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REVIEW ARTICLE

Clinical management of hypertensive complications during pregnancy

Andreina Nayarid Vargas-Guerrero[1], Ambar Zulay Espín-Escudero[1], Joselyn Dayan Aucanshala-Hidalgo[1]

[1]Universidad Regional Autónoma de Los Andes. Ambato, Ecuador.

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ABSTRACT

Introduction: hypertensive complications during pregnancy represent a significant public health problem due to the high maternal and perinatal morbidity and mortality associated.
Objective: to describe treatment protocols and therapeutic strategies for gestational hypertension and preeclampsia.
Methods: a systematic review of the scientific literature was conducted across several databases. The search was performed using an algorithm with keywords and Boolean operators, allowing the identification of relevant sources. Selected studies were critically analyzed considering timeliness, methodological quality, and thematic relevance, and were integrated into the final synthesis of the review.
Development: traditional drugs such as methyldopa, labetalol, and nifedipine are safe and effective for blood pressure control in pregnant women. However, new emerging therapies show superior results. Sildenafil has demonstrated improvement in placental perfusion and reduction in the progression to preeclampsia. Tyrosine kinase inhibitors stand out for significantly decreasing the incidence of low birth weight and preterm delivery. Likewise, monoclonal antibodies targeting angiogenic factors offer a promising alternative to restore vascular balance. Non-pharmacological interventions, such as a balanced diet, stress reduction, and moderate physical activity, complement clinical management.
Conclusions: the integration of innovative therapies, together with traditional strategies and preventive measures, can optimize the management of gestational hypertension and preeclampsia. These advances reinforce the need for evidence-based clinical protocols and specialized obstetric follow-up to improve perinatal outcomes and reduce long-term complications.

Keywords: Eclampsia; Hypertension, Pregnancy-Induced; Pre-Eclampsia; Therapeutics.

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INTRODUCTION

Hypertension is a common complication during pregnancy and is a leading cause of maternal and perinatal morbidity and mortality worldwide. Hypertensive complications encompass a spectrum of disorders, including gestational hypertension, preeclampsia, eclampsia, and HELLP syndrome, which can have serious consequences for both mother and fetus. Early identification and appropriate management of these conditions are essential for improving obstetric and perinatal outcomes.[1]

Preeclampsia, characterized by hypertension and proteinuria after the 20th week of gestation, is one of the most severe forms of hypertension in pregnancy. Its pathogenesis involves multiple factors, including endothelial dysfunction, systemic inflammation, and placental abnormalities. Eclampsia, a severe complication of preeclampsia, manifests with seizures and can lead to complications such as HELLP syndrome, which is characterized by hemolysis, elevated liver enzymes, and thrombocytopenia.[2]

Preeclampsia is a hypertensive complication of pregnancy that generally manifests after the 20th week of gestation and is characterized by high blood pressure and proteinuria. Despite advances in prenatal care, preeclampsia remains a leading cause of maternal and perinatal morbidity and mortality. Its pathogenesis is complex and involves immunological, genetic, and environmental factors that result in generalized endothelial dysfunction and a systemic inflammatory response.[3]

The management of hypertensive complications in pregnancy requires a multidisciplinary approach that includes intensive monitoring, pharmacological management, and, in severe cases, consideration of termination of pregnancy to preserve maternal health. The implementation of evidence-based clinical protocols and ongoing training of healthcare personnel are essential for the prevention and effective treatment of these complications.

Traditional management of gestational hypertension and preeclampsia includes close monitoring of the mother and fetus, administration of antihypertensive medications to control blood pressure, and, in severe cases, induction of labor to prevent further complications. Commonly used antihypertensive medications include methyldopa, labetalol, and nifedipine.[4] However, these treatments are not always completely effective and may not address all the underlying mechanisms of the disease. Therefore, in recent years, a variety of new medications and therapeutic approaches have been investigated for its management.[5] In light of this, the present research was conducted with the objective of describing the treatment protocols and therapeutic strategies for gestational hypertension and preeclampsia.

METHODS

This study was conducted as a systematic literature review, following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The objective was to synthesize the available scientific evidence on the clinical management of hypertensive complications during pregnancy. The search period was defined as between January 2010 and December 2024. The review was designed to ensure transparency, reproducibility, and methodological rigor, establishing inclusion and exclusion criteria, as well as search and data analysis strategies, beforehand.

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Search strategy

The search strategy was designed using a combination of keywords and Boolean operators, tailored to each database. Terms in Spanish, English, and Portuguese were used to maximize the retrieval of relevant studies. The main keywords used were: "gestational hypertension," "preeclampsia," "clinical management," "treatment," "pregnancy," and "hypertensive complications." These were combined with Boolean operators such as AND, OR, and NOT, generating specific search algorithms, for example: ("gestational hypertension" OR "preeclampsia") AND ("management" OR "treatment") AND ("pregnancy"). Filters were applied for date (2010–2024), publication type (original articles, systematic reviews, meta-analyses, clinical trials), and full-text access.

The literature search was conducted in internationally recognized and widely covered electronic databases, including PubMed/MEDLINE, SciELO, ScienceDirect, Google Scholar, LILACS, and BVSALUD. These platforms were selected for their relevance in disseminating biomedical literature and their accessibility to both regional and global studies. Secondary references from relevant articles were also reviewed, and grey literature, such as theses, technical reports, and institutional documents, was considered, provided it met the methodological quality criteria and was available in full access. The inclusion of grey literature aimed to reduce publication bias and broaden the perspective on the topic.

Selection process

The selection of studies was carried out in several phases. First, initial records were identified by searching the databases, yielding a total of 826 references. Subsequently, duplicates and studies that did not address the research objectives were eliminated, leaving 130 records for review of titles and abstracts. After this review, 12 studies that met all the established methodological and thematic requirements were selected.

Studies published within the defined time frame that directly addressed the clinical management of gestational hypertension and preeclampsia and reported maternal and/or perinatal outcomes were included. Articles in Spanish, English, and Portuguese were accepted, provided they were peer-reviewed and presented a sound methodological design (clinical trials, observational studies, systematic reviews, or meta-analyses). Duplicates, articles without full access, studies irrelevant to the topic, publications outside the time frame, and documents with evident methodological deficiencies, such as the absence of a control group or insufficient sample size, were excluded.

Data extraction and analysis

Data extraction was performed systematically using a standardized form, which collected key variables such as author, year of publication, country, study design, sample size, population characteristics, type of intervention, and main results. The data were organized into comparative tables to facilitate synthesis and analysis. A qualitative synthesis of the findings was conducted, highlighting common trends and patterns in the clinical management of hypertensive complications during pregnancy.

DEVELOPMENT

Gestational hypertension is defined as the onset of high blood pressure—systolic ≥140 mmHg and/or diastolic ≥90 mmHg—after 20 weeks of gestation, in the absence of significant proteinuria. Unlike preeclampsia, this condition is not accompanied by other signs of organ dysfunction. However, it is a dynamic clinical state that can progress to preeclampsia if timely and appropriate

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management is not implemented, which underscores the need for strict monitoring protocols and evidence-based treatment.[6,7,8]

Close monitoring is a cornerstone of gestational hypertension management. Periodic blood pressure measurement is essential, both in the clinical setting and at home. Maternal assessment should include monitoring for warning symptoms such as headaches, visual disturbances, epigastric pain, and dyspnea, as well as renal and hepatic function tests using blood and urine analyses.[9] In the fetal setting, serial ultrasounds are recommended to assess growth and amniotic fluid, as well as fetal well-being tests, including biophysical profiles and non-stress tests.

Delivery planning should be individualized according to the maternal and fetal condition. In cases of controlled hypertension without signs of preeclampsia, delivery can be scheduled at term, after 37 weeks. However, in situations of severe hypertension or clinical deterioration, induction may be necessary before 37 weeks. The choice between vaginal delivery or cesarean section will depend on the comprehensive obstetric evaluation. In conclusion, the management of gestational hypertension requires a multidisciplinary approach that combines non-pharmacological and pharmacological measures, rigorous monitoring, and evidence-based protocols. Ongoing education for healthcare personnel and patient support are crucial for optimizing maternal and perinatal outcomes.

Hypertensive complications of pregnancy, such as gestational hypertension and preeclampsia, not only affect maternal and fetal well-being during gestation but also generate long-term repercussions that persist after delivery.[9] In mothers, these conditions are associated with a significant increase in the risk of chronic hypertension and cardiovascular diseases, including ischemic heart disease, heart failure, and stroke, with preeclampsia doubling the likelihood of future heart disease.[10] Furthermore, severe preeclampsia can cause irreversible kidney damage and promote the development of chronic kidney disease, especially in women with a history of recurrent preeclampsia.[11] Metabolically, these complications predispose to insulin resistance and increase the risk of type 2 diabetes mellitus. In addition, psychological sequelae such as anxiety, depression, and postpartum stress are common, affecting women's quality of life and overall health.

In children of mothers with hypertensive complications, the effects also extend into the long term. In utero exposure to a hypertensive environment is associated with an increased risk of hypertension and cardiovascular disease in adulthood.[12] Infants born with low birth weight or intrauterine growth restriction are more likely to develop metabolic syndrome, diabetes, and growth disorders.[13] Severe preeclampsia and eclampsia can compromise neurological development, increasing the risk of learning disabilities and behavioral problems.[11]

Furthermore, premature births associated with these complications predispose to bronchopulmonary dysplasia and other chronic respiratory diseases due to pulmonary immaturity.[13] Therefore, proper management and postpartum monitoring are essential to mitigate these effects, with the implementation of clinical follow-up strategies and continuous patient education being key to improving long-term maternal and perinatal outcomes.

The primary goal of gestational hypertension management is to prevent progression to preeclampsia and reduce maternal and fetal risks. Specific objectives include: controlling blood pressure to avoid serious complications such as stroke, heart failure, and kidney damage; safely prolonging pregnancy to improve perinatal outcomes; and ensuring continuous monitoring of maternal and fetal well-being. These objectives underscore the importance of a comprehensive approach that combines clinical safety with optimal obstetric outcomes.

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Non-pharmacological management
In cases of mild hypertension, non-pharmacological interventions are the first line of action. Dietary modifications are essential, with a reduction in salt intake and the adoption of a balanced diet rich in fruits and vegetables and low in saturated fats being recommended. Moderate physical activity, adapted to the specific recommendations for pregnant women, contributes to blood pressure control.[4] Likewise, stress management through relaxation techniques and psychological support is beneficial, since stress is a factor that can exacerbate elevated blood pressure.

Pharmacological management
When non-pharmacological measures are insufficient or in cases of moderate to severe hypertension, pharmacological treatment is required. Methyldopa is considered first-line due to its safety during pregnancy, acting as a central alpha-2 adrenergic agonist and reducing peripheral vascular resistance. Labetalol, with alpha- and beta-blocking action, is effective in both acute and chronic hypertension. Nifedipine, a calcium channel blocker, is used in severe hypertension and is available in immediate-release or sustained-release formulations.[3] Finally, hydralazine, an intravenous vasodilator, is reserved for hypertensive crises in hospital settings.

In recent years, various therapeutic alternatives for the management of preeclampsia have been explored, with the aim of improving maternal and perinatal outcomes. According to Trejo Argüello FF,[5] these investigations seek to expand the options beyond traditional drugs, incorporating agents with innovative mechanisms of action.

Sildenafil citrate, known primarily for its use in erectile dysfunction, has shown potential in this area. Its vasodilatory effect on uterine arteries promotes placental perfusion, which could reduce the severity of the condition and improve perinatal outcomes. Preliminary studies suggest relevant clinical benefits, although larger-scale trials are still needed to confirm its safety and efficacy.

Tyrosine kinase inhibitors (TKIs), such as sunitinib and sorafenib, are being investigated for their ability to counteract the abnormal angiogenesis characteristic of preeclampsia. By blocking vascular growth signals, these agents help normalize endothelial function and reduce associated complications.[6]

Monoclonal antibodies targeting angiogenic factors, such as placental growth factor (PGF) and soluble tyrosine kinase receptor-1 (sFlt-1), also represent a promising strategy. These treatments aim to restore angiogenic balance and reduce endothelial inflammation, key elements in the pathophysiology of the disease.[7]

On the other hand, acetylsalicylic acid (aspirin), although not a new therapy, plays an important preventive role. Its use in low doses is recommended for women at high risk of developing preeclampsia, as it inhibits platelet aggregation and prostaglandin synthesis, reducing the likelihood of complications.

The incorporation of these emerging therapies represents a significant advance in the clinical management of preeclampsia. However, it raises challenges related to the need for larger clinical trials to determine optimal dosages, potential adverse effects, and interactions with other medications used during pregnancy. Future research will be crucial to solidify their role in clinical protocols and ensure long-term maternal and fetal safety. Table 1 presents the main results of their use.

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Table 1. Perinatal and Maternal Outcomes According to Therapeutic Approach.

Fountain	Therapeutic approach	Progression to preeclampsia %	Low birth weight %	Premature birth %	Maternal complications %
Falla-Zúñiga LF et al.,(2021)[3]	Monoclonal antibodies	12	9	13	6
Trejo Argüello FF(2020)[5]	Traditional antihypertensive medications	25	15	20	10
Klaassen-Campos CM et al. (2022)[6]	Sildenafil	15	10	15	8
Flores Ramírez JF et al.,(2019)[7]	Tyrosine kinase inhibitors	10	8	12	5

Traditional antihypertensive drugs, such as methyldopa, labetalol, and nifedipine, demonstrated a 25 % reduction in progression to preeclampsia, according to Trejo Argüello FF.[5] These results confirm the existing literature, which highlights their effectiveness in controlling blood pressure during pregnancy.

The use of sildenafil has shown a 15 % reduction in progression to preeclampsia, along with a decrease in the incidence of low birth weight (10 %) and preterm birth (15 %), representing a notable improvement compared to traditional approaches. This finding is consistent with recent studies, such as that by Klaassen Campos CM,[6]who suggests that sildenafil improves placental perfusion and may have additional benefits beyond blood pressure control.

Tyrosine kinase inhibitors showed the best results among the treatments studied, with a progression to preeclampsia of only 10 %, and an incidence of low birth weight and preterm birth of 8 % and 12 %, respectively. These data, supported by research such as that by Flores Ramírez JF et al.,[7] confirm the growing evidence of their effectiveness in the management of preeclampsia, suggesting their potential integration into clinical protocols due to their superior results. The same is detailed by other authors.[8,9]

Treatment with monoclonal antibodies also demonstrated significant effectiveness, reducing progression to preeclampsia to 12 % and showing incidences of low birth weight and preterm delivery of 9 % and 13 %, respectively. These results, supported by studies such as that by Falla-Zúñiga LF et al.,[3] indicate that monoclonal antibodies can offer a viable and effective alternative in the management of preeclampsia. These results highlight the innovations and improvements that new therapies can bring to the management of gestational hypertension and preeclampsia. Advances in pharmacotherapy, such as the use of sildenafil and tyrosine kinase inhibitors, not only improve blood pressure control but also optimize perinatal outcomes. This suggests a trend toward more personalized and effective treatments, which may redefine current clinical management strategies.[10,11]

Finally, the results of this research indicate the importance of adopting new therapeutic approaches for the management of hypertensive complications in pregnancy. Integrating these new therapies into clinical protocols can lead to a substantial improvement in maternal and perinatal health, offering better long-term prospects for patients. Comparison with previous studies reinforces the validity of these results and highlights the need to continue researching and developing innovative treatments for these conditions.[12]

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However, it is crucial to consider the limitations of this study. One potential limitation lies in the selection of the reviewed studies, which could introduce bias due to the heterogeneity in methodological designs and the populations studied. The variability in the results of individual studies may also affect the generalizability of the findings. Furthermore, most of the included studies were conducted in specific clinical settings, which could limit the applicability of the results to different geographical and demographic contexts.

CONCLUSIONS

The study met its objective of evaluating the effectiveness of different therapeutic approaches for gestational hypertension and preeclampsia, demonstrating that new alternatives such as sildenafil, tyrosine kinase inhibitors, and monoclonal antibodies are more effective than traditional antihypertensive drugs. Sildenafil showed benefits by reducing the progression to preeclampsia and improving perinatal outcomes, decreasing the incidence of low birth weight and preterm birth; tyrosine kinase inhibitors confirmed their high effectiveness compared to conventional treatments; and monoclonal antibodies showed potential for improving maternal and fetal health. These findings highlight the need to incorporate innovative therapies into clinical protocols, promoting personalized, evidence-based management that optimizes clinical outcomes and reduces long-term maternal and perinatal complications.

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