Original Article

Frequency and Covariates of Maternal Near-Miss Events and Maternal Deaths in a Tertiary Care Hospital; A Cross-Sectional Study

Naila[1], Iffat Irshad[2], Fatima Rehman[1], Nuzhat Amin[1], Nasim Akhtar[1]

[1]Department of Obstetrics & Gyne, Bacha Khan Medical College, Mardan
[2]Wateem Medical and Dental College, Rawat, Islamabad

Correspondence: *Dr. Naila*
Department of Obstetrics & Gyne, Bacha Khan Medical College, Mardan
dr.nailatahir@gmail.com

Abstract

Objective: To determine the frequency and covariates of maternal near-miss events and maternal deaths in a tertiary care hospital.
Methodology: The present cross-sectional study was carried out at the Gynae-A unit of Mardan Medical Complex, Mardan, Pakistan, over a one-year period from January to December 2018. For data collection, we used a pre-designed proforma that included only those patients who fulfilled near-miss criteria according to the validated WHO near-miss criteria. This proforma prospectively recorded the patient demographic variables, including her age, parity, gestational age at presentation, and booking status. Later, the data was analyzed to determine the frequency and underlying causes of near-miss events and mortality in our unit. The study included 268 participants who met the WHO near-miss inclusion criteria in 2009.
Results: In the Gynae-A unit of Mardan Medical Complex, over one year, 9130 deliveries occurred from January to December 2018, resulting in 8966 live births. Among these total deliveries, there were 268 cases of near-miss Obstetric events and 11 cases of maternal deaths. Our unit's calculated maternal near-miss incidence ratio was 29.35 per 1000 live births, and the maternal mortality index was 3.9%. The other important parameter which reflects the quality of obstetric care is the maternal near-miss-to-mortality ratio, which was found to be 24:1, highly predicting a relatively good quality of obstetric care at our obstetric unit.
Conclusion: Our unit's maternal near-miss incidence ratio was 29.35 per 1000 live births, indicating the frequency of severe maternal complications. The ratio of one maternal death for every 24 near-miss events highlights our unit's high level of obstetric care and prevents maternal and perinatal mortalities. The study identified hemorrhage and hypertensive disorders as the main causes of maternal near-miss events and mortality. These findings strongly suggest that identifying women at risk and implementing all evidence-based preventive strategies and timely interventions can reduce maternal mortality and thus help in achieving sustainable development goals by improving overall maternal health.
Keywords: Maternal near-miss, maternal mortality, mortality index.

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Introduction

Maternal mortality has been identified and is still used as an indicator for maternal health, besides the other indicators added later on as maternal health indicators of a country. s most maternal death causes are preventable, there has been a decrease in maternal mortality rates worldwide, particularly in developed nations with the resources to implement preventive strategies effectively. Though, in many countries, the absolute number of maternal deaths remains relatively low, serious maternal morbidities do occur, limiting maternal death as the sole indicator for quantitative analysis of maternal health of a country. To address this relevant limitation and identify gaps in maternal health services, World Health Organization (WHO) introduced the maternal near-miss concept in 2011 as an adjunct important indicator of maternal health besides maternal death.[1] Reducing maternal mortality to three-quarters is a key Millennium Development Goal (MDG-Target 5A).[1]

Maternal death is seen as the tip of the iceberg, while more important to identify and address is the near-miss described as the vast base of the iceberg This remains relatively undetected in the majority of cases high

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despite its importance in maternal health .[2] According to the WHO near-miss criteria, a maternal near-miss event is defined as a woman who suffers from a life-threatening complication during pregnancy, childbirth, or within 42 days of the termination of pregnancy but ultimately survives.[2] Various identification criteria for maternal near-miss cases have been identified and followed in different settings according to the resources available.[3] However, the WHO maternal near-miss tool, consisting of three criteria groups based on clinical, laboratory, and management parameters, has been identified as the standardized method for identifying near-miss cases in obstetrics, specifically emphasizing organ dysfunction.[2]

Maternal near-miss is more sensitive in assessing pregnancy outcomes than maternal mortality alone.[4] In many studies conducted in both developed and underdeveloped nations[2-4], the underlying causes of maternal mortality are often the same even in the resource-rich country, suggesting that taking into account all the near-miss cases and effective preventive strategies implemented to reduce maternal near-miss events in a country can lead to a reduction in long-term mortality rates associated with near-miss events and improvements in overall maternal mortality ratios. Consequently, the primary objective of our study was to assess not only the frequency but, more important, to detect its underlying cause of maternal near-miss events and maternal deaths. We also calculated other important maternal health indicators like maternal near-miss incidence ratio, mortality index, and maternal near-miss-to-mortality ratio.[24] Additionally, our study also helped in detecting the recent trends in near-miss events and maternal deaths within a one-year period at our unit. By analysis of these factors, we can gain crucial insights and identify gaps in the quality of obstetric care addressing them can help to enhance maternal as well as fetal health outcomes.

Methodology

The study was conducted over a one-year period, from January to December 2018, at Mardan Medical Complex, a tertiary care hospital known for providing round-the-clock consultant-led multidisciplinary care to patients. As a referral hospital, it caters to both district and private hospitals, and our unit comprises a ten-bedded intensive care unit and a well-equipped labor room, accepting high-risk referral cases from nearby districts.

To gather data, all near-miss events that met the WHO criteria were carefully selected, and a WHO near-miss proforma was promptly filled out for each near-miss case in a prospective manner. The proforma facilitated recording vital patient characteristics, including age, booking status, parity, and gestational age upon admission. After data collection, a thorough analysis of the frequency and characteristics of near-miss events and mortality cases was performed.

Several near-miss indices were calculated to assess the severity of maternal morbidity and the quality of care. These indices include the maternal near-miss incidence ratio, representing the number of maternal near-miss cases per one thousand live births.

$$\text{MNM incidence ratio} = \frac{MNM\ cases}{Number\ of\ live\ births} \times 1000$$

Additionally, the maternal near-miss mortality ratio was determined, representing the proportion of maternal near-miss cases to maternal deaths. Finally, the mortality index, expressed as a percentage, was computed by dividing the number of maternal deaths by the total number of women with life-threatening conditions.

$$MI = \frac{Maternal\ death}{(Maternal\ nearmiss + maternal\ death)} \times 100$$

These indices identified as important maternal health indicators provide us valuable information on obstetric care's effectiveness and help identify gaps for potential improvement to improve maternal health by reducing the near miss events and thus morbidity and mortality

Results

Over the course of one year, a total of 9130 deliveries were conducted, resulting in 8966 live births. Among these deliveries, 268 obstetric near-miss events were identified, while there were 11 cases of maternal deaths. The prevalence of near-miss cases was calculated to be 29.35 per 1000 live births, providing insight into the frequency of severe maternal complications in our unit. The maternal mortality index, representing the percentage of maternal deaths among women with life-threatening conditions, was 3.9%. Moreover, the maternal near-miss to mortality ratio was 24:1, indicating a higher frequency of near-miss cases than maternal deaths in our study population.

Table I: Patient characteristics.		
Characteristics	Total no of near miss cases	%
Age range in years		
< 18 years	15	5.5%
19 - 25 years	59	22%
26 - 35 years	169	63%
> 35 years	25	9.3%
Gravida		
Primary Gravida	69	26%
Multigravida (Parity 2 - 4)	98	37%
Grandmulti (Parity 5 and above)	101	38%
Gestational age in weeks		
< 12 weeks	15	5.5%
13 - 28 weeks	14	5.2%
28 - 42 weeks	200	74.6%
Postpartum	39	14.5%
Booked/ Unbooked		
Booked	96	35.8%
unbooked	172	64.1%

Patient demographic characteristics for all near-miss events were analyzed and presented in Table I. The data showed that most patients upon admission are within the age range of 26-35 years, constituting 63% of the cases. The next most common age group was 19-25 years, accounting for 22% of the near-miss cases. Patients under 18 represented 5.5% of the near-miss cases, while those above 35 constituted 9.3%.

Among the total near-miss cases, the majority were observed in grandmulti para (38%) and multipara (37%) women. Primigravida accounted for 26% of the total near-miss cases. Notably, many near-miss events occurred during the third trimester (between 28 to 42 weeks) of gestation, constituting 74.6% of the cases. In contrast, only 5% of cases were reported in pregnancies of less than 12 weeks and 13-28 weeks, respectively.

After delivery, 39 patients (14.5%) experienced near-miss events in the postpartum period. Among the total near-miss cases, a majority of 172 (64%) were unbooked, while the remaining 96 cases (35.8%) were booked cases.

These findings suggest that most patients were unbooked and failed to seek antenatal care and early detection and treatments of maternal complications. Thus targeted efforts to improve access to prenatal care can help reduce near-miss events. This study helped us understand these trends in maternal near-miss. It hence can implement more effective strategies to reduce the incidence of near-miss events and improve maternal health outcomes.

The results in Table II reveal the leading causes of near-miss events in our study. Hemorrhage as in other studies, was found to be the most prevalent cause, accounting for 43% of the cases, followed closely by severe hypertension at 38%. Uterine rupture and severe anaemia were also significant and almost equal contributors, comprising 8% and 7% of the total near-miss events.

Further analysis of underlying causes of hemorrhages indicated that placental abruption was the primary cause, representing 58% of the cases. Post-partum haemorrhage followed closely at 26%, while placenta previa and ruptured ectopic cases accounted for 15% collectively.

The data presented in Table 3 provides information into the leading causes of maternal mortality observed in our study. Among the maternal deaths, DIC (Disseminated Intravascular Coagulation) due to haemorrhage emerged as the most prevalent cause, accounting for 36% of the cases. Following closely were cases of HELLP syndrome and uterine rupture, each contributing to 18% of maternal mortality.

Table II: Frequency and causes of maternal near-miss events.		
Cause	Total no of near-miss cases(n=268)	%
Hemorrhage		
Ectopic	15	6%
Placenta previa	15	6%
Placental abruption	58	22%
Postpartum hemorrhage	26	10%
Severe Hypertension		
Eclampsia	68	25%
Severe pre-eclampsia	35	13%
HELLP/ DIC	4	1%
Uterine Rupture	21	8%
Severe Anemia	18	7%
Sepsis	3	1%
Other		
Ruptured appendix (acute abdomen)	1	0.4%
Peripartum cardiomyopathy	2	0.7%
Pulmonary embolism	1	0.4%
Brain stem stroke	1	0.4%

These findings highlight the importance of anticipation of all women at risk of hemmorrhage their timely and effective management can lead to the reduction of this near-miss event. By focusing on implementing preventive strategies and targeted interventions for these primary causes, healthcare providers can significantly improve maternal outcomes and reduce maternal morbidity and mortality.

Table III: Frequency and causes of maternal deaths (n = 11)

Cause	Total number of maternal deaths(n=11)	%age
DIC due to haemorrhage	04	36%
HELLP syndrome	02	18%
Sepsis	01	9%
Uterine rupture	02	18%
Pulmonary Embolism	01	9%
Brain stem stroke	01	9%

Similarly, prompt identification and timely intervention for near-miss cases of HELLP syndrome and uterine rupture are crucial to reducing the effect of these life-threatening complications on maternal health.

Discussion

The decline in maternal mortality rates in higher-income countries reflects progress towards achieving sustainable development goals in maternal health. It remains an essential indicator of a country's socio-economic development. The World Health Organization (WHO) defines maternal near-miss as the near-death of a woman who survives a complication occurring during pregnancy, childbirth, or within 42 days of pregnancy termination, leading to non-life-threatening morbidity. This definition shows maternal near-miss as an important health indicator and indicates the quality of obstetric care. Specific maternal near-miss indicators have been suggested to assess the quality of care, including the maternal near-miss ratio, which estimates the number of near-miss cases per live birth, and e maternal near-miss mortality ratio, indicating the quality of care provided.[6]

The global burden of severe maternal morbidity is increasing, particularly in low- and middle-income countries. According to a comprehensive review and meta-analysis using WHO criteria, there are 18.67 cases of severe maternal morbidity per 1000 live births worldwide. Prevalence varied by region, from 3.10 per 1000 live births in Europe to 31.88 per 1000 live births in Africa. Severe maternal morbidity was seen in Asia's 16.92/1000 live births.[7]

In our study, we found that the frequency of maternal near-miss was 29.35 per 1000 live births, and the ratio of maternal near-miss to maternal death was 24:1. These ratios were larger than those found in earlier research done in middle-income and undeveloped nations, where they varied from 1.5 to 7.7 and 0.14 to 0.75, respectively. The disparities in the definition and identification criteria for maternal near-miss instances, which remain inconsistent across research[8–13], may be to blame for the variation in ratios. Depending on the physical and human resources available and the requirements for admission to intensive care units, disease-specific and management-based criteria cause variances in the reported estimates.[14–16]

In our analysis, haemorrhage (43%), severe hypertension (38%), uterine rupture (8%), and severe anaemia (7%) were the main causes of maternal near-miss events and maternal deaths. These findings are consistent with several other studies that identified haemorrhage and hypertension as the primary causes of maternal near-miss events and maternal mortalit.[17]

Comparing our study with other studies in Pakistan, we found similar patterns in the prevalence of near-miss cases and the causes of near-miss and maternal mortality. Studies from different tertiary care hospitals in various cities reported comparable frequencies of near-miss cases. They highlighted hemorrhage and hypertensive disorders as the primary causes of maternal near-miss mortality.[18-21]

By understanding these top causes of maternal mortality, healthcare providers can develop and implement strategies and adopt timely interventions to improve obstetric care and minimize the risks associated with these complications. Early booking, regular follow-up visits in the antenatal period, childbirth by a skilled health professional, and seeking postpartum care are vital to ensuring early detection and timely management of these conditions, thus contributing to improved maternal outcomes and reduced maternal mortality rates.

Maternal near-miss cases and the critical analysis of the care provided to severely ill women enable us to identify the deficiencies in providing care. Over time

comparative analyses within and between institutions and countries can aid in resource allocation, particularly in low-income countries, improving obstetric care and reducing maternal morbidity and mortality rates.[22] It is crucial to recognize that maternal near-miss cases represent the broader base of maternal health issues, underscoring the need for preventive measures to tackle morbidity and reduce the incidence of maternal mortality.[23]

Conclusion

This study concludes the frequency of near-miss cases in our hospital, revealing a relatively higher incidence than in other healthcare facilities. However, the encouraging findings of a lower mortality index and near-miss-to-mortality ratio in our unit indicate a higher quality of obstetric care provided to critically ill women. These results reflect the dedication and effectiveness of our multidisciplinary team in managing and preventing life-threatening complications during pregnancy and childbirth and strict adherence to unit protocols in managing these patients.

The study also identifies the underlying causes of near-miss events. hemorrhage and hypertensive disorders as the primary contributors to the maternal near-miss event. Efforts should be focused on early interventions and effective management of these conditions to minimize their impact and reduce the incidence of severe complications such as haemorrhage, hypertension, and uterine rupture.

The findings serve as a basis for continuous healthcare improvement, enabling us to allocate our resources more efficiently and implement preventive strategies based on evidence-based practices to further enhance the quality of obstetric care in our unit. Prompt preventive measures and early interventions, regular audits of maternal near-miss cases, will reduce maternal morbidity and mortality rates. This will help us in accomplishing our sustainable development goal.

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