extremes of reproductive age, obesity, and the genetics that are associated with PPCM [7]. One factor having strong relation with PPCM is Hypertensive disorders of pregnancy (HDP).

Animal studies have shown the role of angiogenic factors in the pathophysiology of pre-eclampsia and peripartum cardiomyopathy. As the placenta secretes most angiogenic factors in the 3rd trimester, explaining to some extent the association between Pre-eclampsia and PPCM [8]. However, hypertension is associated with 40% of cases of PPCM as compared to its incidence in the general population and not all patients with PPCM are hypertensive. Also, Pre-eclampsia in patients with PPCM worsens the maternal outcome several folds. Considering these facts and figures, this study determines the Prevalence of Pre-eclampsia in women with peripartum cardiomyopathy and to compare the maternal outcome in cases of PPCM who develop pre-eclampsia with those cases who are normotensive.

2. MATERIALS AND METHODS

It was a prospective observational study conducted in department of Gynecology and Obstetrics, Liaquat university hospital Hyderabad from 20th February 2019 to 19th February 2020. Patients diagnosed with Peripartum cardiomyopathy were enrolled in the study from Department of Gynecology and Obstetrics and Department of Cardiology Liaquat University Hospital Hyderabad. Inclusion criteria were cases admitted with a diagnosis of Peripartum cardiomyopathy, confirmed by echocardiography with ejection fraction less than 45%, with no other demonstrable etiology of heart failure in the last month of pregnancy till 5 months postpartum.

To control confounding factors, cases with multiple pregnancies, smokers, those with chronic hypertension and chronic renal disease or diabetes were excluded from the study. Data were collected regarding age, parity, antepartum or postpartum presentation, ejection fraction on echocardiography, mode of delivery, associated Pre-eclampsia (diagnosed when systolic blood pressure was > 140 mmHg or diastolic blood pressure was > 90 mmHg on two occasions more than 4 hours apart, along with proteinuria with dipstick urine protein >2+). Maternal outcome was measured in cases of PPCM with pre-eclampsia and cases without Pre-eclampsia. Outcome measures studied were acute pulmonary edema, intensive care unit admission, cardiogenic shock and in-hospital death.

3. RESULTS

During the one-year study period, we received 71 cases of Peripartum cardiomyopathy. The mean age of patients was 29.77±6.8 years and age range of 16-45 years (Table 1). About 19.71%

patients were primipara, 61.97% were multipara and 18.30% were grand multipara. Most of the cases were postpartum (62%). All presented with signs and symptoms of heart failure, 15.5% presented in state of cardiogenic shock. Pre-eclampsia was found a common associated factor of peripartum cardiomyopathy, that is about 62% cases were pre-eclamptic. The diagnosis of peripartum cardiomyopathy was made clinically and confirmed by echocardiography. Mean ejection fraction was 33.24±6.49 with range 20-40%. Majority had ejection fraction less than 40%. Ejection fraction was significantly decreased in patients with pre-eclampsia as compared to normotensive patients. Nine (12.7%) patients died of cardiomyopathy during study period. Death rate was higher in patients who were received in state of shock (7 out of 9). In patients of PPCM, serious maternal complications including cardiogenic shock 11(15.5%) cases, intensive care unit admission 10(14.1%) cases, pulmonary oedema 35(49.3%) cases and prolonged hospitalization 58(81.7%) cases (Fig. 1).

Table 1. Patient’s characteristic (n-71)

Variable	Patients	Percentage
Age in years (Means Age 29.77±6.8 years)		
• 16 – 30	32	45.07%
• 31 – 40	25	35.21%
• 41 – 45	14	19.71%
Parity		
• Primipara	14	19.71%
• Multipara	44	61.97%
• Grand multipara	13	18.30%
Pre-Eclampsia		
• Yes	44	62%
• No	27	38%

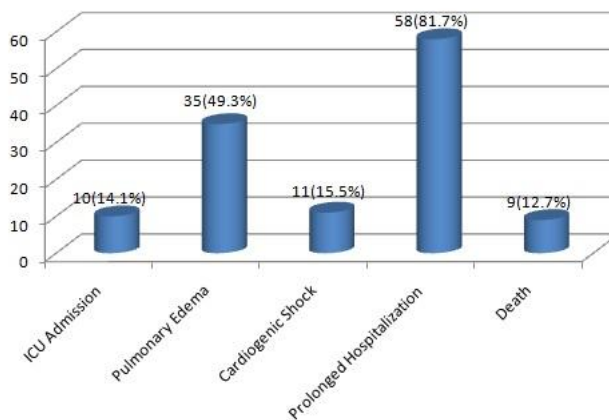


Fig. 1. Maternal complications

4. DISCUSSION

In our study analysis, we found 62 percent of cases of pre-eclampsia in patients admitted as a case of peripartum cardiomyopathy (PPCM). This prevalence of pre-eclampsia in PPCM is significantly higher than the average global prevalence that is 2-8% [9,10]. Pre-eclampsia is associated with significant changes in the cardiovascular system. It leads to remodeling of the left ventricle and impaired contractility, resulting in diastolic dysfunction. Pre-eclampsia and other hypertensive disorders are known to be one of the five leading causes of maternal death worldwide and Pre-eclampsia increases the risk of future hypertension, ischemic heart disease, venous thromboembolism, and stroke [11]. We also know that it preserved the systolic function of the left ventricle in cases of pre-eclampsia, no matter how severe it is [12]. During pregnancy, the maternal cardiovascular system undergoes several hemodynamic changes, including an increase in cardiac output, decrease in total peripheral resistance [13]. They worsen these hemodynamic alterations in patients with pre-eclampsia with vascular stiffness and increase in total peripheral resistance, leading to lower cardiac output and left ventricular remodeling and diastolic dysfunction, however, systolic function is preserved generally [11]. In contrast to this, patients with PPCM have reduced ejection fractions secondary to left ventricular systolic dysfunction [14]. These findings show that both Pre-eclampsia and PPCM are separate clinical entities and not a single disease at varying stages of severity. PPCM has a strong association with Pre-eclampsia has also seen in our study. In a meta analysis conducted by Behrens I et al., the risk of Pre-eclampsia in PPCM is 4 times higher in women with PPCM than the risk in women without PPCM [15].

The mean age of patients with PPCM is 29.77±6.8 years, similar to a study by Lee et al., which stated that PPCM patients are in the older age group as compared to their controls [16]. Majority of patients in our study were multiparous, with one-fourth of the patients being young primigravida. We also knew PPCM as Postpartum cardiomyopathy, as the most common time for presentation is the postpartum period, which is also a finding of our study as 62% of patients presented after delivery mostly within 4 months with signs and symptoms of heart failure. This is like the findings of Arany et al. and Huang GY et al. [17,18]. Literature shows

that the cardiovascular changes of pregnancy lead to stress over the heart, which should be relieved after delivery, however the predominance of postpartum cases over antepartum cases might suggest that the physiological changes of pregnancy is not the main etiologic factor behind the origin of pregnancy related heart failure, but the persistence of pathologic factors with worsening in postpartum period might be the reason behind.

Ejection fraction of the left ventricle is a powerful indicator of clinical outcome and also a guide to response to treatment. In our study analysis, the average left ventricular ejection fraction was 33.24±6.49. The mean ejection fraction of patients who died during hospital admission was 25.56%, which is significantly lower than that of patients who survived, which is 33.24±6.49. Hence, a low ejection fraction at the time of admission shows a high risk of death. In a study conducted by Brethett K et al. [19]. Ejection fraction was taken as a marker of response to treatment and a >5 unit LVEF improvement is associated with significant risk reduction. Considering the serious complications that were seen in PPCM patients include pulmonary oedema, cardiogenic shock, intensive care unit admission, and death. This is like various studies conducted worldwide, including a study by Wu VC et al. [20]. The rate of serious complications was 56.3%. During our study period, 9 patients died of 71 cases giving a case fatality rate of 12.7%. The fatality rate quote in literature is from 17-50% [3]. The patients who died were mostly received in state of cardiogenic shock. Also 7 out of 9 patients had associated Pre-eclampsia. The survival rates of PPCM patients with co-existent pre-eclampsia is lower as compared to normotensive cases.

5. CONCLUSION

This study shows that Pre-eclampsia has a high prevalence in patients with peripartum cardiomyopathy and this association significantly worsens the outcome of the patient, putting her at risk of serious complications and death. So to overcome this challenging problem women should be given priority when it is the health related issues. Governmental and non-governmental organizations working on maternal and child health should focus on identified factors in order to tackle the problem of Pre-eclampsia.

CONSENT AND ETHICAL APPROVAL

We started the study after approval from the ethical review committee of the university . A written well-informed consent was taken.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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