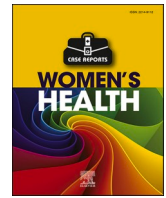


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## Invited Editorial

## Reducing maternal mortality in low- and middle-income countries

## ARTICLE INFO

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The lives of many women in their prime are prematurely lost through neglect and avoidable circumstances during pregnancy, childbirth and postnatal periods. This is the tragedy of maternal mortality, which affects one woman every two minutes or 800 women daily [1,2]. The World Health Organization (WHO) has defined maternal mortality as the death of a woman during any stage of pregnancy (irrespective of the site and duration) or within 42 days following childbirth due to causes associated with or worsened by the pregnancy and/or its management, excluding those resulting from incidental and accidental causes [3].

Despite the multitudinous global efforts to reduce the maternal mortality ratio (MMR), the figures from low- and middle-income countries (LMIC) have remained abysmally poor and discouraging. For instance, although the global MMR declined from 339 to 223 per 100,000 live births from 2000 to 2020, equivalent to a 34.3% reduction [2], a total of 287,000 maternal deaths were recorded in 2020, and almost 95% of them occurred in LMIC [4]. In 2020, the African region, with a MMR of 531 deaths per 100,000 live births, accounted for 69% of the global maternal deaths. In contrast, the MMR in Eastern European countries during the same period declined from 38 to 11 deaths per 100,000 live births [4]. The countries with the highest MMR in 2020 were South Sudan with 1223 deaths, Chad with 1063 deaths, and Nigeria with 1047 deaths per 100,000 live births [2]. Also in 2020, Nigeria had the highest number of maternal deaths, amounting to 82,000, which was 28.5% (over a quarter) of the global maternal deaths [2]. Reducing maternal mortality therefore remains a critical global health challenge, but more so in LMIC.

Maternal mortality can have direct or indirect causes [3]. In LMIC, the commonest direct cause is obstetric haemorrhage, particularly postpartum haemorrhage [5]. The second most common cause is hypertensive disorders of pregnancy, particularly pre-eclampsia and eclampsia. The third most common cause is sepsis, which includes pregnancy-related infections such as puerperal sepsis. Other causes include complications of unsafe abortion [5]. These direct causes account for 75% of all maternal deaths [4], and dominate the global causes

[4,6]. Maternal mortality can also result from indirect causes, including pre-existing medical conditions such as HIV, malaria, cardiovascular diseases, and diabetes mellitus. In high-income countries, amongst the most common direct causes of maternal mortality are thromboembolism, sepsis and haemorrhage. On the other hand, amongst the commonest indirect causes are cardiac disorders and COVID-19 more recently [7,8]. Apart from the direct and indirect causes of maternal mortality, a huge number of near misses occur and continue to ravage women and their families, causing severe morbidity, especially in LMIC. These near misses often share similar avoidable circumstances as the maternal mortalities.

The high MMR in LMIC results from a combination of modifiable and even avoidable factors related to the patient, health worker and health system [9–11]. These modifiable factors culminate in the '3 Maternal Delays' model proposed by Thaddeus and Maine [12,13]. The first delay is in the decision to seek healthcare [10]. This may result from cultural practices that promote gender inequality and subjugate the rights of females in accessing quality healthcare. Other reasons include illiteracy, ignorance of pregnancy complications and when to seek help, previous bad experiences in the health facility, and financial constraints. The second delay is related to access to health facilities located far away, which is worsened by unavailability or high cost of transportation, poor access roads, adverse weather conditions, and insecurity [11,14]. The third is a delay in receiving quality maternal healthcare services at the facility due to inadequate equipment, a shortage of medical supplies and medicine, poorly motivated healthcare workers, an insufficient skilled staff, and a dysfunctional referral system [10,11]. The reasons for the persistently high level of maternal mortality in LMIC can be categorized as persistent poor access to quality healthcare, socioeconomic disparities, and cultural factors; however, these factors often act together and their contributions are not always easily separable. Socioeconomic and cultural factors are closely linked and contribute to the first delay on the road to maternal death. Poor access to quality healthcare contributes to the second and third delays.

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To achieve Sustainable Development Goal 3, target 3.1, which is to reduce the global MMR to less than 70 per 100,000 live births by the year 2030, with no country having a ratio more than twice the global average, a holistic and a pragmatic approach must be adopted. We suggest three broad strategies for such an approach.

The first strategy is to improve the provision of quality and sustainable healthcare for women in LMIC. This will require the political will to strengthen the healthcare system of LMIC to provide adequate infrastructure for comprehensive maternal healthcare, including antenatal, intrapartum, postpartum and critical care. Ensuring that healthcare facilities are adequately equipped with trained staff, essential medicines, supplies, and equipment for safe childbirth is an integral part of this strategy, and this will drastically reduce the direct obstetric causes of maternal mortality. To this end, governments of LMIC need to develop long-term strategies to train and retain the critical number of sufficiently motivated healthcare workers to provide skilled antenatal, intrapartum, and postnatal services in all parts of countries, including rural areas. A functional referral system is an indispensable component of a robust health system. This includes efficient ambulance services for immediate transfer of patients to higher-level facilities in emergencies. A strong health system should also provide adequate family planning services that are appropriate to the local context. This will provide sufficient spacing for high-risk pregnancies, prevent unwanted pregnancies and the consequent unsafe abortions and associated maternal mortality. Notably, the first strategy must encompass visionary leadership with integrity, that shows compassion and accountability. The administrators should understand basic health system management [15,16]. These will result in a steady supply of clean water and electricity as well as availability of functional diagnostic and free blood bank services. It also includes healthcare professionals who are ethical, caring and respectful to patients and their relatives. These professionals should participate in continuous medical education, including practical simulations of clinical measures to prevent the most common causes of maternal deaths [1,4,17], and training for inexperienced clinicians on operative procedures such as safe cesarean delivery.

The second strategy is the reduction of socioeconomic disparities through education and empowerment of women. Education and empowerment of women can delay childbearing, reduce fertility rates, and increase the uptake of skilled family planning, antenatal, childbirth, and postnatal services by women. Education and empowerment of women bridge the gender inequities that hinder access to skilled maternal healthcare. The educated and empowered woman is more likely to circumvent cultural practices and norms that contribute to delays in seeking skilled maternal healthcare. Such education and empowerment should not be limited to formal education and paid employment but should be a continuous exercise of health education and awareness on the causes and prevention of maternal mortality, danger signs during pregnancy, childbirth, and puerperium.

The third strategy is community engagement and international collaboration. Evidence has shown that engaging the community ensures that health interventions are accepted and utilized by the target population. Health policymakers in LMIC should involve appropriate gatekeepers in each community in maternal health education and awareness campaigns. The huge trust deficit between the people and the government in LMIC makes it easier for women to listen to and accept messages from such trusted gatekeepers than from government health officials. Maternal health policymakers in LMIC should partner with civil society and international development agencies to promote maternal health through shared best practices, resources, and technical expertise. Through this partnership, LMIC will strengthen/develop context-appropriate clinical protocols and protocol-adherence monitoring, outreach services, clinical audit (including establishing a national confidential enquiry into maternal deaths), robust maternal near-miss data collection, and monitoring progress towards set targets for maternal mortality reduction.

In conclusion, reducing maternal mortality in LMIC requires a

multifaceted approach that addresses the obstetric causes of maternal mortality, and socio-economic and cultural factors related to maternal mortality. Sustained long-term government commitment, political will, investments in critical health and social infrastructure, education, community engagement, and international collaboration are essential to significant progress in this global public health issue.

#### Contributors

Emeka Kingsley Ekwuazi drafted the initial manuscript, contributed to the literature search, and revised the manuscript.

Chibuikwe O Chigbu contributed to the literature search, and revised the manuscript.

Nnabuike Chibuike Ngene was responsible for conceptualization, contributed to the literature search, and revised the manuscript.

All authors approved the manuscript.

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Emeka Kingsley Ekwuazi<sup>a</sup>, Chibuike O. Chigbu<sup>a</sup>, Nnabuike Chibuoke Ngene<sup>b,c,\*</sup>

<sup>a</sup> *Department of Obstetrics and Gynaecology, College of Medicine, University of Nigeria Nsukka, Nigeria*

<sup>b</sup> *Department of Obstetrics and Gynecology, Leratong Hospital, Krugersdorp, South Africa*

<sup>c</sup> *Department of Obstetrics and Gynaecology, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa*

\* Corresponding author at: Department of Obstetrics and Gynaecology, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa.  
E-mail address: [nnabuike.ngene@wits.ac.za](mailto:nnabuike.ngene@wits.ac.za) (N.C. Ngene).