

Maternal Near Miss: An Indicator for Maternal Health and Maternal Care

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ABSTRACT

Maternal mortality is one of the important indicators used for the measurement of maternal health. Although maternal mortality ratio remains high, maternal deaths in absolute numbers are rare in a community. To overcome this challenge, maternal near miss has been suggested as a compliment to maternal death. It is defined as pregnant or recently delivered woman who survived a complication during pregnancy, childbirth or 42 days after termination of pregnancy. So far various nomenclature and criteria have been used to identify maternal near-miss cases and there is lack of uniform criteria for identification of near miss. The World Health Organization recently published criteria based on markers of management and organ dysfunction, which would enable systematic data collection on near miss and development of summary estimates. The prevalence of near miss is higher in developing countries and causes are similar to those of maternal mortality namely hemorrhage, hypertensive disorders, sepsis and obstructed labor. Reviewing near miss cases provide significant information about the three delays in health seeking so that appropriate action is taken. It is useful in identifying health system failures and assessment of quality of maternal health-care. Certain maternal near miss indicators have been suggested to evaluate the quality of care. The near miss approach will be an important tool in evaluation and assessment of the newer strategies for improving maternal health.

Keywords: Maternal health, maternal near miss, quality of care, severe acute maternal morbidity

Introduction

Maternal mortality is one of the important indicators used for the measurement of maternal health. Improvement of maternal health is one of the millennium development goals, MDG 5 with Target 5 A that calls for the reduction of maternal mortality ratio by three quarters between 1990 and 2015.⁽¹⁾ Since 1990, though maternal deaths world-wide have dropped by 47%, the number of maternal deaths in developing countries remains high. The global maternal mortality ratio is 210/100,000 births while it is about 240 in developing countries as compared to 14/100,000 in developed countries.^(2,3) India has also

reported a decline with the figure for 2007-2009 being 212/100 000 births from 398 in 1997-1998 and 301 in 2001-2003.^(4,5)

Although maternal mortality remains a significant public health problem, maternal deaths are rare in absolute numbers especially within a community, so that assessment of effects of care is difficult.⁽⁶⁾ To overcome this challenge, notion of severe acute maternal morbidity (SAMM) and near miss event was introduced in maternal health care to complement information obtained with review of maternal deaths.⁽⁷⁾

Maternal Near Miss: Indicator for Maternal Health

Near miss is defined as very ill pregnant or recently delivered woman who nearly died but survived a complication during pregnancy, childbirth or within 42 days of termination of pregnancy. SAMM refers to a life-threatening disorder that can end up in near

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miss with or without residual morbidity or mortality. Women who develop SAMM during pregnancy share many pathological and circumstantial factors related to their condition. Although some of these women die, a proportion of them narrowly escape death. Near miss cases and maternal deaths together are referred to as severe maternal outcome (SMO).

Severe morbidity data are vital for policy planners to know the requirements of essential and emergency obstetric care (EmOC) to manage these. It is also assumed to be a better indicator than maternal mortality alone for designing, monitoring, followup and evaluation of safe motherhood programs.⁽⁸⁻¹⁰⁾

Methods

The review aims at discussing this new concept of maternal near miss. For this, the PubMed database was searched. We also actively searched the sites of journals on maternal health and reproductive health and the site of World Health Organization (WHO) for documents and articles. A hand search of journals and publications on the topic in the institutional library was also made. The search terms used were “maternal near miss,” “severe maternal morbidity,” “severe obstetric morbidity” for review and the period of reference was year 1990-2012.

Identification of Near Miss Cases

However, there is a lack of uniform criteria for identification of cases of severe obstetric morbidity or maternal near miss. Identification of cases is complex and varies across studies.^(11,12) Three major criteria have been mentioned in a review conducted by the WHO, these are described in Table 1. The review has suggested the use of the organ system dysfunction based criteria supplemented with compatible clinical markers of organ

system dysfunction that are feasible for collection in the absence of higher-level amenities based criteria for identifying all severe morbidity and investigating the cause as the most reproducible one across similar areas.⁽¹³⁾

In another recent review on maternal near miss the authors observed that on using the disease specific criteria a higher percentage of near miss with a wider range of estimate is reported due to variation in the disorders being reported. The management based criteria mostly identifies emergency hysterectomy and intensive care unit (ICU) admissions as the major criteria. This criteria also produces a large variation as it depends on the physical and human resources available and the criteria for admission to ICU used in the institution.⁽¹⁴⁾

Recently, a WHO Expert Group has suggested a uniform set of identification criteria for maternal near miss cases aiming to facilitate the reviews of these cases. A process of identifying cases with potentially life-threatening conditions in the hospital has been suggested and among these those with organ system failure or dysfunction as per the definition will be included as near miss cases. The causes of these will be aligned with the pathological classification of maternal deaths.⁽¹⁵⁾

Prevalence of Maternal Near Miss

Due to the wide variation in identification of near miss cases, it has been difficult to make a summary estimate of the prevalence of near miss globally. In the systematic review published in 2004 the prevalence of near miss varied between 0.80% and 8.23% in studies that used disease-specific criteria while the range was 0.38% – 1.09% in the group that use organ-system based criteria. Rates were within the range of 0.01% and 2.99% in studies using management-based criteria.⁽¹³⁾ In another, recent

Table 1: Criteria for identification of near miss cases

Criteria	Description	Advantages	Disadvantages
Clinical criteria related to a specific disease entity	Disease specific definitions used for common conditions and clinical criteria defined for severe morbidity. e.g. Pre-eclampsia is a disease and complications such as eclampsia, renal failure and pulmonary edema identify severe cases	Easy to interpret cases can be identified retrospectively	All problems may not be covered
Management specific	Management or intervention to disease. e.g. hysterectomy, blood transfusion or admission to ICU	Quality-of-care of that disease can be identified	Difficult to define and quantify the condition
Organ system dysfunction or failure	Based on the concept that there is a sequence of events leading from good health to death. Death is preceded by organ dysfunction and organ failure. Markers for organ system dysfunction or failure are specified. e.g. Jaundice in the presence of pre-eclampsia	Simple to use in identification of cases	Depends on other variables such as availability of ICU beds, indications for hysterectomy
		Allows for identification of critically ill women	Dependent on the existence of a minimum level of care including functioning laboratories and basic critical care monitoring
		Keeps focus on severe diseases	

ICU: Intensive care unit

review on articles between January 2004 and December 2010 the prevalence rates of maternal near miss varied between 0.6% and 14.98% for disease-specific criteria, between 0.04% and 4.54% for management-based criteria and between 0.14% and 0.92% for organ-based dysfunction based on Mantel criteria. The rates are higher in low-income and middle-income countries of Asia and Africa. Based on meta-analysis, the estimate was 0.42% (95% confidence intervals CI 0.40-0.44%) for the organ dysfunction criteria.⁽¹⁴⁾ Studies from developing countries especially in the African region have reported a high incidence of near miss when compared to the developed world as can be seen from Table 2.⁽¹⁶⁻²⁸⁾ There are not many studies available from India on maternal near miss as is evident from Table 2.

Causes of Maternal Near Miss

The causes of near miss vary in different geographical areas of the world and also there are variations within countries. Hemorrhage, hypertensive disorders, sepsis and obstructed labor are the most important causes in the developing countries as is evident from Table 2. Causes of near miss are similar to causes of maternal deaths prevailing in the area. A systematic review to determine the causes of maternal deaths conducted by the WHO recorded wide regional variation. Hemorrhage was the leading cause of maternal deaths in Africa (33.9%) and in Asia (30.8%) while in Latin America and the Caribbean, hypertensive disorders were responsible for 25% deaths. Anemia was reported as an important cause in 12.8% deaths in Asia, 3.7% in Africa and none in the developed countries^(28,29) Studies from our country have also reported anemia as an important cause and contributor to maternal mortality and severe maternal morbidity.⁽³⁰⁾

Maternal Near Miss and Health Seeking Behavior

Delays in maternal health care

To understand the gaps in access to adequate management of obstetric emergencies leading to severe maternal complications and death three delays have been identified. The first delay is in deciding to seek care by the woman and/or her family as they are unaware of the need for care, this occurs as the danger signs are not recognized or there is lack of support of the family. The second delay is in reaching an adequate health-care facility as the services may not exist or may be inaccessible for reasons such as distance, lack of transport, cost or socio-economic barriers. The third delay occurs in receiving adequate care at that facility resulting from errors in diagnosis and clinical decision-making, or lack of medical supplies and of staff proficiency in the management of obstetric emergencies.⁽⁸⁻¹⁰⁾ In developing countries, about 75% of women with severe obstetric morbidity are in a critical

condition upon arrival, underscoring the significance of the first two delays.^(31,32) Availability, accessibility, cost of health-care and behavioral factors play an important role in the utilization of maternal health services.^(25,28,33-35)

Maternal Near Miss Reviews

Maternal death reviews and verbal autopsies have been the common approaches in investigating barriers to maternal health-care in developing countries. Reviewing near miss cases has the further advantage of having firsthand information from women who have survived in understanding health-seeking behavior. The proportion of women arriving at a health-care facility with SMO provides information about the occurrence of the first delay or second delay and factors contributing to the delays.⁽³⁶⁻³⁸⁾ Understanding of these factors by the health personnel, authorities and policy makers and taking appropriate action to address them would improve utilization of maternal health-care services.

Quality of Care and Maternal Near Miss

Globally, there has been a paradigm shift in the maternal care strategy since the 1990's. According to the World Health Statistics 2011, the proportion of deliveries attended by skilled health personnel rose from 58% in 1990 to 68% in 2008 at the global level.⁽³⁹⁾ In India also there has been a policy change with promotion of institutional births, births by skilled birth attendants and provision of Emergency Obstetric Care.⁽⁴⁰⁾ The Janani Suraksha Yojana (JSY) a cash incentive scheme has been initiated to promote institutional deliveries. Consequently, the proportion of institutional deliveries has risen from 25.4% in 2001 to 38.8% in 2006, 47% in 2007-08 and 72.9% in the recent Coverage Evaluation Survey (CES 2009).⁽⁴¹⁻⁴³⁾ This increase in load on the health facilities may compromise the quality of care due to limited financial resources and trained skilled health personnel available. A recent study on impact of JSY has shown an increase in institutional deliveries among the vulnerable and high-risk cases such as pre-eclampsia, eclampsia, hemorrhage etc., whereas there was no decline in the number of maternal deaths.⁽⁴⁴⁾ These are the potentially life-threatening cases that need to be identified and managed to prevent maternal mortality.

The near miss approach has been suggested to evaluate and improve the quality of care provided by the health system. By reviewing near miss cases we can learn about the processes and their deficiencies that are in place for the care of pregnant women. This would result in identifying the pattern of severe maternal morbidity and mortality, strengths and weakness in the referral system and the clinical interventions available and the ways in which improvements can be made.⁽⁴⁵⁾

Table 2: Causes of near miss and near miss death ratio

Study/year	Country	Study setting	Criteria for near-miss	Prevalence %	Near miss death ratio	Causes of near miss (%)
Baskett ⁽¹²⁾ 1998	Canada 1980-1993	Tertiary maternity hospital	Management based	0.7	NA	Hypertension (25) Hemorrhage (22) Sepsis (15)
Waterstone ⁽¹⁶⁾ 2001	UK 1997-98		Disease specific	1.2	117	Hemorrhage 0.67 Eclampsia and pre eclampsia Severe sepsis
Brace ⁽¹⁷⁾ 2004	Scotland 2001-02	Maternity units	Disease specific and organ system dysfunction	1.34	49	Hemorrhage (50) Eclampsia (13) ICU admission (33)
Zwart ⁽¹⁸⁾ 2008	Netherlands 2004-06	Population based	Management based	7.1	53	Hemorrhage (4.5/1000) ICU admission (2.7/1000) Eclampsia (0.6/1000)
Mantel ⁽¹¹⁾ 1998	South Africa 1996	Academic hospitals	Organ system dysfunction	1.09	5	Hemorrhage (26) Hypertension (26) Sepsis (20)
Pruai ⁽²⁰⁾ 2000	West Africa multi country 1994-96	Maternity units	Disease specific	6.6	29	Hemorrhage (46) Dystocia (30.9) Hypertension (9.6)
Kaye ⁽²³⁾ 2003	Uganda 2000	Teaching hospital	Organ system dysfunction	10.1	17	Obstructed labor (37) Eclampsia and pre-eclampsia (18) Hemorrhage (22)
Fillipi ⁽²²⁾ 2005	Africa 1999-2000	Hospitals at different levels of the health system	Disease specific	8.2	9-108	Hemorrhage (22.7-52.8) Hypertension (9.3-36.1) Anemia (16.5-46.4) Dystocia (30.9)
Oladapo ⁽¹⁹⁾ 2005	Nigeria 2002-04	Teaching hospital	Disease specific and management based	14.1	4.8	Hemorrhage (30.2) Hypertension (31.4) Dystocia (19.4) anemia (10.7)
Khosla ⁽²⁴⁾ 2000	India 1998	Teaching hospital	Disease specific	4.4	7	Hemorrhage (29.9) Hypertension (22.7) Severe anemia (16.4)
Taly ⁽²⁵⁾ 2004	India 2001	Teaching hospital	Disease specific	4.4	6.25	Hemorrhage (60) Hypertension (34) Sepsis (4)
Chhabra ⁽²⁶⁾ 2008	India 2005	Teaching hospital	Disease specific and management based	3.3	31.5	Hemorrhage (34) Eclampsia and pre-eclampsia (34) Sepsis (12)
Siddiqui ⁽²⁷⁾	Pakistan	Civil hospital	Disease specific	8.6	5.8	Hemorrhage (33) Hypertension (31) Sepsis (14)

NA: Not available, ICU: Intensive care unit

Maternal near miss indicators

Certain maternal near miss indicators have been suggested to evaluate the quality-of-care; namely maternal near miss ratio, which is the ratio of the

number of maternal near miss cases and live births. It is an estimation of the amount of care and resources that would be needed in an area or facility. Another important indicator is maternal near miss mortality

ratio which is the ratio of the number of maternal near miss and deaths, higher ratio indicates better care.^(45,46) This ratio was calculated in the WHO systemic review on near miss and observed to be lower in resource poor settings in Asia and Africa when compared to that in the developed world.⁽¹³⁾ These findings assert the fact that maternal near miss to death ratio can be a useful method to assess the care these cases receive.

Access to good quality EmOC is another key strategy to improve maternal outcome. Studies have shown the availability and access of EmOC to be below the target coverage levels especially among the poor and less educated women in poorly performing states.^(47,48) The state of Tamil Nadu has been successful in observing a significant decline in maternal mortality due to series of initiatives such as skilled birth attendance for all births and making EmOC more available and accessible. The key lesson learnt from the success is to focus on specific evidence based strategies to reduce maternal mortality.⁽⁴⁹⁾

Conclusion

Maternal near miss has emerged as an adjunct to investigation of maternal deaths as the two represent similar pathological and circumstantial factors leading to severe maternal outcome. As the number of maternal near-miss cases is more than the maternal deaths and the cases are alive to directly inform on problems and obstacles that had to be overcome during the process of health-care, they provide useful information on quality of health-care at all levels. Thus, there is a need for application of the maternal near-miss concept for assessment of maternal health and quality of maternal care.

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