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REVIEW

Nutritional Management in Pregnant Women with Preeclampsia: A Scoping Review

Yanti Hermayanti[1], Ida Maryati[1], Tetti Solehati[1], Iwan Shalahuddin[2]

[1]Department of Maternity Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, Indonesia; [2]Department of Community of Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, Indonesia

Correspondence: Yanti Hermayanti, Department of Maternity Nursing, Faculty of Nursing, Universitas Padjadjaran, Jln. Ir. Soekarno km. 21 Jatinangor, Kab, Sumedang, Jawa Barat, 45363, Indonesia, Tel +6285886549825, Email yanti.hermayanti@unpad.ac.id

Background: Hypertension during pregnancy is still the second leading cause of death in Indonesia. Most incidents are caused by delays in recognizing, bringing and taking appropriate action for pregnant women. This condition requires mutual awareness of both the mother and her family. One management that must be known together is nutritional management which can help maintain normal blood pressure.

Objective: This study aims to look for various interventions that were proven to help overcome hypertension during pregnancy.

Methods: The method used was a scoping review with the inclusion criteria of free full text articles, the last 12 years (2013–2025), and articles on the topic of nutritional management in pregnant women with preeclampsia. The exclusion criteria for this article review were articles with the type of literature review research. Article search techniques used PICO and PRISMA, using the PubMed (1797), CINAHL (472), and Sciencedirect (56824) databases. Based on data extraction, it was found that there were 10 articles that met the requirements.

Results: Nutritional management that can help overcome hypertension during pregnancy has been proven to be effective and can be used to maintain blood pressure within normal limits, in 3 ways, namely: 1) diet program with an expert; 2) consumption of supplements, and 3) consumption of specific foods such as Ajwa dates, Ambon bananas and tomatoes.

Conclusion: Nutritional strategies involving calcium intake, sodium restriction, and overall healthy dietary patterns appear to support blood pressure control in women with preeclampsia. However, variability across studies highlights the need for further research to define optimal nutritional interventions in this population.

Keywords: hypertension in pregnancy, preeclampsia, nutritional management, dietary intervention, supplements, specific foods, scoping review

Introduction

Preeclampsia is a pregnancy complication characterized by increased blood pressure after 20 weeks of gestation, accompanied by proteinuria or other signs of organ dysfunction.[1,2] This condition is a global health problem because it contributes to high rates of maternal and fetal morbidity and mortality. According to the World Health Organization (WHO), preeclampsia and eclampsia contribute to approximately 14% of maternal deaths worldwide each year, with a higher prevalence in developing countries, including Indonesia.[3]

Risk factors for preeclampsia include a history of hypertension, obesity, multiple pregnancies, extreme maternal age, and genetic factors.[4] However, the nutritional aspect is increasingly receiving attention as an important determinant. Imbalances in nutrient intake, deficiencies in micronutrients such as calcium, magnesium, vitamin D, and antioxidants, as well as high sodium consumption, are believed to play a role in the pathogenesis of preeclampsia.[5,6] Conversely, proper nutritional management has the potential to help lower blood pressure, reduce oxidative stress, improve endothelial function, and support fetal growth.[7]

Hypertension during pregnancy is a major complication for both mother and baby as it can lead to death. In developed countries, the mortality rate is 16%, while in developing countries it ranges from 9% to 26%. In Indonesia, maternal

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mortality occurs in 1110 cases and is the second leading cause of death,[8] with an incidence of hypertension in pregnancy or preeclampsia (25%) after bleeding (30%).[9] This condition occurs because the mother and her family are late in recognizing the signs and symptoms and how to manage them during pregnancy. The right strategy is needed so that mothers can quickly learn and take immediate action, including knowing how to manage their diet during pregnancy.

Preeclampsia causes maternal death of around 1.6%, newborn mortality of about 6.1%, and stillbirth of 5.7% in pregnancies afflicted by the condition, according to a retrospective cohort research carried out in 30 hospitals in different parts of Indonesia. Furthermore, preterm preeclampsia occurred in about 35.5% of cases, although severe preeclampsia accounted for the majority of cases (69%), highlighting the considerable fetal morbidity linked to this illness.[10]

Nutritional management is a non-pharmacological approach that can be combined with medical interventions in the management of preeclampsia. However, existing recommendations still vary, both in terms of the type of nutrition, the amount of intake, and the effectiveness of the intervention.[11] Therefore, a comprehensive literature review is needed to provide an up-to-date overview of nutritional strategies in the management of preeclampsia.

First, it is important to know your blood pressure during pregnancy. If, at a gestational age of ≥20 weeks, a systolic blood pressure increase of ≥140 mmHg and a diastolic blood pressure increase of ≥90 mmHg are found in two examinations with a minimum time interval of 4 hours; or at shorter intervals with a systolic blood pressure of ≥160 mmHg and a diastolic blood pressure of ≥110 mmHg, healthcare providers need to remind the mother and family about the early signs of preeclampsia.[12,13] If these conditions are neglected, both mother and baby will experience serious problems, potentially leading to death.

Other parameters to consider are urine test results and other symptoms such as: a positive result or a quantitative value >300 mg/24 hours, thrombocytopenia, impaired liver function, severe and persistent right upper quadrant or epigastric pain, headache, pulmonary edema, or kidney failure with abnormal laboratory values.[8] This condition needs to be monitored by undergoing regular checkups so that the most appropriate action can be taken.

By combining intakes of important antioxidant minerals, such as zinc, selenium, and vitamins A, C, and E, the Composite Dietary Antioxidant Index (CDAI) provided a thorough measure of dietary antioxidant capacity. Instead of measuring individual nutrient levels, CDAI offers an integrated assessment of total antioxidant consumption. Higher CDAI scores have been linked to better health outcomes, such as lower rates of sarcopenia and hyperlipidemia, as well as inverse correlations with vascular calcification markers, in large population studies like those that use data from the UK Biobank and NHANES. These results highlight the usefulness of CDAI as a worldwide dietary antioxidant screening method.[14]

There are various management options that can be implemented for pregnant women with preeclampsia. Some interventions that can be done include bed rest, diet, antihypertensive medication, and regular proteinuria level checks.[15,16] The benefits obtained are preventing the development of severe preeclampsia and eclampsia; and minimal trauma to the fetus.[17]

One important thing that mothers experiencing high blood pressure during pregnancy must also master is managing their daily nutritional patterns. Proper nutrient intake affects blood pressure,[18] which will subsequently affect the mother's overall condition. Some nutrients and dietary factors previously believed to influence the risk of preeclampsia have now been shown to have no effect on the risk, including vitamins C and E, magnesium, salt, long-chain polyunsaturated fatty acids, and zinc.[19,20]

A scoping review was chosen as the method to comprehensively identify, analyze, and synthesize existing scientific evidence. Therefore, this study is expected to demonstrate the extent of nutrition's role in preeclampsia management, while also identifying research gaps that still need to be explored.[21,22] This review aims to provide mothers, families, and healthcare professionals with an overview of the importance of nutrition and its influence on blood pressure.

Methods

The method used is a scoping review to identify literature in-depth and comprehensively, obtained from various sources using different research methods and relevant to the research topic,[21] thru the following stages: 1) identifying research questions that align with the research objectives; 2) identifying relevant literature sources from various sources; 3) selecting the obtained literature based on the research topic; 4) mapping and collecting the used literature, compiling and reporting the results of the selected literature analysis, and consulting with relevant parties. The formulation of this article review uses the PICOT technique (Population, Intervention, Comparison, Outcome, Time), as presented in Table 1, as follows:

Table 1 Formulation of the Review Using the PICOT Technique

Population (P)	Pregnant mother, preeklampsia
Intervention (I)	Nutrition management
Comparison (C)	–
Outcome (O)	Blood pressure
Time	–

Table 2 Formulation of Article Search Keywords

	Concept 1	Concept 2	Concept 3
Key Concept	Pregnant mother, preeklampsia	Nutrition management	Blood pressure
MESH Term	Pregnant women	Diet therapy	Blood pressure

Based on this technique, the question "How effective is nutritional management in reducing blood pressure in pregnant women with preeclampsia?" was formulated. The keywords used in this literature search are in English, as shown in Table 2 with the following explanation:

The three keywords in this literature search are connected using Boolean operators, namely "AND" and "OR". The selection criteria for articles in this scoping review include inclusion and exclusion criteria. The inclusion criteria for this article review include free full-text articles, articles from the last 12 years (2013–2025), and articles on the topic of nutritional management in pregnant women with preeclampsia. The exclusion criteria for this article review are articles that are literature reviews.

The information sources used for article searches in this scoping review are online databases, including PubMed, CINAHL, and Sciencedirect. The article search strategies used across various databases. The results of extracting the selected articles using the predetermined criteria are presented in the form of Figure 1, a PRISMA flowchart diagram, as follows:

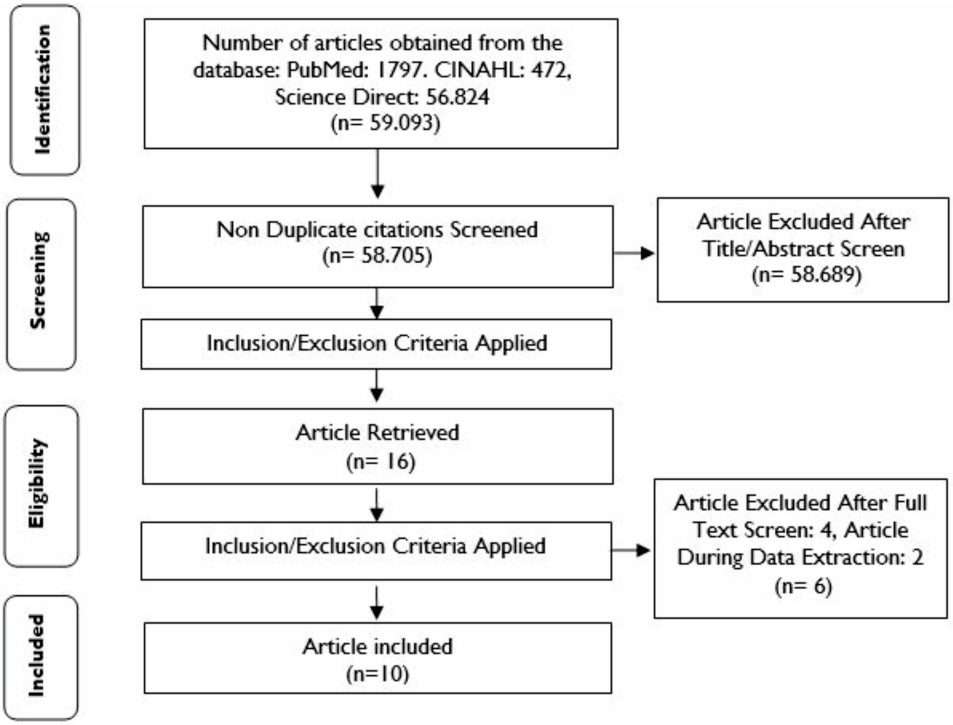

Figure 1 PRISMA Flowchart Diagram.

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Results

From the 10 articles obtained, several nutrition management-based interventions were found to lower blood pressure in pregnant women with preeclampsia, which can be seen in the following Table 3:

Discussion

Based on the study obtained for nutritional management to prevent preeclampsia in pregnant women. Three basic groupings were obtained: 1) Prevention Thru Expert-Led Diet Programs; 2) Prevention Thru Consumption of Specific Foods; 3) Prevention Thru Supplement Consumption. For a detailed explanation, please see below:

Prevention Thru Expert-Led Diet Programs

A diet program supervised by a nutritionist has been proven to lower blood pressure in pregnant women with preeclampsia. This is supported by research,[18] where participants were asked to fill out a food list table that they had to consume every day after consulting with a nutritionist, and then the researchers controlled the eating patterns by asking the participants about their eating patterns every day in the morning, afternoon, and evening. This study shows that the average systolic blood pressure values were 147.06; 143.81; and 140.38 for the first, second, and third measurements, respectively. Systolic blood pressure in pregnant women with preeclampsia significantly decreased within two weeks after the intervention (F = 31.30; p-value = 0.0001; Eta Squared = 0.676). The average diastolic blood pressure scores were 102.31, 99.00, and 91.56.

Diastolic blood pressure decreased within two weeks after the intervention (F = 19.05; p-value = 0.0001; Eta Squared = 0.560). Consuming fruits and vegetables can be a significant highlight in a planned diet program. Research conducted by[29] showed that fruit and vegetable intake is independently associated with a range of improvements in cardiometabolic health outcomes, such as BMI, waist circumference, percentage of body fat mass, and diastolic blood pressure, which are important in pregnant women with preeclampsia. Eating fruits and vegetables daily has a positive impact on fat.

Daily vegetable servings are significantly associated with lower blood pressure or BMI, while daily fruit servings are associated with proven antioxidant properties that significantly reduce blood pressure.[31] As technology advances, follow-up for diet programs can be conducted remotely via phone or application, as was done in both studies.

Micronutrient deficiencies ultimately lead to high blood pressure in both systolic and diastolic readings.[32] Protein and various minerals (calcium and potassium) are excellent for maintaining the stability of the body's metabolism. A preeclampsia diet that meets nutritional needs leads to a decrease in blood pressure in pregnant women with preeclampsia. Calcium is also important for the body, especially for pregnant women.[33] If calcium levels in the body are low, parathyroid hormone will work to maintain calcium balance in the blood. Calcium in the blood will bind to free fatty acids, causing blood vessels to thicken and harden, which can reduce the elasticity of the heart and ultimately increase blood pressure.[18]

A diet rich in protein and potassium can lower blood pressure in pregnant women with preeclampsia. Potassium in the body conducts nerve impulses along with the release of energy from proteins, carbohydrates, and fats during body metabolism.[18] Increased potassium levels in the blood will balance sodium levels and lower urinary sodium levels, thus preventing high blood pressure in hypertensive patients. With sodium balance achieved, edema in pregnant women with preeclampsia can be reduced.[18,34] Beside consuming high-protein and potassium foods, a low-sodium diet can be one of the therapeutic alternatives in lowering blood pressure in pregnant women with preeclampsia.

Protein aids in energy metabolism and vascular endothelial function, hence contributing to hemodynamic stability during pregnancy. A combination of protein and potassium has been shown to possibly lower the risk of prenatal hypertension and enhance blood pressure management in preeclampsia.[11,20]

This scoping review summarizes existing research on the food patterns linked with blood pressure management in pregnant women with preeclampsia. The findings emphasize the importance of targeted nutritional intake including salt management, enough protein, calcium, and important micronutrients in maintaining blood pressure stability and limiting

Table 3 Review of Selected Article Results

Article	Research Objectives	Population and Sample	Type of Research	Intervention/Procedure	Results
[23]	To evaluate the effect of consuming 7 Ajwa dates daily on the prevention of preeclampsia.	**Population**: Patients at Sitti Khadijah 1 Muhammadiyah Hospital, Makassar **Sample**: Control group = 10 people, intervention group = 30 people	Randomized Controlled Trial (RCT)	**Intervention group**: Initially, participants were facilitated thru counselling sessions where the researcher provided information about the risks of preeclampsia, preeclampsia prevention management, and the benefits of consuming 7 Ajwa dates every morning for overall health and pregnancy. Leaflets containing information about preeclampsia and Ajwa dates were also given to the participants. Additionally, participants were also given diary sheets to record their daily Ajwa date intake for 8 weeks. 49 Ajwa dates were also provided each week. **Control group**: Participants were facilitated thru counselling sessions that informed them about the risks of preeclampsia and its preventive management. Additionally, participants were encouraged to consume nutritious foods, avoid fast food, and increase their intake of fruits (except dates) and vegetables. A leaflet containing information about preeclampsia and nutritional needs in pregnant women.	The intervention group showed a significant reduction in MAP and ROT after 8 weeks of intervention with a p-value < 0.05, which means Ajwa dates have great potential in lowering MAP and ROT in pregnant women at risk of preeclampsia and can also contribute to preventing the development of preeclampsia.
[24]	To determine the effect of giving Ambon bananas to pregnant women with preeclampsia.	**Population**: Pregnant women with preeclampsia in the working area of the Bandaharjo Community Health Center. **Sample**: 20 pregnant women with preeclampsia (10 in the intervention group, 10 in the control group)	Quasi-Experimental using pre- post control design	The intervention group was given 400 grams of Ambon bananas per day, divided into 200 grams in the morning and 200 grams in the evening.	The results of the paired *t*-test showed that giving Ambon bananas had an effect on lowering systolic blood pressure in the intervention group with a p-value of 0.0001 and diastolic blood pressure with a p-value of 0.031, which means there was a significant effect of giving Ambon bananas on pregnant women with preeclampsia.
[25]	This study aims to determine the effect of tomato juice on reducing blood pressure in pregnant women with gestational hypertension.	**Population**: The target population for this study is pregnant women in their first, second, and third trimesters with high blood pressure in the working area of the Magelang Public Health Center. **Sample**: The sample selected was 30 people using Consecutive Sampling, divided into an experimental group (15 samples) and a control group (15 samples).	Quasi-Experimental	Fresh red tomatoes (lycopersium commune) with a potassium content of 610.14 mg/kg and antioxidants of 5.68 mg/mL were used based on laboratory test results conducted at the Integrated Research and Testing Laboratory of Gadjah Mada University Yogyakarta (LPPT UGM) from October 12, 2016, to November 2, 2016. Red tomatoes are made into 250 mL of juice, which is made from 200 grams of tomatoes, 100 mL of water, and 5 grams of granulated sugar. Tomato juice was administered once a day for 14 consecutive days; the control group received no intervention.	The results of the study using the Wilcoxon test showed that in the group of pregnant women who received the intervention, after receiving the intervention of tomato juice at a dose of 250 mL/day for 14 days, there was a decrease in systolic and diastolic blood pressure with a p-value of 0.001 (<0.05), indicating a significant difference in blood pressure before and after the intervention.

(*Continued*)

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Table 3 (Continued).

Article	Research Objectives	Population and Sample	Type of Research	Intervention/Procedure	Results
[26]	This study was designed to observe the effect of multiple micronutrient supplements on pregnancy outcomes in preeclamptic women with low body weight.	**Population**: The population for this study consisted of primigravida women with preeclampsia whose BMI was less than the gestational age requirement retrospectively at their first antenatal visit, based on their antenatal records. **Sample**: The sample for this study consisted of 463 people.	Randomized Clinical Trial	Participants from both groups received conventional treatment for preeclampsia and IFA daily. Group 2 participants received an additional 75-gram sachet of high-energy LNS-PLW supplement daily until delivery.	Daily use of LNS-PLW before delivery, along with IFA and routine follow-up, can improve pregnancy outcomes by increasing live births and gestational age, as well as reducing maternal complications such as eclampsia and the number of cesarean deliveries.
[11]	This study aims to test the hypothesis that calcium supplementation before and in early pregnancy (up to 20 weeks of gestation) prevents the development of preeclampsia.	A population of 1335 women participated in the study to receive calcium or a placebo; 331 of the 678 participants in the calcium group and 320 of the 677 participants in the placebo group became pregnant. 298 of the 678 and 283 of the 677 experienced pregnancies beyond 20 weeks of gestation.	Randomized Controlled Trial (RCT)	Participants from two groups were encouraged to consume calcium supplements or a placebo. Participants were unaware of whether the medication they were taking was calcium or a placebo. The procedure was performed over 20 weeks.	Calcium supplementation initiated before pregnancy and continued until 20 weeks of gestation, compared to placebo, did not show a significant reduction in the incidence of recurrent preeclampsia.
[27]	This study aims to test whether 30 mg of iron plus folic acid or some micronutrients during pregnancy reduces the risk of pregnancy-induced hypertension.	17,770 nulliparous pregnant women were registered from 5 counties in northern China.	Randomized Controlled Trial (RCT)	All participants, who were pregnant women, were enrolled in the trial before 20 weeks of gestation. The research criteria are all pregnant women aged at least 20 years and who have not consumed micronutrient supplements other than folic acid in the previous 6 months. In this study, participants had their hemoglobin measured at enrollment and those with hemoglobin levels <10.0 g/dL were excluded. All participants recorded their menstrual periods 2 months or more before enrollment. Gestational age is calculated based on the last menstrual period. Women were randomly assigned to the FA group (400 μg folic acid), the IFA group (400 μg folic acid and 30 mg iron), or the MMN group (400 μg folic acid, 30 mg iron, and 13 additional vitamins and minerals) and included in the group	Overall, there was no significant difference in gestational hypertension between the supplement groups. However, among pregnant women aged 20–24 years, supplementation with multiple micronutrients containing iron was associated with a lower risk of gestational hypertension compared to folic acid supplementation alone.
[28]	To identify the effect of vitamin D3 supplementation during pregnancy on the risk of preeclampsia and to determine the dose effect in achieving normal vitamin D3 levels.	All pregnant women who attend check-ups at King Fahad Medical City Hospital. **Sample**: Patients who meet the inclusion criteria: mother's age 20–40 years, singleton pregnancy with gestational age < 13 weeks, willing to accept gestational age < 13 weeks, willing to receive antenatal care at King Fahad Medical City antenatal clinic, and willing to sign written consent.	Randomized Controlled Trial (RCT)	All samples were randomly divided into 2 groups thru statistical calculation. Subject group 1 was prescribed a Multivitamin Multimineral supplement containing 400 IU of vitamin D3 per tablet once a day. Group 2 was prescribed 4000 IU of vitamin D3 (40 drops daily). The intervention begins at 13 weeks of gestation. The results of the study were analyzed based on the number of preeclampsia patients in both groups and at what gestational age the symptoms appeared.	A comparison of the two groups showed that the group receiving 4000 IU vitamin D supplements reported significantly fewer cases of preeclampsia during the study period compared to patients receiving 400 IU vitamin D.

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[18]	To determine the effectiveness of the preeclampsia diet program on reducing blood pressure in pregnant women.	**Population**: All pregnant women experiencing preeclampsia at the Ciputat Health Center in South Tangerang. **Sample**: Twenty pregnant women who met the criteria and completed the intervention were included in this study using purposive sampling.	Quasi Experimental with pre-experiment al one group with Pre-test and Post-test design	The dietary program intervention was conducted for two weeks. First, the researcher explained the diet program, its benefits, and how participants would follow the diet program. Participants were asked to fill out a table listing the foods they should consume daily. The researchers controlled the dietary patterns by asking participants about their eating habits every day in the morning, afternoon, and evening.	The average systolic blood pressure values were 147.06; 143.81; 140.38 for the first, second, and third measurements. Systolic blood pressure in pregnant women with preeclampsia decreased significantly within two weeks after the intervention (F= 31.30; p-value=0.0001; Eta Squared=0.676). The average diastolic blood pressure scores were 102.31, 99.00, and 91.56. Diastolic blood pressure decreased within two weeks after the intervention (F= 19.05; p-value= 0.0001; Eta Squared = 0.560).
[29]	To describe the effectiveness of lifestyle behaviors in terms of nutritional fulfillment in pregnant women with preeclampsia at 6 months of gestation.	**Population**: 2652 pregnant women diagnosed with preeclampsia, aged >18 years, from six hospitals in metropolitan Sydney. **Sample**: 484 pregnant women diagnosed with preeclampsia, aged >18 years, from six hospitals in metropolitan Sydney.	Randomized Controlled Trial (RCT)	In this study, pregnant women with preeclampsia were given a daily vegetable intake of two servings (IQR 2.0), with only 9% (N=44) meeting the recommended five servings per day. Fruit was consumed with a daily median of one serving (IQR 1.0), with 46% meeting the recommendation of two servings of fruit per day (N=220). The types of vegetables and fruits given are free according to preference.	The research findings indicate that fruit and vegetable intake is independently associated with a range of improvements in cardiometabolic health outcomes, such as BMI, waist circumference, percentage of body fat mass, and diastolic blood pressure, which are important for pregnant women with preeclampsia. Daily servings of fruits and vegetables have a positive impact on fat. Daily vegetable servings are significantly associated with lower blood pressure or BMI, while daily fruit servings are associated with proven antioxidant properties that significantly reduce blood pressure. Based on the findings of this study, interventions targeting fruit and vegetable intake in pregnant women with preeclampsia have the potential to optimize cardiometabolic health (particularly blood pressure) and mitigate the increased risk of CVD.

(*Continued*)

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Table 3 (Continued).

Article	Research Objectives	Population and Sample	Type of Research	Intervention/Procedure	Results
[30]	To determine the effect of vitamin D supplementation on reducing the likelihood of recurrent preeclampsia.	**Population**: Pregnant women recorded at the Department of Obstetrics and Gynecology of the Timis County Emergency Hospital "Pius Brinzeu" during the period 2018–2022. **Sample**: 198 pregnant women at risk of preeclampsia were divided into three study groups based on vitamin D supplementation during pregnancy: No Supplementation (n=59), Low Dose (n = 63), and High Dose (n = 76).	Observational single-centric Case-control study	A total of 59 pregnant women with a history of preeclampsia did not take vitamin D during pregnancy, 63 pregnant women took a low dose of vitamin D, which was 2000 units per day, while 76 pregnant women were given a high dose of vitamin D supplement at a dose of 4000 units per day during the first trimester of pregnancy. Vitamin D supplements are given orally until 36 weeks of gestation.	The research results show that 20.3% of pregnant women who do not take vitamin D develop preeclampsia. Compared to pregnant women who take vitamin D supplements during pregnancy, preeclampsia occurs in 11.1% of pregnant women who take 2000 units of vitamin D and 6.6% in pregnant women who take 4000 units of vitamin D. Proteinuria is more frequently found in the preeclampsia risk group that did not take vitamin D supplements during pregnancy. Similarly, for systolic and diastolic blood pressure values, pregnant women who did not consume vitamin D supplements had higher blood pressure compared to pregnant women who did consume vitamin D. There was no significant change in blood pressure for pregnant women who consumed either low-dose (2000 units) or high-dose (4000 units) vitamin D. It can be concluded that vitamin D supplementation during pregnancy can help prevent gestational hypertension and preeclampsia.

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disease development. This study provides an evidence-based framework for incorporating dietary measures into non-pharmacological preeclampsia therapy in clinical settings.

Prevention Thru the Consumption of Specific Foods

There are specific foods that have been researched specifically with certain portions. One of them is Ajwa dates. In a study conducted by,[23] consuming 7 Ajwa dates every morning showed a significant reduction in Mean Arterial Pressure (MAP) and Roll-Over Test (ROT) after 8 weeks of intervention, with a p-value < 0.05. This indicates that Ajwa dates have great potential in lowering MAP and ROT in pregnant women at risk of preeclampsia and can also contribute to preventing the development of preeclampsia.

Researchers explain that this happens because Ajwa dates contain potassium and magnesium. Potassium and magnesium are essential minerals that play a role in controlling blood pressure, maintaining a normal heart rhythm, and muscle contractions. Potassium also acts as a primary regulator of blood vessels, maintaining the elasticity of arterial walls and thus preventing blood vessel damage in high blood pressure.[35] Additionally, the magnesium in Ajwa dates also functions to activate the Na+/K+ pump, which impacts a decrease in diastolic blood pressure.

Conversely, the vasodilator activity of the flavonoids contained in Ajwa dates also contributes to lowering blood pressure. As we know, endothelial dysfunction has a complex relationship with hypertension, which precedes the development of pathological conditions in the cardiovascular system.[36] Therefore, improved endothelial function can contribute to lower blood pressure. High consumption of flavonoid-rich foods can prevent cardiovascular disease, which has been proven pharmacologically and thru epidemiological studies.

Additionally, Ambon bananas can also lower blood pressure in pregnant women with preeclampsia. Giving 400 grams of Ambon bananas daily, divided into 200 grams in the morning and 200 grams in the evening, showed a decrease in systolic blood pressure in the intervention group with a p-value of 0.0001 and diastolic blood pressure with a p-value of 0.031, indicating a significant effect of Ambon banana consumption on pregnant women with preeclampsia. Organic compounds in bananas act like ACE inhibitors. ACE inhibits the release of angiotensin-2, a substance that causes increased blood pressure thru vasoconstriction. ACE is found in bananas, so potassium-rich foods like bananas can help lower blood pressure.[37]

Besides Ajwa dates and Ambon bananas, consuming tomatoes can also lower blood pressure in pregnant women. In the research,[38] After receiving a 250 mL/day dose of tomato juice intervention for 14 days, there was a decrease in systolic and diastolic blood pressure with a p-value of 0.001 (<0.05), indicating a significant difference in blood pressure before and after the intervention. Tomatoes are a type of vegetable and fruit rich in vitamin C, vitamin E, potassium, fiber, and protein. Potassium in tomatoes can lower sodium in urine and water thru diuretics, thus reducing blood pressure.[38]

Ripe tomatoes contain bioactive nutrients such as tocopherol, phenolics, glycoalkaloids, and flavonoids. They also play a role in maintaining fluid balance and regulating blood pressure. In addition, tomatoes contain lycopene. Lycopene lowers blood pressure thru its role as an antioxidant. Lycopene prevents ROS (reactive oxygen species) free radicals that cause oxidative stress, which then triggers the production of nitric oxide in the endothelium and improves blood vessel function, resulting in lower blood pressure. Antioxidants also have an effect on preeclampsia.[39]

Prevention Thru Supplement Consumption

During pregnancy, mothers need a higher intake of nutrients for the fetus to develop optimally, be born healthy, and grow and develop without hindrance. The food consumed daily is often insufficient to provide all the nutrients needed by pregnant women. To meet these needs, supplements can be an alternative for pregnant women, especially for meeting micronutrient needs such as iron, vitamin D, calcium, etc.

In the research,[26] showing results that the administration of lipid-based supplements with a composition of carbohydrates, protein, fat, vitamin A, vitamin D, vitamin K, vitamin E, vitamin C, vitamin B1, vitamin B2, vitamin B3, vitamin B5, vitamin B6, vitamin B7, vitamin B9, vitamin B12, iron, calcium, zinc, copper, selenium, iodine, magnesium, phosphorus, potassium, and manganese, combined with conventional preeclampsia treatment and IFA (iron and folic

acid), can improve pregnancy outcomes by increasing live births and gestational age, as well as reducing maternal complications such as eclampsia and the number of cesarean deliveries.

In line with that research, the study[40,41] also reported that administering 4000 IU of vitamin D resulted in significantly fewer cases of preeclampsia compared to patients who received 400 IU of vitamin D. The study,[30] He also explained that 20.3% of pregnant women who did not take vitamin D developed preeclampsia. Compared to pregnant women who took vitamin D supplements during pregnancy, preeclampsia occurred in 11.1% of pregnant women who took 2000 units of vitamin D and 6.6% in pregnant women who took 4000 units of vitamin D.

Proteinuria is more frequently found in the preeclampsia risk group that did not take vitamin D supplements during pregnancy. Similarly, systolic and diastolic blood pressure values were higher in pregnant women who did not take vitamin D supplements compared to those who did.[42] However, there were no significant changes in blood pressure for pregnant women taking either low-dose (2000 units) or high-dose (4000 units) vitamin D. From the explanation above, it can be concluded that taking supplements during pregnancy can help prevent gestational hypertension and preeclampsia.

The effectiveness of supplement administration in pregnant women with preeclampsia depends on various factors, including age and Hb levels. As in the case in the study[27] which shows that there was no significant difference in pregnancy-induced hypertension (PIH) between the supplement groups. However, compared to FA (folic acid), supplementation with MMN (folic acid, iron, and 13 additional vitamins and minerals) or IFA (iron and folic acid) during the prenatal period can reduce the risk of PIH in younger women, and supplementation with IFA is associated with a decreased risk in those with lower education levels.[43] Among women with high hemoglobin, compared to the IFA or FA groups, MNN was associated with a decreased risk of PIH. In addition to age and Hb levels, adherence to taking supplements and the quality of preeclampsia management can also be factors.[44]

In the research,[11] The results showed that calcium supplementation initiated before pregnancy and continued until 20 weeks of gestation, compared to placebo, did not significantly reduce the incidence of recurrent preeclampsia. However, the finding of a greater reduction in preeclampsia with calcium supplementation in the per-protocol analysis of participants with adherence greater than 80% suggests that suboptimal adherence may play a role.

Additionally, the low prevalence of severe complications is expected because both groups received high-dose calcium from 20 weeks of gestation, which is known to reduce severe preeclampsia complications. The high quality of service received as a result of participating in this trial may also contribute to reducing adverse outcomes, as illustrated by the fact that, despite a high prevalence of prior eclampsia (19%) in the overall sample, only 1.4% of participants in the calcium group and 1.8% in the placebo group experienced eclampsia during the trial.

Implications of Health Issues Related to the Case Phenomenon

Beside blood pressure monitoring, early prevention of preeclampsia can be done thru nutritional dietary therapy such as consuming green vegetables, side dishes, and fruits. Treatment for preeclampsia can be done thru pharmacological and non-pharmacological methods. Pharmacological treatment can be done using magnesium sulfate, aspirin, and others. Non-pharmacological treatment can be done, for example, thru nutritional management for pregnant women, such as providing a high energy intake (eg, saturated and unsaturated fatty acids, vitamin C, potassium, and magnesium intake).

The nutritional status of pregnant women plays an important role in the growth and development of the fetus. A diet rich in protein and potassium can lower blood pressure in hypertensive patients.[45] Potassium in the body conducts nerve impulses and releases energy from proteins, fats, and carbohydrates during metabolism. Increased blood potassium levels will balance sodium levels and lower urinary sodium levels, thus avoiding increased blood pressure in hypertensive patients.[46] Beside consuming high-protein and potassium-rich foods, a low-sodium diet and physical activity can be used as a therapy for hypertension.

Limitations

This study has several limitations that need to be considered when interpreting the results. First, the literature specifically addressing nutritional management in pregnant women with preeclampsia is still limited and unevenly distributed, so the information obtained cannot comprehensively describe all aspects of nutritional interventions. Some relevant articles were also not fully accessible, potentially leading to missed data.

With these limitations, the results of this study need to be interpreted carefully and serve as a basis for further research that is more focused, comprehensive, and contextual, in line with the needs of the pregnant population.

Conclusions

Death from hypertension during pregnancy can be prevented thru various activities such as regular checkups, knowing the signs and symptoms, and managing nutrition to control hypertension during pregnancy by following a diet program with an expert, taking supplements, and consuming specific foods like Ajwa dates, Ambon bananas, and tomatoes. Nutritional strategies involving calcium intake, sodium restriction, and overall healthy dietary patterns appear to support blood pressure control in women with preeclampsia. However, variability across studies highlights the need for further research to define optimal nutritional interventions in this population.

These three methods have been proven effective in lowering blood pressure in pregnant women, so it is recommended that healthcare workers share the results of research that has been proven to help stabilize blood pressure during pregnancy and that mothers and their families implement these methods by choosing interventions that are appropriate for their conditions and needs.

Disclosure

The authors report no conflicts of interest in this work.

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