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Heartbeat of Hope: Saving Mothers' Lives through Effective Pre-Eclampsia Management

Osintona Ronke Rebecca[1], Abiodun-Ojo Oluwabukola Esther[2]
Department of Nursing Sciences, College of Medicine and Health Sciences, Afe Babalola University of Post-graduate Studies

Abstract- Background: ***Pre-eclampsia (PE) is a multisystem hypertensive disorder of pregnancy, typically presenting after 20 weeks of gestation with hypertension and proteinuria. It contributes significantly to maternal and perinatal morbidity and mortality, accounting for over 50,000 maternal deaths and 500,000 fetal deaths annually. The burden is disproportionately high in sub-Saharan Africa, including Nigeria, where prevalence ranges from 2–16% and maternal mortality ratios exceed 1,000 per 100,000 live births.***

Objectives: ***This narrative review, Heartbeat of Hope: Saving Mothers' Lives through Effective Pre-eclampsia Management, aims to examine the burden, risk factors, and pathophysiology of PE; evaluate diagnostic biomarkers and screening tools; explore clinical management and preventive strategies and identify barriers and propose solutions for Nigeria and similar resource-limited settings.***

Methods: ***Evidence was synthesized from peer-reviewed studies, WHO guidelines, and meta-analyses published between 2021 and 2025, with emphasis on African and Nigerian data.***

Results: ***PE complicates 3–5% of pregnancies globally, with higher incidence in low-resource settings. Risk factors include primigravidity, advanced maternal age, obesity, diabetes, and family history. Diagnostic advances such as the sFlt-1/PlGF ratio, uterine artery Doppler, and angiogenic biomarkers improve predictive accuracy beyond traditional blood pressure and proteinuria measures. Preventive strategies—low-dose aspirin, calcium supplementation, and lifestyle interventions—reduce risk in high-risk women. Management relies on antihypertensives, magnesium sulfate for seizure prophylaxis, and timely delivery. In Nigeria, barriers include poor antenatal coverage, limited access to diagnostic tools, shortages of essential medicines, and inadequate provider training.***

Conclusion: ***Effective PE management requires integration of advanced diagnostics, preventive interventions, and evidence-based treatment within strengthened health systems. In Nigeria, scaling up antenatal care, training frontline providers, ensuring magnesium sulfate availability, and community education are critical to reducing maternal mortality. Addressing these barriers aligns with the Sustainable Development Goal of reducing maternal deaths to fewer than 70 per 100,000 live births by 2030.***

Index Terms- ***diagnostic biomarkers, magnesium sulfate, maternal mortality, Pre-eclampsia, preventive strategies***

I. INTRODUCTION

Pre-eclampsia (PE) is a pregnancy-specific hypertensive disorder characterized by new-onset hypertension after 20 weeks of gestation, frequently accompanied by proteinuria and evidence of systemic organ dysfunction [1]. It is a major contributor to maternal and perinatal morbidity and mortality globally, especially in low-resource settings where access to quality maternal healthcare remains inadequate [2]. The disorder affects approximately 5–10% of pregnancies worldwide and accounts for nearly 15% of maternal deaths annually [3].

Globally, hypertensive disorders of pregnancy are responsible for approximately 76,000 maternal deaths and over 500,000 neonatal deaths annually [4]. In Nigeria and other sub-Saharan African countries, the burden of pre-eclampsia is disproportionately high due to delayed diagnosis, poor antenatal attendance, inadequate health infrastructure, and socioeconomic inequalities [5]. Recent systematic reviews estimate the prevalence of pre-eclampsia in Nigeria to range between 2% and 16.7%, with maternal mortality rates remaining alarmingly high [6].

The pathogenesis of pre-eclampsia is multifactorial and incompletely understood. Current evidence implicates abnormal placentation, endothelial dysfunction, angiogenic imbalance, oxidative stress, inflammation, and maternal cardiovascular maladaptation [7]. If left untreated, pre-eclampsia may progress to eclampsia, HELLP syndrome, stroke, renal failure, pulmonary edema, placental abruption, fetal growth restriction, preterm birth, and maternal or fetal death [8].

Despite improvements in obstetric practice, challenges persist in early detection and effective management of the disease. Current management strategies emphasize early diagnosis, blood pressure control, seizure prophylaxis with magnesium sulfate, and timely delivery [9]. Preventive interventions such as low-dose aspirin and calcium supplementation have demonstrated benefits in high-risk women [10].

This narrative review discusses the epidemiology, pathophysiology, risk factors, classification, diagnosis, management, prevention, barriers, and

future directions in pre-eclampsia management with emphasis on improving maternal and fetal outcomes.

II. METHODS

This narrative review synthesized evidence from peer-reviewed studies, WHO reports, ACOG guidelines, and obstetric publications published between 2021 and 2026. Literature was retrieved from PubMed, Scopus, Google Scholar, and SpringerLink using keywords including "pre-eclampsia," "eclampsia," "maternal mortality," "hypertension in pregnancy," and "magnesium sulfate." Priority was given to systematic reviews, meta-analyses, and international clinical guidelines.

III. BURDEN OF PRE-ECLAMPSIA

Pre-eclampsia remains a major contributor to maternal and perinatal mortality worldwide, particularly in low- and middle-income countries. Globally, the condition affects approximately 4–10% of pregnancies and contributes to over 70,000 maternal deaths annually [3,4]. In sub-Saharan Africa, hypertensive disorders of pregnancy account for a substantial proportion of maternal deaths due to delayed diagnosis, inadequate antenatal care, and poor access to emergency obstetric services [12].

Nigeria continues to record one of the highest maternal mortality ratios globally, with pre-eclampsia and eclampsia contributing significantly to preventable maternal deaths [6,13]. Poor healthcare infrastructure, poverty, weak referral systems, and shortages of trained healthcare workers further worsen outcomes.

IV. RISK FACTORS

Risk factors for pre-eclampsia include previous history of pre-eclampsia, chronic hypertension, diabetes mellitus, multiple gestation, obesity, nulliparity, advanced maternal age, and chronic kidney disease [1,14]. Women with poor access to antenatal care are also at increased risk.

Pre-eclampsia is classified according to onset and severity. Early-onset disease (<34 weeks) is strongly associated with placental dysfunction and poorer fetal outcomes, whereas late-onset disease (≥34 weeks) is more common and often linked to maternal cardiovascular maladaptation [15,16]. Severe pre-eclampsia is characterized by severe hypertension, neurological symptoms, renal insufficiency, thrombocytopenia, pulmonary edema, or liver dysfunction [17].

V. PATHOPHYSIOLOGY AND CLINICAL MANIFESTATION

The pathophysiology of pre-eclampsia is primarily linked to abnormal placentation and defective remodeling of uterine spiral arteries [18]. Reduced placental perfusion leads to oxidative stress, endothelial dysfunction, inflammation, and release of antiangiogenic factors such as soluble fms-like tyrosine kinase-1 (sFlt-1) [20]. These changes contribute to hypertension, proteinuria, vasoconstriction, and multisystem organ dysfunction.

Clinical manifestations range from mild hypertension and edema to severe complications such as persistent headache, visual disturbances, pulmonary edema, HELLP syndrome, renal failure, stroke, placental abruption, and eclampsia [21,22].

VI. RESULTS/FINDINGS

Diagnosis is based on new-onset hypertension after 20 weeks of gestation with proteinuria or evidence of end-organ dysfunction [17]. Current diagnostic approaches include blood pressure measurement, urinalysis, renal and liver function tests, platelet count, and fetal monitoring.

Biomarkers such as sFlt-1 and placental growth factor (PlGF) have improved early detection and risk prediction. The sFlt-1/PlGF ratio is increasingly used to identify women at high risk of severe disease [20].

Management depends on gestational age, disease severity, and maternal-fetal condition. The primary goals are seizure prevention, blood pressure control, fetal surveillance, and timely delivery.

A. Antihypertensive therapy

First-line medications include methyldopa, labetalol, nifedipine, and hydralazine [23]. These agents reduce maternal complications associated with severe hypertension.

B. Magnesium sulfate

Magnesium sulfate remains the gold standard for seizure prophylaxis and treatment of eclampsia [24]. Both the Pritchard and Zuspan regimens are widely recommended.

C. Delivery

Delivery remains the definitive treatment for pre-eclampsia. Women with severe disease or fetal compromise may require urgent delivery irrespective of gestational age [25].

D. Prevention Strategies

Preventive interventions focus on early identification of high-risk women and strengthening antenatal care services. Low-dose aspirin started

before 16 weeks of gestation significantly reduces the risk of severe pre-eclampsia and fetal growth restriction [10]. WHO also recommends calcium supplementation in populations with low dietary calcium intake [26].

Routine antenatal visits improve early detection, risk assessment, and timely referral. Public health education, nutritional counseling, and management of chronic diseases such as obesity and diabetes are equally important preventive measures.

VII. BARRIERS TO EFFECTIVE MANAGEMENT

Several barriers continue to hinder effective pre-eclampsia management in low-resource settings. These include inadequate healthcare infrastructure, shortages of magnesium sulfate and diagnostic equipment, delayed laboratory investigations, and weak referral systems [28].

Socioeconomic barriers such as poverty, transportation difficulties, low health literacy, and cultural beliefs contribute to delayed care-seeking. In addition, inadequate training of healthcare workers and poor adherence to clinical guidelines remain major challenges [29].

VIII. FUTURE DIRECTIONS AND NURSING IMPLICATIONS

Improving maternal outcomes requires strengthening healthcare systems, increasing access to quality antenatal care, ensuring availability of essential medications, and improving referral services. Continuous training of healthcare providers and implementation of evidence-based guidelines are critical.

Digital health technologies, telemedicine, and community-based maternal health programs may improve monitoring and early referral in underserved communities [30]. Nurses remain central to screening, monitoring, health education, medication administration, and emergency response.

Future nursing research should focus on predictive biomarkers, digital monitoring tools, patient education strategies, and culturally appropriate interventions to improve maternal outcomes.

IX. CONCLUSION

Pre-eclampsia remains a leading cause of maternal and perinatal morbidity and mortality worldwide. Early diagnosis, effective antenatal surveillance, timely antihypertensive therapy, magnesium sulfate prophylaxis, and appropriate timing of delivery remain the cornerstones of management.

Despite advances in obstetric care, low-resource countries continue to experience poor maternal outcomes because of inadequate healthcare infrastructure, limited access to care, and shortages of trained personnel. A multidisciplinary and evidence-based approach involving healthcare strengthening, public health education, policy implementation, and ongoing research is essential to reduce preventable maternal and neonatal deaths.

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