Report to the Preeclampsia Foundation – Vision Grant 2017

The PEACH Project: Preeclampsia Survivor Awareness of Cardiovascular Health Risk

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Final Report

Introduction

Women who survive preeclampsia (PE) or other hypertensive disorders of pregnancy (HDOP) are at a significantly increased risk for future cardiovascular disease (CVD) including heart attack, coronary artery disease, thrombosis and stroke. They also have an increased risk of death from a CVD event compared to women who did not have PE during their pregnancy. [1-5] Further, preeclampsia[1] survivors are more likely to have CVD disease or death earlier in life than other women.[6] While substantial evidence of this connection has been in the medical literature for more than a decade, ensuring patient education on increased risk and preventative measures for CVD is a challenge. Research suggests that appropriate medical follow up and monitoring of cardiovascular status beyond pregnancy is not common practice.[7,8] In addition, a history of PE is often not included in primary care assessment or in provider medical education regarding health history acquisition (Leslie and Briggs, unpublished).[9,10] This evidence-practice gap suggests an urgent need to improve both healthcare delivery and patient engagement in their own care after preeclampsia. To develop effective strategies for improvement, it is critical that we understand the PE survivor's awareness and perceptions concerning the impact of this disorder on their lives.

According to the Health Belief Model, the likelihood of taking action to improve one's health depends on the perceptions of the individual facing the disease or health issue.[11] This model has been adapted, modified and expanded throughout the years for use in health research.[11] The core components of the model include the person's perception of susceptibility to a disease, its perceived severity, cues to take action (education, provider input, etc.) and perceived benefits of and barriers to taking action.

Awareness is a prerequisite for perception. Unfortunately, little is known about the awareness and perceptions of preeclampsia survivors regarding their increased risk for CVD morbidity and mortality as well as the importance of modifying CVD risk factors. This study examined the CVD risk awareness of PE survivors participating in The Preeclampsia Registry and assessed whether their awareness and perceptions were associated with any changes in their CVD risk factor profile.

Hypotheses

To achieve the objectives of this research study specific aims and corresponding hypotheses were generated. The hypotheses were:

[1] For the purposes of this report, we will use the terms preeclampsia and preeclampsia survivors. Survivors who experienced more severe forms of the disorder (eclampsia) or gestational hypertension are included in this term.

H1: Preeclampsia survivors are not aware of their increased risk for future CVD.

H2: Preeclampsia survivors do not report having been informed by care providers of their increased risk for CVD

H3: Preeclampsia survivors who are aware of their increased risk for CVD have not improved modifiable risk factors since the index pregnancy.

H4: Preeclampsia survivors who have higher Health Belief Model composite scores have not improved modifiable risk factors since the index pregnancy.

Methods

There were two sources of data collected for this study. The first source was The Preeclampsia Registry (TPR) belonging to the Preeclampsia Foundation. This is a database of currently more than 5000 women who have had preeclampsia, or family members who provide data regarding a deceased female relative who experienced the disorder.

The second source of data for this study was the survey generated by the researchers - the Preeclampsia Survivor Awareness of Cardiovascular Health Risk Survey (PEACH). This was a 30-question survey divided into questions concerning the Health Belief Model and CVD risk and questions about behaviors and opinions. The questions were grouped into the 5 categories in the HBM (above). The remaining questions asked about self-reported changes in health behaviors.

For the current study, the inclusion criteria were: 1) participants were enrolled in TPR, 2) they completed designated portions of TPR enrollment survey, 3) they self-reported a personal history of at least one pregnancy with a hypertensive disorder of pregnancy (HDOP), and 4) they completed the new survey related to the Health Belief Model - PEACH. Registry entries reported by family members were excluded.

Data Collection

The Preeclampsia Registry and the PEACH study survey were approved by Advarra Institutional Review Board. The study was determined exempt from human subjects research by the Institutional Review Board of George Washington University. The invitation to participate in the PEACH survey was sent out to registry participants from the Preeclampsia Foundation via a PE Foundation newsletter article, direct emails, the registry website, and through foundation social media links. Two reminders were sent to those persons receiving email invitations at 2 weeks and 4 weeks following the initial invitation. The Preeclampsia Foundation provided selected information from de-identified TPR records for those individuals who responded to the PEACH survey. The TPR records and PEACH survey responses were linked by registry participant numbers.

Composite Awareness Score

For analysis, two composite scores were developed. First, to determine awareness of increased risk for cardiovascular disease, an awareness score was computed from selected questions in the Severity and Susceptibility sections of the survey. Five questions were included. These questions addressed the likelihood of having a heart problem (heart attack, heart disease, stroke) after preeclampsia.

Composite Health Belief Model Score

For the second score, in order to determine the potential influence of the combined effects of the Health Belief Model sub-scale components, a composite score was computed. To do this, all the sub-scale scores were added together. Each question in the five sub-scales was formatted as a likert-style item.

Counseling/Notification of Future Health Effects of PE

To determine whether or not respondents recalled having received information regarding future health risks related to their preeclampsia, a question from TPR was analyzed. Respondents answered the following question with "yes", "no", or "I don't know":

"Were you counseled about later-life health risks associated with [hypertensive disorders of pregnancy]?"

The frequencies of the responses to this question are reported.

Other Variables

The physiologic variables of mean blood pressure (calculated from self-reported systolic and diastolic blood pressures) and body mass index (BMI) (calculated from self-reported height and weight) were recorded for two different time periods. Time 1 was when the participant originally entered TPR. Time 2 was from data in TPR update that corresponded to when they completed the PEACH survey. Women who were pregnant during these time periods were excluded from analysis.

Results

The majority of respondents were between the ages of 25 and 44, white, and had completed at least some college.

Areas of Inquiry

Awareness of future cardiovascular disease risk:

There were five questions that dealt with awareness. Based on the Composite Awareness Score, participants *were* aware of their risk for future CVD (mean 21.21, SD 2.87, range 10-25, n = 666. Fifty percent of the respondents had composite scores indicating a high degree of awareness.

Post-delivery counseling regarding future CVD risk:

In TPR, participants were asked: "Were you counseled about later life health risks associated with [hypertensive disorders of pregnancy]?" Of 630 who answered the question (yes or no), 507 (80.48%) reported *not* having been informed of future risks.

Relationship between Awareness and Changes in Modifiable Risk Factors:

Of all those who answered the self-reported behavior change questions, 335 out of 617 (54.29%) reported eating more fruits and vegetables; 360 out of 617 (58.35%) reported consuming less fatty foods; and 321 out of 623 (51.52%) reported using less salt. With regard to exercise, 195 out of 665 (29.32%) reported exercising more than before. In multiple Chi Square analyses, there were no

significant relationships between the Composite Awareness Score and the self-reported changes in behavior described above.

Chi Square analyses of the Composite Health Belief Model Score were significantly related to positive health behavior changes. Higher Composite Health Belief Scores were associated with eating more fruits and vegetables, eating less fatty foods, consuming less salt, and exercising more (in each behavior analysis $p < 0.0001$).

In addition, self-reported physiologic variables (mean blood pressure [n=247] and BMI [n=301]) were examined for changes between Time 1 and Time 2 as described above. The average mean blood pressure at Time 1 was 91.94 mm Hg and at Time 2 was 91.74 mm Hg. The BMI at Time 1 was 27.22 kg/m^2 and at Time 2 was 28.02 kg/m^2 . In regression analyses, neither changes in mean blood pressure nor BMI were significantly related to either the Composite Awareness Score or to the Composite Health Belief Model Score when controlling for age and education level.

Changes in mean BP and BMI calculated from self-reported data were not significantly associated with the time interval between measurements. The average time elapsed between self-reported BP data was 877 days (n=247; range 0 – 2105 days). The average time between self-reported values used to calculate BMI (height and weight) for Time 1 and Time 2 was 889 days (n=301; range 2 – 2105 days).

Discussion

Two important findings from this study were:

1. A large proportion (80.48%) of TPR participants in this study reported not having been counseled regarding future health risks associated with hypertensive disorders of pregnancy during the peripartal period.
2. A majority of respondents to the PEACH survey demonstrated a high degree of awareness regarding the CVD risk associated with preeclampsia.

While the participants in the current study reported high levels of awareness of their risk for CVD, *Composite Awareness Scores* were *not* significantly associated with positive efforts in risk factor reduction. This suggests that awareness alone did not influence behavior change. In contrast, the *Composite Health Belief Model Score was* significantly associated with positive self-reported behavior changes. This is consistent with Health Belief Model theory, which proposes that it takes more than awareness of risk to motivate people to make behavior changes.

Another important finding was that even though participants were aware of their CVD risk and did report changes in health behaviors, there were no significant changes noted in mean BP and BMI. This was due –at least in part – to very small changes in mean BP and BMI over time among all participants. The current study did not assess the duration of self-reported behavior changes which could have an effect on the magnitude of changes reported.

Conclusions

An important finding in this study was that women with preeclampsia reported not being counseled during the peripartal period about their risk for future health issues. This observation is significant for future research and action. Other studies have reported a lack of knowledge among health care

professionals regarding the link between HDOP and later cardiovascular disease. Professional education regarding the link between PE and CVD for physicians, nurse practitioners, nurses and other health care workers is essential. Not only is the provision of patient education regarding this issue vital in the peripartal period, but appropriate follow-up care and life-long management of increased cardiovascular risk should be provided to all preeclampsia survivors.

Another important finding was that higher Composite Health Belief Model Scores, which reflected knowledge of the link between HDOP and CVD, its perceived severity, identified cues to action, and positive attitudes about healthy behavior changes, were positively and significantly associated with self-reported healthy behaviors. This suggests that providers need to take time to determine women's personal assessments of their cues to action, as well as barriers and perceived benefits of engaging in risk factor reduction.

Subsequent research on this topic should be designed for more heterogenous populations and utilize actual physiological measures rather than self-reported. Development of a specific instrument to measure awareness of cardiovascular risk should be considered. Longitudinal study of the long-term effects of positive risk factor modification on the cardiovascular health and CVD event rates among PE survivors is also warranted.

References

1. Riise HK, Sulo G, Tell GS, et al. Incident coronary heart disease after preeclampsia: Role of reduced fetal growth, preterm delivery, and parity. *J Am Heart Assoc*. 2017;6(3):10.1161/JAHA.116.004158. doi: e004158 [pii].

2. Bellamy L, Casas JP, Hingorani AD, Williams DJ. Pre-eclampsia and risk of cardiovascular disease and cancer in later life: Systematic review and meta-analysis. *BMJ*. 2007;335(7627):974. doi: bmj.39335.385301.BE [pii].

3. Brown MC. Cardiovascular disease risk in women with pre-eclampsia: Systematic review and meta-analysis. *Eur J Epidemiol*. 2013;28(1):1; 1-19; 19.

4. McDonald SD, Malinowski A, Zhou Q, Yusuf S, Devereaux PJ. Cardiovascular sequelae of preeclampsia/eclampsia: A systematic review and meta-analyses. *Am Heart J*. 2008;156(5):918-930. doi: 10.1016/j.ahj.2008.06.042 [doi].

5. Leslie MS, Briggs LA. Preeclampsia and the risk of future vascular disease and mortality: A review. *J Midwifery Womens Health*. 2016;61(3):315-324. doi: 10.1111/jmwh.12469 [doi].

6. Mosca L, Benjamin EJ, Berra K, et al. Effectiveness-based guidelines for the prevention of cardiovascular disease in women - 2011 update. *J Am Coll Cardiol*. 2011;57(12):1404-1423.

7. Staff AC, Redman CW, Williams D, et al. Pregnancy and long-term maternal cardiovascular health: Progress through harmonization of research cohorts and biobanks. *Hypertension*. 2016;67(2):251-260. doi: 10.1161/HYPERTENSIONAHA.115.06357 [doi].

8. Young B, Hacker MR, Rana S. Physicians' knowledge of future vascular disease in women with preeclampsia. *Hypertens Pregnancy*. 2012;31(1):50-58. doi: 10.3109/10641955.2010.544955 [doi].

9. Wilkins-Haug L, Celi A, Thomas A, Frolkis J, Seely EW. Recognition by women's health care providers of long-term cardiovascular disease risk after preeclampsia. *Obstet Gynecol*. 2015;125(6):1287-1292. doi: 10.1097/AOG.0000000000000856 [doi].

10. Roberts JM, Catov JM. Pregnancy is a screening test for later life cardiovascular disease: Now what? research recommendations. *Womens Health Issues*. 2012;22(2):e123-8. doi: 10.1016/j.whi.2012.01.001 [doi].

11. Abraham C, Sheeran P. The health belied model. In: Connor M, Norman P, eds. *Predicting health behavior.* 2nd ed. Open University Press; 2005:30-69.

12. Hoedjes M, Berks D, Vogel I, et al. Motivators and barriers to a healthy postpartum lifestyle in women at increased cardiovascular and metabolic risk: A focus-group study. *Hypertens Pregnancy*. 2012;31(1):147-155. doi: 10.3109/10641955.2010.544803 [doi].

13. Wilkins-Haug L, Celi A, Thomas A, Frolkis J, Seely EW. Recognition by women's health care providers of long-term cardiovascular disease risk after preeclampsia. *Obstet Gynecol*. 2015;125(6):1287-1292.

14. Leslie MS, Briggs LA. Preeclampsia Foundation position paper: Preeclampsia and Future Cardiovascular Disease. 2019.

15. Paasche-Orlow M, Parker RM, Gazmarian JA, Nielsen-Bohlman, LT, & Rudd RR. The prevalence of limited health literacy. *J Gen Intern Med*. 2005; 20(2): 175-184.

16. Wing RR. (2002). Behavioral weight control. In Wadden TA, Stunkard AJ, editors. Handbook of Obesity Treatment. New York, NY: The Guildford Press; 2002:301–316.