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## Depression and health behaviors in women with Peripartum Cardiomyopathy

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### ABSTRACT

**Background:** Depression and health behavior engagement are a critical issue for recovery and secondary prevention in heart failure patients. No prior studies have examined these important clinical outcomes in young women diagnosed with Peripartum Cardiomyopathy (PPCM). We sought to characterize the prevalence of depression and health behaviors in PPCM patients and examine whether depression is associated with reduced engagement in health behaviors.

**Methods:** A nation-wide, cohort of 177 PPCM patients (mean age of  $34.8 \pm 5.7$  years; median time since diagnosis of  $3.0 \pm 4.3$  years) from a web-based quality of life registry completed questionnaires about depression (Patient Health Questionnaire; a cutoff score  $\geq 10$  was used for depression screening) and health behaviors. *T*-tests, chi-square and linear regression were used to compare clinical characteristics and health behaviors among depressed and non-depressed women.

**Results:** The prevalence of clinical depression at enrollment was 32.3% and was associated with use of antihypertensive medications, disability insurance status, higher BMI, history of arrhythmia and current or past use of psychotropic medication. Health behavior engagement for diet, physical activity, and tobacco cessation were low in the overall sample and depressed PPCM patients were significantly less likely to attend medical appointments than non-depressed women.

**Conclusions:** Nearly 1 in 3 PPCM survivors reported symptoms of clinical depression which was associated with worse attendance at medical follow-up visits. Further research is needed to develop risk stratification models and patient-centered interventions to improve clinical outcomes for PPCM survivors.

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### Introduction

Peripartum cardiomyopathy (PPCM) is a rare form of heart failure that develops in young women during pregnancy and up to 6 months postpartum.<sup>1,2</sup> This condition is a leading cause of

maternal morbidity and mortality<sup>3</sup> that affects 1 in 968 births in the United States each year.<sup>4</sup> To date, research on PPCM has largely focused on survival and little is known about long-term behavioral or psychosocial outcomes.

Given the acute onset, severity, and prognostic uncertainty associated with PPCM, women appear to have an inherently higher risk for poor psychological outcomes, depression in particular. Postpartum alterations in estradiol, progesterone, and cortisol and their effects on serotonin and dopamine receptor activity<sup>5</sup> further contribute to the high risk of depression in PPCM patients diagnosed within the first year of delivery. Depression is also a risk factor for poor adherence to recommended health behaviors (e.g., physical activity, medication adherence, tobacco cessation) in heart failure patients<sup>6,7</sup> and has been associated with greater symptom burden, hospitalization, morbidity, and mortality.<sup>8</sup> However, such data primarily stems from *typical* heart failure patients (e.g., older

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males with comorbid medical illness) and may not reflect the unique characteristics of young women with PPCM.

Whether depression affects health behaviors among women with PPCM is a critical issue for the recovery of these patients but also for secondary prevention of future cardiovascular events. We sought to characterize the prevalence of depression and health behaviors in PPCM patients, and examine whether depression is associated with reduced engagement in clinically recommended health behaviors.

## Methods

### Study overview and patient population

The sample included women with a self-reported PPCM diagnosis consecutively enrolled in the Peripartum Cardiomyopathy Quality of Life Registry (PC-QoL), an online research registry studying health-related quality of life outcomes among women diagnosed with PPCM. All women enrolled in the registry were included in this study. The PC-QoL collaborated with a patient education website, [www.mysistersheart.com](http://www.mysistersheart.com) (MSH), to recruit women diagnosed with PPCM. A detailed description of the study and link to the registry website was provided on the MSH website. The study website provided information about the PC-QoL registry, research team and required electronic consent from participants prior to enrollment. At the time of enrollment, women completed questionnaires about their medical history, health behaviors, psychological adjustment, functional status and quality of life outcomes. No compensation was provided for registry participation. Enrollment data indicate that PPCM patients from 27 states participated in the registry, lending further credibility to the generalizability of this nationwide cohort of PPCM patients. Inclusion criteria were age 18 years and older; prior diagnosis of PPCM; English fluency; and access to the internet. All study procedures were approved by the Institutional Review Board at East Carolina University.

### Variables and measures

Depression was assessed using the Patient Health Questionnaire Depression Scale (PHQ-8), an 8-item screening tool for depression validated in heart failure<sup>9</sup> and perinatal populations.<sup>10</sup> A PHQ-8 score  $\geq 10$  indicated clinically significant symptoms of depression (88% sensitivity and 88% specificity for major depression).<sup>11</sup>

The Revised Heart Failure Compliance Scale,<sup>12</sup> was used to capture health behaviors consistent with AHA guidelines for secondary prevention.<sup>13</sup> Participants rated how often they attended scheduled medical appointments and took medications as prescribed on a 5-point scale [0 = never (0% of the time), 1 = sometimes (25% of the time), 2 = half of the time (50% of the time), 3 = most of the time (75% of the time), 4 = Always (100% of the time)]. All other health behaviors (maintaining a low fat/low sodium diet, engaging in daily physical activity, limited alcohol consumption and tobacco use) were rated using a 5-point scale (0 = 0 days per week, 1 = 1–2 days per week, 2 = 3–4 days per week, 3 = 5–6 days per week, 4 = everyday), indicating how many days per week women engaged in the specific health behavior. For the physical activity scale item, examples of physical activity (i.e., ‘going for a walk’ and ‘attending a Zumba class or dance class’) were provided to capture meaningful forms of physical activity in addition to traditional gym-based forms of exercise. Scores were transformed to a 0 to 100 scale (0 = 0%, 1 = 25%, 2 = 50%, 3 = 75%, and 4 = 100%), with scores  $\geq 75\%$  indicating health behavior engagement consistent with current secondary prevention guidelines from the American Heart Association.<sup>12,13</sup> Any tobacco use and

alcohol consumption scores  $\geq 50\%$  or  $>3$  days per week were considered inconsistent with current heart failure guidelines that recommend complete smoking cessation and limited alcohol consumption.<sup>13</sup> This scale has demonstrated good validity and internal consistency (Cronbach  $\alpha$  of 0.68).<sup>12</sup>

Socio-demographic information and medical history were self-reported via validated questionnaires.<sup>14</sup>

### Statistical analyses

Demographic and clinical characteristics of women scoring above and below the clinical cutoff for depression (PHQ-8 scores  $\geq 10$ ), including health behavior compliance rates, were compared using *t*-tests for continuous measures and chi-square for categorical variables. Correlation analyses were conducted to examine the relationship between time since PPCM diagnosis and depressive symptoms. Multivariable linear regression models were used to adjust for any confounding variables (i.e., variables that differed among depressed and non-depressed patients and that were associated with the outcomes of interest). Only BMI, disability insurance status and history of psychotropic medication were included in final models. All analyses were performed with SPSS version 22.0 (SPSS Inc, Chicago, Illinois).

## Results

Between December 2015 and June 2016, 177 women enrolled in the PC-QoL Registry. On average, women were  $34.8 \pm 5.7$  years old (age range was 21–45 years), white, married, overweight, had a family history of cardiovascular disease (CVD), were currently being treated for heart failure and were not receiving disability insurance. Most women were multiparous and nearly half the sample reported premorbid psychiatric symptoms and previous or current use of psychotropic medications (Table 1). Median time since diagnosis was  $3.0 \pm 4.3$  years. Twenty-seven percent of PPCM patients in this sample were diagnosed within 12 months of delivery. Characteristics of the PPCM pregnancy are shown in Table 2. A majority of the PPCM pregnancies resulted in live births but with high rates of preeclampsia (37.6%), labor and delivery complications (31.7%), and neonatal complications (14.1–25.8%). Subsequent pregnancies were reported by 19.1% of patients.

### Depression

Mean depression scores on the PHQ-8 were  $8.27 \pm 6.86$ . Clinically significant symptoms of depression were reported by 32.3% of PPCM patients in this sample. As shown in Table 1, depressed PPCM patients were more likely to report a higher BMI, antihypertensive medications use, previous arrhythmias, current or past psychotropic medication use and receive disability insurance than non-depressed patients. Time since diagnosis was not correlated with depressive symptoms ( $r = -0.08$ ,  $n = 138$ ,  $p = 0.34$ ).

### Health behaviors

Medical appointment attendance and medication use consistent with guideline-based care were reported by 96.5% and 94.2% of women respectively (Fig. 1). Only 18.7% reported engaging in recommended levels of physical activity (5–7 days per week) with the greatest proportion of women (35.1%) exercising only 1–2 days per week. Daily exercise was reported by 2.9% of PPCM patients and 11.1% reported they never exercised. Similarly, 50.9% of women were maintained a low fat/low sodium diet and only 7.0% reported daily compliance with dietary recommendations. Tobacco cessation was reported by 87.7% of PPCM patients and any history of tobacco

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