ORIGINAL ARTICLE

Near-Miss Obstetrical Events and Maternal Deaths

Rozina Mustafa and Haleema Hashmi

ABSTRACT

Objective: To determine the frequency of near-miss cases, nature of near-miss events and mortality among obstetric patients.

Study Design: Cross-sectional, observational study.

Place and Duration of Study: The study was conducted in the Obstetric Unit of Fatima Hospital, Baqai Medical University, from January 2006 to December 2006.

Methodology: Near-miss case definition was based on validated specific criteria comprising of five diagnostic features: haemorrhage, hypertensive disorders in pregnancy, dystocia, infection and anemia. The main outcome measures were frequency and characteristics of near-miss cases, total hospital stay, high dependency unit/ICU stay and development of multiple organ dysfunction. Near-miss events and maternal deaths were described with respect to disease profiles. Mortality indices were determined for various disease processes to appreciate the standard of care provided for near-miss cases. The maternal death to near-miss ratio was calculated.

Results: There were 868 deliveries in the year 2006, 44 near-miss cases, 47 near-miss events and 6 maternal deaths. The maternal death to near-miss ratio was 1:7. The most common type of near-miss events were obstetrical haemorrhage, anemia and dystocia responsible for 51%, 21.2% and 14.8% respectively. Severe hypertensive disorders in pregnancy and infections accounted for 8.5% and 4.2% of near-miss events. Postpartum haemorrhage was responsible for 83.3% and infection for 16.6% of the maternal deaths. The mortality index was higher for infections (33.3%) than for haemorrhage (17.2%). Organ system dysfunction/failure was diagnosed in 18.1% of near-miss cases.

Conclusion: This study showed that for every 7 women who survived life threatening complications, one died. However, the underlying disease processes for near-miss and mortalities were almost same. Evaluation of the circumstances surrounding near miss cases could act as proxy for maternal deaths in the studied population.

Key words: *Maternal deaths. Near-miss cases. Near-miss events.*

INTRODUCTION

The status of women and their health care system can be assessed by a country's maternal mortality ratio. Maternal mortality ratio in Pakistan was calculated by UNICEF in 1997 as 340/100,000 live births (LB), whereas the National Health Survey figures were 500/100,000 live births in 1998.[1] According to the Pakistan Demographic Health Survey 2006-2007, the maternal mortality ratio was 371/100,000 LB in rural areas.[2] For many years, evaluation of maternal health care services relied on inquires into maternal deaths. More recently, review of cases within the severe acute maternal morbidity spectrum, described as "near- miss" (those who nearly died), has been found to be useful tool for investigating maternal mortality.[3,4] Unlike the developed countries, in Pakistan there is limited experience with the use of near-miss reviews as a tool for monitoring the quality of maternity services in developing countries.

Department of Obstetrics and Gynaecology, Baqai Medical University, Karachi.

***Correspondence:** Dr. Rozina Mustafa, 91-A, Street 23, Askari-IV, Main Rashid Minhas Road, Karachi.*
E-mail: roz_mustafa@yahoo.com

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Near-miss events are defined as acute obstetric complications that immediately threaten a woman's survival but do not result in her death either by chance or because of hospital care she receives during pregnancy, labour or within 6 weeks after termination of pregnancy or delivery.[3] A near-miss case is a woman with at least one near-miss event. Near-miss cases occur more often than maternal deaths and may generate more information because the woman herself can be a source of data. Once maternal morbidity precedes maternal death, the systematic identification and the study of near-miss cases helps in further understanding the determinants of maternal mortality.[5,6] A more comprehensive and statistically reliable quantitative analysis that is of value to clinical audit can be rapidly conducted.[3,4,7,8]

This study was cnducted to determine the prevalence of near-miss cases and the nature of near-miss events and mortalities among the obstetric patients in order to serve as a complementary method for auditing the quality of maternal health care in our institution.

METHODOLOGY

This was a cross-sectional, observational study carried out from 1st January 2006 to 31st December 2006. The study was conducted in the obstetric unit of the Fatima

Hospital, Baqai Medical University, Karachi. The hospital serves the lower socio economic community of interior Sindh including villages. It is also has a referral centre for nearby small clinics and maternity hospitals. In addition to providing 24 hour emergency obstetric services to referred cases, the hospital also provides ante-natal care and delivery services for both low and high risk pregnant women.

For identifying near-miss events, the disease specific criterion as described by Pattinson *et al.*[4] was used based on five main diagnostic groups: (1) haemorrhage leading to shock, emergency obstetrical hysterectomy, coagulation defects and/or blood transfusion of ≥ 2 liters; (2) hypertensive disorders in pregnancy including eclampsia and severe pre-eclampsia with clinical/ laboratory indications of termination of pregnancy to save the woman's life; (3) dystocia leading to uterine rupture and impending rupture (prolonged obstructed labour or previous caesarean section; (4) infections causing hyperthermia or hypothermia or a clear source of infection and clinical signs of septic shock; and (5) anemia with hemoglobin level < 6 g/dl or clinical signs of severe anemia in a woman without severe haemorrhage.

Near-miss cases were identified among women with pregnancy-related complications whose diagnosis met the above mentioned criteria and who were admitted in the obstetric unit of Fatima Hospital Laboratory. Investigations were done for coagulation defects, septicemia, anemia and organ system dysfunction/ failure. Data was collected for determining the nature of the obstetrical complication, presence of organ-system dysfunction/failure and timing of near miss-events with respect to admission. Fetal outcome and ICU admissions were also noted. Detailed information of maternal mortalities for the underlying cause and time period was obtained.

The descriptive analysis of collected data was done using SPSS 11 and the results were given in percentages. The frequency of near-miss cases and maternal death to near miss ratio was calculated. Mortality indices were determined for various disease processes to appreciate the standard of care provided for life-threatening obstetric conditions.

RESULTS

During the study period, there were 868 deliveries, 44 near- miss cases, 47 near-miss events and 6 maternal deaths. The booking status showed that 90.4% of near-miss cases were unbooked and all deaths occurred in the unbooked cases. Among the 31 near-miss cases in labour, 22.5% and 9.6% resulted in stillbirths and early neonatal deaths respectively. The hospital stay ranged between 3 and 28 days.

Table I shows the prevalence of near-miss cases. There were more near-miss cases (81.8%) on arrival, while during hospitalization only 18.8% were diagnosed. Near-miss cases per 1000 deliveries (calculated as total near- miss cases divided by total deliveries x 1000) were 50.6. The maternal mortality ratio was 729 and mortality to near-miss ratio was 1:7.

Table I: Frequency, characteristics of near-miss cases and maternal deaths to near-miss ratio.

	Year 2006
Deliveries (n)	868
Live births	822
Near-miss cases (n)	44 (5.3%)
On arrival	36 (81.8%)
During hospitalization	8 (18.8%)
Near- miss cases / 1000	50.6
On arrival	41.4
During hospitalization	9.2
Maternal deaths	6
Maternal mortality ratio	792
Maternal death to near-miss ratio	1:7

Table II shows that near-miss events were 47 in 44 of near-miss cases. This means 3 women had more than one near-miss morbidity. The most common types of near-miss events were haemorrhage, anemia and dystocia responsible for 51%, 21.2%, 14.8% respectively. Late pregnancy haemorrhage accounted for 44.6% of near-miss events. Out of them, half were with abruption and half with postpartum haemorrhage.

Table II: Nature of near-miss events, maternal deaths and mortality index.

Complications	NME n (%)	Maternal deaths n (%)	LTOC n (%)	MI (%)
Haemorrhage	24 (51)	5	29 (54.7)	17.2
Early pregnancy	3 (6.3)	-	-	-
i. Ectopic pregnancy	3 (6.3)	-	-	-
ii. Abortions	-	-	-	-
Late pregnancy	21 (44.6)	-	-	-
i. Placenta previa	1	-	-	-
ii. Abruption	10	-	-	-
iii. PPH	10	5 (83.3%)	-	-
Severe hypertension	4 (8.5)	-	4 (7.5)	-
i. Eclampsia	1	-	-	-
ii. Severe pre-eclampsia	3	-	-	-
Dystocia	7 (14.8)	-	7 (13.2)	-
i. Uterine rupture	2	-	-	-
ii. Impending rupture	5	-	-	-
Anemia	10 (21.2)	-	10 (20.7)	-
Infections	2 (4.2)	1 (16.6%)	3 (5.6)	33.3
Total	47 (100)	6 (100)	53	

NME= Near-miss Events; LTOC= Life Threatening Obstetric Complications; MI = Mortality Index; PPH = Post-partum hemorrhage.

Severe hypertensive disorders of pregnancy and infections were responsible for 8.5% and 4.2% of near-miss events respectively. Haemorrhage was the leading cause of maternal death responsible for 83.3% of deaths in women and all were with postpartum

haemorrhage. Infection caused death in 16.6% of women. No indirect maternal death was seen during the study period.

This table also showed the nature of near-miss events and the primary causes of death. Haemorrhage was responsible for both near-miss events and maternal death in higher frequency than infections. Severe hypertensive disorders of pregnancy, dystocia and anemia had near-miss events but no maternal death. Life threatening obstetric complications were the highest in haemorrhage (55.7%) than infections (5.6%), but mortality index was higher for infections (33.3%) than for haemorrhage (17.2%).

Organ system dysfunction/failure was diagnosed in 18.1% of cases. The affected organ systems were cerebral, cardiac, renal and coagulation as shown in Table III with their associated obstetric conditions.

Table III: Causes of organs system dysfunction/failure in near-miss cases.

Organ system	n=8*	Obstetric condition (n)
Cardiac (pulmonary edema)	2	Accompanying eclampsia – 1 Anemia (unrelated to haemorrhage) – 1
Coagulation	3	Abruption – 1 PPH – 2
Renal	1	Puerperal sepsis – 1
Cerebral	2	Eclampsia – 1 Puerperal sepsis – 1

Some women had > 1 organ system dysfunction/failure.

DISCUSSION

Maternal mortality was used to assess the quality of obstetric care but this indicator is vulnerable to many flaws. A better assessment of obstetrical care now includes near-miss cases and events to be a useful complement any tool for investigation of maternal mortality. The theory underlying this approach is described by Pattinson. “The sequence from good health to death in a pregnant woman is a clinical insult, followed by a systemic inflammatory response, organ failure and finally death. By viewing pregnancy and its potential outcomes as a continuum, beginning at normal pregnancy and concluding with maternal death, the number which can be studied meaningfully can be increased by examining the group of outcomes closest to death”.[9]

In the present study, the prevalence of near miss cases was 5.3%. In resource poor settings, 4-8% of pregnant women experience near misses and in developed world it is 1%.[9] The maternal death to near-miss ratio in this study was 1:7. This indicates that for every 7 women who survived life threatening complications, one died. Other studies found that the maternal death to near-miss ratio was 1:5 and 1:7 respectively.[10,11] This ratio is indicative of the standard of obstetrical care the unit offers. This is in contrast to what is observed in developed countries of the world. Studies carried out in Europe[9,12,13] revealed a ratio of 1:117-223, whereas in Niger[14] it is 1:11-22 using the same criteria for case definition. Yet another study in Africa showed near-miss cases 15 times more common than maternal deaths with a ratio of 9:1-108:1 In this study, 81.8% of near-miss cases with near-miss events were already in a critical condition on arrival equal to 83% in an African study.[15]

The study showed that near- miss events occurred in a sizeable percentage of women. This reflects that the community is still unaware of the complications of pregnancy, as a majority of the patients were unbooked. It is much higher than those of developed countries.[12,16] However, similar results were shown in another study.[10] Out of the various types of obstetric haemorrhage, postpartum haemorrhage was the main cause of near-miss morbidity and maternal mortality. Another study showed that the commonest cause of death was postpartum haemorrhage.[17] This is because in developing countries like Pakistan, which have poor obstetric services, emergency transfers in labour are very common. Eighty percent of the deliveries are still taking place at home and are being conducted by traditional birth attendants. It is observed that all cases of maternal deaths and half of the near-miss cases due to postpartum haemorrhage were delivered by traditional birth attendants. This observation is similar to another study.[18] This shows that trained birth attendants should conduct the deliveries and they must ensure timely referral of the patient to a tertiary care hospital to reduce the number of near-miss cases and maternal mortality.

Hypertensive disorders, dystocia and anemia were the leading causes of near-miss morbidities accounting for almost half of the total cases. However, no maternal death occurred due to these complications. It is generally accepted that uncomplicated gestational hypertension usually runs a benign course. However, transformation into pre-eclampsia increases the risk of maternal morbidity and mortality.[19] Magnesium sulphate protocol is used to prevent severe pre-eclampsia and eclampsia related risk of maternal mortality.[9,12] Uterine rupture is a serious obstetric complication with high morbidity and mortality, particularly in less developed countries. The over all rate ranged from 0.1% to 1%. One of the major factors in uterine rupture is obstructed labour. Reports from Nigeria, Ghana, Ethopia and Bangladesh indicated that about 75% of cases of uterine rupture were associated with obstructed labour.[20] The prevalence of uterine rupture in women with previous caesarean section is of considerable importance in calculating the long term risks associated with primary caesarean section. Efforts to reduce morbidity and mortality from uterine rupture should focus on reducing primary caesarean section rates and optimizing care for women with previous caesarean section.[21]

Infections were found to be the cause of near- miss events in 4.2% of cases as compared to a study in which this morbidity was responsible for 20% of cases.[22] One i.e. 16.6% of maternal deaths resulted from infections, while in another study it was responsible for 10.9% of cases.[4] The most frequent types of near-miss events in this study were haemorrhage followed by anemia, dystocia and hypertension, while in another study haemorrhage, hypertension and anemia were responsible for near-miss events.[15] Anemia is a leading cause of severe morbidity and mortality in developing countries. This study reflects the lack of antenatal care which is a major determinant of maternal outcome, as a majority of women with near-miss morbidity arrived in the hospital in a critical condition. They were managed in the hospital and their timely recovery reflects the efficiency of the health professionals of the obstetric unit, which helps in reducing maternal mortality. All maternal deaths in this study and the majority of near-miss morbidities were found in those women who had not attended the ante-natal clinics but were referred to our hospital when they developed life threatening obstetric complications.

The other socioeconomic factors besides medical management which can influence near-miss morbidities and maternal mortality ratio are low socio economic status, hindrance by family members in seeking timely medical help, poor transport facilities and lack of awareness about pregnancy related complications. Same problems were mentioned in a study carried out in Uganda.[23] The mortality index is used to assess the standard of care in specific maternal conditions as in another study.[8] The mortality index was higher for infections (33.3%) than for post partum haemorrhage (17.2%) in this study. The community workers, midwives and other health related personel should do their best to create awareness in the community about pregnancy related complications. The differences in definition and identification of cases are limitation in the comparison of near-miss data in different institutions.[19] In some studies ICU admission or organ system dysfunction/failure was used as a criteria for case selection of near-miss maternal morbidities and mortality for subsequent reproductive outcome. However, it may under estimate the frequency of severe maternal morbidities. Organ system dysfunction/failure was diagnosed in 18.1% of near -miss cases which is double to what was found in another study.[10] The commonest organ involved were those with coagulation, cerebral and cardiac functions. The same organs were affected in a study by Ghandi.[24] The high dependency unit is appropriate for patients who are conscious and have a single organ dysfunction. However, 15.9% of patients were managed in the ICU as compared to a study in which 4.3%[25] of the patients were admitted.[25] ICU admission depends on availability, capacity and location of ICU, as well as institutional guidelines for ICU admissions.

These types of studies and audits on near-miss cases and events should be conducted more frequently and in small sample population groups. Incorporation of near-miss cases into maternal death enquiries would strengthen these audits by allowing for more rapid reporting, more robust conclusions, comparisons to be made with maternal deaths, reinforcing lessons learnt, establishing requirements for intensive care and calculating comparative indices. The survival of pregnant woman is dependant on the disease, her basic health, the health care facilities and the personnel of health care system. However, near-miss events must be estimated separately for those already in a critical condition on arrival and those developing complications after admission; the first as a good indicator of the effectiveness of emergency referrals and the second as a potential pattern of maternal death.

CONCLUSION

This study showed that for every 7 women who survived life threatening complications, one died. In this study, the underlying disease processes for near-miss and mortalities were almost same, so evaluation of the circumstances surrounding near miss cases could act as proxy for maternal deaths in the studied population. Efforts geared towards improving the management of near miss-morbidities would definitely go a long way in reducing the present maternal mortalites.

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