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Peripartum cardiomyopathy: An epidemiologic study of early and late presentations

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ABSTRACT

Objective: Peripartum cardiomyopathy (PPCM) can present during pregnancy and up to months post-delivery. Most large-scale epidemiologic studies have reported on cases occurring during pregnancy or the first few days postpartum (termPPCM). Limited information is available on PPCM in the later postpartum period (latePPCM). We studied the incidence, predictors, and hospital outcome of peripartum cardiomyopathy (PPCM) in the prepartum and immediate post delivery period versus up to 3 months post-delivery.

Methods: We performed a secondary analysis of the 2013 Nationwide Readmissions Database, and compared the incidence, patient characteristics and in-hospital outcomes of PPCM during the peripartum and three-month postpartum period. All women with a discharge diagnosis of PPCM during a hospitalization for childbirth were included in the termPPCM group and those re-hospitalized within 3 month post-delivery with a new diagnosis of PPCM comprised the latePPCM group.

Results: There were 568 cases of PPCM, indicating an incidence of 1 per 2187 deliveries. Two thirds of those were latePPCM, and 75% of latePPCM cases occurred within 10 days of discharge. LatePPCM incidence was 1 per 208 deliveries in the highest risk group (age > 35, gestation diabetes and preeclampsia). Patients with termPPCM were more likely to be co-diagnosed with preeclampsia, to be anemic, and to be delivered by C-section.

Conclusions: Most cases of PPCM were diagnosed during a readmission, rather than during pregnancy or childbirth-related index hospitalization. It may be possible to identify latePPCM cases by pre-discharge screening in high risk women and institute early management to potentially decrease morbidity/mortality.

1. Introduction

Peripartum cardiomyopathy (PPCM) occurs during pregnancy, delivery and up to months post-delivery period and is thought to be caused directly by pregnancy related changes like nutritional deficiencies, hormonal changes, autoimmunity, hemodynamic stresses, and vascular dysfunction, although the exact etiology is not clear [1,2]. The diagnosis requires confirmation of reduced left ventricular systolic function and exclusion of pre-existing cardiac conditions and other etiologies of heart failure [2,3]. Although PPCM is relatively uncommon, it has a disproportionate impact as it involves a young and otherwise healthy population and has a significant adverse effect on maternal mortality and also adversely impacts future pregnancies [4–6].

In recent years, publication of studies using regional and national databases has resulted in a better understanding of the epidemiology of PPCM, including its incidence and risk factors predisposing to the disease [4,5,7,8]. However, most of the published epidemiologic studies have only reported on the prepartum and immediate post delivery period (during same hospitalization for delivery) and do not have postpartum follow-up, thus likely underestimating the true incidence of the disease [4]. In fact, the first report on PPCM was titled 'Toxic Postpartal Heart Disease' and there is some evidence that more cases may present in postpartum period rather than prepartum or immediate post delivery period [9–11]. Furthermore, it is not well known if there are differences in risks and outcomes of cardiomyopathy that occurs during pregnancy or around delivery versus that which manifests later. We conducted a detailed analysis of the Nationwide Readmission Database (NRD) to compare, in a nationwide setting, the incidence and risk factors of PPCM, and maternal adverse events in the prepartum and

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immediate post delivery period versus up to 3 months post-delivery.

2. Methods

2.1. Data source and patient selection

A secondary analysis of the 2013 Nationwide Readmissions Database (NRD) was conducted. The Nationwide Readmissions Database is part of the Healthcare Cost and Utilization Project (HCUP) that is sponsored by the Agency for Healthcare Research and Quality (AHRQ) in the United States. The NRD contains data from approximately 14 million discharges each year, and when weighted, it estimates roughly 36 million discharges. The 2013 NRD was constructed from 21 states with reliable, verified patient linkage numbers in the state inpatient database that could be used to track the patient across hospitals within a state. The NRD is a 100 percent sample of discharges, not hospitals. Patients' information is de-identified in the NRD, therefore this study was exempted from our institution's human subjects committee review [12].

All adult patients with a discharge diagnosis of PPCM and who had childbirth during the same hospitalization were included in the termPPCM group (includes those diagnosed immediately post child birth but during same hospital admission). Women who had hospitalization with a new diagnosis of PPCM within 3 months of childbirth hospitalization were included in the latePPCM. We defined the whole (overall) PPCM cohort by combining the termPPCM and the latePPCM cohorts. In order to study the latePPCM in more detail, we further subcategorized the latePPCM cohort into two groups; proximate latePPCM (Within 10 days of disharge for a delivery) and delayed latePPCM (> 10 days). The control group was defined by patients admitted for childbirth but without a diagnosis of PPCM.

The Relevant international Classification of Diseases, Ninth Revision, Clinical Modification Code (ICD-9 codes), Diagnosis Related Group (DRG) codes and Clinical Classifications Software (CCS) codes for comorbidities and procedures were included in Supplementary Table 1.

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.preghy.2018.06.018.

For the study, latePPCM was defined as a hospitalization occurring with new diagnosis of PPCM within 90 days of discharge from the index hospitalization for a child birth in 2013. The months of October, November, and December were included for the 90-day readmission data, but all index hospitalizations in these 3 months were excluded since their readmission would fall in 2014 and data for that is not available in the 2013 NRD.

3. Study outcomes

The primary study outcome was the incidence of overall PPCM (including termPPCM and latePPCM). The PPCM incidence was defined as the number of hospitalizations with PPCM divided by the number of all hospitalizations for deliveries in the same period.

We measured the in-hospital mortality and adverse maternal outcomes: cardiac arrest, cardiogenic shock, ventricular fibrilation, and the use of mechanical support. Further we investigated the association of various clinical and demographic characteristics with PPCM.

3.1. Variables

The various variables studied included demographic details (including age, and income percentile) and clinical characteristics (comorbid medical conditions based on ICD-9 diagnostic codes, Supplementary Table 1). We used the Deyo-modified Charlson Comorbidity Index (CCI) using inpatient diagnoses [13]. The CCI is calculated based on several comorbidities including chronic pulmonary disease, cerebrovascular disease, dementia, diabetes without complications, liver disease, peptic ulcer disease, rheumatologic disease, hemiplegia/paraplegia, diabetes with complication, malignancy, renal disease, metastatic solid tumor, HIV/acquired immune deficiency syndrome, peripheral vascular disease, and congestive heart failure (excluded here). It is divided into three groups: mild (with CCI scores of 0-1); moderate (with CCI scores of 2-3); and severe (with CCI scores > 3).

3.2. Statistics

SPSS (Version 22, SPSS Inc, Chicago, Ill) was used for statistical analysis. Continuous data was presented as mean ± standard deviation (SD). For calculation of variances, the stratified samples and hospitals defining the clusters were taken into account. The analyses involved comparing continuous and categorical data using the Student's *t*-test, Chi-square or Fisher Exact test as appropriate. P value < 0.05 was considered significant. Multivariable sequential logistic regression analyses were conducted to study independent factors for PPCM. We exclude variables with very low frequency < 2% in PPCM group, including liver disease, CKD, and dyslipidemia from multivariable regression analysis. We did not include smoking or illicit drug history since this data has been felt to be unreliable in the NIS database in prior studies.

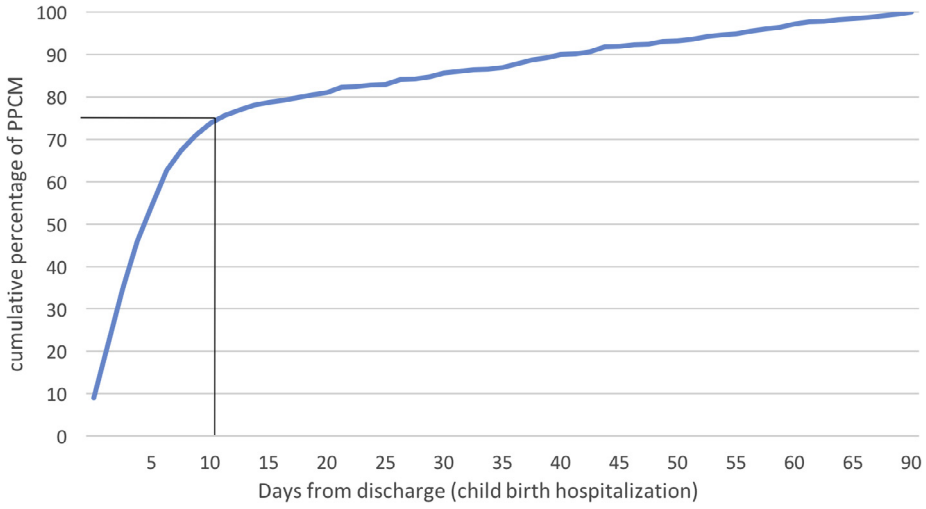

Fig. 1. The cumulative incidence of PPCM in 90-day post-delivery period.