AN OVERVIEW OF LONG-TERM CARDIOVASCULAR DISEASE AFTER PREECLAMPSIA: INTERVENTIONS FOR AWARENESS AND RISK REDUCTION

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ABSTRACT

Cardiovascular disease (CVD) continues to be the leading cause of death throughout the world. In the United States this is also true, as CVD is the leading cause of death among women overall and during pregnancy. Additionally, preeclampsia continues to lead morbidity and mortality. A diagnosis of preeclampsia will increase a woman's risk of cardiovascular disease odds by 75% within 10 years of birth. During pregnancy and the postpartum period, as providers, there is a window of opportunity to assess and teach women of lifestyle changes preventing CVD. Unfortunately, many healthcare providers are unaware of this long-term effect and women are not assessed nor taught about the dangerous cardiovascular effects from preeclampsia. This article addresses the pathophysiology of preeclampsia, provides an overview of the long-term effects of CVD from preeclampsia, and introduces interventions needed to recognize and respond along with lifestyle preventative measures to decrease the cardiovascular risk and improve the health of women.

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1. PRECIS

Women with a history of hypertensive disorders of pregnancy are at risk for long-term cardiovascular disease. Healthcare providers should be knowledgeable in order to recognize the risk factors and respond with management of lifestyle preventative measures to decrease cardiovascular risk.

Cardiovascular disease (CVD) leads the number of deaths worldwide accounting for 31% of all global deaths[1]. CVD is ischemic heart disease caused by disorders of the heart and blood vessels, and includes coronary heart disease, hypertension, peripheral artery disease, cerebrovascular disease, deep vein thrombosis and pulmonary embolism[1]. The risk of CVD increases with tobacco use, unhealthy diet, obesity, physical inactivity, hypertension, diabetes, and hyperlipidemia[1]. In the United States (US), one in three women will die from CVD and stroke[2,3]. In more recent data, young women, less than 55 years of age, are at an increased risk of mortality from CVD[2]. Healthcare providers should understand the cause and risk contributing to atherosclerotic cardiovascular disease (ASCVD) in women in order to implement prevention strategies.

Globally, 14% of maternal mortality is related to hypertensive disorders of pregnancy[4]. However, in the U.S., hypertensive disorders of pregnancy affect 4.1 to 19.4% of pregnancy and carries a 10% maternal morbidity and mortality[4,5]. Hypertensive disorders of pregnancy numbers continue to rise as much as 25% in the past two decades[6]. Contributing to increasing maternal morbidity and mortality are history of hypertensive disorders, heart disease, advanced maternal age, and obesity. Additionally, disparities in health care contribute to the increasing maternal morbidity and mortality number as African American women are three times more likely than white women to die from hypertensive disorders of pregnancy[4].

Hypertension in pregnancy is a complex, multisystem disorder of pregnancy. In 2013, the American College of Obstetricians and Gynecologist (ACOG) Task Force recommended changes to the definitions of hypertension in pregnancy[5]. There are four subtypes of hypertension included in the definition of hypertension in pregnancy (Table 1): chronic hypertension, gestational hypertension, preeclampsia, and superimposed preeclampsia. Chronic hypertension is hypertension or a blood pressure of 140/90 mmHg or greater prior to pregnancy or prior to 20 weeks' gestation; gestational hypertension is new-onset hypertension that develops after 20 weeks' gestation without proteinuria; preeclampsia is new onset hypertension (defined by high blood pressure on two separate occasions four hours apart) that develops in previously normotensive women and is accompanied by new onset of proteinuria or in the absence of proteinuria, there is presence of multisystem involvement; chronic hypertension with superimposed preeclampsia is chronic hypertension with new onset of preeclampsia[5].

It is a well-known fact that CVD is a leading cause of death among women, but what if the woman has a history of preeclampsia. There continues to be an expanding body of research connecting preeclampsia and CVD. According to the Preeclampsia Foundation white paper, two out of three women diagnosed with preeclampsia will die from CVD[7]. A diagnosis of preeclampsia will increase a woman's odds of developing CVD related morbidity and mortality within 10 years of childbirth by 75%. [2]. Therefore, the American Heart Association (AHA) has recently included preeclampsia as a new risk factor in women for stroke, heart disease, and deep venous thrombosis in the 5 to 15 years following pregnancy[2].

Maternal mortality and morbidity is most likely to occur during the postpartum period when the woman is discharged home[8,9]. Postpartum deaths from one day to one year after birth account for more than one third of all maternal deaths[10,3]. Mortality is rare; however, 65,000 women experience morbidity due to chronic medical conditions such as CVD[11,3]. From 2011-2015, one-third (36%) of pregnancy related deaths occurred at delivery or in one week after birth[9]. The leading cause of death after delivery is heart disease and stroke occurring in one in three deaths overall [3]. High blood pressure is seen as cause of death one week after delivery and cardiomyopathy is the leading cause of death one week to one year after delivery [3]. Additionally, it is well documented that black women experience maternal morbidity two times higher and mortality three to four times more frequently than white women [12,9].

In order to mitigate these pregnancy risks, healthcare providers must understand the causes related to long term cardiovascular complications in women. Awareness of CVD after preeclampsia is lacking among the healthcare team and women[13]. During

the hospital stay, there is lack of education regarding long-term CVD effects from preeclampsia[14]. Additionally, women lack follow-up appointments typically seeing their healthcare provider once or twice during a six-week postpartum period[15]. After six weeks, women are told to follow-up with their provider, however this frequently does not happen[15]. When a woman presents to the emergency department with complaints of symptoms of CVD or worsening preeclampsia postpartum, treatment is less likely to be aggressive, medications are less likely to administered, and improper transfer to a labor and delivery unit for the best care [16]. Nurses are the key in advocating for long-term health and wellness for these women. This article will discuss the pathophysiology of preeclampsia, preeclampsia risk factors linked to CVD, provide an overview of the long-term effects of CVD from preeclampsia, and introduce interventions needed to recognize and respond with lifestyle preventative measures to decrease the cardiovascular risk and improve the health of women.

2. PATHOPHYSIOLOGY OF PREECLAMPSIA

The pathophysiology of preeclampsia remains to be completely understood, but there are some consistencies that continue. Preeclampsia develops in two stages with the initiating event occurring at placental implantation. The placenta fails to embed into the uterine wall endometrium, beginning the immunologic process, signaling monocytes and converging macrophages to the site of embedment. The macrophages then release cytokines, TNF-a and interlukin-1 causing inflammation. The inflammation causes a shallow cytotrophoblast migration or impaired remodeling of the maternal spiral arteries from the poor placental implantation therefore leading to reduced placental perfusion throughout the pregnancy. The reduced placental perfusion leads to prolonged hypoxia at the tissue site. Further hypoxia begins the prolonged inflammation cascade[17]. The second stage or placental ischemia from the hypoxic cascade causes a release of factors (cytokines and reactive oxygen species (ROS)) that further cause maternal vascular endothelial dysfunction. The endothelial dysfunction results in generalized vasospasm or constriction, decreased blood flow to organs leading to multiple system stress or failure.

When comparing the pathophysiology of preeclampsia to that of CVD, emerging data indicate the ROS plays a significant role in the progression of CVD disorders such as hypertension, hyperlipidemia, diabetes mellitus, ischemic heart disease, chronic heart failure, atherosclerosis and preeclampsia[17].The ROS generation, chemically reactive molecules formed in cells during mitochondria respiration, leads to vascular endothelial injury and atherosclerosis[17]. The injury of the endothelium from ROS decreases nitric oxide (NO) synthase activity[17]. This disturbance at the vascular wall or endothelium from injury and buildup of atherosclerotic plaques cause inadequate ability for the vessel to vasodilate thereby contributing to further vasoconstriction[17]. Decreased production of NO, a mediator of endothelial dysfunction, contributes to the development of preeclampsia. Another contributor is increased oxidative stress and elevation of ROS[18].

Even though there is no conclusive connection between CVD and preeclampsia noted in the literature, after reviewing the pathophysiologic mechanism, implantation of the placenta is interrelated with oxygen concentration and oxidative stress[18]. ROS can regulate trophoblast proliferation and invasion. Oxidative stress influences autophagy (natural way cells clean up or self-eat) and apoptosis (programmed

cellular death) and there is an imbalance in preeclampsia[17,18]. Oxidative stress is commonly seen in smoking, obesity, preeclampsia, placental dysfunction, diabetes mellitus, and cardiovascular disease[17,18].

Risk Factors Linked to CVD

In 1927, Cowin and Herrick were the first known study identifying the risk of long-term cardiovascular disease from preeclampsia[19]. The American Heart Association (2019) completed a systematic review and meta-analysis of 84 studies which included over 28 million women finding that women with hypertensive disorders of pregnancy, preterm birth, diabetes, placental abruption and still birth are at increased risk of CVD earlier in life and cerebrovascular-related morbidity and mortality when compared to normotensive women[20]. As a result of this study, a history of placental abruption and stillbirth are now added as risk factors for future CVD. Additionally, there is increased risk of delivering a small for gestational age birth weight infant or low birth weight infant [20].

Cardiovascular disease and preeclampsia share similar risk factors (Table 2). These include family history, chronic hypertension, history of preeclampsia, obesity, diabetes, metabolic syndrome, obstructive sleep apnea, hyperlipidemia, endothelial dysfunction, stress, smoking, chronic kidney disease, polycystic ovarian disease[20,5] . Increased triglycerides, low-density lipoprotein (LDL), total cholesterol and low levels of high-density lipoprotein (HDL) are markers for cardiovascular health and increased risk or preeclampsia. Similarly, the woman diagnosed with chronic hypertension is twenty-five times at risk for developing preeclampsia[21]. Smoking or rather smokeless tobacco results in vasoconstriction from the nicotine therefore increasing risk of preeclampsia[20].

Preterm birth combined with preeclampsia is a strong risk factor for CVD. Irgens et al (2001) reported women delivering preterm and diagnosed with preeclampsia have an eight-fold increase chance of mortality from CVD when compared to women who did not have preeclampsia (HR = 8.12; 95% CI: 4.31-15.33)[22]. Women with preeclampsia delivering at term accounted for 6.6 deaths per 1000 versus women with preeclampsia delivering preterm accounted for 15.5 deaths per 1000 [22].

When reviewing the timing that preeclampsia is diagnosed in pregnancy and the risk of CVD, women with a late-onset preeclampsia have a two-fold increased risk of myocardial infarction or stroke and a fourfold increased risk of hypertension later in life [23,14]. However, if preeclampsia is diagnosed early, the risk is increased to a seven or eightfold risk of ischemic heart disease, cerebrovascular disease, and peripheral arterial disease [23, 14, 24,13]. Early-onset preeclampsia is associated with poor placentation contributing to fetal growth restriction and potential for stillbirth[25]. Women with a history of early-onset preeclampsia had significantly higher blood pressures, higher BMI's, abnormal lipid profiles, higher HgA1c, and higher levels of proteinuria[26]. Women with recurrent preeclampsia have increased risk of CVD and stroke thereby leading to a shorter life span, 48.9 versus 51.9 years [27].

Diabetes mellitus increases the risk of preeclampsia two to four-fold and thereby increases the risk of CVD two-fold[20]. Diabetes is a risk factor for endothelial dysfunction. Huang et al performed a meta-analysis that included 53 prospective cohort studies to evaluate the association between impaired glucose intolerance, increased fasting glucose, increased HgA1c level and the risk of cardiovascular disease [28]. The researchers concluded

prediabetes is significantly associated with an increased risk of CVD and stroke[28]. Insulin resistance is another risk factor contributing to vasoconstriction and the development of preeclampsia and future CVD[28]. Prolonged vasoconstriction causes damage to the blood vessels increasing the risk of CVD. Therefore, high glucose level during pregnancy should be a marker for atherosclerosis and maternal morbidity.

Women with a greater body mass index and abdominal circumference measurements are at increased risk of CVD by threefold [1]. Obesity is higher in women than in men contributing to the development of coronary artery disease by 64% as compared to 46% in men [2]. Having a high BMI during pregnancy is a strong predictor of poor maternal outcomes. Obesity causes a release of inflammatory cytokines from the intrabdominal adipocytes or rather adipokines and is associated with activation of the sympathetic nervous system and renin angiotensin aldosterone system[17]. It is these cytokines that cause insulin resistance, atherosclerosis, dyslipidemia, and hypertension[17]. Obesity is common in patients diagnosed with metabolic syndrome. The criteria for metabolic syndrome include an abdominal circumference greater than 35 inches, hypertension, elevated fasting glucose of greater than 100 mg/dL, and dyslipidemia or triglycerides $\geq$ 150 mg/dL and HDL $\leq$ 50 mg/dL[2]. Women previously diagnosed with gestational diabetes are at increased risk of metabolic syndrome.

Long-term Effects of CVD from Preeclampsia

Women with a history of preeclampsia have a risk of recurrent preeclampsia and long-term cardiovascular hospitalization. Auger et al studied the association of recurrent preeclampsia and long-term cardiovascular hospitalization identifying cardiovascular hospitalizations up to 25 years after pregnancy[29]. An additional study by Brouwers et al, performed a systematic review and meta-analysis to evaluate the risk of hypertension and CVD after recurrent preclampsia[30]. The researchers concluded recurrent preeclampsia was consistently associated with hypertension (RR 2.3; 95% CI 1.9-2.9) and ischemic heart disease (R.R. 2.4; 95% CI 2.2-2.7), heart failure (R.R 2.9; 95% CI 2.3-3.7), and stroke (RR 1.7; 95% CI 1.2-2.6)[30]. The pathophysiology of CVD could be related to the inability of the cardiovascular system to recover from the previous history of preeclampsia. Within the endothelium, the intima-media thickness is increased causing vasoconstriction and a decrease in cardiac output commonly seen in women with history of preeclampsia versus women without preeclampsia [27, 25]. Overtime, the endothelium becomes inflamed and is dysfunctional which is a common problem in CVD and preeclampsia. Therefore, a history of preeclampsia can determine the morbidity of organ-systems serving as a marker for cerebrovascular damage, ophthalmic damage, and cardiomyopathy[25]. Women with a history of preeclampsia were found to have approximately double the risk of early cardiac, cerebrovascular, and peripheral arterial disease [25,30].

In a study by Ehrenthal, Maiden, Rogers, and Ball, a prospective cohort of women (N=294) diagnosed with gestational diabetes and/or hypertension were surveyed during postpartum period about patient follow-up[31]. The authors found that 168 women reported attending their six-week postpartum visit with their obstetrician (OB-GYN) and 37 women attended an office visit with their primary care provider (PCP)[31]. Of the 294, only 143 could report ever having lipid testing completed and at three months, none of the women were being treated for diabetes and 17 were

prescribed medication for hypertension[31]. The study reported the women were least likely to complete screening tests were those who had no college education or had less than a high school health literacy and no insurance[31]. This study demonstrates women are more likely to receive care from their OB-GYN rather than PCP, but yet incorporating a PCP into follow-up should occur. Secondly, social determinants of health could be related to CVD preventative care[31].

There are many new studies, describing children born from preeclamptic mothers are prone to hypertension, insulin resistance, diabetes mellitus, neurological problems, and stroke at some time during their life [25, 32,33]. Through a meta-analysis of 36 studies including 53000 individuals reviewing the effect on maternal preeclampsia on the offspring, the authors concluded higher blood pressure in children of mothers with preeclampsia and recommend early blood pressure screening in childhood [33].

Health promotion interventions

Evidence is growing regarding the relationship between preeclampsia and increased long term CVD. Many interventions exist that healthcare providers can initiate to assist in the prevention of cardiovascular disease later in a woman's life. Some successful interventions proven to be successful include risk assessment, optimal blood pressure management, weight control, diabetes mellitus management, lipid disorder management, and aspirin therapy.

When the woman with preeclampsia presents to the health care provider, a risk assessment such as the traditional Framingham risk score tool to establish the threat of CVD. The Framingham risk score estimates a 10-year risk of heart disease enabling healthcare providers to identify early diagnosis, preventative strategies, and enhanced monitoring, however, this scoring system could underestimate the risk in some women as it is used in both men and women [34]. When calculating the risk score, age, total cholesterol, HDL, blood pressure, history of smoking, and diabetes are calculated.

Management of hypertension during pregnancy has significant implication for CVD risk, the fact remains identification of high-risk women and treatment of hypertension. There are multiple studies and recommendation for the treatment of hypertension in pregnancy. In 2017, the American Heart Association (AHA) published clinical guidelines on hypertension, but there is unclear guidance as to how they apply to pregnancy[20]. According to the guidelines, achievement of a systolic blood pressure (BP) less than 120 mmHg results in significant decrease in the risk of CVD events when compared to BP management of stage 1 hypertension, systolic BP 130-139 mm Hg or diastolic BP 80 – 89 mm Hg[20]. When paired to the management of blood pressure in pregnancy, it is higher before treatment, generally systolic BP 140-160 mm Hg and diastolic BP 90-110 mm Hg. In Europe, blood pressure control is slightly tighter with treatment of systolic BP 140-150 mmHg and diastolic BP 90-100 mm Hg[20]. Nevertheless, this remains a question among healthcare providers as to when to initiate treatment. The fact remains, blood pressure screening should be completed frequently and maintaining BP less than 120mmHg systolic and less than 80 mm Hg diastolic.

Obesity is a strong predictor of adverse health outcomes. Maintaining a healthy weight such as a BMI of less than 25 kg/m^2, participating in moderate activity for at least 150 minutes per week, and eating a diet high in fruits and vegetables is the cornerstone for a healthy lifestyle[7]. Other dietary recommendations are low sodium

and low saturated and trans-fat such as recommended in the Dietary Approaches to Stop Hypertension (DASH) diet[7].

Many studies identify a higher incidence of insulin resistance in the women with preeclampsia. Increasing numbers of obesity and diabetes mellitus leads to an increase in Type 2 diabetes mellitus (T2DM). Obesity is highly correlated with hyperinsulinemia and decreased insulin receptor signaling[17]. ACOG recommends screening via a 75-gram, two-hour glucose tolerance test postpartum at six weeks, 12 weeks, and then every three years following for women with a history of gestational diabetes[35]. Screening should occur if the woman's BMI is greater than 25 kg/m^2 with additional risk factors[35]. A HgA1c should be drawn and if elevated, the woman is at an increased risk of CVD. Knowing glucose levels enables preventative treatment and diagnosing early can decrease the risk of complications.

During the postpartum visit, healthcare providers should monitor lipid levels. In women, CVD is predominately related to initiation of atherosclerosis. More women develop CVD and its complications such as myocardial infarction from erosion of the endothelium as a result of small vessel disease and atherosclerosis. Prevention of atherosclerosis is focused on reducing risk factors such as dyslipidemia. After reviewing risk factors, pharmacological therapy for the management of hyperlipidemia has been shown to decrease the risk of CVD, therefore it may be necessary to begin a statin treatment after discussions and appropriate contraceptive measures have been explored[5].

Lastly, low dose aspirin therapy is a gold standard of treatment for secondary prevention of CVD and stroke by lowering the risk of total stroke by 17% and ischemic stroke by 24% [2]. Low dose aspirin therapy is given to women at high risk for preeclampsia or a history of preeclampsia [16, 5].

Educational interventions

Nurses and healthcare providers should be familiar with risk factors and be able to educate women with a history of preeclampsia in order to decrease the long-term effects. Additionally, healthcare providers need to be aware that women do not know about the long-term cardiovascular effects of preeclampsia.

According to Hutchesson, Shrewsbury, Park, Callister, & Collins, greater than one third of women with preeclampsia are unaware of the long-term risk of cardiovascular disease[36]. Similarly, another study evaluating the effect of education on women's knowledge and self-care practice with preeclampsia noted significant results[37]. Afefy & Kamel found that women have a lack of knowledge and inadequate self-care beyond preeclampsia[37]. Yet another study by Burgess and Feliu who conducted a survey through an online social media outlet, asked women about the education or referrals they received about preeclampsia and CVD[14]. From the survey, 36.9% women did not know about preeclampsia and long-term CVD and 43.9% did not receive education to prevent CVD nor did they receive follow-up care after being diagnosed with preeclampsia[14].

Levine, Nkonde-Price, Limaye, and Srinivas, reviewed a retrospective cohort of women diagnosed with persistent hypertension or preeclampsia with severe features to determine factors associated with lower six-week postpartum follow-up rates[38]. The authors reported 52.3% of women followed up with their postpartum appointment[38]. However, young African American women and those with less than five visits prenatally were least likely

to follow-up[38]. Interestingly, those with diabetes or Cesarean delivery attended a postpartum visit. Additionally, the authors reported obese women, women with severe features of preeclampsia, and those discharged home with a prescription of antihypertensives were more likely to have persistent hypertension at six weeks[38]. The authors of this study suggest identifying these women and teaching them about their lifetime risk of cardiovascular disease. One study regarding the knowledge of providers, Traylor et al concluded physicians had the knowledge of higher CVD risk after preeclampsia, yet patient follow-up care and counseling was lacking[39].

Potential educational interventions include telephonic support, online educational modules, lifestyle intervention program, and a postpartum transition clinic. One potential intervention to assist with education is through telephonic support. Spratling et al conducted a structured CVD education by telephone to African American women and yielded CVD risk perception was significantly higher, indicating telephonic support was an effective strategy for teaching women[40].

The use of online educational modules was used in a randomized controlled trial over a period of nine months [41]. The researchers recruited 151 women with preeclampsia in the past five years to take part in online educational modules, a community forum, and communication with a life coach[41]. The control group received the internet links to learn about CVD risk reduction. The researchers concluded women had significantly greater knowledge of CVD risk factors, increased self-efficacy to eat healthy, and increase physical activity. At the end of the study, all of the women except three had normal blood pressure (<120 mmHg SBP and <80 mmHg DBP)[41]. Recommendations from this study included the possibility of targeted health apps in the future.

A similar study conducted by Berks, Hoedjes, and Raat et al evaluated the feasibility and effectiveness of a lifestyle intervention program to improve maternal risk factors for future cardiometabolic disease through a pre-post controlled design study[42]. The program consisted of computer education along with counseling over seven months. Researchers reported positive results for the lifestyle intervention program, but stated the need for a longer time period to evaluate true effectiveness[42]. The researchers concluded that health care providers should teach lifestyle changes and interventions for women with preeclampsia to prevent long-term CVD[42]. Positive outcomes from this program included weight loss, decreased amount of visceral fat, and reduction in waste to hip ratio improving long-term cardiovascular risk.

Another intervention was the development of a postpartum transition clinic to support women after hypertensive pregnancy [43]. The goals of the clinic were to implement early postpartum hypertension medical management, teach patients about their CVD risk, and transition the patient to their primary care provider. The clinic staff and providers evaluated patients that were racially and socioeconomically diverse at one, two or three appointments. Over a period of five years, 47.3% of the patients had two to three visits, increased supply of home blood pressure monitors ($p<0.0001$), attendance with a nutrition consultant, hypertensive medication adjustments, and 79.5% transitioned effectively to their primary care provider for continued follow-up [43]. Results of this program implementation indicate the further need to enhance multidisciplinary clinics in efforts to reduce CVD risk.

3. DISCUSSION

Women with preeclampsia are discharged home every day and are consistently lacking education and knowledge of the potential long-term effects of CVD from preeclampsia. Likewise, healthcare providers are not aware of the significant role CVD has after a preeclampsia diagnosis in order to educate or continue to treat the woman. There are many ideas regarding educating women, primarily through technology which hold some promise. Additionally, there are clinics that are effective in the assessing, treating, and helping these women decrease their CVD risk, however we are at the tip of the iceberg in combating CVD risk reduction after preeclampsia. ACOG and Association of Women's Health Obstetric and Neonatal Nurses (AWHONN) recommend education to these women during their postpartum time period upon discharge. However, nurses and physicians need to begin education at every visit. Much work remains regards to research and education.

Pregnancy provides is a window for the provider to teach a woman about cardiovascular health and the presence of preeclampsia is an indicator of future CVD risk. Young women that are pregnant will see a healthcare provider on a regular basis and research indicates this as a unique time to begin teaching the implementation of primary prevention strategies. It is also a time to thoroughly assess the woman and begin cardiovascular teaching prevention and lifestyle changes. Many studies note that during pregnancy and early postpartum, women are motivated and will make lifestyle changes for their health as a mother[6].

4. CONCLUSION

Women with a history of preeclampsia are at a higher risk of CVD morbidity and mortality especially within 10 years following the pregnancy[2]. Women are not taught about their increase risk by health professionals, or receive advice during the postpartum period. There is lack of follow up and yet mortality, morbidity related to pregnancy as well as cardiovascular morbidity and mortality continue to rise among women. Healthcare providers need to take the initiative to screen, teach, and play an active role in CVD prevention for all women.

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Table 1

The four hypertensive disorders of pregnancy are classified as follows:	
Chronic hypertension	hypertension of any cause that predates pregnancy or develops before 20 weeks' gestation
Gestational hypertension	new-onset hypertension that develops in a previously normotensive woman after 20 weeks' gestation in the absence of proteinuria
Preeclampsia-	new-onset hypertension that develops in a previously normotensive woman after 20 weeks' gestation and is accompanied either by new-onset proteinuria or, in the absence of proteinuria, by signs of multisystem involvement, such as thrombocytopenia
Chronic hypertension with superimposed preeclampsia	preeclampsia that develops in a woman with chronic hypertension

Table 2

Risk factors shared between Preeclampsia and CVD
Family history of cardiovascular disease and/or preeclampsia
Hypertension
Obesity
Diabetes/Metabolic syndrome/Polycystic Ovarian Syndrome
Obstructive sleep apnea
Hyperlipidemia
Endothelial Dysfunction
Stress
Smoking
Chronic Kidney disease