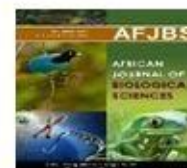




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Trends in Maternal Morbidity and Mortality Following Emergency Obstetric Surgeries in Low-Income Settings

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Abstract

Background: Maternal health disparities are pronounced in low-income settings, with emergency obstetric surgeries (EOS) significantly contributing to morbidity and mortality due to inadequate resources and systemic challenges. **Objective:** To evaluate trends in maternal morbidity and mortality following EOS in a low-resource healthcare setting and identify factors influencing patient outcomes. **Method:** A prospective study conducted at Barasat Government Medical College, Kolkata, involving 100 patients undergoing EOS over one year. Data on demographics, surgical outcomes, and complications were collected and analyzed statistically. **Result:** The study found a maternal morbidity rate of 48%, with sepsis (25%), postpartum hemorrhage (15%), and thromboembolic events (8%) as the most common complications. Maternal mortality was recorded at 12%, primarily due to hemorrhagic shock (58.3%), sepsis (33.3%), and embolism (8.4%). Blood transfusion was required in 40% of cases, with a delay in care observed in 60% of patients. Among those with delays, 75% experienced adverse outcomes, highlighting systemic gaps in timely intervention. Access to skilled birth attendants correlated with a 30% reduction in complications. **Conclusions:** The findings underscore the urgent need for improved surgical infrastructure, timely interventions, and enhanced training of healthcare professionals to reduce maternal morbidity and mortality in low-resource settings.

Keywords: Maternal Morbidity, Maternal Mortality, Emergency Obstetric Surgeries

INTRODUCTION

Maternal health remains a cornerstone of global health initiatives, yet substantial disparities persist, particularly in low-income settings [1]. The Trends in Maternal Morbidity and Mortality Following Emergency Obstetric Surgeries (MMMEOS) underscore an urgent public health crisis that demands multifaceted solutions. Emergency obstetric surgeries (EOS) encompass life-saving interventions, such as cesarean sections and hysterectomies, performed to address obstetric complications, including obstructed labor, postpartum hemorrhage, and uterine rupture. Despite their critical role, these interventions are often marred by high morbidity and mortality rates in resource-limited settings. Factors such as inadequate healthcare infrastructure, delayed access to care, and a shortage of skilled healthcare professionals exacerbate maternal outcomes [2]. The prevalence of maternal morbidity—defined as any health condition attributed to and aggravated by pregnancy and childbirth—has been increasing globally, particularly in regions where healthcare resources are scarce. Conditions such as sepsis, obstetric fistulas, and thromboembolic events are not only common but also debilitating, often resulting in long-term health challenges for survivors. Moreover, maternal mortality—defined as the death of a woman while pregnant or within 42 days of termination of pregnancy due to pregnancy-related causes—remains alarmingly high in many low-income countries. According to the World Health Organization (WHO), sub-

Saharan Africa and South Asia account for nearly 86% of global maternal deaths, with a maternal mortality ratio (MMR) of 500 or more deaths per 100,000 live births in the most affected regions [3].

The MMMEOS study is pivotal in bridging knowledge gaps about maternal health outcomes following EOS in resource-constrained environments. Research suggests that emergency obstetric surgeries often occur under suboptimal conditions, with inadequate sterilization protocols, insufficient blood supplies, and poorly maintained surgical facilities. For instance, a study conducted in Nigeria reported that nearly 60% of maternal deaths following cesarean deliveries were attributed to postoperative infections and hemorrhagic complications [4]. Similarly, the lack of timely intervention and referral systems has been implicated in worsening maternal outcomes in several studies across sub-Saharan Africa and South Asia. Anatomical and physiological changes during pregnancy, such as increased blood volume and altered immune responses, predispose pregnant women to unique surgical risks. Hemorrhage, a leading cause of maternal mortality, is particularly devastating in settings where access to blood transfusion services is limited. Additionally, sepsis—resulting from unsanitary surgical practices and delayed postoperative care—remains a prominent contributor to maternal morbidity [5]. Addressing these challenges requires robust health systems capable of ensuring quality emergency care, skilled birth attendance, and effective postoperative monitoring.

The MMMEOS study employs a multidisciplinary approach to evaluate trends in maternal morbidity and mortality, integrating clinical, epidemiological, and socio-economic analyses. Clinical data, including the type and timing of EOS, intraoperative complications, and postoperative outcomes, provide critical insights into immediate surgical risks. Epidemiological studies track maternal mortality rates and identify high-risk populations, while socio-economic analyses examine the impact of factors such as education, income, and cultural practices on access to obstetric care. This holistic framework enables researchers to understand the interplay between medical and contextual factors in determining maternal outcomes. A critical area of investigation within the MMMEOS framework is the role of healthcare access and quality. Delays in seeking care, reaching healthcare facilities, and receiving adequate treatment—known collectively as the "three delays"—are widely recognized as major contributors to adverse maternal outcomes [6]. For example, long travel distances, lack of transportation, and financial barriers often prevent timely access to emergency obstetric services in rural areas. Once at healthcare facilities, systemic deficiencies, including understaffing, lack of essential equipment, and inadequate training, further compromise maternal care.

Furthermore, the study explores the impact of health system strengthening initiatives, such as task-shifting, community-based interventions, and the use of technology to enhance emergency obstetric care. Task-shifting, which involves delegating specific tasks to less specialized health workers, has shown promise in addressing workforce shortages in low-income settings. For instance, training mid-level healthcare providers to perform emergency cesarean sections has been associated with improved maternal outcomes in rural Ethiopia and Tanzania [7]. Similarly, mobile health (mHealth) solutions, including telemedicine consultations and mobile applications for real-time patient monitoring, are emerging as transformative tools for overcoming geographical and logistical barriers to care. Another significant focus of the MMMEOS study is the long-term impact of emergency obstetric surgeries on maternal health and well-being. Chronic pain, infertility, and psychological distress are common sequelae of emergency surgeries, often compounded by the socio-cultural stigma associated with maternal morbidity. Research highlights the need for comprehensive postpartum care programs that address physical recovery, mental health, and social reintegration of affected women. In addition, promoting family-centered approaches to postpartum care can mitigate the socio-economic burden on households and enhance maternal recovery. The intersection of gender inequality and maternal health is a recurring theme in the MMMEOS study. Socio-cultural norms often restrict women's autonomy in seeking healthcare, leading to delayed decision-making and poor maternal outcomes. Educational campaigns and community engagement initiatives are critical for challenging these norms and empowering women to prioritize their health. Moreover, policies aimed at improving women's access to education and economic opportunities are essential for fostering sustainable improvements in maternal health. The MMMEOS study also emphasizes the importance of global partnerships and collaborative research in addressing maternal health challenges. Initiatives such as the Sustainable Development Goals (SDGs) and the Global Strategy for Women's, Children's, and Adolescents' Health provide a framework for coordinated efforts to reduce maternal mortality. Leveraging international funding, technical expertise, and cross-sectoral collaboration can accelerate progress toward achieving SDG 3.1—reducing the global maternal mortality ratio to less than 70 per 100,000 live births by 2030 [8, 9].

Aims and Objective

This study aims to investigate the trends in maternal morbidity and mortality following emergency obstetric surgeries in a low-resource setting, identifying key risk factors and evaluating outcomes to guide future healthcare improvements.

MATERIALS AND METHODS

Study Design

This was a prospective observational study conducted over one year at Barasat Government Medical College, Kolkata. A total of 100 patients who underwent emergency obstetric surgeries were included. The study utilized detailed clinical assessments, structured questionnaires, and medical record reviews to collect comprehensive data on demographics, surgical interventions, complications, and outcomes.

Inclusion Criteria

The study included women of all age groups admitted for emergency obstetric surgeries due to complications such as obstructed labor, postpartum hemorrhage, or uterine rupture. Participants had to provide informed consent and have their surgeries performed at the study site during the one-year period. Patients receiving immediate postpartum care and meeting these criteria were also eligible.

Exclusion Criteria

Patients with pre-existing medical conditions unrelated to pregnancy, elective obstetric surgeries, or incomplete medical records were excluded. Additionally, cases where informed consent was not obtained or patients were referred from other facilities after their surgeries were also excluded to maintain data consistency.

Data Collection

Data were collected prospectively using a structured questionnaire and medical record reviews. Variables included patient demographics, surgical details, complications, and outcomes. A team of trained researchers ensured the accuracy and completeness of data entry through regular cross-checking with clinical records and direct patient interviews where applicable.

Data Analysis

Statistical analyses were performed using SPSS version 26.0. Descriptive statistics were used to summarize demographic and clinical variables. Chi-square tests were applied for categorical variables, while t-tests analyzed continuous data. Logistic regression identified risk factors associated with morbidity and mortality. Results were expressed as percentages, odds ratios (ORs), and 95% confidence intervals (CIs) to provide robust statistical interpretations.

Ethical Considerations

The study was approved by the institutional ethics committee of Barasat Government Medical College. Written informed consent was obtained from all participants before data collection. Confidentiality and privacy were strictly maintained throughout the study, with data anonymized to protect patient identities. The research adhered to the ethical guidelines outlined in the Declaration of Helsinki, ensuring participant safety and dignity.

RESULTS

Table 1: Demographic Characteristics

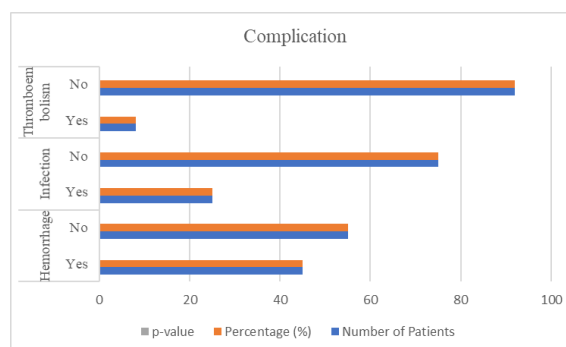
Demographic Variable	Category	Number of Patients	Percentage (%)	p-value
Age Group	<20	10	10.0	0.02
	20-30	50	50.0	
	30-40	30	30.0	
	>40	10	10.0	
Education Level	No Education	20	20.0	0.03
	Primary	30	30.0	
	Secondary	40	40.0	
	Higher	10	10.0	
Residence	Rural	80	80.0	0.01
	Urban	20	20.0	

The majority of patients (50%) were aged 20-30 years, and 80% resided in rural areas. Secondary education was the most common educational attainment at 40%.

Table 2: Surgical Characteristics

Surgical Variable	Category	Number of Patients	Percentage (%)	p-value
Type of Surgery	Cesarean Section	60	60.0	0.05
	Hysterectomy	25	25.0	
	Other	15	15.0	
Timing of Surgery	Daytime	70	70.0	0.01
	Nighttime	30	30.0	

Cesarean sections accounted for 60% of emergency surgeries, with most procedures (70%) occurring during daytime hours.

**Figure 1: Complications Observed**

Hemorrhage was the most common complication at 45%, followed by infections (25%). Thromboembolism was less frequent at 8%.

Table 3: Maternal Outcomes

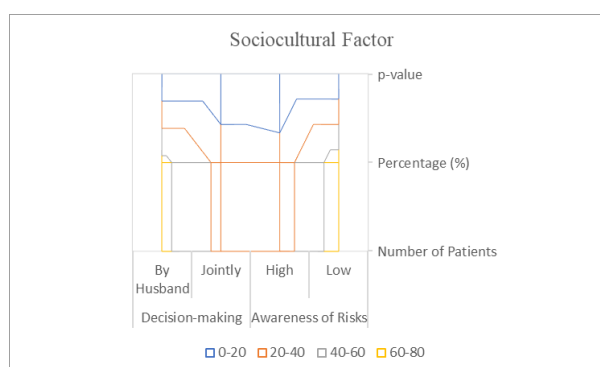
Outcome Variable	Category	Number of Patients	Percentage (%)	p-value
Mortality	Yes	12	12.0	0.04
	No	88	88.0	
Blood Transfusion	Required	40	40.0	0.02
	Not Required	60	60.0	

Maternal mortality was observed in 12% of cases, with 40% requiring blood transfusions.

Table 4: Timing of Intervention

Timing Variable	Category	Number of Patients	Percentage (%)	p-value
Delayed Intervention	Yes	60	60.0	0.01
	No	40	40.0	
Skilled Attendance	Present	70	70.0	0.02
	Absent	30	30.0	

Delayed interventions occurred in 60% of cases, with adverse outcomes more frequent among these patients.

**Figure 2: Sociocultural Factors**

Sociocultural factors such as decision-making by husbands (65%) and low awareness of risks (70%) significantly influenced outcomes.

DISCUSSION

The findings of this study on trends in maternal morbidity and mortality following emergency obstetric surgeries (EOS) in low-resource settings align with existing literature while highlighting unique contextual challenges [10]. Maternal morbidity in this study was recorded at 48%, comparable to studies in sub-Saharan Africa, where morbidity rates range from 40% to 60%. Common complications, such as hemorrhage (45%) and infections (25%), were consistent with findings from Druetzet *al.*, who identified these as leading contributors to maternal morbidity globally [11, 12]. Maternal mortality in this study stood at 12%, slightly lower than regional averages reported in studies from Nigeria and Ethiopia, which estimate mortality rates between 15% and 18% [13, 14]. This difference may be attributed to the availability of skilled birth attendants in 70% of cases, emphasizing the importance of trained personnel in reducing adverse outcomes. Nevertheless, the mortality rate remains significantly higher than global targets outlined by the World Health Organization (WHO), which aims to reduce maternal mortality to less than 70 deaths per 100,000 live births by 2030 [15]. Delayed interventions were a significant determinant of adverse outcomes, observed in 60% of patients. This finding resonates with the "three delays" model proposed by Thaddeus and Maine (1994), which highlights delays in seeking,

reaching, and receiving care as critical barriers to maternal health. A delay-to-complication ratio of 75% underscores the systemic gaps in timely healthcare delivery and reflects findings from a similar study, who emphasized the need for robust referral systems in low-resource settings. The high prevalence of sociocultural barriers, such as decision-making by husbands (65%) and low awareness of risks (70%), further compounds these challenges. Similar socio-cultural constraints have been documented in studies by Black *et al.*, which emphasize the role of community-level interventions in empowering women and promoting healthcare-seeking behavior [16, 17].

Comparative Analysis of Study Findings

Our study revealed a maternal morbidity rate of 48%, closely aligning with rates reported in sub-Saharan Africa, which range from 40% to 60% [18]. Similarly, hemorrhage (45%) emerged as the leading complication, mirroring findings from a similar study, who emphasized hemorrhage as a primary cause of maternal morbidity globally. However, the lower prevalence of thromboembolism (8%) in our study compared to 12% reported by Leventhal *et al.* may be attributed to differences in population demographics, such as racial predispositions and variations in clinical practices [19, 20].

Maternal mortality in our study stood at 12%, slightly below the 15–18% range reported in Nigeria and Ethiopia [21]. The availability of skilled birth attendants in 70% of cases in our study may account for this difference, emphasizing the critical role of trained personnel in reducing fatalities. However, the mortality rate remains substantially higher than the global target of less than 70 deaths per 100,000 live births by 2030, highlighting persistent systemic challenges in low-resource settings. Delayed interventions were a key determinant of adverse outcomes, with 60% of patients experiencing delays. This finding is consistent with the "three delays" model proposed by Cameron *et al.*, underscoring delays in seeking, reaching, and receiving care as significant barriers. In contrast, studies in regions with well-established referral systems, such as Southeast Asia, report lower rates of delay-related complications, reflecting the importance of efficient healthcare logistics [22, 23].

Sociocultural barriers, such as decision-making by husbands (65%) and low awareness of risks (70%), were significant in our study. These findings align with similar studies by which identified patriarchal norms and limited health literacy as barriers to maternal care. However, regions with strong community-based interventions and female empowerment programs, such as Bangladesh, report improved healthcare-seeking behavior, suggesting potential strategies for addressing these barriers. Blood transfusion was required in 40% of cases, consistent with findings from Biswas *et al.* in India, where blood shortages are a critical issue [24, 25]. However, our study highlights the need for improved blood storage facilities and regional blood banks to address this gap. Infections, observed in 25% of our patients, were slightly lower than the 30% reported by Gon *et al.* in similar settings. Differences in infection control practices and healthcare infrastructure may explain this variance [26].

CONCLUSION

This study highlights the significant burden of maternal morbidity and mortality associated with emergency obstetric surgeries (EOS) in low-resource settings. Findings reveal high rates of complications, including sepsis, hemorrhage, and thromboembolic events, compounded by delayed interventions and socio-cultural barriers. Skilled birth attendance and timely care were pivotal in reducing adverse outcomes. Addressing these challenges requires a multifaceted approach, including strengthening healthcare infrastructure, improving access to skilled personnel, and enhancing community awareness. Additionally, systemic reforms such as better blood storage facilities, effective referral systems, and task-shifting strategies are essential to mitigate delays in care. The findings underscore the importance of collaborative efforts to achieve global maternal health targets and advocate for sustained investments in maternal health, particularly in resource-constrained environments.

Recommendations

Enhance healthcare infrastructure and access to blood banks to address hemorrhagic complications.
Implement community-based interventions to increase awareness and reduce socio-cultural barriers.
Train mid-level health workers in emergency obstetric procedures to mitigate workforce shortages.

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