CHAPTER 1

INTRODUCTION

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* 1. Background.

Maternal health encompasses the health and well-being of an expectant mother. It is the physical, mental, and social well-being of women during **pregnancy**, **childbirth**, and **postnatal** period. The term “**Pregnancy**” refers to when an egg fertilizes, implants, and develops into a fetus inside a woman’s uterus over approximately 9 months, culminating in childbirth. **“Childbirth”** is the process of delivering a developed fetus either via the vagina (vaginal delivery) or by surgical intervention (cesarean session). **“Postnatal”** is the care a woman and the child receive after childbirth. It is pertinent to state that each of these three (3) phases should be a good experience, making sure that women and their babies can be as healthy and happy as possible (WHO, 2024). For decades, and through the 1980s, maternal health in the developing world remained virtually absent from the global health agenda. It was not until 1985, after an article published by Lancet with the subheading, “Where is the M in MCH?” that the public health community paused to recognize that half a million women each year, or one every minute of every day, where dying due to avoidable complications from pregnancy and childbirth (Rosenfield and Maine, 1985). The significance of good maternal health cannot be overemphasized. It not only lowers maternal mortality but also significantly reduces the risk of maternal morbidity. As defined by the World Health Organization, **Maternal Mortality** is the death of a woman while pregnant and in childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to and/or aggravated by the pregnancy or its management but not from accidental or incidental causes, while **Maternal Morbidity** is any health condition attributed to and/or aggravated by pregnancy and childbirth that has negative outcomes to the woman’s well-being (Firoz et al., 2013).

The World Health Organization (WHO) in its fact sheets, published 26th April 2024, states that about 287000 women died during and following pregnancy and childbirth in 2020. it further listed that thou other complications may exist before pregnancy, the following complications account for nearly 75% of all maternal deaths.

* Severe bleeding (mostly bleeding after childbirth
* Infections (usually after childbirth)
* High blood pressure during pregnancy (Pre-eclampsia and eclampsia)
* Complications from delivery
* Unsafe abortion.

The Safe Motherhood Initiative (SMI), an initiative of the UN launched in 1987, to ensure that women go through pregnancy and childbirth safely marked a pivotal moment in global maternal health policy. This groundbreaking initiative aimed to address the alarmingly high maternal mortality rates in low- and middle-income countries, with a particular focus on Sub-Saharan Africa and Asia (AbouZahr, 2003). The SMI advocated for a comprehensive, multi-sectoral approach to improving maternal health, recognizing that progress in this area required efforts beyond the health sector alone. According to Starrs (2006), the initiative gained support from various UN agencies and a network of global organizations. It gained momentum through a series of international conferences in the 1990s, helping to elevate maternal on the global agenda. As Rosenfield and Maine (1985) argued even before the initiative’s launch, addressing maternal mortality required focused attention and resources. Smith and Rodrigues (2016) note that the framing of maternal health as a women’s issue may have contributed to its slow uptake among policymakers. The women’s rights movement’s preference for the broader term “reproductive health” over “safe motherhood” also created some tension within the advocacy community. While progress was slower than initially hoped (Shiffman and Smit, 2007), the SMI laid important groundwork for future efforts to improve maternal health worldwide. Its legacy continues to influence policy and practice of ensuring maternal health, even as the global community continues to grapple with the complex challenges of reducing maternal mortality and improving maternal health outcomes.

However, persistent challenges continue to impede progress. Significant disparities in maternal health outcomes exist between and within countries, with women in low-income countries and marginalized communities facing higher risks (UNICEF, 2020; WHO, 2023). In 2020, the lifetime risk of maternal death in low-income countries was 1 to 49, compared to 1 in 5,300 in high-income countries (WHO, 2023). This glaring disparity between low and high-income maternal health outcomes sheds light on the substantial imbalance in maternal health issues on a global scale. Sub-Sahara Africa and Southern Asia account for approximately 86% of global maternal deaths with Sub-Sahara Africa recording 533 deaths per 100,000 live births as compared to developed countries with 10 deaths per 100,000 live births (UNICEF, 2023). In 2020, the World Health Organization reported that skilled health personnel assisted with only 60% of births in low-income countries as against 99% in high-income countries (WHO, 2021). Furthermore, in low-income countries, there is a significant gap in maternal care between rural and urban areas. This is evident in the World Health Organization report where it was stated that in 2011, 53% of rural births were attended by skilled personnel, compared to 84% of urban births (WHO, 2015). While access to maternal health services has increased globally over the past few decades, the quality of care provided often falls short of recommended standards, especially in low and middle-income countries (Kruk et al., 2016). The disparity in maternal healthcare outcomes encompasses several critical components that need to be addressed.

Maternal Health Risk is significantly impacted by a woman’s level of education. Women with no formal education face a 2.7 times higher risk of maternal death/complications compared to women who have completed more than 12 years of schooling. Similarly, women with 1-6 years of education are twice as likely to experience maternal mortality compared to those with higher levels of education (Karlsen et al., 2011). The difference between the maternal health risk of education and uneducated women highlights the crucial role education plays in maternal health outcomes. Educated women are more likely to access antenatal care, skilled birth attendance, and postnatal care services (Karlsen et al, 2011). It also enables women to actively participate in making informed decisions regarding their reproductive health.

The launch of the Safe Motherhood Initiative made maternal health record significant improvement in recent years, but substantial challenges still lie ahead. The number of births attended by skilled health personnel has risen from 58% in 1990 to 81% in 2019 (WHO, 2024). This progress has partly contributed to the decline in the global maternal mortality ratio by about 34%. This is considered a remarkable improvement in maternal survival rates worldwide (WHO, 2024).

While the mortality ratio has experienced substantial declines worldwide, maternal morbidity has not shown the same degree of progress and continues to be a significant worry. For every maternal death, an average of 20-30 women experience acute or chronic morbidity (Firoz et al., 2013). This means that millions of women around the world experience pregnancy-related complications every year. The effect of the various pregnancy-related complications on women’s well-being can persist for an extended period, even after the immediate postpartum period has elapsed. These can include chronic pain, urinary incontinence, depression, and other physical and mental health issues (Geller et al., 2018). Severe maternal morbidity can have a profound impact on a woman’s general well-being such as physical and mental health, inability to care for her child, engage in meaningful employment, and/or partake in social activities (Machiyma et al,2017). Due to a lack of standardized definitions and measurement tools, maternal morbidity is often underreported and underrecognized (Chou et al., 2016). As with maternal mortality, maternal morbidity also has a more significant effect on women in countries with low and middle incomes, as well as on marginalized populations in high-income countries (Graham et al., 2016).

Improved antenatal care coverage which has helped in identifying and managing potential complications in early pregnancy played a crucial role in the maternal mortality decline (Moller et al., 2019). Medical intervention advancements for managing conditions like postpartum hemorrhage, pre-eclampsia, and infections have contributed significantly to saving mothers’ lives (Say et al, 2014). Furthermore, there is increased international recognition of maternal health concerns, resulting in targeted interventions and policy efforts (Starrs, 2006).

The issue of maternal health is multifaceted and presents a complex challenge in the healthcare sector. The use of machine learning (ML) in recent years in the healthcare sector has grown exponentially. The technology has shown great potential with promising results in different areas of healthcare, including but not limited to diagnosis, treatment planning, and patient monitoring (Topol, 2019). The methodology of machine learning focuses on developing algorithms and statistical models that permit computers to execute assignments without explicit instructions, relying instead on patterns and inference from data. The use of machine learning in pregnancy diseases and complications is relatively recent, with the most reviewed articles published in the last five years (Carvajal et al., 2023). It has been on the rise in the background of maternal and fetal health, offering promising solutions for early diagnosis, screening, and risk determination of pregnancy-related complications (Carvajal et al., 2023). Machine learning has proven to be a powerful branch of artificial intelligence with robust technology that can uncover complicated patterns, correlations, and subtle risk factors that traditional analytical approaches may not be able to discern, potentially leading to timely interventions and improved results. The large quantity of data generated during pregnancy, childbirth, and the postpartum period, combined with the complex nature of timely interventions, makes maternal health ideal for machine learning applications (Paydar et al., 2017)

Importants.

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