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Evaluation of Maternal Near Miss (MNM) Events and Maternal Mortality at Tertiary Care Hospital

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ABSTRACT

Maternal Near-Miss events are critical indicators of the quality of maternal healthcare, representing instances where women survive severe obstetric complications that could have resulted in death. **Objectives:** To find out the characteristics and causes of maternal near-miss events and maternal mortality at Liaquat University Hospital Hyderabad/Jamshoro. **Methods:** This cross-sectional study was conducted on 233 pregnant and postpartum women of were within 42 days of childbirth, who presented with severe morbidity or early maternal mortality. The duration of the study was from January 1 2021 to June 30 2021. Women undergoing uncomplicated cesarean sections or normal vaginal deliveries, as well as cases of mild anemia, mild-to-moderate hypertension, and Class I and II hemorrhages (less than 30% blood loss), were excluded. Data were collected on demographic characteristics and clinical details such as the mode of delivery, timing of near-miss events concerning admission, patient presentation, surgical interventions performed to save the mother's life, and obstetric complications. **Results:** The mean age of maternal near-miss cases was 25.5 ± 5.5 years. Most maternal near-miss cases occurred among multiparous, rural, un-booked women aged 26–30 years. The leading causes of maternal near-miss were hemorrhage (44.2%), hypertensive disorders (35.1%), and dystocia (12%), followed by sepsis and severe anemia (4.2% each). A significant proportion, 176 cases (75.5%), required intensive care unit admission, with a mean hospital stay of 14.5 days. **Conclusions:** It was concluded that hemorrhage and hypertensive disorder were found to be the most common causes of maternal near-miss cases.

INTRODUCTION

Maternal health is the key parameter of the overall quality and accessibility of healthcare the world over. World Health Organization (WHO) estimates more than 300,000 maternal deaths and about ten million women facing complications of pregnancy, childbirth or the post-natal period in a single year (2020). To address these, events of maternal near-miss (MNM) are identified as those that occur in women who were severely affected by complications during pregnancy or within 42 days following termination of pregnancy but survived [1, 2]. With multiple commonalities with maternal deaths; these show a vital means to identify gaps in the healthcare system [3]. Maternal health has benefits over the years on a global scale with such improvements being more pronounced in low and middle-income countries however there is still a long way to go. The maternal mortality rate (MMR) in Pakistan improved from 375 per 100,000 live births in 1995 to 178 per 100,000 live births in 2019 [4]. Such a decrease in MMR indicates improvements in maternal healthcare services focused on women. However, the maternal mortality rate is still a public health problem with most women dying from hemorrhage, hypertensive disorder and sepsis as documented causes

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[5]. MNM is gaining global attention as a useful measure of maternal health care. WHO defines it as "A woman who almost died but survived a complication of pregnancy, childbirth and pregnancy termination in the 42-days post-pregnancy" [3]. Survival does not occur by chance; it requires timely interventions to prevent death from severe obstetric complications that arise during pregnancy [6]. Different criteria for identifying MNM cases have been proposed, which can be categorized under disease-specific, management-specific and organ-system dysfunction-based approaches. Hemorrhage continues to be the leading cause of MNM and maternal mortality. A study reported hemorrhage as the cause in 44.2% of MNMs cases, hypertensive disorder in (35.1%), dystocia (12%) and sepsis (4.2%) [7]. These results highlight the importance of timely identification and management of lapses during obstetric complications. While global studies on MNM have provided valuable insights, there is limited research specific to the Pakistani population. Given the high burden of maternal complications in the region, understanding the prevalence and causes of MNM is essential to improve maternal outcomes. MNM investigations can help identify high-risk groups, plan interventions for managing obstetric emergencies, and strengthen healthcare systems to prevent maternal deaths.

This study aims to address this gap by evaluating the characteristics and causes of MNM in a tertiary care hospital in Pakistan.

METHODS

This cross-sectional study was conducted at the Department of Gynaecology and Obstetrics Unit-I, Liaquat University of Medical and Health Sciences, Hyderabad from January 1 2021 to June 30 2021. A sample size of 233 participants was included, consisting of pregnant and postpartum women within 42 days of childbirth who presented with severe morbidity or early maternal mortality. Exclusion criteria included women undergoing uncomplicated cesarean sections or normal vaginal deliveries, as well as cases of mild anemia, mild-to-moderate hypertension, and Class I and II hemorrhages (less than 30% blood loss). The sample size was calculated via Open Epi Sample Size Calculator with the prevalence of maternal near misses as 18.6% with a 5% margin of error and 95% confidence interval [4]. The study was approved by the Ethical Review Committee of Liaquat University of Medical & Health Sciences, Jamshoro, vide letter (NO.LUMHS/REC/-1003). All eligible patients meeting the inclusion criteria, as defined by the WHO protocol for maternal near-miss events [8], were registered using a pre-designed Performa. Informed written consent in local languages (Urdu and Sindhi) was taken from each participant after a complete debriefing about the study and before enrollment. The WHO clinical criteria include acute cyanosis, shock, or loss of consciousness lasting over 12 hours, while laboratory parameters include oxygen saturation below 90% for more than 60 minutes, creatinine ≥3.5 mg/dL, or lactate >5 mEq/mL [8]. Data were collected on demographic characteristics, including age, parity, gestational age at admission, booking status, referral status, and mode of admission. Clinical details such as the mode of delivery, timing of near-miss events concerning admission, patient presentation, surgical interventions performed to save the mother's life, and obstetric complications leading to MNM events or maternal deaths were documented. Additionally, data on organ-system dysfunction or failure, Intensive Care Unit (ICU) admissions, and maternal mortality were collected. Patients were categorized by final diagnosis into direct causes (e.g., hypertension, hemorrhage, sepsis) and indirect causes (e.g., anemia, cardiac disease) contributing to maternal near-miss events and deaths. The collected data were analyzed using SPSS version 23.0, focusing on descriptive statistics to identify characteristics and causes of MNM events and maternal mortality.

RESULTS

The mean age of maternal near-miss (MNM) cases was 25.5 ± 5.5 years, with most women (44.2%) aged between 26–30 years. A majority resided in rural areas (57.1%) and were un-booked for antenatal care (73.8%). Multiparous women accounted for 82.4% of cases. Emergency admissions were predominant (88.0%), and 57.9% of cases had gestational ages ≥34 weeks (Table 1).

Table 1: Demographic Characteristics of Maternal Near-Miss Cases (n=233)

Demographic Characteristics	n (%)
Mean Age (Years ± SD)	25.5 ± 5.5
Age Groups	
20–25 Years	96 (41.2%)
26–30 Years	103 (44.2%)
31–35 Years	20 (8.6%)
36–40 Years	14 (6.0%)
Residence	
Urban	100 (42.9%)
Rural	133 (57.1%)
Booking Status	
Booked	61 (26.2%)
Un-booked	172 (73.8%)
Parity Status	
Primipara	41 (17.6%)
Multipara	192 (82.4%)
Mode of Admission	
Emergency	205 (88.0%)
Outpatients Department (OPD)	28 (12.0%)

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Amongst mode of delivery, most of the participants i.e. 55% (n=128) had emergency cesarean sections, followed by assisted/spontaneous vaginal deliveries i.e. 40% (n=93). Elective cesarean sections were reported in least proportion i.e. 5% (n=12) (Figure 1).

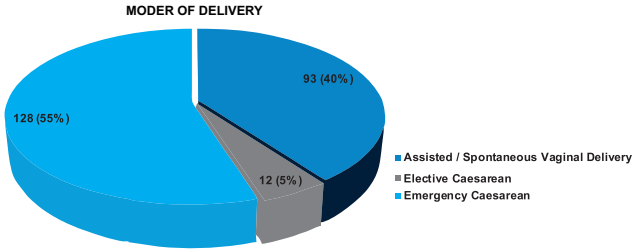

Figure 1: Mode of Delivery among participants with MNM (N=233)

Hypertensive disorders were the leading causes of MNM, with eclampsia (24.9%) and severe pre-eclampsia (10.3%) being significant contributors. Severe hemorrhage, including ectopic pregnancy (15.5%), abortion (5.6%), antepartum hemorrhage (9.9%), and postpartum hemorrhage (13.3%), accounted for 44.3% of cases. Other notable causes included uterine rupture (11.6%), puerperal sepsis (3.4%), severe anemia (4.3%), and chorioamnionitis (0.9%) (Table 2).

Table 2: Causes of Maternal Near-Miss (n=233)

Causes of MNM	n (%)
Hypertensive Disorders	
Severe Pre-Eclampsia	24 (10.3%)
Eclampsia	58 (24.9%)
Severe Hemorrhage in Early Pregnancy	
Ectopic	36 (15.5%)
Abortion	13 (5.6%)
Severe Hemorrhage in Late Pregnancy	
Antepartum Hemorrhage	23 (9.9%)
Severe Hemorrhage After Pregnancy	
Postpartum Hemorrhage	31 (13.3%)
Sepsis	
Puerperal Sepsis	8 (3.4%)
Chorioamnionitis	2 (0.9%)
Dystocia	
Uterine Rupture	27 (11.6%)
Impending Rupture	1 (0.4%)
Anemia	
Severe Anemia	10 (4.3%)

Regarding complications, 75.5% of women required ICU admission, 79.4% were discharged within seven days, and 20.6% had prolonged hospital stays. Organ dysfunction was observed in various systems, with neurological (10.7%), hematological (9.9%), and coagulation (8.2%) dysfunctions being the most frequent (Table 3).

Table 3: Complications Related to Maternal Near-Miss among study participants (n=233)

Complications	n (%)
Total ICU Admissions	176 (75.5%)
Duration of Hospital Stay	
≤7 Days	185 (79.4%)
>7 Days (Prolonged Hospital Stay)	48 (20.6%)
Organ Dysfunctions	
Neurological	25 (10.7%)
Respiratory	10 (4.3%)
Cardiac	8 (3.4%)
Hematological	23 (9.9%)
Coagulation	19 (8.2%)
Hepatic	10 (4.3%)
Renal	16 (6.9%)
Uterine	13 (5.6%)
Multiple System Involvement	7 (3.0%)

DISCUSSION

The mean age of maternal near-miss cases in this study was 25.5 years, consistent with findings by Zafar *et al.*, [9] (24.58 years) and Wasim *et al.*, (28.9 years) [10]. Most cases occurred in women aged 20–30 years, which is comparable to studies by Yasmin *et al.*, and Naik *et al.*, showing that the majority of maternal near-miss cases fell within this age range [11, 12]. Rural residency was predominant among the cases, with 57.08% coming from rural areas, similar to findings by Ojha *et al.*, where 74.8% of near-miss cases were from rural regions [13]. Un-booked status was a significant factor, with 74% of cases being un-booked. This finding aligns with Zahoor *et al.*, where 84.16% of cases were un-booked, highlighting the critical role of antenatal care in preventing maternal morbidity [14]. Multi-parity was more common among maternal near-miss cases (82.4%) compared to primiparity (17.5%), which aligns with studies by Yasmin *et al.*, and Naik *et al.*, both reporting higher proportions of multiparous women among near-miss cases [11, 12]. Regarding gestational age, 57.08% of patients were ≥34 weeks at admission, consistent with findings from Naik et al., where the majority of cases occurred after 34 weeks of gestation [12]. Socioeconomic disparities were evident, with 70.8% of cases belonging to socioeconomically poor groups, corroborating findings by Ojha *et al.*, and Naik *et al.*, who reported similar trends [14, 12]. Emergency admissions accounted for 88% of maternal near-miss cases, as seen in studies by Ugwa *et al.*, and Yasmin *et al.*, emphasizing the importance of timely referrals and interventions to prevent adverse outcomes [15, 11]. Emergency cesarean sections were the most common mode of delivery (55%), followed by spontaneous vaginal deliveries (40%), similar to the distribution reported by Yasmin *et al.*, [11]. A notable proportion of cases (55.3%) were referred from other healthcare facilities, which aligns with findings by Verma *et al.*, where 88.7% of near-miss cases were referrals [16]. Hemorrhage (44.2%) was the leading cause of maternal near-miss followed by hypertensive disorders (35.1%) and dystocia (12%). Wasim *et al.*, and Yasmin *et al*, reported similar findings as

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hemorrhage and hypertensive disorders were the most common cause of maternal near-miss [10, 11]. Sepsis and severe anemia, which stresses the multi-causative nature of maternal morbidity, also contributed. Similar to the results by Wasim *et al.*, [10], cases of maternal mortality were more often due to hemorrhage and hypertensive disorders [17]. An organ dysfunction was commonly seen among maternal near-miss cases. Neurological (10.7%), hematological (9.8%), coagulation, renal, uterine, hepatic, and respiratory dysfunction were the four most frequent types of dysfunction observed Such results were also similar to those reported by Manyahi *et al.*, and the work of Chama *et al.*, who described similar organ dysfunction patterns among near-miss cases [18, 19]. Surgical and therapeutic procedures were frequent; laparotomy (27%), hysterectomy (5.5%) and hypertension disorders of pregnancy based on an indication received magnesium sulfate therapy in 24.4% of individuals. A total of 27.8% of patients required blood transfusions, and 6.4% needed ventilator assistance. The interventions were similar to those reported by Manyahi *et al.*, and Ingole *et al.*, [18, 20]. The findings of this study highlight the critical need for improving access to antenatal care, particularly for women in rural areas and low socioeconomic groups. Strengthening emergency obstetric care and ensuring timely referrals from lower-level facilities can significantly reduce maternal morbidity and mortality.

CONCLUSIONS

It was concluded that maternal near-miss cases primarily involved un-booked, rural, and multiparous women, emphasizing the need for improved antenatal care and timely access to emergency services. Hypertensive disorders and severe hemorrhage were the leading causes, with ICU admissions and organ dysfunctions being significant complications.. Expanding critical care access and implementing targeted interventions can significantly improve maternal health outcomes and reduce near-miss events.

Authors Contribution

Conceptualization: HM

Methodology: HM, SP, EM, BU, MH

Formal analysis: FL

Writing review and editing: SP, EM

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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