ORIGINAL ARTICLE

The major clinical determinants of maternal death among obstetric near-miss patients: a tertiary centre experience

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Abstract

Objective: To evaluate the characteristics of obstetric near-miss patients to clarify the major risk factors of maternal mortality.

Methods: From among the patients referred to the Department of Obstetrics and Gynaecology, Inonu University of Medical Sciences, Turkey, between August 1, 2010 and March 1, 2012, electronic records of obstetric near-miss cases were retrospectively analysed. The obstetric and demographic characteristics of cases that were successfully treated (Group 1) as well as cases with maternal death (Group 2) were analysed and compared. SPSS 11.5 was used for statistical analysis.

Results: Of the total 2687 cases handled during the study period, 95 (3.53%) were of the near-miss nature. The most frequently encountered underlying aetiology was severe preeclampsia (n=55; 57.89%) and haemolysis, elevated liver enzymes, low platelet count syndrome (n=20; 21.1%). These were followed by cases of postpartum bleeding (n=18; 18.9%). Maternal mortality occurred in 10 (10.5%) patients, representing Group 2. The amount of haemorrhage and blood transfused were significantly higher in the group. Maternal mortality cases had also significantly longer duration of intensive care unit admission.

Conclusion: Early diagnosis and immediate management of the complications noted by the study can be the most important measures to prevent the occurrence of mortality.

Keywords: Maternal mortality, Critical care, Catastrophic illness. (JPMA 63: 988; 2013)

Introduction

Maternal mortality rate is globally accepted as the most important criteria for women's health. As reported by the World Health Organisation (WHO), among the targets for a healthy life for the millennium, the fight against maternal mortality and the minimisation of mortality rates are included.[1] within this frame, patients with severe obstetric complications have a distinct and crucial importance. Patients who survived despite the development of life-threatening obstetric complications during pregnancy and postpartum period of up to 42 days were defined as near-miss patients by the WHO.[2] The most important causes of near-miss maternal morbidity are complications related to obstetric haemorrhages and hypertensive diseases of pregnancy.[3] Another important issue is that the incidence of long-term morbidities, such as renal failure, respiratory tract problems, and sudden death within a year is higher when compared with the population in general.[4,5]

In the present study, medical records of obstetric near-miss patients who were admitted to a large-scale tertiary reference centre in Turkey were analysed to explore the distinct clinical features of cases with near-miss and maternal mortality.

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Patients and Methods

The retrospective case-control study, approved by the institutional ethical committee, was conducted at Inonu University Faculty of Medicine, Department of Obstetrics and Gynaecology, between August 1, 2010 and March 1, 2012. The centre is a major referral clinic for perinatal care in south-eastern Turkey. The clinical data, maternal outcome and information regarding the operations, follow-up and intensive care unit (ICU) admissions of the cases were obtained from the electronic medical records section. If the required data could not be obtained from the electronic records, the medical files of the patients were examined manually.

The inclusion criteria was based on the five main points required for the definition of 'near-miss morbidly obstetric patient' as determined by Flippi et al:[6] shock, emergent hysterectomy, coagulopathy or severe bleeding requiring transfusion of more than two litres of blood products; severe pre-eclampsia, eclampsia, and diagnosis of haemolysis, elevated liver enzymes, low platelets (HELLP) syndrome; patients with sepsis, shock and associated morbidities (body temperature <36°C or >38°C

or systolic blood pressure <90 m, and heart rate >120 bpm; diagnosis of dystocia associated with uterine rupture or dehiscence; and symptoms of serious anaemia (haemoglobin <6g/dl) without evidence of severe bleeding.

Patients were then divided into two subgroups: those who were admitted with a diagnosis of obstetric near-miss and successfully managed formed Group 1, and those who ended with maternal death formed Group 2.

Clinical, obstetric and demographic characteristics, including age, parity, gravidity, gestational age, co-existing medical conditions, mode of delivery, mean birth weights, additional operations, amount of transfusion, duration of ICU admission, intra-operative complications, and accompanied morbidities were recorded and compared between the groups.

Data was analysed using the SPSS version 11.5. Continuous variables were reported as mean ± standard deviation (SD). Categorical variables were reported as frequencies and percentage. The normality for continuous variables in groups was determined using the Shapiro Wilk test. For the comparison of variables which showed normal distribution (p>0.05), an unpaired t test was used. Mann-Whitney U test was applied for the comparison of continuous clinical variables with non-normal distributions between groups. Categorical variables were analysed with the chi-square test or Fisher's exact test as appropriate. A value of p<0.05 was considered significant.

Results

During the study period of 18 months, a total of 2687 deliveries were performed in our clinics. Among them, 95 (3.53%) patients were admitted with near-miss morbidities. Maternal mortality occurred in 10 (10.5%), which consisted of Group 2. Group 1 comprised the remaining 85 (89.47%) patients.

There was no significant difference between the groups with regard to baseline clinical characteristics (Table-1). In Group 1, 18 (21.1%) patients had concomitant medical conditions, including hypertension (n=11; 61%), diabetes (n=3; 16.6%), congestive heart failure (n=1; 5.5%), and known thrombophilia (homozygous factor V Leiden mutation) (n=3; 16.6%). In cases with maternal mortality, 7 (70%) had concomitant conditions, including hypertension (n=3; 43%), diabetes (n=1; 14.3%), ventricular tachycardia (n=1; 14.3%), and known thrombophilia (homozygous factor V Leiden mutation and hyperhomocysteinemia) (n=2; 28.5%) (p<0.001).

The most frequently diagnosed conditions were severe pre-eclampsia (n=54; 63.5%) in Group 1, and HELLP syndrome in Group 2 (n=6; 60%) (p<0.001), followed by peripartum haemorrhage (n=16; 18.8% in Group 1; and n=2; 20% in Group 2) (Table-2). Furthermore, in Group 1, class 1 or severe HELLP syndrome was noted in 4 (4.7%) cases. In Group 2, 5 (50%) of the patients were diagnosed with severe HELLP syndrome. This was according to the Mississippi-triple classification system (p<0.001).[7] The most common accompanied complication in the HELLP syndrome cases of Group 2 was intracerebral haemorrhage, which was present in 6 (60%) of the group. No intracranial event was detected in the patients in Group 1.

Additional operations were performed on 12 (14.1%) patients in Group 1, and 8 (80%) patients in Group 2 due

Table-1: Comparison of baseline characteristics.

	Group 1 (n:85) mean±SD (min-max)	Group 2 (n:10) mean±SD (min-max)	P-value
Age	28.7±6.4 (17-45)	34.7±3.2 (26-41)	0.128
Gravidity Med (min-max)*	2 (2-6)	1 (1-2)	0.029
Parity Med (min-max)*	1 (0-4)	0 (0-1)	0.059
Gestational week Med (min-max)*	34.7±3.2 (26-41)	31.7 (21.39)	0.105
Mode of delivery N, %			
Vaginal birth	9 (10.5%)	3 (30%)	0.08
Caesarean section	76 (89.5%)	7 (70%)	

* Med (min-max): Median (minimum-maximum).

Table-2: Distribution of diagnosis of patients.

Diagnosis	Group 1 N:85 N, %	Group 2 N:10 N, %	P-value
HELLP syndrome	14 (16.5)	6 (60)	
Severe preeclampsia	54 (63.5)	1 (10)	
Obstetrical haemorrhage	16 (18.8)	2 (20)	<0.001
Sepsis	None	1 (10)	
Acute fatty liver of pregnancy	1 (1.2)	None	

*Fisher's Exact Test was used.
HELLP: Haemolysis, Elevated Liver Enzymes, Low Platelets.

Table-3: Comparison of additional surgical interventions.

Diagnosis	Group 1 N:85 N, %	Group 2 N:10 N, %	P-value
None	73 (85.9)	2 (20)	
Peripartum hysterectomy	9(10.5)	6 (60)	<0.001
BIIAL*	3 (3.5)	1 (10)	
Peripartum hysterectomy + BIIAL*	0	1 (10)	

*Fisher's Exact Test was used.
BIIAL: Bilaterally Internal Iliac Artery Ligation.

to obstetrical haemorrhage, hemodynamic instability and associated coagulopathy (p<0.001) (Table-3). Peripartum hysterectomy was found to be significantly more common in Group 2. No intra-operative surgical complications occurred in any of the patients.

In our study, all patients required ICU monitoring. Estimated blood loss was 1000ml (500-5500) in Group 1 and 3250 ml (1000-6700) in Group 2, respectively (p<0.001). The amount of blood transfusion was 4.0 units (0-13) vs. 11.5 units (7-21) (p<0.001) and the mean duration of ICU admission was 4.0±1.6 days (2-10) in Group 1 and 8.0±5.7 days (2-23) in Group 2 (p<0.001).

Discussion

The results obtained from the current study clearly showed that obstetric near-miss patients diagnosed with severe HELLP syndrome with intracranial haemorrhage and who required additional surgical intervention and multiple transfusions were strong candidates for maternal mortality. Studies related to salvaged near-miss women during their pregnancies, childbirth, and postpartum periods have been considered important indicators of obstetric care and women's health worldwide. Our study is the first report about the inventory of near-miss obstetric patients in Turkish population. As a tertiary referral perinatal centre, our incidence of near-miss mothers and mortality rate related to this diagnosis were found to be 3.05% and 10.5%, respectively. According to a recently reported review by the WHO about maternal morbidity and mortality, the prevalence of near-miss mothers ranges between 0.4%, and 8%.[8] In reports from African countries, its prevalence climbs up to 25%.[6] This higher prevalence has been reported to be associated with the uneven distribution of maternal care services among countries and with the diversities among the diagnostic criteria for near-miss cases. In 2009, WHO revised the diagnostic criteria of near-miss patients to encompass disorders in each organ systems, such as cardiovascular, respiratory, renal, haematologic, hepatic, and nervous systems.[2] On the other hand, some investigators reported that the frequency of over-diagnoses of near-miss patients will increase in case of usage of these criteria. Updated criteria have not been routinely used.[9,10] In our study, we used the diagnostic criteria for near-miss patients recommended by Flippi et al. in 2005 instead of the WHO criteria revised in 2009 because we have encountered difficulties in obtaining clinical, physiological, and laboratory data of each organ system and because these new criteria have not been entered yet in routine clinical use.[2,6]

In our study, hypertensive complications of pregnancy and postpartum haemorrhages were the most frequently detected risk factors in near-miss patients. Furthermore, the diagnosis of HELLP syndrome and the severity of the condition were found to be strongly associated with maternal mortality. Thromboembolic complications, which are the foremost etiologic factors of maternal mortality in developed countries, were found only in one patient who died because of cardiopulmonary arrest secondary to massive pulmonary embolism. Acute fatty liver of pregnancy and sepsis are rarely seen etiologic factors, which might eventually result in the death of the patient. A recent review by the WHO on this issue has indicated that obstetric bleedings, especially during postpartum period, were predominant etiologic factors in maternal mortalities seen in African (33.9%) and Asian (30.8%) countries.[11] However, in Latin America, hypertensive complications of pregnancy have been reported as the most frequently (25.7%) encountered causes of maternal mortalities.[11] The same review emphasised that mortalities that were particularly due to pre- and post-partum haemorrhages can be prevented and that reduction in maternal mortalities should be among the targeted priorities of healthcare strategy. In our study, among the obstetric near-miss cases referred to us, 18.9% had a diagnosis of obstetrical haemorrhage. In 88.8% of these cases, we were able to save the mother's life by using advanced and timely surgical interventions, including bilaterally hypogastric artery ligation, uterine compression sutures and, eventually, hysterectomy. In addition, any complication related to surgical intervention was not encountered in any of patients included in the study. This higher success rate may be a consequence of the sufficient surgical experience gained by our team on the management of serious post-partum bleeding and, most importantly, by the availability of rapid and organised multi-disciplinary intensive care facilities for obstetric near-miss patients in our perinatal centre.

The main determining factor for the survival of near-miss patients is the provision of timely and optimal medico-surgical care. A guideline published by the WHO in 2005 formulated an algorithm for the management of near-miss patients.[12] The first step in this algorithm required countries to have a control over their national statistical data related to maternal mortalities and obstetric near-miss patients. Though the results obtained in our study belonged to a database of a single centre, they are important in that they were retrieved from a database of a regional reference hospital in consideration of the guideline recommendations of WHO.

According to the result of the current study, patients with severe HELLP syndrome, who had massive obstetrical

haemorrhage of more than 1500ml and who required blood transfusion of more than a mean value of 4.5 units were moving towards mortality. Similar to our results, a retrospective analysis of 126 patients with HELLP syndrome, reported a 7.9% mortality rate.[13] Another study also reported that cases with severe HELLP syndrome and eclampsia had significantly more common intracerebral haemorrhage and higher rate of mortality.[14] Therefore, in patients with HELLP syndrome, the timely management of these cases, including the induction of delivery, haemodynamic stabilisation and appropriate multi-disciplinary follow-up by perinatologists, ICU providers and neurologists would be life-saving among the obstetric near-miss population. Another important determinant for maternal mortality turned out to be peripartum hysterectomy, which has been found to be significantly more prevalent in mortal cases.

The study had clear limitations. The relatively small number of patients in the current study and the reporting of single perinatal centre were the main ones. Larger retrospective investigations are needed to gain necessary experience about the timely management of obstetric near-miss cases and to differentiate the patients who are candidates for mortality. The lack of use of the revised WHO diagnostic criteria for obstetric near-miss cases in the current study was another important limitation. It was not possible to obtain reliable and detailed clinical examination data from each organ system in our organisation. Diagnostic standardisation as well as appropriate records of patients would become available for healthcare providers as our knowledge and understanding increase in this area, which is currently a topic with limited experience.[1-4]

Conclusion

Obstetric near-miss patients can be diagnosed based on accurate criteria. On a large scale, they can be saved with timely and effective medico-surgical management. To achieve these targets, obstetricians should be aware that these cases are not a homogenous population. Those with severe HELLP syndrome, who are undergoing advanced surgery, who needed multiple transfusion, and those who have longer duration of ICU admission should be managed with extreme caution. Adequate and timely intervention on these patients and adequate follow-up by a multi-disciplinary team can be used as main preventive measures to avoid maternal mortality.

References

1. World Health Organization, UNICEF, UNFPA, The World Bank. Trends in maternal mortality: 1990 to 2008. Geneva: WHO Press, World Health Organization; 2010.
2. Say L, Souza JP, Pattinson RC, WHO working group on Maternal Mortality and Morbidity classifications. Maternal near miss - towards a standard tool for monitoring quality of maternal health care. Best Pract Res Clin Obstet Gynaecol 2009; 23: 287-96.
3. World Health Organization, Reproductive Health and Research. Maternal mortality in 2005: estimates developed by WHO, UNICEF, UNFPA, and the World Bank. Geneva: WHO Press, World Health Organization; 2007.
4. Leung NY, Lau AC, Chan KK, Yan WW. Clinical characteristics and outcomes of obstetric patients admitted to the Intensive Care Unit: a 10-year retrospective review. Hong Kong Med J 2010; 16: 18-25.
5. Sousa MH, Cecatti JG, Hardy EE, Serruya SJ. Severe maternal morbidity (near miss) as a sentinel event of maternal death. An attempt to use routine data for surveillance. Reprod Health 2008; 5 : 6. doi: 10.1186/1742-4755-5-6.
6. Filippi V, Ronsmans C, Gohou V, Goufodji S, Lardi M, Sahel A, et al. Maternity wards or emergency obstetric rooms? Incidence of near-miss events in African hospitals. Acta Obstet Gynecol Scand 2005; 84: 11-6.
7. Martin JN Jr, Rinehart K, May WL, Magann EF, Terrone DA, Blake PG. The spectrum of severe preeclampsia: comparative analysis by HELLP (hemolysis, elevated liver enzyme levels and low platelet count) syndrome classification. Am J Obstet Gynecol 1999; 180: 1373-84.
8. Say L, Pattinson RC, Gülmezoglu M. WHO systematic review of maternal morbidity and mortality: the prevalence of severe acute maternal morbidity (near-miss). Reprod Health 2004; 1: 3. doi:10.1186/1742-4755-1-3.
9. Kaye DK, Kakaire O, Osinde MO. Systematic review of the magnitude and case fatality ratio for severe maternal morbidity in sub-Saharan Africa between 1995 and 2010. BMC Pregnancy Childbirth. 2011; 11:65. doi:10.1186/1471-2393-11-65.
10. Shrestha NS, Saha R, Karki C. Near miss maternal morbidity and maternal mortality at Kathmandu Medical College Teaching Hospital. Kathmandu Univ Med J (KUMJ) 2010; 8: 222-6.
11. Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. Lancet 2006; 367: 1066-74.
12. Pileggi C, Souza JP, Cecatti JG, Faúndes A. Neonatal near miss approach in the 2005 WHO Global Survey Brazil. J Pediatr (Rio J) 2010; 86: 21-6.
13. Erdemoglu M, Kuyumcuoglu U, Kale A, Akdeniz N. Factors affecting maternal and perinatal outcomes in HELLP syndrome: evaluation of 126 cases. Clin Exp Obstet Gynecol 2010; 37: 213-6.
14. Yildirim G, Gungorduk K, Gul A, Asicioglu O, Sudolmus S, Gungorduk OC, et al. HELLP Syndrome: 8 years of experience from a tertiary referral center in western Turkey. Hypertens Pregnancy 2010; 31: 316-26.