

Review Article

Interventions to prevent hypertension in pregnant women: A systematic review

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ABSTRACT

Introduction: Pre-eclampsia is one of the serious complications of pregnancy with a high incidence rate, which is about 5-8% in pregnancies worldwide. Although often experienced by pregnant women, the aetiology of pre-eclampsia is still largely unknown. This systematic review article aims to conduct a systematic review of various interventions that have been tested to prevent hypertension in pregnant women.

Methods: This systematic review article was conducted based on literature obtained from several databases SAGE Journals, ProQuest, PubMed, Scopus, and ScienceDirect by synthesising relevant research articles on hypertension prevention interventions in pregnant women using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist method.

Results: The research results of this systematic review identified 6 articles published between 2019 and 2024. The articles included in this systematic review included studies conducted in 3 geographical regions, including: Asia, America, and Europe. Some of the interventions included in these studies include the development of educational mobile apps on pre-eclampsia for pregnant women, provision of educational tools such as pamphlets and videos, dietary management, and evaluation of low-dose aspirin and probiotics

Conclusion: Several hypertension prevention interventions that can be implemented in the care of pregnant women include education on risk factor management, lifestyle modification, and pharmacological therapy.

Keywords: pregnancy; pre-eclampsia; hypertension prevention

INTRODUCTION

Pre-eclampsia is one of the serious complications of pregnancy with a high incidence rate, which is around 5-8% in pregnancies worldwide (Mamuroh & Nurhakim, 2023). Although often experienced by pregnant women, the aetiology of preeclampsia is still largely unknown. Pre-eclampsia is characterised by an increase in blood pressure and the presence of protein in the urine after the 20th week of pregnancy (Astuti et al., 2024). This condition not only threatens the health and safety of the mother, but can also have a negative impact on foetal development, such as premature birth, low birth weight, and foetal death (Osman et al., 2023). More than 4 million pregnant women worldwide experience pre-eclampsia each year. Each year, it is estimated that between 50,000 and 76,000 pregnant women and 500,000 babies die from pre-eclampsia (Xia et al., 2022). Pre-eclampsia is one of the leading causes of foetal morbidity and mortality and accounts for 15-20% of maternal deaths worldwide (Chang et al., 2023).

In Indonesia, pre-eclampsia is a significant health problem with an incidence of 128,273 cases in a year or about 5.3% of all pregnancies (Ristyaningsih et al., 2018). This high incidence

suggests the need for effective and evidence-based preventive interventions to reduce the risk and impact of pre-eclampsia in pregnant women. Various studies have been conducted to understand the risk factors and mechanisms underlying the occurrence of pre-eclampsia, but effective prevention is still an area that needs to be developed. Pre-eclampsia prevention involves interventions that focus on managing risk factors and lifestyle modifications, such as dietary management, weight control, and specific supplementation (Ekholuenetale et al., 2020). In addition, pharmacological approaches are also explored to reduce the risk of pre-eclampsia in high-risk pregnant women. This systematic review article aims to conduct a systematic review of various interventions that have been tested to prevent pre-eclampsia in pregnant women. By evaluating the effectiveness of the various interventions that have been conducted, it is expected to provide clearer guidance for health practitioners and pregnant women in managing and preventing pre-eclampsia.

METHODS

Design

The design of this study was a systematic review conducted by synthesising relevant research articles on hypertension prevention interventions in pregnant women using The Centre for Review and Dissemination and Meta-Analyses (PRISMA) checklist method as an evaluation and determination of study completion. This study did not perform meta-analysis on quantitative data.

Search Strategy

The data used in this study came from secondary data from

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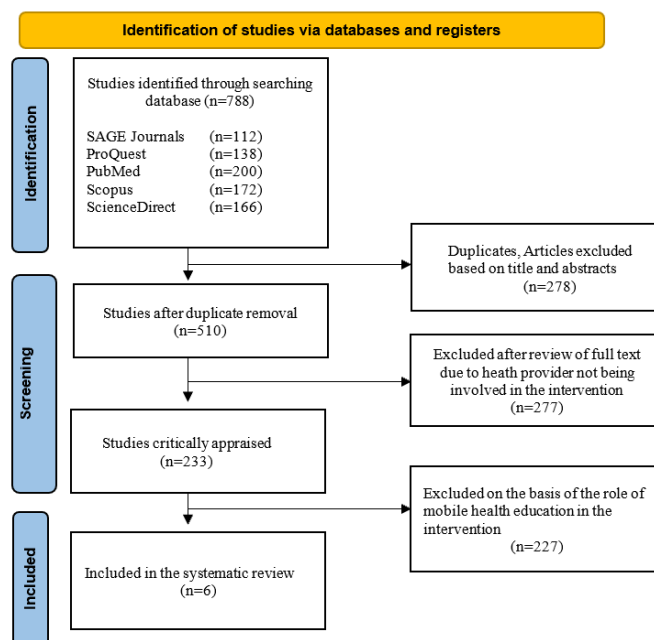


Figure 1. PRISMA Flowchart

previous studies, not from direct observation. Secondary data sources consisted of reputable international articles with predetermined themes from the SAGE Journals, ProQuest, PubMed, Scopus, and ScienceDirect databases in April 2024. Articles were searched using the keywords “Pre-eclampsia” OR “Gestational hypertension” AND “Intervention” OR “Education” OR “Coaching” AND “Pregnancy” OR “Pregnancy women.”

Study Selection

The inclusion criteria in this study included all articles describing hypertension prevention interventions in pregnant women. Inclusion criteria using PICOT are given in Table 1. Based on the results of the literature search, researchers identified 788 articles that matched the specified keywords and were obtained from various databases: SAGE Journals (n=112), ProQuest (n=138), PubMed (n=200), Scopus (n=172), and ScienceDirect (n=166). After careful examination, duplicate entries were detected, resulting in the removal of 278 identical articles, leaving 510 articles. Researchers then filtered based on titles that matched the research topic, 277 articles were excluded because they did not meet the criteria, leaving 233 articles. Assessment of the suitability of these remaining articles based on the overall manuscript and its conformity with the eligibility criteria resulted in six articles that were eligible for inclusion in the systematic review. The results of the article selection process are illustrated in Figure 1.

Risk of Bias

The method used to analyse and avoid the risk of bias in this study involved the use of The Joanna Briggs Institute (JBI) Critical Appraisal for several types of studies used in this study Quasi-experimental studies and randomised control and trial (RCT). Criteria ratings were marked with a value of “yes”, “no”, “unclear”, or “not applicable”. If at least 50% of the studies met the critical appraisal criteria with a cut-off point value agreed by the researchers, then the study was included in the inclusion criteria.

Quality Appraisal

The assessment was carried out based on The Joanna Briggs Institute (JBI) Critical Appraisal on the inclusion and exclusion criteria of six articles used in the systematic review. To assess the quality of articles, the first thing to do is to choose the tools in JBI, which are; checklists for analytical cross-sectional and cohort studies, and then evaluate according to the criteria on the checklist and set a score.

Data Analysis

Three independent reviewers collaboratively synthesized qualitative data and conducted discussions in evaluating selected studies. This systematic review records all interventions incorporating the results of previous studies.

RESULTS

The research results of this systematic review identified six articles published between 2019 and 2024. The articles included in this systematic review included studies conducted in three geographical regions, including: Asia, the Americas and Europe. Some of the interventions included in these studies include the development of educational mobile apps on pre-eclampsia for pregnant women, provision of educational tools such as pamphlets and videos, dietary management, and evaluation of low-dose aspirin and probiotics (Table 2).

DISCUSSION

The research results presented in this article show that various interventions that have been tested to prevent pre-eclampsia in pregnant women have varying effectiveness. Some of the intervention methods include the use of mobile-based educational apps, administration of probiotics during pregnancy, education with pamphlets and videos, and dietary or lifestyle modifications.

Studies show that the use of mobile-based educational applications can effectively improve pregnant women’s knowledge about pre-eclampsia. This mobile application

Tabel 1. PICOT

PICOT Framework	Inclusion Criteria	Exclusion Criteria
Population	Pregnant Woman	Children, teenagers, women, elderly
Intervention	Education, counselling and management of pre-eclampsia prevention strategies	Does not discuss the provision of pre-eclampsia prevention interventions to respondents
Comparison	Comparing the effectiveness of different interventions to prevent pre-eclampsia in pregnant women.	-
Outcome	Effectiveness of interventions in preventing pre-eclampsia	-
Time	2019-2024	Before 2019
Language	English	Languages other than

Tabel 2. Result of systematic review of interventions to prevent hypertension in pregnant women

No	Authors, year, country	Interventions	Findings
1.	Parsa et al., 2019 Iran, Asia	The intervention in this study involved the development of a mobile application specifically designed to provide educational information about pre-eclampsia to pregnant women. The app covered important topics such as the definition of pre-eclampsia, risk factors, complications, and signs and symptoms to be aware of. Respondents consisted of pregnant women who were divided into an intervention group and a control group. The intervention group was given access to use the mobile app, while the control group did not receive the intervention. Participants' knowledge was evaluated before and after the intervention through a questionnaire that included questions related to pre-eclampsia.	The results of this study showed that the use of a mobile-based educational application was effective in improving pregnant women's knowledge about the symptoms, signs, and complications of pre-eclampsia. There was a significant increase of 63% in the mean knowledge score after the intervention in the intervention group, while the control group only experienced an increase of about 1%.
2.	Alnuaimi et al., 2020 Jordan, Asia	The intervention group received a 2-hour educational programme on pre-eclampsia that included the definition, signs and symptoms, complications, diagnosis, management, and prevention practices of pre-eclampsia. They were also taught how to perform self-monitoring of proteinuria and blood pressure, while the control group received a 2-hour educational programme on urinary tract infection.	The results of this study showed a significant difference in the mean score of awareness about pre-eclampsia where there was an increase in the awareness of pregnant women about pre-eclampsia in the intervention group after the intervention compared to the control group.
3.	Gingras-Charland et al., 2020 Canada, America	The intervention involved providing educational tools to the intervention group, while the control group received routine care. The educational tools consisted of a pamphlet explaining pre-eclampsia, its symptoms and complications, along with a graphic summary. In addition, the participants were also given a video containing the same information as the pamphlet.	Results from this study showed that the group that received the educational tools achieved significantly higher global knowledge scores than the control group (70.1% vs. 51.1%).
4.	Minhas et al., 2024 United States, America	The intervention involved monitoring diet during the third trimester of pregnancy. Researchers collected the respondents' dietary data and then analysed the relationship between diet and healthy eating indices such as solid fats, refined grains, cheese, vegetables, oils and fruit.	The results of this study show that a diet containing vegetables, oils, and fruits can reduce the risk of pre-eclampsia. Whereas a diet containing solid fats, refined grains and cheese may increase the risk of hypertensive disorders of pregnancy (HDPs) and pre-eclampsia.

No	Authors, year, country	Interventions	Findings
5.	Ruano et al., 2023 Brazil, America	The intervention was conducted by evaluating the administration of low-dose aspirin in preventing pre-eclampsia in pregnant women.	The results showed that the administration of low-dose aspirin has a fairly good effect in reducing the incidence of pre-eclampsia in pregnant women.
6.	Mcdougall et al., 2024 Finland, Europe	The intervention was conducted by evaluating the administration of probiotics containing specific types of bacteria such as <i>Lactobacillus rhamnosus</i> GG, <i>Bifidobacterium lactis</i> Bb12, <i>Streptococcus thermophilus</i> , and <i>Lactobacillus delbrueckii</i> subsp during pregnancy	The results showed that pregnant women who frequently consume milk or foods containing probiotics have a lower chance of suffering from pregnancy complications or pre-eclampsia.

provides easy access for pregnant women to obtain relevant and important information related to pre-eclampsia conditions (Parsa et al., 2019). According to Baltacı and Başer (2022), by using mobile applications, pregnant women can quickly and easily access information about the symptoms, signs and complications of pre-eclampsia whenever needed. This allows pregnant women to gain real-time knowledge without having to wait for a consultation with medical personnel. The use of mobile-based educational applications is one of the effective methods in educating pregnant women about pre-eclampsia, so as to increase understanding, awareness, and alertness to the condition.

In addition, education provided using pamphlets and videos can also be used in delivering information to pregnant women about pre-eclampsia. Videos and pamphlets can encourage active involvement from pregnant women in learning information about pre-eclampsia. Pregnant women can read the pamphlet, watch the video, and reflect on the information presented, thus increasing the effectiveness of learning (Gingras-Charland et al., 2020). However, in making pamphlets and videos, the information should be written in a language that is easily understood by various groups, including pregnant women who may not have a medical background (Alnuaimi et al., 2020). This can help increase pregnant women's knowledge, awareness, and vigilance towards pre-eclampsia, allowing for better early detection and prevention.

A healthy and balanced diet plays an important role in the health of pregnant women, including in the prevention of pre-eclampsia. Vegetables contain fibre, vitamins, minerals and antioxidants that are important for the health of pregnant women. Vegetable consumption can help maintain blood pressure, reduce inflammation, and provide essential nutrients for foetal development (Minhas et al., 2024). Healthy oils, such as olive oil or fish oil, contain omega-3 fatty acids that are good for heart and vascular health (Perry et al., 2022). In addition, consumption of fruits can help maintain blood sugar balance, provide energy, and support a healthy immune system (Dunton et al., 2024). It is important for pregnant women to pay attention to their diet during pregnancy, by choosing healthy and nutritious foods to help reduce the risk of pre-eclampsia and maintain maternal and foetal health.

Administering low-dose aspirin to pregnant women at high risk of pre-eclampsia can be an effective prevention strategy as aspirin has anti-inflammatory, antithrombotic, and vasodilatory properties that can help maintain the balance of factors involved in the development of pre-eclampsia (Ruano et al., 2023). Low doses of aspirin have been shown to increase blood flow to the placenta, reduce inflammation, and maintain blood pressure balance, thereby reducing the

likelihood of pre-eclampsia occurring (Hu et al., 2024). According to Lin et al. (2022), the combination of anti-inflammatory, antithrombotic, and vasodilating properties in low-dose aspirin may provide a protective effect against the development of pre-eclampsia in high-risk pregnant women. However, it is important to always consult with the treating medical professional before deciding to use low-dose aspirin, as each pregnancy has unique characteristics and risks that need to be evaluated individually.

Consuming probiotics containing certain types of bacteria such as *Lactobacillus rhamnosus* GG, *Bifidobacterium lactis* Bb12, *Streptococcus thermophilus*, and *Lactobacillus delbrueckii* subsp during pregnancy may provide benefits in reducing the risk of pre-eclampsia (Mcdougall et al., 2024). Probiotics can influence the balance of the gut microbiota and the immune system and may help to improve the body's immune response thereby reducing inflammation that contributes to pre-eclampsia (Shahriari et al., 2021). Some studies suggest that consumption of certain probiotics may help maintain vascular health and regulate blood pressure, which are important factors in the prevention of pre-eclampsia (Davidson et al., 2021). Thus, consumption of probiotics containing certain bacteria during pregnancy may provide benefits in reducing the risk of pre-eclampsia through various mechanisms involving the immune system, vascular health, anti-inflammatory effects, and regulation of the metabolic system. However, it is important to consult a medical professional before consuming probiotics during pregnancy to ensure their safety and benefits.

The results of this study highlight the importance of various intervention approaches that can be taken to prevent pre-eclampsia in pregnant women, ranging from education, probiotic consumption, to dietary modifications. Collaboration between medical personnel and pregnant women in implementing these preventive interventions can help reduce the risk of pre-eclampsia and improve the health of pregnant women and their foetuses.

CONCLUSION

Pre-eclampsia is a potentially preventable complication of pregnancy that threatens maternal health and safety. Several hypertension and pre-eclampsia prevention interventions that can be implemented in the care of pregnant women include education on risk factor management, lifestyle modification, and pharmacological therapy.

Declaration of Interest

There are no conflicts of interest.

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Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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