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Hemodynamics-Guided therapy for hypertensive disorders of pregnancy- a systematic review

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ADMINISTRATIVE INFORMATION

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Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 19 June 2025 and was last updated on 19 June 2025.

INTRODUCTION

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eview question / Objective Despite further research into the underlying pathology of hypertensive disorders in pregnancy, maternal mortality is hardly decreasing. Current antihypertensive therapy is aimed at controlling symptoms and preventing severe courses of pregnancy. However, sufficient blood pressure (BP) control within the targets is often not achieved. Traditional management focuses on BP control but does not consider individual hemodynamic variations. Hemodynamically guided therapy offers a personalized approach that can improve BP control and outcomes by treating the underlying pathomechanisms. The aim of this review is to provide an overview of hemodynamically guided antihypertensive therapy in hypertensive disorders of pregnancy and to present the results of recent trials in this area.

Rationale Hemodynamic-guided antihypertensive therapy in hypertensive disorders of pregnancy offers the possibility of treating not only the symptoms of high blood pressure but also the underlying pathology.

Condition being studied Despite further research into the underlying pathology of hypertensive disorders of pregnancy, maternal mortality is hardly decreasing 1,2 and still accounts for 6.5% of all pregnancy-related deaths in the US. 5-10% of all pregnant women are affected and the incidence increased over the last 30 years4. If hypertension in pregnancy is accompanied by any organ dysfunction preeclampsia is diagnosed. Women after hypertensive disorders of pregnancy are at increased risk of cardiovascular events and coronary artery disease. Current antihypertensive therapy is aimed at controlling symptoms and preventing severe courses in order to prolong pregnancy for the benefit of the fetus. Traditional management focuses on BP control but does not take into account individual hemodynamic variations. Hemodynamically guided therapy offers a personalized approach that can improve BP control and outcomes by treating the underlying pathomechanisms. Hemodynamic measurements include various parameters such as Cardiac Output (CO), total peripheral vascular resistance (TPVR) and BP itself. The individual hemodynamic parameters are used to select appropriate antihypertensive treatment. This should lead to faster and more effective antihypertensive therapy and improve the outcomes of mother and child.

METHODS

Search strategy This review was conducted in reference to the PRISMA guidelines for systematic reviews. We performed our advanced research in the electronic databases PubMed, CENTRAL and Google scholar. Our review included publications from the inception of the databases until 29 May 2024 (Google scholar and PubMed) and 30 May 2024 (Central) and consisted of the following terms and synonyms: "hypertensive disorders of pregnancy", "gestational hypertension", "preeclampsia", "hemodynamic measurements", "antihypertensive therapy", "hemodynamically guided therapy", "pregnancy".

Participant or population Pregnant women with hypertensive disorders or at elevated risk for developing preeclampsia.

Intervention Our review included intervention studies that used maternal hemodynamic parameters like CO or TPVR to guide antihypertensive therapy in pregnant women with hypertensive disorders or at elevated risk for developing preeclampsia compared to control groups.

Comparator Standard care.

Study designs to be included Intervention studies.

Eligibility criteria Our review included intervention studies that used maternal hemodynamic parameters like CO or TPVR to guide antihypertensive therapy in pregnant women with hypertensive disorders or at elevated risk for developing preeclampsia compared to control groups. We excluded animal studies, case reports, reviews, meta-analyses, conference abstracts, commentaries, and editorials. Studies without a control group or in non-pregnant women were also excluded. There were no restrictions on language or publication date.

Information sources This review was conducted in reference to the PRISMA guidelines for systematic reviews. We performed our advanced research in the electronic databases PubMed, CENTRAL and Google scholar. Our review included publications from the inception of the databases until 29 May 2024 (Google scholar and PubMed) and 30 May 2024 (Central) and consisted of the following terms and synonyms: "hypertensive disorders of pregnancy", "gestational hypertension", "preeclampsia", "hemodynamic measurements", "antihypertensive therapy", "hemodynamically guided therapy", "noninvasive hemodynamic monitoring", "pregnancy" (Appendix 1).

All titles and abstracts resulting from our search were screened independently by two reviewers. Based on our selection criteria, eligible studies were identified, and full texts were retrieved. Duplicates were therefore excluded. Furthermore, we hand-searched all references of the selected articles and related articles to identify additional relevant publications. Any disagreement was resolved by consensus and, if necessary, a third reviewer was consulted.

Main outcome(s) A total of 5 studies met the inclusion criteria. A total of 1,261 pregnant women were included in all trials. All studies showed improved BP control when the antihypertensive medication administered was matched to hemodynamic characteristics of the women being treated. In women with a hypodynamic circulation (high total peripheral vascular resistance), maternal and fetal pregnancy complications were significantly reduced by hemodynamically controlled therapy.

Data management All titles and abstracts resulting from our search were screened independently by two reviewers. Based on our selection criteria, eligible studies were identified, and full texts were retrieved. Duplicates were therefore excluded. Furthermore, we hand-searched all references of the selected articles and related articles to identify additional relevant publications. Any disagreement was resolved by consensus and, if necessary, a third reviewer was consulted.

Quality assessment / Risk of bias analysis The quality of data collection and the information on following methodological measures were assessed independently by two reviewers: study design, randomization, blinding of results, reasons for study discontinuation. Disagreements were resolved by consensus and, if needed, a third author was consulted.

The Jadad scale was used to evaluate the methodological quality. According to Jadad scale, studies scoring less than three points were assessed as of low quality.

Strategy of data synthesis Data from the included studies were pooled to provide a narrative synthesis of the findings. Percentages and p-values are given when presenting statistical results. Due to the limited number of studies, individual studies are discussed in detail in the results section. In our discussion section, other studies in the field of hemodynamic measurements in pregnancy that did not meet the inclusion criteria of our review are briefly mentioned.

Subgroup analysis No.

Sensitivity analysis No.

Country(ies) involved Italy, Netherlands, USA.

Keywords hypertensive disorders of pregnancy; hemodynamic-guided antihypertensive therapy; preeclampsia.

Dissemination plans The article should submit 2025.

Contributions of each author

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