Special journal of the Medical Academy and other Life Sciences
Vol. 2 No. 7 (2024)

Peculiarities of arterial hypertension in pregnancy from the point of view of evidence-based medicine.

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Abstract

Background: Arterial hypertension during pregnancy is a significant public health issue, affecting 10-15% of pregnancies globally. It encompasses gestational hypertension, preeclampsia, and chronic hypertension, which are leading causes of maternal and fetal morbidity and mortality. Understanding and managing these hypertensive disorders is crucial due to their impact on maternal and child health outcomes. Recent advancements in screening, diagnostic criteria, and treatment options have significantly improved clinical practices, emphasizing the importance of evidence-based management.

Methods and Materials: This study adopts an evidence-based methodology, combining qualitative and quantitative research to investigate arterial hypertension in pregnancy. A systematic literature review was conducted using databases such as PubMed, Cochrane Library, and ScienceDirect. Comparative and statistical analyses were performed to evaluate diagnostic and treatment efficiencies across various studies. The study aims to synthesize current data on epidemiology, risk factors, and management outcomes to enhance clinical guidelines and improve maternal-fetal health.

Results: The findings highlight the significant global burden of hypertensive disorders in pregnancy, with varying prevalence across different regions influenced by genetic, healthcare access, and socioeconomic factors. Effective management strategies include both pharmacological interventions, such as the use of labetalol, methyldopa, and nifedipine, and non-pharmacological approaches, including dietary modifications and lifestyle changes. The study also underscores the importance of early detection and personalized treatment plans to mitigate adverse outcomes.

Conclusion: The study concludes that hypertensive disorders in pregnancy pose substantial risks to maternal and fetal health, necessitating precise diagnostic protocols and evidence-based therapeutic interventions. Public health strategies, including educational programs and community-based interventions, are essential in raising awareness and preventing these conditions. Continued research and clinical practice improvements are vital to better understanding and managing hypertension in pregnancy, ultimately improving health outcomes for mothers and future generations.

Keywords: Arterial Hypertension, Pregnancy, Preeclampsia, Evidence-Based Medicine, Maternal-Fetal Health.

List of abbreviations

ACOG - American College of Obstetricians and Gynecologists

BP - Blood pressure

DBP- Diastolic blood pressure

DHL lactic dehydrogenase

ECG- Electrocardiogram

HDP - hypertensive disorders in pregnancy

HELLP - Hemolysis, Elevated Liver enzymes, and Low Platelet count

ISSHP - International Society for the Study of Hypertension in Pregnancy.

IUGR - intrauterine growth restriction

WHO - World Health Organisation

SBP- Systolic blood pressure

TGO - Transaminase Glutâmico Oxalacética

TGP - Transaminase Glutâmico Pirúvica

Introduction

Relevance of Topic

Arterial hypertension during pregnancy is a crucial public health issue, affecting between 10-15% of pregnancies globally. This prevalence underscores the importance of understanding and managing hypertensive disorders in pregnancy, which include conditions such as gestational hypertension, preeclampsia, and chronic hypertension. These disorders are leading causes of maternal and fetal morbidity and mortality, indicating the necessity for focused research and targeted interventions. The global burden of these conditions also highlights disparities in health outcomes, which are influenced by geographical and socioeconomic factors [1].

Continued advancements in diagnostic and therapeutic strategies for managing hypertension in pregnancy are critical. Studies from the last decade have led to improvements in screening methods, diagnostic criteria, and treatment options, significantly impacting clinical practices. Provide a comprehensive look at how blood pressure changes during pregnancy can influence fetal growth and gestational age at delivery, demonstrating the impact of effective hypertension management. These advancements are crucial for reducing the adverse outcomes associated with hypertensive disorders in pregnancy [2].

Aim of topic

To investigate the complexities and management of arterial hypertension in pregnancy, employing an evidence-based approach to enhance patient outcomes and inform clinical practices.

Objectives of the study

1. To analyze the global incidence and prevalence of hypertension in pregnancy, classify the types of arterial hypertension encountered, and identify modifiable and non-modifiable risk factors.
2. Elucidate the biological, placental, immunological, and genetic/environmental mechanisms underpinning hypertension in pregnancy, aiming to deepen understanding of its pathophysiology.
3. To assess current screening methods and diagnostic criteria for hypertension in pregnancy and evaluate the efficacy of various monitoring techniques ranging from blood pressure measurements to biomarker analysis.

4. Review evidence-based therapeutic strategies and interventions for managing hypertension in pregnancy, critically analyze the use of antihypertensive medications, explore non-pharmacological interventions and lifestyle modifications, and examine public health strategies for prevention and education.

5. Investigate the short and long-term maternal consequences of hypertension in pregnancy and assess the associated fetal and neonatal outcomes, aiming to chart the overall impact of hypertensive disorders on maternal and child health.

Material and methods

This study adopts an evidence-based methodology combining qualitative and quantitative research to investigate arterial hypertension in pregnancy. It involves a systematic literature review to synthesize current data on epidemiology, risk factors, and management outcomes from peer-reviewed journals, clinical trials, and meta-analyses. Comparative and statistical analyses will further evaluate diagnostic and treatment efficiencies across various studies using major databases like PubMed, Cochrane Library, AHA journals, Medscape, Research Gate, MSD manuals, ScienceDirect, and others. Data will be rigorously extracted and managed to ensure reliable findings, aiming to enhance clinical guidelines and improve maternal-fetal health outcomes.

Practical Significance

The practical significance of this study on arterial hypertension in pregnancy lies in its potential to directly impact clinical practices and patient care standards. By systematically reviewing and analyzing current evidence, the research aims to clarify the best practices for diagnosing, managing, and preventing hypertension during pregnancy. This could lead to more effective and tailored treatment plans that enhance maternal and fetal outcomes.

Moreover, by addressing gaps in the existing literature and consolidating knowledge on risk factors and pathophysiological mechanisms, the findings may inform future guidelines and policy-making. This could potentially reduce the incidence of hypertensive disorders in pregnancy and their associated complications, thereby improving long-term health outcomes for mothers and their children. The study's focus on evidence-based approaches ensures that the results will be both relevant and applicable to everyday clinical settings, making it a valuable contribution to obstetric medicine.

Chapter 1: Mapping the Landscape: Epidemiology, Classification, and Risk Factors in Hypertensive Pregnancy

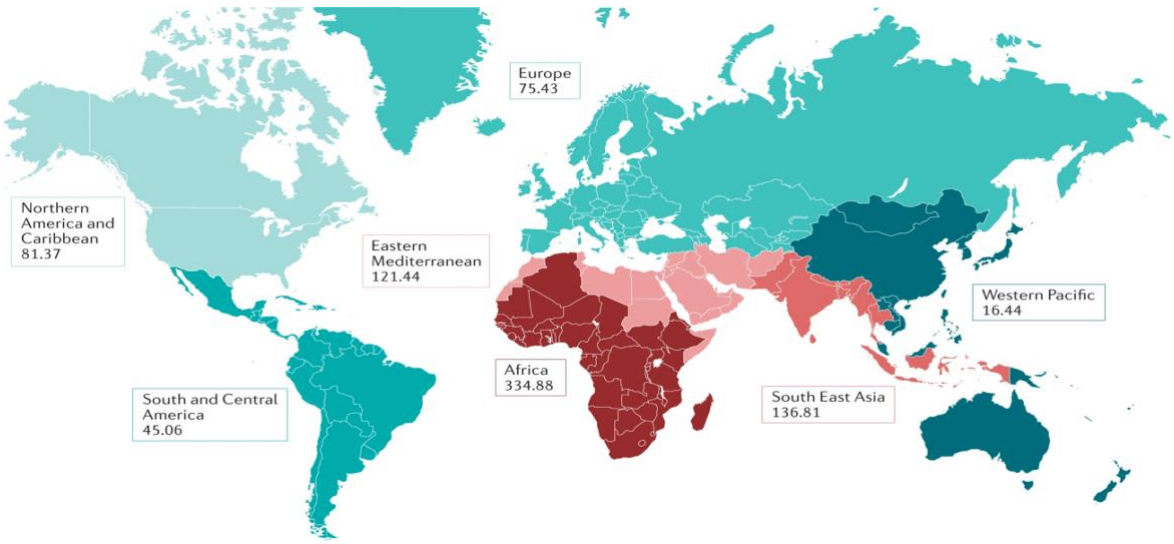
1.1 Global Incidence and Prevalence of Hypertension in Pregnancy

Hypertensive disorders in pregnancy, including gestational hypertension, preeclampsia, eclampsia, and chronic hypertension, continue to pose significant health challenges across the globe. These conditions are among the leading causes of maternal and perinatal morbidity and mortality, affecting an estimated 10-15% of all pregnancies worldwide. The incidence and prevalence of these disorders vary significantly across different geographical regions and are influenced by factors such as genetic predispositions, healthcare access, and socioeconomic status [3].

The scope of this problem is highlighted by its implications on maternal and neonatal health, which underscores the urgency of addressing these conditions. Some studies provide a comparative analysis of prevalence rates across continents, showing higher rates in Western countries compared to Asia, possibly due to varying diagnostic criteria and reporting standards [4].

A systematic review and meta-analysis conducted by Ananth et al. (2022) emphasize the critical global health burden posed by hypertensive disorders in pregnancy. The review also emphasizes the need for international healthcare policies that prioritize maternal health and address the disparities in the prevalence and outcomes of hypertensive disorders in pregnancy [5].

Fig. 1: Prevalence of hypertensive disorders of pregnancy (per 100,000 women of childbearing age) in 2019 by WHO region [6].



The mean prevalence of hypertensive disorders in pregnancy (HDP) shows a state of inequity among different regions worldwide. Africa has the highest mean prevalence of HDP, which is far higher than in other regions. It is followed by South East Asia and Eastern Mediterranean, which have a mean prevalence of HDP of over 0.1% among women of childbearing age. The Western Pacific has the lowest mean prevalence of HDP [6].

1.2 Classification of Arterial Hypertension in Pregnancy

The classification of arterial hypertension in pregnancy is critical for accurate diagnosis and management. Hypertensive disorders are primarily divided into four categories:

- Chronic Hypertension: This type predates the pregnancy or is diagnosed before the 20th week of gestation and often persists after childbirth [7].
- Gestational Hypertension: Developing after the 20th week of pregnancy without the presence of protein in the urine, this condition usually resolves post-delivery [7].
- White-coat hypertension refers to elevated office/clinic(≥140/90 mm Hg) BP, but normal BP measured at home or work (<135/85 mm Hg); it is not an entirely benign condition and conveys an increased risk for preeclampsia [8].
- Preeclampsia-Eclampsia: This involves the new onset of hypertension after the 20th week of pregnancy combined with significant Proteinuria. In severe cases, eclampsia can manifest, characterized by life-threatening seizures [7].
- Chronic Hypertension with Superimposed Preeclampsia: Occurs in women with chronic hypertension who develop worsening high blood pressure and Proteinuria during pregnancy [7].

Each subtype has distinct implications for treatment and monitoring, making their differentiation a key aspect of prenatal care protocols.

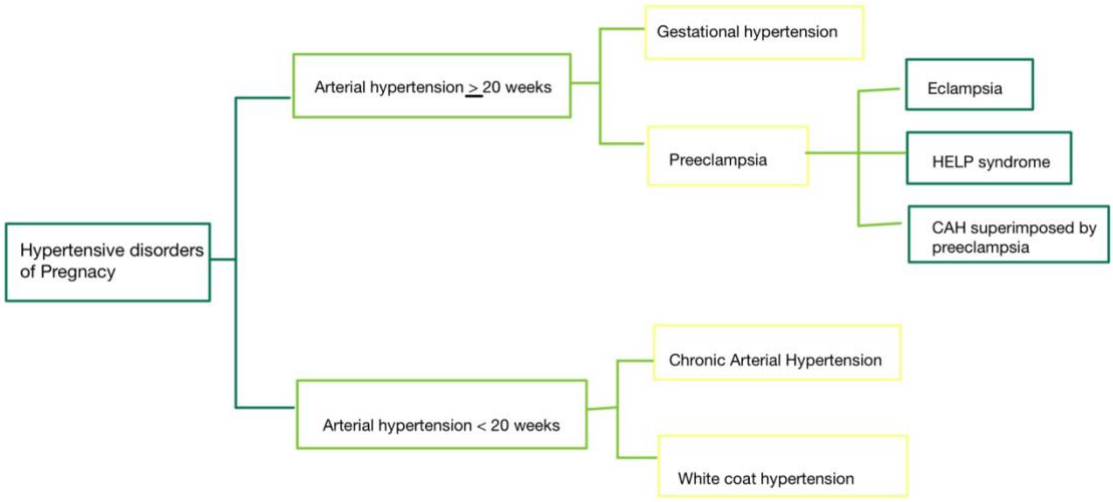


Fig. 2: Classification of hypertensive disorders in pregnancy.

The above figure shows that hypertensive disorder in pregnancy will be divided into arterial hypertension developed before 20 weeks of gestation. After 20 weeks of gestation, and from this, each category will be determined.

1.3 Risk Factors (Modifiable and Non-modifiable) for Developing Hypertension in Pregnancy

Hypertension in pregnancy is influenced by a spectrum of both modifiable and non-modifiable risk factors. Non-modifiable risk factors include age (advanced maternal age), a personal or family history of hypertension, and ethnic background (ex., African American women and Filipino women have an increased risk of developing hypertension during pregnancy). These factors are intrinsic to the individual and can significantly heighten the risk of developing conditions such as preeclampsia [8].

On the other hand, modifiable risk factors are largely lifestyle-related and can be altered to reduce risk. Key modifiable factors include obesity, dietary sodium intake, and overall physical activity levels. The ISSHP guidelines specifically recommend dietary and lifestyle interventions as preventive measures to manage these risks effectively. Notably, the guidelines underscore the importance of tailored dietary advice and regular physical activity to mitigate the onset of hypertensive disorders during pregnancy [8].

Furthermore, the ISSHP emphasizes the role of medical management in mitigating risk where lifestyle changes alone may be insufficient. This includes the careful monitoring of blood pressure and the potential use of antihypertensive medications under strict medical supervision [8].

Chapter 2: Precise Detection: How to Diagnose Hypertension in Pregnancy

2.1 Screening Methods and Diagnostic Criteria

Screening for hypertension in pregnancy is essential for the early detection and management of hypertensive disorders. The American College of Obstetricians and Gynecologists (ACOG) recommends measuring blood pressure at every prenatal visit to screen for hypertension. Diagnostic criteria for hypertension in pregnancy have been defined as a systolic blood pressure of 140 mmHg or higher or a diastolic blood pressure of 90 mmHg or higher, on two occasions at least 4 hours apart. If SBP is greater than or equal to 160 mmHg or DBP is greater than or equal to 110 mmHg, wait only 15 minutes to confirm the presence of arterial hypertension [9].

In recent years, home and ambulatory blood pressure monitoring have also been recognized for their roles in diagnosing hypertension in pregnancy. These methods can help distinguish between white-coat hypertension and true hypertension by providing more representative blood pressure readings outside the clinical setting [10].

2.2 Monitoring Techniques: From Blood Pressure to Biomarkers

Once hypertension is diagnosed, monitoring techniques are crucial for the management of the condition throughout pregnancy. The use of biomarkers, such as serum uric acid, liver enzymes, and the ratio of soluble fms-like tyrosine kinase to placental growth factor, has been researched extensively as tools for predicting the severity of complications such as preeclampsia and the risk of adverse outcomes [11].

Diagnosing Proteinuria in hypertensive pregnant women is crucial because it can indicate preeclampsia, which is a significant risk to both mother and fetus. Proteinuria is typically identified when a woman has a urinary protein excretion of 300 mg or more in a 24-hour urine collection or a protein/creatinine ratio of 0.3 mg/dL or greater in a random urine sample. The importance of diagnosing Proteinuria lies in its role in early detection and management of preeclampsia, which can lead to serious complications if left untreated. For detailed protocols on diagnosis and management, clinicians refer to comprehensive guidelines encompassing blood pressure measurement techniques, laboratory tests including urine analysis, and other diagnostic procedures like ECG. Regular monitoring and appropriate treatment of hypertension and associated conditions in pregnancy are key to preventing adverse outcomes [9].

Other laboratory tests that should be requested when preeclampsia is suspected are: complete blood count, transaminases (TGO and TGP), bilirubin, lactic

dehydrogenase (DHL) or schistocytes, urea, creatinine, uric acid, and obstetric Doppler velocimetry. Some symptoms indicate the severity of the disease, so they should be valued. They are headache, epigastric pain, pain in the right hypochondrium, oliguria, visual changes, change in mental status, and seizures.

Furthermore, the development of predictive models incorporating biomarkers and clinical features is an emerging field that can offer insights into the risk of progression from mild to severe disease, potentially guiding therapeutic decision-making and the frequency of monitoring required [12].

Table 1: Classification of hypertension in pregnancy according to markers [13].

Classification	Gestational age (weeks)	Maternal blood pressure (mmHg)	Proteinuria	Seizures
Gestational hypertension	>20	>140/90	No	No
Mild preeclampsia[5]	>20	>140/90	<5 g/24 h	No
Severe preeclampsia	>20	>160/110	>5 g/24 h	No
Eclampsia[6,7]	>20	>160/110	>5 g/24 h	Present
Chronic hypertension[5]	<20 and prior to	>140/90	No	No

Taking into consideration age, levels of maternal blood pressure, Proteinuria, and presence of seizures, hypertension can be differentiated from various types.

Chapter 3: Clinical Management and Prevention

3.1 Evidence-Based Therapeutic Strategies and Interventions

Effective management of hypertension in pregnancy requires adherence to evidence-based guidelines that prioritize both maternal and fetal health. As the American College of Obstetricians and Gynecologists (ACOG) outlined, initial measures should include lifestyle modifications and, if necessary, pharmacological treatment initiated under close medical supervision. The goal is to maintain blood pressure within a range that minimizes the risk of hypertension-related complications while avoiding adverse drug effects on the fetus [14].

Regular monitoring through office visits and home blood pressure measurements is recommended to assess the effectiveness of the prescribed therapy and make timely adjustments. This proactive approach helps in early identification of potential complications, such as preeclampsia, which may require more intensive interventions or even preterm delivery [15].

3.2 Pharmacological Management: A Critical Review of Antihypertensive Medications

The pharmacological management of hypertension in pregnancy is carefully tailored to balance the benefits of controlling blood pressure with the safety of the fetus. Among the medications deemed safe and effective during pregnancy, labetalol, methyldopa, and nifedipine stand out due to their extensive track record and supportive evidence from clinical trials and guidelines. Labetalol, a combined alpha and beta-blocker is often the first-line treatment for hypertension in pregnancy, typically administered in doses ranging from 100 to 400 mg twice daily, depending on the patient's blood pressure response and tolerability [16].

Methyldopa, which has been used for several decades, remains a preferred choice due to its safety profile during pregnancy. It is generally started at a dose of 250 mg twice or three times a day, which may be increased to a maximum of 2 grams daily to achieve blood pressure control. This drug is favored for its minimal placental transfer and proven safety record across numerous gestational hypertension studies [17].

Nifedipine, a calcium channel blocker, is used as an alternative, particularly in cases where beta-blockers are contraindicated. The immediate-release form is avoided due to potential sudden hypotensive effects, and the extended-release formulation is prescribed, usually starting at 30-60 mg once daily [18].

The choice of medication often depends on individual patient factors, including the severity of hypertension, any coexisting medical conditions, and the gestational age at onset. Monitoring for side effects is crucial, as pregnancy can alter drug metabolism and pharmacodynamics. Therefore, close supervision by a healthcare provider is essential to adjust the medication regimen as pregnancy progresses and to monitor for any potential adverse effects on both the mother and the fetus. Regular follow-ups and blood pressure monitoring are critical to ensure the efficacy and safety of the treatment regime, thus preventing complications associated with uncontrolled hypertension [19].

3.3 Non-Pharmacological Interventions and Lifestyle Modifications

Non-pharmacological interventions play a crucial role in the management of hypertension in pregnancy. Dietary modifications, particularly reducing salt intake, increasing intake of fruits and vegetables, and maintaining a healthy weight, are effective strategies. Regular physical activity appropriate for pregnancy can also help manage blood pressure [20].

Stress reduction techniques such as yoga and mindfulness meditation have been shown to have beneficial effects on blood pressure control. Educating pregnant women about the importance of these lifestyle changes and supporting them in implementing them is essential for effective hypertension management [21].

3.4 Public Health Strategies for Prevention and Education

Public health initiatives aimed at preventing hypertension in pregnancy focus on education, early detection, and lifestyle interventions. Programs designed to increase awareness about the importance of prenatal care and blood pressure monitoring can significantly reduce the incidence of hypertensive disorders in pregnancy [22].

Community-based interventions that provide education about diet, exercise, and weight management are also effective. These programs are particularly important in underserved populations, who may be at higher risk for developing hypertension during pregnancy [23].

Chapter 4: Charting the Impact: Maternal and Fetal Outcomes

4.1 Short and Long-Term Maternal Consequences of Hypertension in Pregnancy

Hypertensive disorders of pregnancy, such as preeclampsia, can lead to severe health implications both during and after pregnancy. In the immediate term, these disorders can result in complications such as HELLP syndrome (hemolysis, elevated liver enzymes, low platelet count), acute renal failure, and an increased risk of eclampsia, which may necessitate premature delivery [24]. Managing these acute issues requires

intensive medical care and can significantly increase the complexity and cost of childbirth.

In the long term, women who experience hypertension during pregnancy have a higher likelihood of developing cardiovascular diseases, including chronic hypertension, ischemic heart disease, and stroke. These risks persist even decades after pregnancy, suggesting that hypertension in pregnancy may be a marker of an increased predisposition to cardiovascular diseases or may itself contribute to the etiology of these conditions [25]. This underscores the importance of postpartum follow-up and long-term health monitoring for women who have had hypertensive disorders in pregnancy.

Moreover, recent studies have suggested that the impact of hypertension can extend to mental health, with increased risks for conditions such as depression and anxiety disorders postpartum. These psychological dimensions highlight the need for comprehensive health strategies that encompass both physical and mental health care post-pregnancy [26].

4.2 Fetal and Neonatal Outcomes Associated with Hypertensive Disorders in Pregnancy

Fetal outcomes in hypertensive pregnancies can be significantly compromised. Hypertension can cause placental insufficiency, which in turn may lead to intrauterine growth restriction (IUGR). In this condition, a fetus is smaller than expected for the number of weeks of pregnancy, which may have long-standing effects on the child's development [27]. Prematurity is another direct consequence of hypertensive disorders in pregnancy, often resulting from medically indicated preterm delivery to prevent further maternal and fetal deterioration.

Studies have also shown that children born from pregnancies affected by hypertension are at a greater risk of neonatal complications such as low birth weight, respiratory distress syndrome, and, in severe cases, stillbirth. The early life conditions these children experience can influence their health trajectories significantly, predisposing them to higher rates of hypertension, type 2 diabetes, and metabolic syndrome later in life [28].

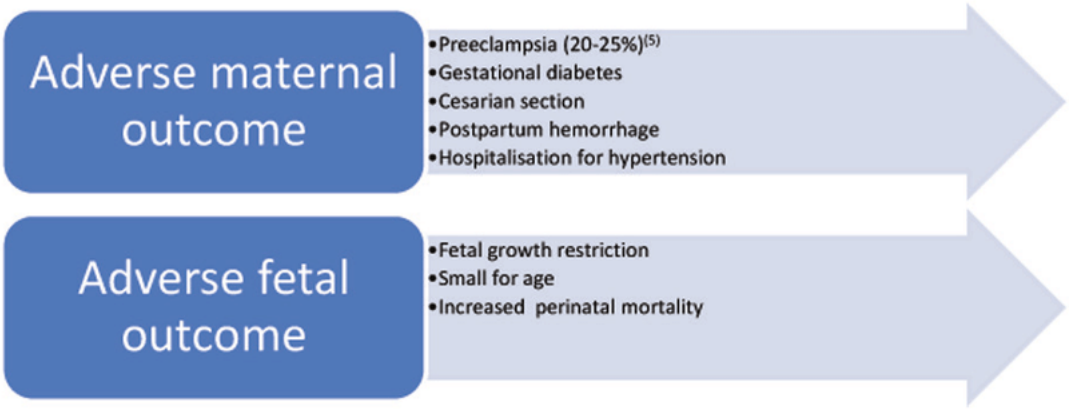


Fig. 3: Maternal and fetal outcome in chronic hypertension in pregnancy [30].

Furthermore, there is emerging evidence linking maternal hypertension with neurodevelopmental disorders in offspring. Hypertension may affect the fetal brain development due to a suboptimal intrauterine environment, leading to potential cognitive impairments and behavioral issues as the child grows. This connection emphasizes the need for early intervention and monitoring of children born to hypertensive mothers to mitigate these risks [29].

Arterial hypertension should be closely monitored because it can cause severe complications for the mother and fetus, as shown in the figure above.

Conclusion

In exploring the peculiarities of arterial hypertension in pregnancy, this article has highlighted the complex interplay between pathophysiological insights, diagnostic approaches, and management strategies. Hypertensive disorders in pregnancy, including preeclampsia, gestational hypertension, and chronic hypertension, not only pose significant risks to maternal and fetal health but also offer a window into the broader implications of cardiovascular health in women.

Firstly, the comprehensive review of epidemiological data underscores these disorders' substantial burden on healthcare systems worldwide. This burden is amplified by the diverse manifestations of the disease, which necessitate precise and early diagnostic protocols to mitigate adverse outcomes. The adoption of evidence-based screening methods and the refinement of diagnostic criteria are crucial in ensuring early intervention.

Secondly, the discussion on therapeutic interventions reveals a nuanced landscape where the balance between efficacy and safety is paramount. Pharmacological management with drugs like methyldopa, labetalol, and nifedipine has been validated as effective, yet the need for personalized treatment plans is evident to cater to individual patient profiles and reduce the incidence of complications. Moreover, non-pharmacological interventions, including dietary and lifestyle modifications, have proven to be instrumental in managing mild cases of hypertension and in preventing its onset.

Additionally, the role of public health strategies in combating hypertension in pregnancy cannot be overstated. Educational programs aimed at both healthcare providers and expectant mothers, alongside community-based interventions, have the potential to significantly reduce the prevalence of these conditions. Such strategies are essential in raising awareness and fostering preventive practices that can lead to improved maternal and fetal health outcomes.

Ultimately, this article calls for a continued focus on research and clinical practice improvements to better understand and manage hypertension in pregnancy. It is imperative that future research explores the long-term cardiovascular impacts on mothers who experience hypertensive disorders during pregnancy and investigates the intergenerational effects of these conditions. By enhancing our understanding and management of hypertension in pregnancy, we can improve the quality of care provided to women and contribute to better health outcomes for future generations.

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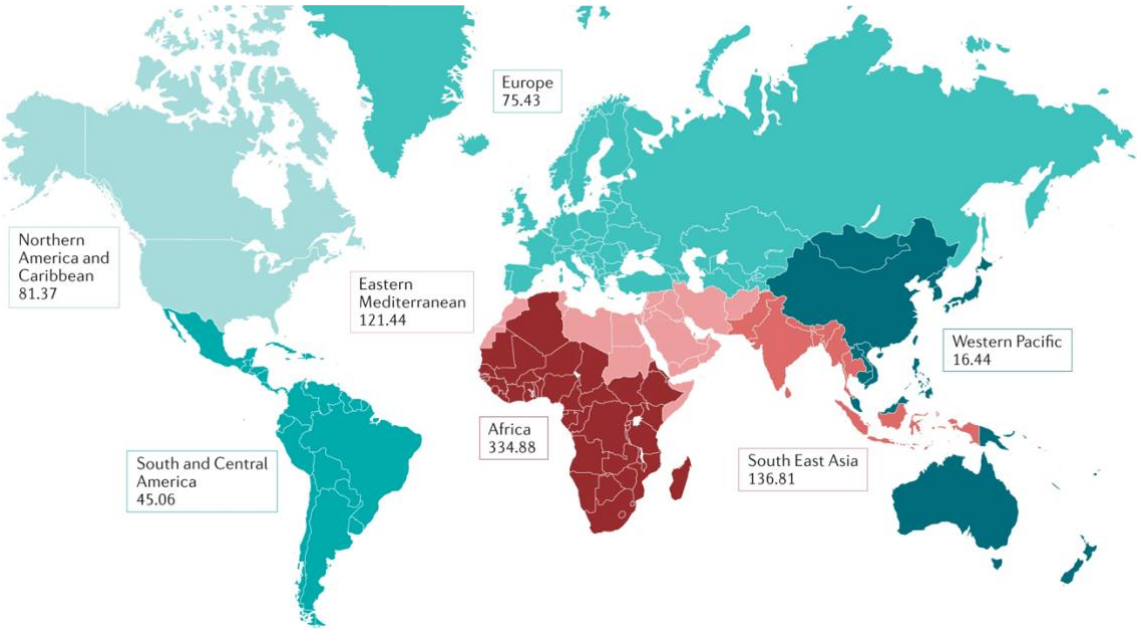
Figures

Fig. 1: Prevalence of hypertensive disorders of pregnancy (per 100,000 women of childbearing age) in 2019 by WHO region [6].



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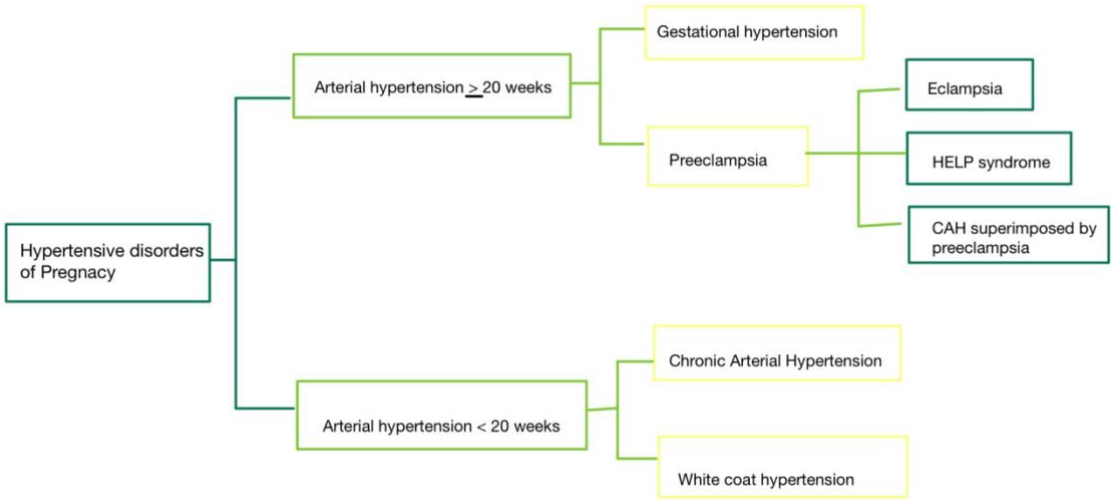

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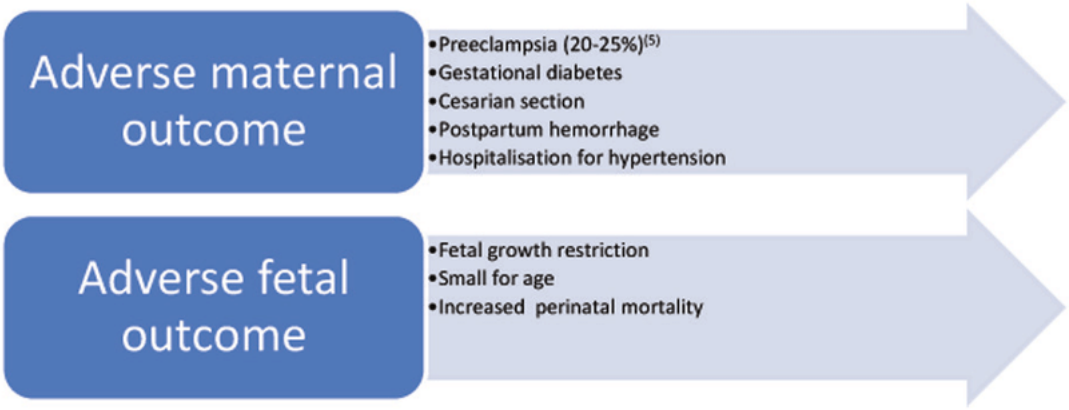

Fig. 3: Maternal and fetal outcome in chronic hypertension in pregnancy [30].

Arterial hypertension should be closely monitored because it can cause severe complications for the mother and fetus, as shown in the figure above.

Table

Table 1: Classification of hypertension in pregnancy according to markers [13].

Classification	Gestational age (weeks)	Maternal blood pressure (mmHg)	Proteinuria	Seizures
Gestational hypertension	>20	>140/90	No	No
Mild preeclampsia[5]	>20	>140/90	<5 g/24 h	No
Severe preeclampsia	>20	>160/110	>5 g/24 h	No
Eclampsia[6,7]	>20	>160/110	>5 g/24 h	Present
Chronic hypertension[5]	<20 and prior to	>140/90	No	No

Taking into consideration age, levels of maternal blood pressure, Proteinuria, and presence of seizures, hypertension can be differentiated from various types.