Using World Health Organisation near miss approach to assess preventable maternal morbidity and mortality at a tertiary care hospital

Asma Ansari,[1] Umbreen Akram,[2] Samina Khattak[3]

Abstract

Objectives: To determine frequency of severe maternal complications, maternal near-miss cases and maternal deaths in obstetric patients in a tertiary care setting.

Methods: The prospective cross-sectional analytical study was conducted at the Obstetrics Unit of Combined Military Hospital, Kharian, Pakistan, from January to June 2019, and comprised cases of severe maternal complications, critical interventions and life-threatening situations. A conditions as defined by the World Health Organisation guidelines. Severe maternal outcome ratio, maternal near-miss, maternal mortality ratio, near-miss-to-mortality ratio and the mortality index were calculated. Data was analysed using SPSS 20.

Results: Of the 1054 live births during the study period, there were 42(3.9%) near-miss cases and 4(0.3%) maternal deaths. Management-based criteria identified 34(80%) cases, followed by clinical 14(33%) and laboratory criteria 2(4.7%). Maternal mortality ratio was 379/100,000 and near-miss-to-mortality ratio was 39/1000 live births. Severe maternal outcome ratio was 4.36 (42+4/1054). For near-miss cases, the mortality index was 8.6, and the maternal near-miss-to-maternal death ratio was 10.5:1.

Conclusion: The use of a standardised near-miss criterion makes audit and comparison of results between hospitals and even countries having the same resources possible and reproducible.

Keywords: Health system, Maternal mortality, Near miss morbidity, Risk factors. (JPMA 71: 2721; 2021)

DOI: https://doi.org/10.47391/JPMA.299

Introduction

Maternal death (MD) has been used traditionally as an indicator of quality of care provided to the obstetric population. Maternal mortality is also a social indicator of how a society cares for human beings irrespective of gender. Mostly, information and statistics on morbidity and mortality are available from hospitals, and community-based data-collection is almost nonexistent. Even though mortality cases are fewer, hurdles have been encountered in studying them. Thus, a need was felt for a quality indicator which was more common and prevalent across the world. Maternal near-miss (MNM) case is defined as a woman who survives life-threatening conditions during pregnancy, child birth, or within six weeks postpartum.[1] High-quality timely care is crucial in saving lives. Every year, 10 million women suffer from severe complications of pregnancy. Out of these, nearly 50,000 die and 99% of these deaths occur in the developing countries and most of them are largely preventable.[2] Pakistan is one of the countries with high maternal mortality rate of 178/1000 and the exact

Department of Obstetrics and Gynae, [1]Army Medical College, Combined Military Hospital Rawalpindi, [2]Bahawalpur Medical College, Combined Military Hospital Bahawalpur, [3]Kharian Medical College, Combined Military Hospital, Kharian, Pakistan.

Correspondence: Asma Ansari. Email: asmaansari31@gmail.com

number of severe morbidity or MNM cases is not known, which underlines the importance of identifying and managing such cases by healthcare staff as well as administrators.[3]

One of the primary objectives of the World Health Organisation (WHO) Global Strategy for Women, Children and Adolescents Health 2016-2030 is to ensure adequate quality of healthcare, and its provision is considered a basic human right.[4] The WHO and partners since 2004 are working on approaches to improve maternal health and the level of provision of health services. The MNM approach was considered to be the most inclusive.[5] In 2009, the WHO presented a consensus MNM definition along with validated criteria for identification of such cases.[6] The MNM audit approach was developed in 2011 for the evaluation of obstetric care quality in health facilities.[1] Compared to MD, MNM cases are more common, especially in low maternal mortality settings and their review bring to surface the gaps in healthcare delivery. It also identifies the areas that need allocation of resources. Another advantage is that discussing mortality can be considered threatening as well as emotionally taxing by hospital staff which is not so in MNM cases as women survive and can provide details themselves. It requires development of communication skills by staff dealing with these women.[7] As a result of these factors, the review of MNM cases is more acceptable to all

A. Ansari, U. Akram, S. Khattak

stakeholders; healthcare staff, patients and their families. Extensive research has been carried out in the past decade to identify MNM cases and to understand the hindrances in healthcare delivery.[8] A study in 2013 identified MNM cases by applying the WHO criteria.[9] The current study was planned to identify MNM cases through a standardised approach and to provide statistical evidence to work on the areas that need more attention by measuring mortality and morbidity statistics.

Patients and Methods

The prospective cross-sectional analytical study was conducted at the Obstetrics Unit of Combined Military Hospital (CMH), Kharian, Pakistan, from January to June 2019. After getting approval from the institutional ethics review board, the sample size was calculated using Open Epi sample size calculator[10] with 95% confidence interval (CI), 5% margin of error and 3% incidence of severe maternal morbidity and mortality.[5] The sample was raised using non-probability sampling technique from among cases of severe maternal complications, critical interventions, and life-threatening conditions using the WHO criteria.[1] All healthy patients who had uneventful childbirth were excluded. Staff members were sensitised for case identification. Data was collected after taking informed consent from patients with severe maternal outcome who fulfilled the criteria. Demographic profile included age, parity, period of gestation, booking status and mode of delivery. Also noted was data on MNM status: whether on arrival or within 12 hours or developed after 12 hours. Intensive care unit (ICU) admission and total length of hospital stay was also noted. For MNM

cases, clinical criteria to identify organ dysfunction, investigations and management-based organ dysfunction was used. To calculate severe maternal outcome ratio (SMOR), MNM+MD rate per 1000 live births (LB) was calculated. SMOR is an indicator identifying the care areas and resource requirement in an area or facility. MNM ratio (MNMR) refers to the number of near-miss cases per 1000 live births. MNMR and SMOR together estimate the need for investment in human resource, equipment or policymaking at a certain facility or area. Maternal mortality ratio (MMR), which is the ratio of MNM to MD, is the ratio between MNM cases and MDs. The areas or hospitals exhibiting higher ratio provide quality care. Mortality index (MI) was calculated, with higher index indicating low-quality care. To calculate it, the number of deaths due to a condition was taken as a numerator and was divided by the sum of near-miss morbidities and MDs from that condition. This indicator is helpful as it directly identifies the impact of care received by the patient for a particular condition.

Data was subjected to descriptive analysis using SPSS 20. Frequencies and percentages of the underlying causes of death and contributory conditions were calculated. MMR and MNMR were calculated using 1000 live births as the denominator.

Results

Out of 1062 total births, 1054(99.24%) were LBs, and, among them, there were 42(3.9%) MNM cases and 4(0.3%) MDs. Management-based criteria identified 34(80%) cases, followed by clinical 14(33%) and

Table-1: Demographic and reproductive data.

Parameter	Severe maternal outcome (n)	Percentage (%)	Near miss cases (n%)	Maternal Mortality cases (n%)	Mortality Index (100%)
Age (years)					
18-29	27	58.6	25(59.5%)	02(50%)	7.4
30-40	13	28.2	12(28.5%)	01(25%)	7.6
>40	6	13	05(11.9%)	01(25%)	16
Booking status					
Unbooked	34	73.9	31(73.8%)	4(100%)	8.8
Booked	12	26	11(26.1%)	Nil	Nil
Referral status					
Referred before labour	23	50	22(52.3%)	01(25%)	4.3
Referred after delivery	7	15.2	05(11.9%)	02(50%)	28
Not referred	16	34.7	15(35.7%)	01(25%)	6.2
Gestation					
First trimester	8	17.3	08(19%)	Nil	Nil
Second trimester	13	28.2	12(28.5%)	01(25%)	7.6
Third trimester	25	54.3	22(52.3%)	03(75%)	12
Mode of delivery					
C section	29	63	26(61.9%)	03(75%)	10
Vaginal delivery	7	36.9	16(38%)	01(25%)	5.8

2723

Using world health organisation near miss approach to assess preventable maternal morbidity...

Table-2: Near-Miss cases according to the World Health Organisation (WHO) criterion.

Inclusion criteria	Identification parameters	(n %) n=42
Severe maternal complications	Massive PPH	14(33.3%)
	Severe preeclampsia	10(23.8%)
	Eclampsia	05(11.9%)
	Sepsis	05(11.9%)
	Ruptured uterus	01(2.3%)
	Obstructed labour	02(4.7%)
	Severe complications of abortion	02(4.7%)
	Obstetric haemorrhage	03(7.1%)
Critical intervention for management	Admission to ICU	30(71.4%)
	Intervention radiology	Nil
	Laparotomy for severe obstetric conditions	14(33.3%)
	Use of blood and blood products	21(50%)
Organ dysfunction/Life threatening conditions	Cardiovascular	4(9.5%)
	Respiratory	8(19%)
	Renal	6(14%)
	Haematological	6(14%)
	Hepatic	2(4.7%)
	Neurologic	4(9.5%)
	Alternative Severity proxy	16(38%)

PPH: Postpartum haemorrhage, ICU: Intensive care unit.
Open Source Statistics for Public Health.OpenEpi.Toolkit Shell for Developing New Applications.
https://www.openepi.com/SampleSize/SSPropor.htm.

laboratory criteria 2(4.7%). There were 6(14%) cases that had more than one organ system involvement and an overlap of the identification criteria. Maternal mortality ratio was 379/100,000 and MNMR was 39/1000 LBs. SMOR was 4.36 (42+4/1054). For MNM cases, the MI was 8.6, and the MNM-to-MD ratio was 10.5:1 (Table-1).

Postpartum haemorrhage (PPH) 14(33.3%) was the leading severe complication, followed by severe pre-eclampsia 10(23.8%), eclampsia 5(11.9%) and sepsis 5(11.9%). Out of critical interventions, admission to ICU was the leading identification parameter of MNM in 30(71.4%) cases. Life-threatening conditions involving different organ systems showed maximum patients identified by alternative severity proxy 16(38%), and the least by hepatic dysfunction 2(4.7%) (Table-2).

Discussion

MNM has been used as a complimentary indicator of maternal health because of a reduction in maternal mortality worldwide.[11] Morbidity and mortality continues to occur in obstetric patients despite tremendous advances made in healthcare over the decades.[12] In order to understand the failures of health systems and to devise methods to solve issues related to obstetric care, an increasing number of studies have been conducted over the last decade.[13] Many studies have been carried out on MNM, but they lacked uniformity. WHO MNM identification criteria incorporates the clinical, laboratory as well as management-based criteria, thus providing a balanced blend of previously used criteria.[1]

In the current study, there were 42 MNM case over six months. The mean age of MNM cases was 29±2.5 years and majority 32(76%) were multigravida (MG) with median parity 2±1.2. Highest MI was in the >40 years age group. A six-month study in an Australian tertiary maternity hospital showed almost double the number of MNM cases with higher parity.[14] Mean age in another study was 27±4 years and 56% were primigravida (PG) and 43% MG.[15] In another study, MNM was higher (45.6%) in MG, but mortality was the same.[16] The mode of delivery in the current study showed 63% MNM cases delivered by Caesarean Section (CS) and 36.9% by vaginal delivery, but these had high MI of 5.8%. A study in India reported that CS was required in 37.5% MNM patients.[17] Majority of the MNM patients in the current study were un-booked (73.9%) with a high MI of 8.8%, while all in the mortality group were un-booked which is in agreement with other studies.[18-20] A study in Karachi also showed highest mortality (54.4%) in patients referred as emergency cases.[16] In the current study, 50% patients were referred in time before labour and had a low MI of 3.3%. Those referred after delivery were only 15% and had the highest MI (28%). In a study done in Pakistan on similar lines, 48% MDs happened at healthcare facility, 27% at home and 22% en route. All of these nearly were due to delay in seeking treatment and no prior contact with healthcare professionals.[21] More than 90% of referred patients from other hospitals arrive late and in a critical condition.[22,23]

Leading severe maternal complications in the current study were massive PPH (33.3%) followed by pre-eclampsia (23.8%) and eclampsia (11.9%). PPH was the major contributor of MNM in the current study compared to (64%) reported in Brazil[24] and 36% in Ethopia.[11] This is primarily due to an increase in the incidence of placenta accreta spectrum (PAS) as 24 patients presented with the condition, while 16 had obstetrical hysterectomy.

A study showed that the most significant criteria for identifying MNM was management-based.[2] Management-based MNM criteria was the leading identification parameter in 87% participants in a study, followed by clinical and laboratory criteria, which is in

A. Ansari, U. Akram, S. Khattak

agreement with the current study.[22] Among life-threatening conditions, alternate severity proxy (38%) was the main contributor. The leading organ system involved in the study was respiratory (19%), followed by haematological and renal systems (14%) each. One study reported that the most common was haematological system (34%), followed by neurological (15%), renal (12.5%) and cardiac (9.3%) systems, while the least frequent was respiratory, but 50% of the mortality was in this group. ICU admission was major criteria in 71.4% of critical interventions, followed by use of blood products in 50% of patients in the current study, while it was laparotomy in another study.[17]

The MNMR was 39/1000 in the current study against 7.4/1000 reported in Brazil[14] and 24/1000 in India.[12] The MNM-to-MD ratio in the current study was 10.5:1, which means there was one maternal death for every 10.5 MNM cases, with an MI of 8.6%, compared to MNMR 17/1000 LBs and MNM-to-MD ratio 4.9:1, with an MI of 16.9% reported in Africa.[11] A similar study at a tertiary care hospital showed MNM-to-MD ratio of 5.6:1, and MI 14.9%.[15] Across the high-income countries, the reported MNM-to-MD ratio was 1:117-223,[25] and in the rest of the world it was anywhere between 7-40/1000 LBs.[26] Frequency of MNM cases in a study done in Sweden, a high-income country, was 2.9/1000. The participants were immigrant Asian population which compares well with the participants of the current study. The most frequently occurring criteria in the Swedish study was uterine rupture, followed by pre-eclampsia.[27] In most of the studies done in low- and middle-income countries (LMICs), the leading cause of maternal morbidity and mortality was still the same triad of haemorrhage, hypertension and sepsis, although the WHO MNM approach was not used in these studies for case identification.[18-21]

A similar study, conducted in the same hospital, reported 76 MNM cases. The MNM ratio was 676, MNM-to-MD ratio was 10:1 and MI was 8.4%.[9] A comparison of results of the two studies at the same centre showed an improvement in all indicators.

The audit approach shows that despite all the advancements in drugs, massive transfusion protocols and surgical techniques, the leading cause of morbidity and mortality was still PPH and hypertensive disorders. Un-booked patients contributed to high MI and complications occurring in booked patients were better managed. CS deliveries had a high MI directly, and majority of cases ending up in hysterectomy were due to PAS, a known complication of repeat CS, thus identifying the need to reduce CS rate. A multipronged approach targeting patients, communities and healthcare system is required to address these issues, and audits, like the present study, will help in identifying the areas requiring maximum financial and human resource investment.

Conclusion

The WHO criteria helped in systematic data-collection and comparison of health indicators over time. Substandard care was identified for healthcare providers and healthcare administrators to act upon.

Disclosure: The Abstract was submitted to the Royal College of Obstetricians and Gynaecologists (RCOG) World Congress 2020, and was accepted as a poster presentation.

Conflict of Interest: None.

Source of Funding: None.

References

1. WHO. Evaluating the quality of care for severe pregnancy complications: The WHO near-miss approach for maternal health. Department of Reproductive Health and Research, 2011.
2. Karolinski A, Mercer R, Micone P, Ocampo C, Mazzoni A, Fontana O, et al. The epidemiology of life-threatening complications associated with reproductive process in public hospitals in Argentina. BJOG Int J Obstet Gynaecol. 2013; 120:1685-95.
3. Hayat K. National health survey of Pakistan Islamabad. [Online] [Cited 2019 September 18]. Available from: URL: https://dhsprogram.com/pubs/pdf/FR354/FR354.pdf
4. WHO What is the Global Strategy? [Online] [Cited 2019 September 18]. Available from: URL: http://www.who.int/life-course/partners/global-strategy/global-strategy-2016-2030/en/
5. Tunçalp Ö, Hindin MJ, Adu-Bonsaffoh K, Adanu RM. Assessment of maternal near-miss and quality of care in a hospital-based study in Accra, Ghana. Int J Gynecol Obstet. 2013; 123:58-63.
6. SouzaJP, CecattiJG, Parpinelli MA, Serruya SJ, AmaralE. Apprapriate criteria for identification of near miss maternal morbidity in tertiary care facilities: a cross sectional study.BMC Pregnancy Child birth. 2007; 7:20.
7. Oliveira Neto AF, Parpinelli MA, Costa ML, Souza RT, Ribeiro do Valle C, Cecatti JG. Exploring Epidemiological Aspects, Distribution of WHO Maternal Near Miss Criteria, and Organ Dysfunction Defined by SOFA in Cases of Severe Maternal Outcome Admitted to Obstetric ICU: A Cross-Sectional Study .BioMed Res Int.2018; 2018:5714890.
8. Tunçalp Ö, Hindin MJ, Suza JP. Google Search. [Online] [Cited 2019 September 18]. Available from: URL: https://www.google.com/search?sxsrf=ACYBGNTAncBpraqEJJFX Jl4Mf7_iGLJcwA%3A1568831763096&ei=E3mCXfPHBcAaeO6kJA O&q=tuncalp+o+hindin+mj+suza+jp+2012&oq=tuncalp+o+hin d i n + m j + s u z a + j p + 2 0 1 2 & g s _ l = p s y - ab.3...254132.289170..290702...4.5..0.390.10981.2- 2 1 j 1 5 . . . . . . 0 . . . . 1 . . g w s - wiz.......0i71j0i131j0j0i67j0i10j0i30j0i13j0i13i30j0i22i30j33i21j33i1 6 0 . w J m O - btlUjl&ved=0ahUKEwiznc7fgdvkAhVPQBoKHWMdBOIQ4dUDCAs &uact=5
9. Ansari A, Zubair UB, Parveen S, Tasleem G. Near Miss Obstetric Events As A Reflection Of Quality Of Maternal Health Care.Pak Armed Forces Med J. 2016; 66:98-103.
10. Open Source Statistics for Public Health.OpenEpi.Toolkit Shell for

2725

Using world health organisation near miss approach to assess preventable maternal morbidity...

Developing New Applications.[Online] [Cited 2020 February 12]. Available from: URL:https://www.openepi.com/SampleSize/SSPropor.htm

11. Tura AK, Zwart J, Roosmalen J van, Stekelenburg J, Akker T van den, Scherjon S. Severe maternal outcomes in eastern Ethiopia: Application of the adapted maternal near miss tool. PLOS One. 2018; 13:e0207350.

12. Kamal S, Roy P, Singh S, Minz J. A study of maternal near miss cases at tertiary medical college of Jharkhand, India. Int J Reprod Contracept Obstet Gynecol. 2017; 6:2375-80.

13. Bashour H, Saad-Haddad G, DeJong J, Ramadan MC, Hassan S, Breebaart M, et al. A cross sectional study of maternal 'near-miss' cases in major public hospitals in Egypt, Lebanon, Palestine and Syria. [Online] [Cited 2019 September 18]. Available from: URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4644334/

14. Jayaratnam S, Kua S, deCosta C, Franklin R. Maternal 'near miss' collection at an Australian tertiary maternity hospital. BMC Pregnancy Childbirth 2018; 18:221.

15. Ps R, Verma S, Rai L, Kumar P, Pai MV, Shetty J. 'Near miss' obstetric events and maternal deaths in a tertiary care hospital: an audit. J Pregnancy. 2013; 2013:393758.

16. Sultana S, Ishtiaque S, Fareed S, Kamal S, Aslam Z, Hussain R, et al. Clinical Spectrum of Near-miss Cases in Obstetrics. Cureus.2019; 11:e4641.

17. Tallapureddy S, Velagaleti R, Palutla H, Satti CV. 'Near-Miss' Obstetric events and maternal mortality in a Tertiary Care Hospital. Indian J Public Health. 2017; 61:305-8.

18. NisarN, SohooN.Maternal mortality in rural community.A challenge for achieving millennium development goal. J Pak Med Assoc. 2010; 60:20-4.

19. Akbar N, ShamiN, AsifS. Maternal mortality in a tertiary care teaching hospital. J Coll Physicians Surg Pak. 2002; 12:429-31.

20. SultanaA, SabaN, Ghazala R. Maternal death and its causes-a challenge for achieving millennium goals. Annals KE Med Coll. 2007; 13:3-6.

21. SiddiquiSA, SoomroN, Sabih-ul-Hussain F. Severe obstetric morbidity and its outcome in patients presenting in a tertiary care hospital of Karachi. J Pak Med Assoc. 2012; 62:226-31.

22. Fikree F, MirA, Haq I. She may reach a facility but will still die!An analysis of quality of public health sector maternal health services, district Multan, Pakistan. J Pak Med Assoc. 2006; 56:156-63.

23 Almerie Y, Almerie MQ, Matar HE, Shahrour Y, Al Chamat AA, Abdulsalam A. Obstetric near-miss and maternal mortality in maternity university hospital, Damascus, Syria: a retrospective study. BMC Pregnancy Childbirth. 2010; 10:65.

24. Galvão LP, Alvim-Pereira F, de Mendonça CM, Menezes FE, Góis KA, Ribeiro RF Jr, et al. The prevalence of severe maternal morbidity and near miss and associated factors in Sergipe, Northeast Brazil. BMC Pregnancy Childbirth. 2014; 14:25.

25. Roosmalen JV. Zwart. Severe acute maternal morbidity in high-income countries.In: Roosmalen JV. Zwart, eds. Best Practice and Research: Clinical Obstetrics and Gynaecology. 23rd edition. 2009, pp 297-304.

26. Say L, Souza JP, Pattinson RC. Maternal near miss-towards a standard tool for monitoring quality of maternal health care. In: Say L, Souza JP, Pattinson RC, eds. Best Practice and Research. 23rd edition. Elsevier, 2009; pp 287-96.

27. Wahlberg A, Rööst M, Haglund B, Högberg U, Essén B. Increased risk of severe maternal morbidity (near-miss) among immigrant women in Sweden: a population register-based study. Int J Obstet Gynaecol. 2013; 120:1605-11.