

Pregnancy as an Early Cardiovascular Stress Test: A Systematic Review of Cardiovascular Risk After Preeclampsia

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BACKGROUND

Preeclampsia affects 5-8% of pregnancies and is characterized by abnormal placentation, endothelial dysfunction, and cardiovascular maladaptation. Early or severe disease is associated with LV hypertrophy, altered filling patterns, and diastolic dysfunction that may persist postpartum. Angiogenic imbalance, including increased sFLt-1 and decreased PlGF, may precede clinical disease and contribute to cardiovascular dysfunction, providing potential opportunities for earlier risk stratification (Shaw et al. 2024). Preeclampsia is also associated with increased postpartum hypertension and long-term cardiovascular disease (CVD), raising the possibility that pregnancy may identify women at elevated cardiovascular risk years before clinical disease develops (Contouris et al., 2025). Echocardiography may identify LV remodeling, diastolic dysfunction, and abnormal global longitudinal strain (GLS) despite preserved LVEF. However, the optimal timing and role of cardiac assessment in patients with preeclampsia remain uncertain.

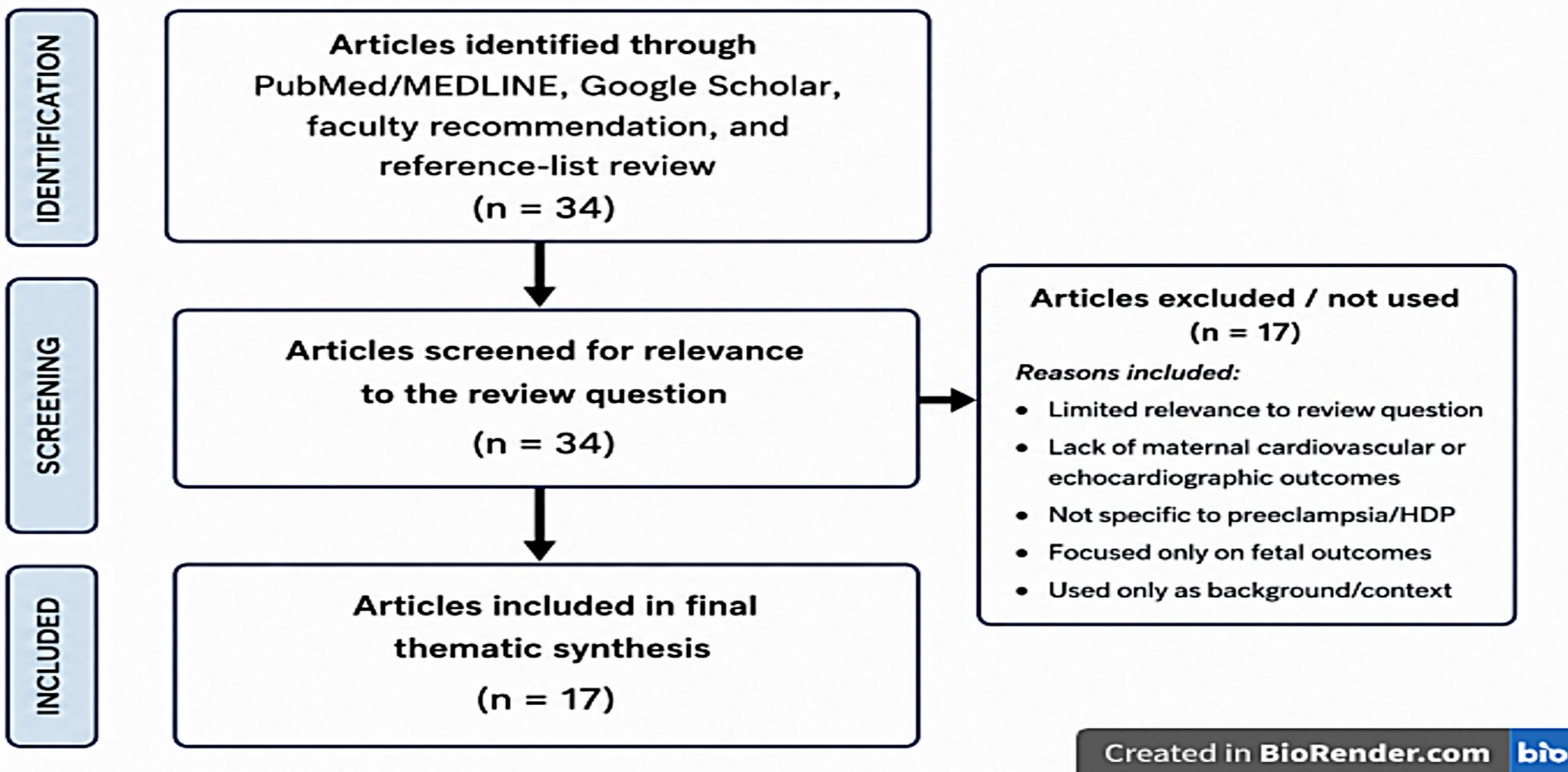
OBJECTIVE

To synthesize evidence linking preeclampsia with maternal cardiac dysfunction and long-term cardiovascular risk, and to evaluate the potential role of cardiovascular risk stratification and surveillance during pregnancy and postpartum.

METHODS

Figure 2. Article Selection Flow Diagram

- A structured literature search of PubMed/MEDLINE and Google Scholar was conducted using predefined terms related to preeclampsia/HDP and maternal cardiovascular outcomes
- Studies reporting maternal cardiovascular or echocardiographic outcomes were included. Of 34 records screened, 17 met inclusion criteria for final synthesis.



RESULTS

Key Findings from Systematic Review

KEY FINDINGS

Cardiac Remodeling

Preeclampsia is associated with increased LV mass, remodeling, and diastolic dysfunction

Subclinical Dysfunction

Abnormal GLS may occur despite preserved LVEF

Persistence

Cardiovascular abnormalities may persist years after pregnancy

Long-term Risk

HDP predicts increased subsequent hypertension, heart failure, stroke, and CVD

Risk Gradient

Early, severe, and recurrent preeclampsia confer the greatest cardiovascular risk

Table 1 - Pivotal Studies

Study	Evidence Domain	Key Finding
Thayaparan et al. (2019)	Asymptomatic, subclinical cardiac changes years after pregnancy	A large meta-analysis including over 6.4 million women and over 285,000 with preeclampsia, showed a two-fold increased risk of coronary heart disease events in women with a history of PE.
Forst et al. (2026)	Preeclampsia as a systemic pregnancy-associated cardiovascular risk state	Early onset (<34w) has placental origins while late-onset (>34w) is associated with existing maternal risk factors; PE is associated with adverse cardiac remodeling and dysfunction and elevated Brain Natriuretic Peptide (BNP).
Stuart et. al (2022)	HDP identifies women at risk for long-term cardiovascular risk	Women with a HDP (preeclampsia or gestational hypertension) have a 63% higher rate of developing a cardiovascular disease (CVD) with the association being stronger for women with preeclampsia over gestational hypertension (HR 1.72 vs HR 1.41). The CVD developed is largely attributed to the development of postpartum HTN.
Giorgione et. al (2023)	Cardiovascular intervention in the 4th trimester	Aggressive postpartum BP monitoring and management could have long-term effects on diastolic BP and lead to effects in the trajectory of the patient's' cardiovascular health. Furthermore, the cardiovascular abnormalities caused by preeclampsia persist after birth.
O'Driscoll et al. (2022)	Echocardiographic Findings & Screening Gaps	GLS was significantly impaired in HDP, supporting detection of subclinical myocardial dysfunction beyond conventional systolic measures
Gibbone, Huluta, Wright, Nicolaides, & Charakida, (2022)	Echocardiographic Findings & Screening Gaps	Cardiovascular abnormalities at midgestation before clinical PE, but cardiac indices did not improve screening beyond established maternal factors and biomarkers.
Gunderson et al. (2023)	Blood pressure monitoring throughout pregnancy as a screening tool for HDP	The trajectory of blood pressure across early pregnancy may reveal underlying susceptibility to preeclampsia or gestational hypertension before conventional diagnostic criteria are met.
Ogunwole et al. (2021)	Maternal cardiometabolic health before, during, and after pregnancy	Women who developed new chronic hypertension during the interpregnancy period had approximately a 6-fold greater risk of incident preeclampsia: RR 6.1 (95% CI 2.9–13). New chronic hypertension between pregnancies was also associated with recurrent preeclampsia:RR 2.4 (95% CI 1.5–3.9).

DISCUSSION

- Preeclampsia is associated with **acute cardiovascular maladaptation and persistent postpartum risk**
- Endothelial dysfunction and angiogenic imbalance** may contribute to myocardial remodeling, hypertension, and later CVD
- GLS may detect subclinical myocardial dysfunction** despite preserved LVEF
- Risk is greatest with **early-onset, severe, or recurrent preeclampsia** and traditional cardiovascular risk factors
- Postpartum BP monitoring and risk modification are essential**, but evidence is insufficient to define the role of routine echocardiography or intensified cardiac surveillance

CONCLUSION

Preeclampsia is not solely a pregnancy complication but an early marker of future maternal cardiovascular risk. Cardiac remodeling and subclinical myocardial dysfunction may persist postpartum, particularly after early, severe, or recurrent disease. Pregnancy and the postpartum period provide an opportunity for earlier cardiovascular risk identification and prevention. Further research is needed to define optimal screening and surveillance strategies.

FUTURE DIRECTIONS

A prospective pilot study is planned to evaluate cardiovascular risk stratification and targeted longitudinal follow-up in patients with a history of preeclampsia.

REFERENCES

