Review Article

Effect of Self-care Before and During Pregnancy to Prevention and Control Preeclampsia in High-risk Women

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Abstract

Our aims to examine the factors influencing self-care for the prevention and control of preeclampsia in high-risk women. The current study is a review where the researcher browsed the available databases such as PubMed, Cochrane, Medline, Google Scholar, Medscape, and relevant research published between 1980 and 2016 were studied. To search for articles, relevant Medical Subject Heading keywords were first determined (Self-care, preeclampsia, prevention.) A total of 350 related articles were first selected, and the findings of 70 were used to compile the present article. The results of the study were classified under two general categories, including (1). Counseling and screening strategies and (2) self-care strategies for the prevention and control of preeclampsia in high-risk women. Screening women at risk for preeclampsia include measures such as measuring their blood pressure, checking for signs of depression, testing for thrombosis, taking a history of preeclampsia, providing preconception counseling about the appropriate age, time of pregnancy, and encouraging weight loss in obese women. This review showed a positive relationship between knowledge about self-care for preeclampsia and its control. The factors influencing preeclampsia self-care include making lifestyle changes, having a healthy diet, learning stress management, performing exercise and physical activities, taking antioxidants, dietary supplements, and calcium and adherence to aspirin and heparin regimens. There is a positive relationship between preconception counseling, screening women at risk for preeclampsia, self-care for the prevention, and control of preeclampsia.

(1) Tweetable abstract self-care in high-risk women is strongly associated with prevention and control of preeclampsia.

Keywords: *Preeclampsia, prevention and control, self-care*

Introduction

Preeclampsia is a pregnancy-specific syndrome characterized by hypertension and proteinuria that occurs after the 20th week of pregnancy in women who have had a normal blood pressure and no protein in their urine in the past.[1,2] In the US, 15.9% of the cases of maternal mortality are caused by preeclampsia, and the condition is also considered the main cause of prenatal mortality and morbidity.[3,4] About 1%–8% of Iranian women suffer from preeclampsia.[5]

Gestational hypertension is one of the most common medical problems occurring during pregnancy. It is particularly important for pregnant women to be trained on this condition and to learn proper self-care for its prevention and control. Butler *et al*. reported that only 24% of women with gestational hypertension can manage their blood pressure.[6] A study conducted in Uganda on women with normal blood pressure who suffered from preeclampsia and severe hypertension during their postpartum period found 64% of the women to have a high level of knowledge about pregnancy-induced hypertension; however, these women had no knowledge about self-care for this condition.[7]

In India, Singh and Srivastava reported that 60.49% of women were uninformed about hypertension, and of all the women who agreed that a high salt intake is associated with hypertension, only 61.54% adhered to a low-salt diet.[8]

Although studies have shown the positive effects of self-care on controlling pregnancy-induced hypertension, there is still a lack of comprehensive resources that can help pregnant women and health-care providers take effective measures to control and prevent gestational hypertension. The present study, therefore, aims to identify

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the factors influencing the control of preeclampsia in the domains of counseling, screening, and self-care in high-risk women and to provide endorsed solutions for improving maternal and neonatal health. It is now clear that the onset of the disease is multifactorial, and interventions for management of preeclampsia will necessarily have to address a wide range of factors through lifestyle and diet modification and multidisciplinary care.

Methods

The present narrative review was conducted in five main steps, including defining the research questions, identifying relevant research, selecting relevant articles, summarizing, and categorizing the results and reporting the results. The current study is a review where the researcher browsed the available databases such as PubMed, Cochrane, Medline, Google Scholar, Medscape, and relevant research published between 1980 and 2016 were studied. To search for articles, PubMed Medical Subject Heading (MeSH) and TEXTWORDS; using EMBASE subject headings and text words relevant MeSH keywords were first determined (Self-care, preeclampsia, prevention.) A total of 350 related articles were first selected and the findings of 70 were used to compile the present article [Figure 1].

Results

The results of this study can be classified under two general categories, including (1) counseling and screening strategies and (2) self-care strategies for the prevention of preeclampsia in high-risk women [Tables 1 and 2].

Discussion

The results of the study showed that preconception counseling, screening, and self-care training can be effective in the prevention and control of preeclampsia in women at a high risk of this disease. The results are discussed in two general categories.

Counseling and screening strategies for the prevention and control of preeclampsia in high-risk women: The following section discusses some of the risk factors associated with preeclampsia and the counseling and screening strategies that can be taken to prevent and control them.

The risk factors associated with the incidence of preeclampsia

Reproductive age

The appropriate age for pregnancy can affect the pregnancy outcomes. According to a study conducted in Taiwan, the

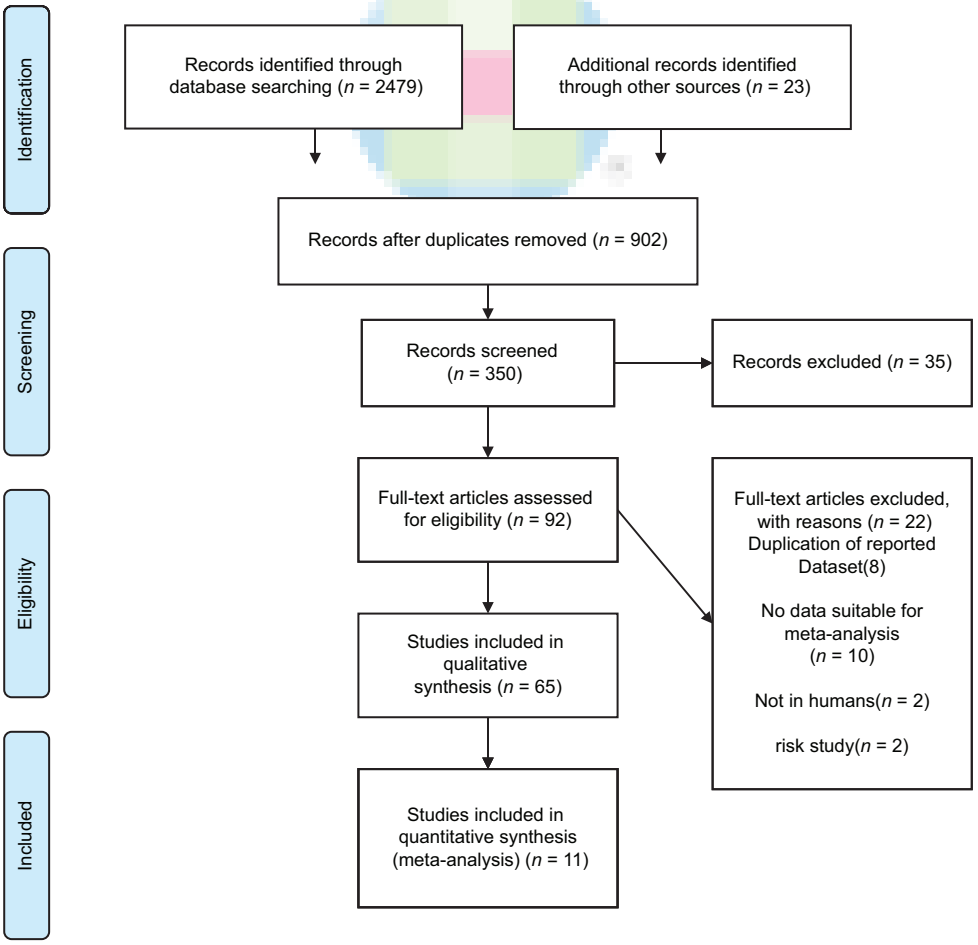

Figure 1: The effect of self-care before and during pregnancy to prevention and control preeclampsia in high-risk women

Table 1: Counselling and screening strategies for the prevention of preeclampsia in high-risk women

Category	Influential factors	Number of articles	Recommendations
Counseling and planning for pregnancy	Appropriate age	5	Recommending to get pregnant at ages 20-24; avoiding pregnancy under the age of 20 and over the age of 35; avoiding intervals of 10 years or higher between pregnancies
	Evaluating the mother's BMI	3	Recommending weight loss in obese and overweight women at interpregnancy intervals
	Planning for becoming pregnant at the right season	8	Preeclampsia is more prevalent in cold seasons and women who are at risk for the condition should be more carefully monitored
Screening	Blood pressure	1	Measuring the mean arterial pressure at the 11th-13th and the 20th-24th week of pregnancy
	Depression	2	Screening for mild, moderate, and severe depression with the available tools
	History of preeclampsia	5	Reviewing the woman's history of preeclampsia in her previous pregnancies and both the man's and the woman's family history of the condition
	Thrombosis	3	Checking for thrombophilia in women with a history of preeclampsia, especially in white women
	UTI	2	Screening UTI in the first, second, and third trimester of pregnancy

UTI=Urinary tract infection, BMI=Body mass index

Table 2: Self-care strategies for the prevention and control of preeclampsia in high-risk women

Self-care topic	Influential factors	Number of articles	Recommendations
Stress management	Relaxation; examining psychosocial stress; reducing job strain	6	stress management with a cognitive-behavioral approach, stress management, and relaxation with techniques such as yoga therapy; reducing job strain during pregnancy; reducing psychosocial stress; providing emotional support to mothers who have lost their babies from 6 months before their pregnancy to these end trimester of pregnancy
Nutrition and dietary supplements	Nutritional status; dietary supplements; taking iron, folic acid and multivitamins; complementary medicine	23	Taking calcium supplements and prescribing adequate Vitamin D supplements to patients with Vitamin D deficiency; increasing the consumption of fruits, organic vegetables and vegetable oils; the regular consumption of folate; taking antioxidants; refraining from the total elimination of salt, rather using it mildly and for flavoring foods only; avoiding drinking alcohol and caffeine at beverages; avoiding eating cold and frozen foods; reducing the consumption of fried food, coffee, processed meat and salty snacks; treating anemia
Physical activity	The importance of moving and physical activity; the recommended exercises	5	Doing recreational physical activities; stretching exercises and walking; seated exercises on a stationary bicycle and modifying the sedentary lifestyle
Adherence to the medical regimen and the prenatal care routine	Regular intake of the prescribed medications; prenatal checkups	7	Taking aspirin, heparin, and the prescribed supplements; starting treatment before the 16th week of pregnancy; more frequent prenatal checkups

prevalence of preeclampsia is associated with the mother's age. The lowest rate of preeclampsia was found to pertain to the 20–24 age group, and the prevalence of the condition was found to increase in the 35 and older age group.[9] There was a significant relationship between pregnancy after the age of 35 and gestational hypertension.[10,11] According to another study conducted in Iran (2011), the prevalence of eclampsia was reported as 6% in mothers aged <20 and 1.6% in mothers aged over 20, indicating a significant relationship between the mother's age and the relative frequency of eclampsia.[12] Birth spacing is also associated with the incidence of preeclampsia. Skjaerven *et al*. found that with inter-pregnancy intervals of 10 years or more, the risk of preeclampsia in the second and third pregnancies is similar to that in nulliparous women.[13] It is recommended for high-risk women to prevent pregnancy under the age of 20 and over the age of 35and to observe the recommended birth spacing.

Being overweight and obese

Obesity and excessive weight gain during pregnancy comprise one of the predictors of the development of preeclampsia.[14-16] In Iran, Keshavarz and Babaee reported obesity as an independent factor responsible for the incidence of preeclampsia and gestational hypertension.[17] Mostello *et al*. found that losing weight in the interpregnancy intervals reduces the risk of recurrent preeclampsia in women with a history of preeclampsia and

concluded that these women need to be encouraged to lose weight.[18] According to a study conducted in Haiti (2016), there was a significant relationship between high maternal weight and pregnancy-induced hypertensive disorders.[10] Prepregnancy weight loss in obese and overweight women of reproductive age is, therefore, recommended as an easy and low-cost health intervention.

Seasonal and climatic factors

Preeclampsia is significantly more prevalent when conception occurs during the dry season.[19] Wellington and Mulla and Shental *et al*. found that the incidence of preeclampsia increases during the cold season.[20,21] In Sweden, the prevalence of preeclampsia during the winter was almost twice the rate during other seasons.[22] A study conducted in Sudan (2015) reported the highest rate of preeclampsia to occur during the winter.[23] Wacker *et al*. in Zimbabwe found that climate change plays an important role in the incidence of preeclampsia and reported the highest rate of preeclampsia to occur at the end of the dry season and at the beginning of the rainy season.[24] In studies conducted by Subramaniam, Zahiri *et al*. and Phillips *et al*.,[25-27] no relationship was found between the incidence of preeclampsia and the season.

Appropriate screening and counseling

The following items should be carefully considered in preeclampsia screening.

Blood pressure screening

Having a high blood pressure is one of the first signs of this disease. Blood pressure screening is also crucial for women with a history of preeclampsia during pregnancy.[28] Gallo *et al*. reported the best means of screening for preeclampsia to be the measuring of the mean arterial pressure at both the 11th–13th and the 20th–24th weeks of pregnancy as compared to its measurement in only one of these periods.[29] Blood pressure screening should be conducted more carefully in women with a history of gestational hypertension.

Screening for depression

Depression is a common condition developed during pregnancy. Qiu *et al*. found that the risk of preeclampsia during pregnancy is 2.3 higher in women with mild depression compared to those without depression while moderate-to-severe depression increases the risk of preeclampsia by 3.2.[30] Kurki *et al*. reported depression to be associated with a 2.5 times higher risk of preeclampsia and anxiety with a 3.2 times higher risk.[31] Given the high prevalence of depression and its relationship with several pregnancy complications, pregnant women are recommended to be screened for depression.

Screening for personal and family history

Having a history of preeclampsia constitutes an important risk factor for the recurrence of preeclampsia.[15] Dalmáz *et al*. reported a family history of preeclampsia and chronic hypertension to be associated with the incidence of preeclampsia.[32] Preeclampsia is more prevalent in women with mothers who have a history of preeclampsia compared to those who do not have such a family history.[33] Onwudiwe *et al*. found that maternal characteristics, including ethnicity, parity, body mass index and personal and family history of preeclampsia, are known risk factors for the incidence of preeclampsia.[34] According to a study conducted in Norway, the risk of preeclampsia was two times higher in pregnant women who had become pregnant from a man who had previously had another child from a previous wife with preeclampsia than in women whose sexual partners did not have such a history.[35] Men who were themselves born from preeclamptic mothers have a two times higher chance of having children born from mothers with preeclampsia during their pregnancy compared to men who were born from normal pregnancies.[36] Examining the personal and family history of preeclampsia in both men and women should therefore be a priority.

Screening for thrombophilia

One study found a significant relationship between the factor V Leiden mutation and the severity of preeclampsia.[37] The risk of the recurrence of preeclampsia in the future pregnancies is higher in women with thrombotic defects, which is likely associated with hereditary thrombophilia. It is therefore recommended to screen for thrombophilia in white women with a history of preeclampsia as part of their preconception counseling and pregnancy management.[38] Saghafi *et al*. found that the risk of thrombophilia is higher in preeclamptic women than in women with normal pregnancies.[39] Screening for thrombosis, particularly in individuals with a hereditary history of the condition, is therefore highly recommended.

Screening urinary tract infection

The presence of urinary tract infection (UTI) in pregnancy, particularly in the third trimester, is strongly associated with preeclampsia.[40] UTI screening in the first visit of the pregnant women and repeating it at the second and third trimester of pregnancy we could decrease adverse effects of UTI such as severe PE in pregnant women.[41]

Self-care strategies for the prevention and control of preeclampsia in high-risk women

The knowledge of self-care for pregnancy-induced hypertension consists of an awareness about the skills that help prevent the incidence of the condition and includes a range of awareness on the part of the mother about the factors signaling gestational hypertension and the strategies for reducing or controlling blood pressure. A study conducted in Tanzania reported that 54% of women had some knowledge about gestational hypertension; however, none of them had any knowledge on self-care for the

condition.[42] Soya *et al*. conducted a study on nulliparous pregnant women in India found a clear relationship between knowledge about self-care and the actual control of blood pressure.[43] The following section discusses some of the items that pregnant women need to be aware of and that health-care providers should emphasize when training women on self-care for gestational hypertension.

Stress management

A study conducted in Iran (2013) recommends cognitive-behavioral stress management as a preferred treatment for reducing stress, anxiety, and depression in pregnant women.[44] Jayashree *et al*. reported prenatal yoga as an effective technique for reducing gestational hypertension and preeclampsia.[45] Leeners *et al*. found that mental stress during pregnancy was associated with a 1.6-fold increase in the risk of gestational hypertension.[46] Mental stress levels are significantly higher in women with severe preeclampsia and hypertension than in women with mild gestational hypertension.[47] There is a relationship between the loss of the baby and primary preeclampsia, and this relationship is strongest when the loss has occurred from 6 months before the pregnancy to the beginning of the second trimester of the pregnancy.[48] Marcoux *et al*. found that women with a high job strain are 2.1 times more likely to develop preeclampsia than those with a lower job strain.[49] In a study conducted by Vollebregt *et al*. in the Netherlands, job stress, anxiety, pregnancy-induced anxiety, and depression were found to have no effects on the incidence of preeclampsia or gestational hypertension.[50] It is, therefore, essential for health-care providers to examine pregnant women's stress levels and to recommend practical strategies for stress management based on their particular stressors and conditions.

Nutritional status and dietary supplements

He following section thus reviews nutritional factors influencing the prevention and control of preeclampsia in women at the risk of developing the condition.

Mother's nutrition

Various studies have recommended the increased consumption of fruits, vegetables, and vegetable oils, the regular consumption of folate and iron, the reduced consumption of fried foods, processed meat, and salty snacks and the avoidance of alcohol and caffeinated beverages as methods for the prevention of preeclampsia.[51-55] Schoenaker *et al*. proposed the consumption of fruits, vegetables, and folate during pregnancy as independent variables contributing to the prevention of preeclampsia and considered anemia and high coffee consumption during pregnancy as some of the risk factors for the development of preeclampsia.[56] Torjusen *et al*. in Norway, found women who consume organic vegetables "often" or "most often" are less likely to develop preeclampsia than women who consume these vegetables "sometimes", "rarely" or "never".[51]

In a study (2003) reported a 75% reduction in the incidence of preeclampsia with the consumption of antioxidants.[57] In the incidence of preeclampsia, refraining from a severe restriction on salt intake and an increased water intake are essential to maintaining a normal blood volume and the placental blood circulation.[24]

The role of dietary supplements

According to a systematic review and a meta-analysis carried out by Tang *et al*. in Australia, calcium supplement consumption reduces the risk of developing preeclampsia, but further investigation is required to fully support this claim.[58] In a meta-analysis of clinical trials conducted in China between 1991 and 2012, calcium supplements appear to be effective in reducing the risk of hypertension during pregnancy.[59] Vadillo-Ortega *et al*. found that the use of antioxidant vitamin supplements in combination with L-arginine supplements during pregnancy reduce the incidence of preeclampsia significantly in women at the risk of developing the condition.[60]

In a clinical trial in India, Sharma *et al*. reported the incidence of preeclampsia to be significantly lower in the group of women receiving lycopene than in the group of women receiving only placebos.[61] According to a study conducted by Cohen *et al*. in Canada, there is a significant relationship between lutein levels and the general risk of developing preeclampsia.[62]

Achkar *et al*. found that women with 25-hydroxyvitamin D levels lower than 30 n mol/L were 2.23 times more likely to develop preeclampsia than women with at least 50 n mol/L of 25-hydroxyvitamin D.[63] According to a systematic review conducted in Pakistan, Arain *et al*. found a positive relationship between Vitamin D deficiency and preeclampsia in more than half of the studies reviewed.[64] Several studies have been conducted on the effect of fish oil supplements on the prevention and incidence of preeclampsia. According to a meta-analysis conducted by Chen *et al*., the benefits of using fish oil supplements in reducing the risk of developing preeclampsia and pregnancy-induced hypertension is not yet confirmed.[65]

The role of using iron and folic acid supplements and multivitamins

In Denmark (2009), the regular consumption of folic acid and multivitamins before pregnancy and immediately after conception in women with a healthy weight is associated with a reduction in the mean incidence of preeclampsia.[66] Agrawal *et al*. in India reported that a diet rich in iron and folic acid is associated with a significant reduction in the symptoms of preeclampsia and eclampsia.[67] In a clinical trial conducted in Canada (2013), using folic acid supplements (4 mg doses of folic acid from the 8–16th week of pregnancy until the date of delivery) is effective in the prevention of preeclampsia and its side effects.[68] Saccone *et al*. in Italy found that women who received

5-methyltetrahydrofolate during the first trimester of pregnancy had a significantly lower incidence of recurrent preeclampsia, severe preeclampsia, and early-onset preeclampsia.[69]

The role of complementary medicine and traditional Chinese medicine

In Chinese medicine, a diet that helps develop a healthy vital blood circulation and strengthen the energy channels also supports the tonicity of the growing uterus. In a systematic review, however, Zhang *et al*. argued that no clinical trials have ever been conducted on this subject and the effectiveness of traditional Chinese medicine in the treatment of preeclampsia is therefore still uncertain.[70] In a cross-sectional study conducted in Taiwan, Yeh *et al*. reported that traditional Chinese medicine is becoming increasingly popular among pregnant women in Taiwan for the treatment of problems associated with pregnancy-induced hypertension and morning sickness.[71] The effectiveness of traditional Chinese medicine in the treatment of preeclampsia is still unclear.

Physical activity

In a study in Norway (2008), Women who had regular physical activity showed a 20% reduction in the incidence of preeclampsia.[72] According to a study.(2005) in New York, pregnant women who had a high level of physical activity during the year preceding their pregnancy were 78% less likely to develop preeclampsia compared to women who did not exercise at all or who had low levels of physical activity during this exact period.[73] Kasawara *et al*. found that physical exercise has a protective effect against preeclampsia.[74]

According to a clinical trial (2008) conducted in North Carolina on pregnant women with a history of preeclampsia in the previous pregnancies who also led sedentary lifestyles, walking was found to have no harmful effects during pregnancy; however, for women who were at a higher risk of developing preeclampsia, stretching exercises may have a better protective effect against the condition.[75] Kasawara *et al*. examined pregnant women with chronic hypertension and a history of preeclampsia who used stationary bicycles once a week for 30 min under the supervision of an expert and compared them to the study's control group and argued that this exercise routine is not associated with an increased risk of maternal and neonatal complications and does not interfere with the type of delivery either.[76]

Recreational physical activities, stretching exercises, walking, using stationary bicycles, and modifying the sedentary lifestyle are other measures recommended for the control and prevention of this condition.

Adherence to the medical regimen and the prenatal care routine

Low doses of aspirin[77] and calcium supplements[78] are known as the only definite ways for reducing the incidence of gestational hypertension. Antiplatelet compounds are also associated with a 17% reduction in the risk of the incidence of preeclampsia.[77] In a study conducted in Canada, (2013) found that the use of low-dose aspirin at or before the 16th week of pregnancy in women at the risk of preeclampsia reduces the risk of developing severe preeclampsia and gestational hypertension.[79] A clinical trial conducted in India (2014) found that the combined use of low-dose aspirin and antioxidants is associated with a reduced incidence of pregnancy-induced hypertension and preeclampsia.[80] In a meta-analysis, Bujold *et al*. found that using aspirin the 16th week of pregnancy is associated with a 52% reduction in the risk of developing preeclampsia compared to when using aspirin after the 16th week of pregnancy.[81] According to a 5-year review study, women with gestational hypertensive disorders made significantly fewer prenatal care visits.[82] Developing policies to encourage pregnant women at a high risk for preeclampsia to adhere to their medical regimen and to make regular and more frequent doctors' visits is, therefore, highly recommended.

Conclusions

There is a positive relationship between preconception counseling, screening women at the risk of developing preeclampsia, knowledge about self-care for gestational hypertension, and the prevention and control of preeclampsia.

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Conflicts of interest

There are no conflicts of interest.

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