Nurses' knowledge of the clinical management of hypertensive disorders of pregnancy in low- and middle-income countries: A narrative review

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Background. Hypertensive disorders of pregnancy (HDP), particularly pre-eclampsia (PE) and eclampsia, are significant contributors to maternal morbidity and mortality worldwide. The exact cause of this pregnancy condition is unknown, and it has no specific treatment apart from delivery of the fetus and placenta. Nurses, especially in low- and middle-income countries (LMICs), play a critical front-line role in identifying women at risk of HDP, initiating clinical management, and ensuring timely referrals to appropriate healthcare facilities.
Objectives. This narrative review aimed to assess the knowledge and practices of professional nurses, including midwives, in identifying women at risk of developing HDP during pregnancy, childbirth and the immediate postpartum period.
Methods. A systematic literature search was conducted using PubMed, Google Scholar and ScienceDirect. Keywords included 'pre-eclampsia', 'nurses' knowledge', 'management of HDP' and 'training of nurses'. The search was not restricted by publication year.
Results. The review revealed significant gaps in nurses' knowledge regarding management of PE. Early identification of women with HDP risk factors during antenatal visits is of critical importance for maternal and fetal health. However, inadequate training on diagnostic criteria, blood pressure measurement techniques, and initial treatment protocols remains a challenge in LMICs. Effective communication between primary healthcare facilities and referral hospitals is essential for managing severe PE and eclampsia.
Conclusion. Despite the provision of guidelines, maternal morbidity and mortality rates remain high in LMICs owing to insufficient training of nurses and resource constraints. Emphasis on mandatory training programmes for all health professionals at primary healthcare level is crucial. Strengthened referral systems are also necessary to improve outcomes for women with HDP.

Keywords. Pre-eclampsia, eclampsia, nurses, knowledge, training, management, treatment

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Hypertensive disorders of pregnancy (HDP), particularly severe pre-eclampsia (PE) and eclampsia, are the third leading cause of maternal morbidity and mortality worldwide.[1] HDP are also associated with increased risks of perinatal and neonatal morbidity and mortality.[2,3] Globally, HDP account for 16% of maternal deaths, with prevalence rates of 9% in Africa and Asia.[4] In South Africa (SA), approximately 14.7% of maternal deaths were reported as due to HDP according to the 2020 - 2022 Saving Mothers report.[5] While maternal mortality has decreased over the past decade, it remains a significant concern in SA and other low- and middle-income countries (LMICs).[6]

An observational study conducted in three tertiary hospitals in SA revealed that incidences of PE complications, perinatal death and preterm delivery among women referred to tertiary care were higher than those reported in other LMICs, despite access to tertiary care interventions.[7] The study highlighted that complications from PE with severe features were common, even with the availability of antihypertensive therapy, magnesium sulphate administration and critical care services.

PE is a pregnancy-specific disorder responsible for more than 500 000 fetal and neonatal deaths and more than 70 000 maternal deaths annually. The burden of PE is disproportionately high in LMICs, with sub-Saharan Africa (56%) and Southern Asia together accounting

for 85% of the global burden.[4,8] PE can present clinically for the first time during labour or the early postpartum period.[9] It is no longer classified as mild or severe, but rather as PE or PE with severe features such as blurred vision, persistent headache, nausea, vomiting and epigastric pain, indicating its potential to worsen rapidly.[10]

PE is characterised by placental dysfunction that can lead to fetal growth restriction and placental abruption due to placental malperfusion.[11] Accurate diagnosis and clinical management remain challenging because diagnostic measures still rely on nonspecific signs and symptoms.[11] Furthermore, commonly used criteria for severity of PE correlate poorly with adverse maternal and fetal outcomes.[11] Biomarkers such as soluble fms (feline McDonough sarcoma)-like tyrosine kinase-1 (sFlt-1) and placental growth factor (PlGF) have shown promise for early diagnosis before 34 weeks' gestation, but their use in LMICs is limited because of financial costs, lack of laboratory infrastructure, and availability issues.[12]

Identifying risk factors during antenatal clinic visits may be a tool to use in preventing pregnant women from developing PE. Common risk factors are a history of PE in a previous pregnancy (associated with an eight-fold increased risk), chronic hypertension (five-fold increased risk), and preterm PE (25 - 30% recurrence risk).[9] Other risk factors include prior pregnancy complications such as fetal growth restriction, stillbirth, or placental abruption linked to placental dysfunction.[9] Preventive interventions include weight reduction prior to pregnancy, avoiding multifetal pregnancies from assisted reproduction technologies, increasing societal awareness of the adverse pregnancy outcomes linked to advanced maternal age (>40 years) and teenage pregnancies, and stabilising chronic medical conditions such as hypertension before conception.[9] Recent studies have also highlighted masked and white-coat hypertension as additional risk factors for PE.[13]

Recent studies have shown that PE remains a leading cause of maternal and perinatal mortality in LMICs owing to inadequate resources, poor access to healthcare facilities, late booking for antenatal care, limited antenatal visits, and a lack of family planning services compared with high-income countries (HICs).[14-17] Many women who have experienced PE are unaware that they had the condition in previous pregnancies or do not recognise its symptoms during subsequent pregnancies.[17]

Poor clinical management at primary healthcare facilities further increases morbidity and mortality rates, and includes failure to detect women at risk of PE early and non-adherence to referral protocols.[18,19] Current preventive therapies include low-dose aspirin at night for pregnant women at risk and calcium supplementation for all pregnant women in regions with low dietary levels of calcium.[18] Low-dose aspirin remains the mainstay of prevention;[20] it is recommended at a dose of 162 mg nightly from 12 weeks' gestation until approximately 36 weeks' gestation for women at high risk of PE.[13]

According to the 2021 HDP guidelines by Magee *et al.*,[11] midwives and nurses should encourage exercise during pregnancy as well as calcium supplementation or dietary intake equivalent to at least 500 mg/day. Women diagnosed with HDP should receive antihypertensive therapy, while those with eclampsia should be treated with magnesium sulphate to prevent further convulsions.[13]

Challenges related to diagnosis in LMICs include incorrect blood pressure (BP) measurement techniques, lack of validated BP measuring devices for use in pregnancy, and inconsistent detection of proteinuria using dipstick tests.[21,22] At the primary healthcare level, insufficient training or in-service education on HDP diagnosis and management among healthcare workers further complicates early detection efforts. If undetected early in pregnancy, PE can lead to preterm labour, intrauterine growth restriction, eclampsia (convulsions), and in some cases even fetal and maternal death during the antenatal, intrapartum or postpartum periods.[23]

Given the high mortality rates associated with PE, urgent action is required to prevent maternal deaths. While biomarkers offer promise for early detection of PE pathogenesis, reliance on laboratory testing may delay timely diagnosis.[24-26] It is therefore essential that nurses, particularly those stationed at primary health clinics, are equipped with adequate knowledge of PE, its diagnosis, immediate management strategies, and referral protocols. This review aimed to assess nurses' knowledge regarding management of HDP in LMICs, with a particular focus on sub-Saharan Africa, and identify gaps that need addressing through targeted training interventions.

Methods

A comprehensive literature search was conducted using the databases PubMed, Google Scholar and ScienceDirect. The keywords used included 'pre-eclampsia', 'nurses' knowledge', 'management of HDP' and 'training of nurses'. The search focused on articles addressing the knowledge and management of PE owing to the high prevalence of HDP in LMICs.

The initial screening involved reading titles and abstracts to identify studies relevant to the knowledge, identification and management of PE in LMICs. Articles that met the inclusion criteria underwent a full-text review. Studies were included if they provided information relevant to nurses' knowledge and practices in managing HDP, while articles that did not focus on the subject were excluded. The search was not restricted by publication year to ensure comprehensive coverage of available data.

Results

This review synthesised findings from 49 articles, with key results presented in the sections below.

Nurses' knowledge and training on BP measurement

BP measurement is of critical importance for detecting HDP. However, the review revealed significant gaps in nurses' knowledge regarding correct BP measurement techniques. A cross-sectional study conducted in 78 nurses reported correct answers as follows: assessment of faulty equipment 58%, cuff size 57%, arm position for seated measurement 14%, determination of inflation pressure 29%, recommended deflation rate 62%, and incidence of terminal digit preference 32%.[27] In a study of third-year nursing students, only 33% could identify suitable cuff size, only 22% knew about measuring BP more than once during each outpatient visit, and 55% knew about hypertension diagnosis when BP is elevated on more than one visit.[28]

The University Malaysia Sarawak also assessed individual knowledge of all the necessary steps taken during BP measurement using a manual device.[29] This study found that 66.9% of respondents knew the required sitting position for accurate measurements, 59.1% knew the correct cuff size, and 51.2% knew how to use the chest piece, while 66.1% knew the inflation cuff pressure, 65.3% knew the recommended deflation rate, 60.7% knew about the preference of the last digit of BP reading, 31% reported knowledge of the auscultatory gap, and only 27.7% were aware of the palpatory method. In general, only half (51.7%) of the student nurses had sufficient BP measurement knowledge.

In SA, Du Toit[30] reported that nurses scored an average of 63.1% on BP measurement knowledge, with 87.7% showing some level of understanding. However, a study in Nigeria revealed that 73.5% of nurses lacked sufficient BP measurement knowledge, and 71.1% admitted that they had not reviewed BP measurement guidelines since graduating from nursing school.[31]

Nurses' knowledge on the diagnosis of HDP

Understanding of the causes and management of HDP varies widely across LMICs.

In India, maternal deaths frequently occur at primary healthcare facilities owing to insufficient resources and a lack of specialised staff.[32] The community at large trusts nurses and midwives, as they regard them as the main link between the community and health services. The study revealed misconceptions among nurses with regard to PE aetiology.[32] Some believed that hypertension was caused by anaemia; others attributed it to missed tetanus vaccinations or stress. This finding highlights significant gaps in healthcare workers' knowledge about HDP causes.

A study in Ghana aimed to assess specific clinical and non-clinical training needs of midwives.[33] This study recruited 250 midwives, who completed an online validated World Health Organization Hennessy-Hicks training questionnaire. The results revealed that 62.0% of midwives required additional training on PE and eclampsia management. A Tanzanian study conducted in 2017 in a primary healthcare setting with 172 nurses reported that factors influencing knowledge included age, professional qualifications, duration of training, experience, and years in practice.[34] Nurses with more experience and higher qualifications were more knowledgeable. Of the participants, 51.2% demonstrated adequate knowledge, while 93% correctly identified the correct treatment drugs for PE management. Only 39% knew the appropriate intravenous fluids for patients with eclampsia. The authors concluded that regular training is essential to address gaps in PE prevention and management.

Guidelines for the early prediction of PE

Early prediction guidelines are crucial for identifying women at risk for PE. HICs employ advanced prediction methods such as those outlined by the National Institute of Health and Care Excellence in the UK and the Western Sydney (WS) risk model in Australia.[35,36] The S model predicts PE in nulliparous women based on maternal characteristics including body mass index (≥26.3 kg/m^2), maternal age (≥27 years), multiple pregnancy, immigrant status, non-English-speaking background, and a family history of PE.[36]

SA created a detailed national guideline for the management of PE in 2019.[37] For patients in a pre-hypertensive state (BP 135/85 - 139/89 mmHg), nurses and midwives are advised to have the patient rest and retake the BP measurement after 30 minutes to 2 hours. If the reading remains within the pre-hypertensive state, a follow-up reading should be taken after 3 - 7 days. If the reading persists, the patient should be referred to an appropriate higher level of care.[37]

A study of 200 midwives in low-resource primary healthcare facilities in SA by Ramavhoya *et al*.,[38] using self-reported questionnaires, revealed that 17.5% were unaware that a first pregnancy is a risk factor for HDP, and 85.5% could not differentiate between chronic hypertension and HDP. Owing to resource constraints in LMICs, risk factor identification during antenatal visits remains a key strategy.[38]

Knowledge on intrapartum and postpartum care

Nurses and midwives should know that an HDP may manifest for the first time during or immediately after childbirth.[39] Childbirth is a critical period for both the mother and baby, requiring optimal care.[39] In a cross-sectional study conducted in sub-Saharan Africa, 245 midwives from four hospitals completed electronic questionnaires.[40] While the majority of midwives reported feeling knowledgeable about managing PE/eclampsia (90.95%) and hypertension (89.35%), they lacked knowledge with regard to teaching women about complications.

Initial management of HDP by professional nurses and midwives

Nurses and midwives in LMICs face challenges due to limited resources and equipment, including transportation and medication.[41] The 2016 SA maternity care guidelines indicated low confidence and a lack of knowledge among midwives with regard to managing women with PE.[42] In cases where patients present with severe PE or eclampsia, nurses are allowed to use a rapid-acting antihypertensive and magnesium sulphate, followed by prompt referral to higher levels of care.[42,43] Given the high prevalence of PE in LMICs, the Saving Mothers report in SA has consistently recommended training for nurses and midwives on the management of PE and eclampsia.[5]

The study by Ramavhoya *et al*.[38] assessing the management of women with HDP by midwives in low-resource primary healthcare facilities in SA found that of the midwives, 56.5% held diploma certificates in nursing, and only 4.5% had advanced midwifery certificates. With regard to knowledge of PE risk factors, only 71% could correctly identify at-risk women, while 29% could not. Additionally, 17.5% of the midwives believed that primigravidas were not at risk of PE, while 82.5% knew it was a risk. While 65.5% of the midwives reported that pregnant women diagnosed with PE needed admission and close monitoring, 28% considered it not to be a serious condition. Furthermore, 58.5% of the midwives could not differentiate between the different types of HDP, posing a significant issue in terms of management and treatment.

Regarding PE management, 86% of the midwives were familiar with the guidelines on managing women with a diastolic BP of

110 mmHg.[38] Confusion existed regarding HDP subtypes, with 56% believing that gestational hypertension occurred before 20 weeks' gestation and 58.5% believing that essential hypertension occurred after 20 weeks' gestation. Despite the confusion, these midwives recognised that BP monitoring in pregnancy was critical for maternal and fetal wellbeing. With regard to training, 65.4% of the midwives had received Essential Management of Obstetric Emergencies (ESMOE) training, while 34.5% had not. In addition, 71.5% had received specific training on HDP, whereas 28.5% had not.

Nurses face challenges in terms of HDP management. One of the main issues reported by Ramavhoya *et al*.[38] was staff shortage relative to the number of pregnant women. Knowledge about PE treatment is also critical, as some midwives reported continuing magnesium sulphate administration even when the patient's respiratory rate was >16 breaths/minute, which can be detrimental. Equipment shortages were reported by 63.5% of the midwives, and 80.4% indicated that ambulance services were inconsistent.[38]

Discussion

The findings of the review indicate that knowledge of midwives and nurses with regard to the diagnosis of HDP in pregnant woman is inadequate. Most studies revealed poor knowledge of midwives and nurses with regard to the identification of HDP.[36,44,45] While midwives and nurses are not qualified to independently treat HDP in pregnant women, their expertise in its early detection and referral to hospitals for further assistance is of critical importance, as unmanaged HDP may result in adverse maternal and perinatal outcomes.

It is important to recognise that pregnant women are a vulnerable population requiring regular antenatal care.[5,46] Nurses and midwives stationed in primary healthcare settings play a vital role in managing pregnant women, including disease identification and hospital referrals.[47] They also perform deliveries in the absence of complications.[47] Despite the availability of guidelines, midwives and nurses still require proper training on HDP.[45] HDP have been reported to affect 10% of all pregnancies globally,[48] emphasising the importance of improving knowledge about this condition among all healthcare workers, especially midwives and nurses, who serve as frontline assistants of pregnant women.[45]

Conclusion and recommendations

Despite the provision of guidelines on the identification, referral and initial management of HDP, maternal morbidity and mortality rates are still high in LMICs.[5,49] Nurses' knowledge in LMICs is inadequate. Guidelines on management of HDP in primary healthcare facilities need to be emphasised, and training sessions should be mandatory for all healthcare workers, regardless of experience level.

Nurses working in clinics located in informal settlements that lack the proper equipment to diagnose HDP, including PE, should be encouraged to follow the guidelines suggested by the Saving Mothers report published by the National Department of Health.[5] Regular communication between antenatal healthcare facilities or clinics and the district hospital is crucially important for the referral and treatment of women with severe PE and eclampsia.

In summary, this narrative review reveals that commencement of the following steps for all healthcare workers, particularly midwives and nurses, is needed to improve maternal healthcare. These steps are:

- Regular training on guidelines for the management of HDP must be offered every 6 months by the health system.
- The health system needs to ensure that protocols for the management of PE and eclampsia are not only available but made visible in the form of posters.
- The health system must provide sufficient day and night nursing staff, to prevent overload with duties. Appropriate distribution of nurses during busy periods must be done by the senior nursing management.
- Nurses who work in primary healthcare should be allowed to attend and partake in all district health meetings on perinatal and maternal mortality, and consideration should be given to joint learning sessions with doctors.
- Ensure that the eclampsia boxes with the guidelines are available.
- There is sufficient evidence in the current literature that low-dose aspirin (162 mg) taken at night, initiated at 12 - 16 weeks' gestation, is useful in reducing the frequency of HDP, especially PE, in an SA population of African ancestry. The recommendation of low-dose aspirin is therefore crucial for the prevention of HDP. It should be combined with calcium supplementation in geographical areas where the diet is deficient in calcium.

The above are key points to consider in reducing maternal mortality and morbidity associated with HDP.

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