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Optimizing maternal healthcare: Holistic strategies for early detection and management of preeclampsia

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ABSTRACT

Preeclampsia remains a serious challenge in maternal healthcare, with significant risks of complications for both the mother and the fetus. In this context, this research aims to explore holistic strategies for early detection and management of preeclampsia to optimize maternal healthcare. Through a comprehensive literature review, this article presents various approaches that have been implemented, including blood pressure monitoring, biomarker identification, and the use of prediction models for preeclampsia. The research findings highlight the need for an integrated approach between primary healthcare services and hospitals, as well as increased awareness and training for healthcare professionals in recognizing the symptoms and risk factors of preeclampsia. Furthermore, the article emphasizes the importance of interdisciplinary collaboration and further research to develop more effective and efficient strategies in managing this condition. Therefore, the optimization of maternal healthcare requires a holistic approach that encompasses early detection and management of preeclampsia to improve overall maternal and neonatal health outcomes.

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INTRODUCTION

Preeclampsia is a serious condition that can occur in pregnant women and pose a threat to both the mother and the fetus(Chang et al., 2023; Mayrink et al., 2018; Rana et al., 2019). It is characterized by a significant increase in blood pressure after 20 weeks of pregnancy, accompanied by the presence of protein in the urine. Preeclampsia can lead to serious complications such as organ dysfunction, fetal growth restriction, premature birth, and even maternal and fetal death(Al-Jameil et al., 2014; Bokslag et al., 2016; Chang et al., 2023). According to the World Health Organization (WHO), preeclampsia and related disorders are a leading cause of maternal mortality worldwide. An estimated 46,000 pregnant women die each year due to preeclampsia and eclampsia(Bhorat, 2018; Myatt, 2022).

Data from the Global Burden of Disease Study in 2017 indicates that preeclampsia and eclampsia cause approximately 76,000 maternal deaths worldwide. This places preeclampsia as a

significant cause of maternal mortality. Preeclampsia also has negative effects on fetal health. According to WHO, preeclampsia and related disorders can account for about 20% of fetal deaths worldwide.

The mortality rate due to preeclampsia can vary in each country. Countries with limited access to healthcare and inadequate pregnancy monitoring tend to have higher mortality rates due to preeclampsia. According to data from the Basic Health Research (Riskesdas) in 2018, preeclampsia and eclampsia are significant causes of maternal mortality in Indonesia. The survey found that approximately 7.2% of total maternal deaths were caused by preeclampsia and eclampsia.

Data from the Indonesian Health Profile Report in 2019 also indicates that preeclampsia and eclampsia are significant causes of maternal death in Indonesia. In 2018, there were 1,139 maternal deaths due to preeclampsia and eclampsia. Additionally, data from the Basic Health Research in 2018 shows that preeclampsia and eclampsia are the leading causes of maternal death in Indonesia among women of reproductive age. In the age group of 15-49 years, preeclampsia and eclampsia accounted for approximately 16.3% of total maternal deaths.

Although preeclampsia can occur in any pregnant woman, several risk factors have been identified, including a history of previous preeclampsia, high blood pressure before pregnancy, obesity, diabetes, and a family history of preeclampsia. Optimizing maternal healthcare, including early detection and management of preeclampsia, is crucial for improving the health of both mothers and infants(Armaly et al., 2018; Osungbade & Ige, 2011). Through early detection and appropriate management, serious complications caused by preeclampsia can be prevented or reduced, thereby increasing the chances of delivering a healthy baby and reducing maternal and infant mortality rates. The management of preeclampsia requires a coordinated and integrated approach, involving continuous monitoring of the mother and fetus, strict blood pressure management, and comprehensive organ function evaluations(Fisher, 2015; Hofmeyr et al., 2017; Rana et al., 2014).

In some cases, medical interventions such as the use of antihypertensive drugs or early delivery of the baby may be necessary to protect the health of both the mother and fetus. Additionally, a holistic approach to preeclampsia management includes psychosocial aspects and emotional support for pregnant women(Chaemsaithong et al., 2022; Myatt et al., 2014; R. A. Salam et al., 2015). A holistic strategy for early detection and management of preeclampsia in pregnant women is not just about managing the medical condition but also about comprehensively caring for the whole individual. Involvement of partners and family, counseling focusing on mental and emotional needs, and understanding the psychological impact of this medical condition are crucial for the overall well-being of the mother and the family facing it. Previous research on similar topics has extensively covered various aspects of preeclampsia, including risk factors, pathophysiology, diagnostic methods, and interventions. However, the current study aims to differentiate itself by adopting a holistic approach to maternal healthcare, emphasizing comprehensive strategies for early detection and management of preeclampsia. It seeks to fill gaps in the literature by focusing on optimizing management beyond medical interventions, exploring early detection techniques, addressing implementation challenges, and integrating lifestyle modifications and psychosocial support into the care plan. By addressing these gaps, the current study aims to provide novel insights and contribute to the advancement of knowledge in the field of preeclampsia.

Preeclampsia is a serious pregnancy complication characterized by high blood pressure and damage to organs such as the liver and kidneys. It poses significant risks to both the mother and the unborn child, including premature birth, low birth weight, and even maternal and fetal mortality. Early detection and effective management of preeclampsia are crucial to reduce these risks and improve maternal healthcare outcomes. The existing approaches to the detection and management of preeclampsia have shown limitations in terms of accuracy, accessibility, and comprehensiveness. Current diagnostic methods often rely on measuring blood pressure and

proteinuria, which may not provide a complete picture of the condition. Additionally, these methods may not be easily accessible in resource-constrained settings or may require specialized equipment and expertise. To address these challenges, this study aims to optimize maternal healthcare by implementing holistic strategies for early detection and management of preeclampsia. Holistic strategies encompass a comprehensive approach that considers various factors contributing to the development and progression of preeclampsia, including maternal health history, genetic predisposition, lifestyle factors, and biomarkers.

Furthermore, the study will consider the implementation challenges and feasibility of these holistic strategies in different healthcare settings, including low-resource areas. It will explore cost-effective and scalable solutions to ensure that the benefits of early detection and effective management of preeclampsia can reach a wide range of pregnant women, regardless of their geographical location or socioeconomic status. The outcomes of this research will contribute to the advancement of maternal healthcare by providing evidence-based recommendations for optimizing the detection and management of preeclampsia. By implementing holistic strategies, healthcare providers can improve patient outcomes, reduce maternal and fetal mortality rates, and enhance the overall quality of prenatal care. Additionally, this study will pave the way for future research and innovation in the field of maternal health, with potential applications beyond preeclampsia to other pregnancy-related complications. The research is expected to bring significant benefits to the field of research, including the optimization of preeclampsia detection and management through holistic strategies. By considering various factors such as maternal health history, genetic predisposition, lifestyle factors, and biomarkers, the study expands the understanding of preeclampsia and offers potential improvements in accuracy and effectiveness of detection. Additionally, the exploration of accessible and cost-effective approaches, particularly in low-resource settings, addresses current limitations and promotes equitable maternal healthcare. The evidence-based recommendations resulting from the research will guide healthcare providers and policymakers in implementing comprehensive protocols, ultimately advancing maternal health and inspiring future innovations in the field.

RESEARCH METHOD

The research method used in this study is a Systematic Literature Review. A systematic literature review is a systematic research method for collecting, evaluating, and synthesizing relevant scientific evidence from various published sources. This method consists of two main points, namely eligibility criteria and search strategy (Bedaso et al., 2022). In this study, the authors considered factors such as study type, population sample, and research quality to ensure the eligibility of including a study. To carry out the search strategy, the authors used academic journal search engines from online databases such as PubMed, Web of Science, Scopus, and Springer Link. The search was conducted using relevant keywords such as " Maternal healthcare, Pregnancy care, Holistic strategies, Early detection, Preeclampsia management"and other related keyword variations.

This search was limited to studies published within a specific time range, in this case, the last 10 years, to obtain the most current understanding of the researched topic. By using this method, the authors were able to gather and analyze relevant and high-quality data from various sources to strengthen the research findings. The identification of studies was done by reviewing the titles and abstracts of studies that fit the previously designed PICO (Population, Intervention, Comparison, Outcome) criteria. Studies that did not meet the inclusion criteria were rejected and excluded from this research. Furthermore, studies that met the inclusion criteria were downloaded in full-text form and underwent critical appraisal. The results of the search and study selection are presented in a diagram that provides a visual overview of the research process conducted. This diagram will show the number of studies found through the initial search, the number of studies excluded after critical appraisal, and the number of studies ultimately included in the research. The

summarized results of the search using this method can be visually observed through the diagram that will be presented in this research.

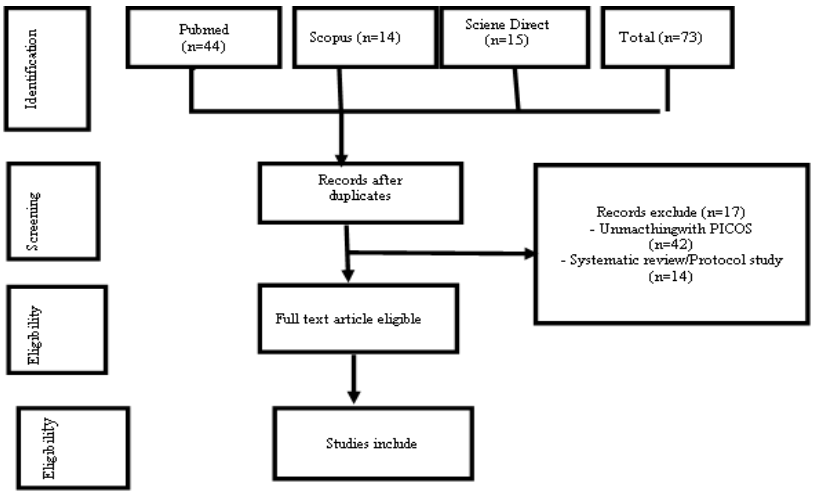

Figure 1. Prisma diagram

RESULTS AND DISCUSSIONS

The holistic strategy for early detection and management of preeclampsia is crucial to optimize maternal healthcare. Efforts are made to reduce maternal mortality rates (MMR) and infant deaths due to preeclampsia through programs such as the Preeclampsia Elimination Program in Boyolali, Indonesia (Fitriani et al., 2021; Liwang & Bhargah, 2019). Various risk factors for preeclampsia have been identified, including a history of diabetes, obesity, hypertension, age, PE lineage, multigravida, and income(Mongraw-Chaffin et al., 2010). Low-dose aspirin (LDA) prophylaxis has been recommended for women at increased risk of preeclampsia, and externally validated prediction models have been applied to guide risk-based obstetric care pathways(Pasca Wardhana et al., 2021). Non-invasive tests, such as measuring annexin A2 (ANXA2) levels, have been developed to identify women at risk of developing preeclampsia(Handayani et al., 2015). However, the use of individual markers alone may not provide adequate predictive insight, and further research is needed to identify marker combinations for more accurate screening.

Table 1. Table analysis of reviewed and relevant articles with the topic

Author and title	Objective:	Method	Findings
Yuliastanti et al., n.d.(2023)Relationship between Detection of Preeclampsia High-Risk by Pregnant Women and Health Workers with the Success of the Preeclampsia Eradication Program at the Nogosari Health Center, 2023.	This paper aims to determine the relationship between the detection of high-risk preeclampsia by pregnant women and health workers with the success of the Preeclampsia Eradication Program at the Nogosari Health Center.	This research uses a quantitative research design and correlation analysis to analyze the data.	The analysis of the data indicates that the detection of high-risk preeclampsia by pregnant women and FIGO screening by health workers have a significant relationship with the success of the preeclampsia eradication program.
Fouly et al., (2022)Monitoring intra-abdominal pressure for early detection of preeclampsia among pregnant women.	The study aims to monitor intra-abdominal pressure (IAP) in pregnant women to detect preeclampsia early.	A quasi-experimental clinical practice research design with an intervention group of 30 preeclamptic patients and a control group of 30 normotensive women is	The study finds a statistically significant difference in intra-abdominal pressure (IAP) between the preeclamptic and normotensive groups, with significantly higher

Author and title	Objective:	Method	Findings
		used.	IAP in the preeclamptic group. .
Meazaw et al., (2022)Health Care Readiness in Management of Preeclampsia/Eclampsia in Ethiopia: Evidence from National Facility-Based Survey. 2022	The study aims to assess the readiness of healthcare facilities in Ethiopia in managing preeclampsia and eclampsia and identify significant gaps in detecting and managing these conditions.	The study utilizes a national facility-based emergency obstetric and newborn care (eMONC) survey in Ethiopia. Data on facility infrastructure, equipment, and supplies are collected through facility checklists, and healthcare provider experiences are obtained through interviews.	The findings highlight the need for essential supplies, medications, referrals, and refresher training for healthcare providers to improve the detection and management of preeclampsia and eclampsia in Ethiopia.
van Montfort et al., (2020)Implementing a Preeclampsia Prediction Model in Obstetrics: Cutoff Determination and Health Care Professionals' Adherence.2020	The study aims to determine the appropriate risk threshold for implementing a prediction model for preeclampsia and evaluate the adherence of obstetric healthcare professionals to the model.	A survey and structured meetings among healthcare professionals are conducted to propose possible cutoff values for discussing low-dose aspirin prophylaxis (LDA).	A prospective multicenter cohort study is conducted to analyze healthcare professionals' adherence to the prediction tool. Patient questionnaires related to individual risk profiles calculated by the online tool are utilized. The study demonstrates the successful implementation of the prediction model, with consensus reached on an appropriate risk threshold and adequate adherence to recommendations.
Robbins et al., (2023)Understanding challenges as they impact on hospital-level care for pre-eclampsia in rural Ethiopia: a qualitative study. 2023	The study explores barriers and facilitators to early detection, care escalation, and appropriate management of pre-eclampsia in rural Ethiopian hospitals, considering the perspectives of affected women and healthcare providers.	Qualitative study design is used to explore hospital-level care for pre-eclampsia in Ethiopia, employing participant interviews and observations. Participants include women with lived experiences of pre-eclampsia care, families of deceased women, midwives, physicians, integrated emergency surgical officers, and healthcare management.	Quality care for pre-eclampsia requires organizational changes to create safe spaces for learning and improvement, patient-centered care, and equipping providers with knowledge and resources. Systemic barriers, such as limited resource availability, inconsistent support, lack of communication, and punitive culture, undermine individual staff efforts to respond to maternal emergencies.
El Hassan et al., (2015)Preeclampsia: an old disease with new tools for better diagnosis and risk management.	This research also aims to evaluate the combination of maternal risk factors, uterine artery Doppler, mean arterial pressure, maternal serum PAPP-A, and PlGF in screening for early-onset PE cases.	This research is a review considering previous studies and relevant data existing in the scientific literature. Methods include searching, selecting, and synthesizing information from relevant studies regarding the use of biomarkers in first-trimester screening for PE.	The research shows that screening using a combination of maternal risk factors, uterine artery Doppler, mean arterial pressure, maternal serum PAPP-A, and PlGF can identify approximately 75% of early-onset PE cases with a false positive rate of 10%.

Author and title	Objective:	Method	Findings
Salam et al., (2015). Diagnosis and management of preeclampsia in community settings in low and middle-income countries.	This study aims to review the deficiencies in evidence-based guidelines for screening, identification, and management of preeclampsia at the community level, taking into account the specific challenges faced by low and middle-income countries.	This study is a review exploring the challenges in managing preeclampsia, particularly at the community level and in low and middle-income countries. The review method includes analysis of relevant scientific literature, mapping of existing policies and clinical practices, and identification of gaps in current knowledge and practices.	This study identifies an urgent need to develop evidence-based guidelines for screening, identification, and management of preeclampsia at the community level. Understanding of preeclampsia and the necessary steps to manage it remains limited, especially in countries with limited resources.
Rastegari et al., (2019) A comprehensive home-care program for health promotion of mothers with preeclampsia: protocol for a mixed method study.	This study aims to design a postpartum health care program for women with a history of preeclampsia, considering the importance of long-term monitoring to prevent future health complications.	This study consists of three sequential phases: a qualitative phase to understand the postpartum health needs and strategies for women with a history of preeclampsia, a phase to design the postpartum health care program involving qualitative studies.	It is expected that conducting a mixed method study to design and execute an interventional program for women with a history of preeclampsia will improve their health status and well-being, while reducing their health care costs through prevention at various levels within the current structure of health care services..
(Kamravamanesh et al., 2018a)A comprehensive postpartum follow-up health care program for women with history of preeclampsia: protocol for a mixed methods research.	This qualitative study explores the perspectives of key stakeholders in a tertiary hospital in Ghana regarding the facilitators and barriers influencing midwives' provision of preeclampsia care using a socioecological model.	Semi-structured interviews were conducted with 42 participants comprising senior managers (n = 7) and hospital midwives (n = 35) in 2021. Thematic analysis used Braun and Clarke's six-step method, and the findings were organized within four levels of the socioecological model: individual, interpersonal, organizational, and public policy.	Two main themes were identified: 1) Facilitators of preeclampsia management, and 2) Barriers to preeclampsia management. Facilitators were found at three levels (individual, interpersonal, and organizational) and include midwives' knowledge about preeclampsia; midwives' self-efficacy; midwives' skills to enhance preeclampsia care; collaborative practices; and strategies to improve the quality of preeclampsia care.

Holistic strategies for early detection and management of preeclampsia in pregnant women can significantly reduce maternal and fetal mortality rates. Current practices involve the use of blood pressure measurements to identify women at risk of hypertension disorders, followed by blood and urine analysis for further assessment. However, the lack of laboratory facilities in rural areas poses challenges in the diagnosis and management of preeclampsia. To address this issue, the proposed solution is the development of portable and wireless devices that can be operated by semi-skilled healthcare workers. These devices integrate multiple sensing techniques, including blood pressure monitoring, creatinine and uric acid level measurements, albumin content measurement, and new methods for early detection of preeclampsia. Additionally, the

success of preeclampsia eradication programs can be enhanced by improving the detection of high-risk pregnancies through the involvement of pregnant women and healthcare workers. Implementing a preventive approach that combines biophysical and biochemical markers with maternal factors can help identify pregnancies at high risk of preeclampsia and reduce its prevalence(Ali et al., 2017).

Furthermore, research by Maereg Wagnew Meazaw and his team in 2022 highlights the need for supplies, medications, referrals, and refresher training for healthcare providers to improve the detection and management of preeclampsia in Ethiopia. These findings underscore the need for holistic and integrative strategies in the early detection and management of preeclampsia to improve the quality of maternal healthcare globally. Holistic strategies for early detection and management of preeclampsia in pregnant women are crucial to optimize their healthcare(Chaemsaithong et al., 2022; Mészáros et al., 2023). Regular blood pressure monitoring is essential for detecting increases in levels and identifying pregnancy hypertension disorders. Intra-abdominal pressure monitoring can also be used as a tool for early detection of preeclampsia, as there is a positive correlation between increased intra-abdominal pressure and preeclamptic complications. Additionally, risk factor-based assessment cards can be effective in early detection of preeclampsia. Non-invasive tests measuring annexin A2 levels can reliably identify women at risk of preeclampsia. Furthermore, optimizing maternal health through diet and lifestyle interventions can help prevent excessive pregnancy weight gain, reduce the risk of preeclampsia, and other adverse pregnancy outcomes. Implementing these strategies can contribute to effective early detection and management of preeclampsia, ultimately enhancing the overall health and well-being of pregnant women(Hackelöer et al., 2023). To address challenges related to early detection and management of preeclampsia, holistic strategies involving multiple approaches are required. First, a comprehensive medical approach is required for early detection of preeclampsia.

This involves regular blood pressure checks, monitoring of protein in urine, and laboratory analysis to identify changes associated with this condition. Additionally, the use of advanced technologies such as ultrasonography and electronic fetal monitoring can assist in identifying early signs of preeclampsia. Second, it is important to provide education and awareness to pregnant women about preeclampsia. This includes information about possible symptoms, the importance of regular prenatal check-ups, and preventive measures that can be taken(Petla et al., 2013). Through proper education, pregnant women can become more aware of the risks of preeclampsia and seek medical care promptly if needed. Furthermore, there needs to be collaboration among healthcare providers, researchers, and healthcare institutions to develop clear guidelines and protocols for the early detection and management of preeclampsia. This includes updating blood pressure measurement guidelines, researching potential biomarkers, and developing more effective therapies(Adnyana et al., 2018). Moreover, it is crucial to strengthen the healthcare system by ensuring the availability of adequate healthcare facilities and trained medical personnel. This will enable better early detection and management of preeclampsia, especially in hard-to-reach areas. Finally, holistic strategies should also include psychosocial support for pregnant women experiencing preeclampsia(Wardhana et al., 2018). This condition can cause significant anxiety and stress for pregnant women, so it is important to provide emotional support, accurate information, and resources to help them cope with the challenges associated with this condition. Holistic strategies for the early detection and management of preeclampsia encompass a comprehensive medical approach, public education and awareness, collaboration among various stakeholders, strengthening of the healthcare system, and psychosocial support. With this approach, it is hoped that early detection, timely treatment, and reduction of risks associated with preeclampsia will improve the health of mothers and babies.

CONCLUSION

The importance of early detection and management of preeclampsia in maintaining the health of pregnant women and their fetuses cannot be overstated. By employing various approaches such as FIGO screening, monitoring of intra-abdominal pressure, evaluation of healthcare facility readiness, and implementation of predictive models, we can enhance the healthcare system's ability to identify preeclampsia risks and provide timely interventions. The significance of increasing resource availability, medical staff training, and stakeholder coordination also highlights the need for improving preeclampsia management. Through holistic and integrated approaches, it is hoped that we can reduce the adverse effects of preeclampsia and improve health outcomes for pregnant women and their babies. The research on Optimizing maternal healthcare holistic strategies for early detection and management of preeclampsia holds significant implications. This study can enhance maternal healthcare by providing a holistic approach to the early detection and management of preeclamp sia. The research findings can guide clinical practices, inform care guidelines, foster interdisciplinary collaborations, and raise public awareness about preeclampsia. Overall, this research contributes to the improvement of maternal healthcare and the management of preeclampsia.

Limitations and future directions in the research on preeclampsia detection and management include the need for larger, more diverse samples to enhance generalizability, rigorous methodologies encompassing prospective designs and objective outcome measures to ensure validity, exploration of long-term health implications for both mothers and infants, especially regarding cardiovascular risks and neurodevelopmental outcomes, investigation of innovative and cost-effective strategies to address resource constraints in low- and middle-income countries, and fostering interdisciplinary collaboration among healthcare professionals, researchers, policymakers, and community stakeholders to develop comprehensive approaches for preeclampsia prevention and management, thus contributing to improved maternal and neonatal health outcomes globally. Research in the future may involve a more in-depth cost-benefit analysis to examine the economics and scalability of implementing this holistic strategy. This can help in understanding the long-term financial impact and sustainability of this approach.

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