An audit of maternal near-miss and mortality cases in a tertiary care rural teaching hospital in Eastern India: A 2-year retrospective analytical case–control study

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ABSTRACT

Background: Maternal near-miss and mortality patients provide firsthand knowledge of remote and immediate factors linked to morbidity and mortality. **Aims and Objectives:** The objectives of this study were to evaluate the characteristics of maternal near-miss and mortality cases in a tertiary care hospital. **Materials and Methods:** The present study is a retrospective analytical case–control study analyzing the different factors associated with maternal near-miss and mortality and comparing the same with a control group having mothers with normal outcome. Data were obtained from record section of Rampurhat Medical College from January 2019 to December 2020. **Results:** During the study period, maternal mortality ratio was 223 and near-miss cases were 501/lakh live births. Critical care unit admission rate was 2.1% of the total admitted obstetric cases. The maternal near-miss mortality ratio was 2.25. Most women in our study group were anemic teenagers or multigravidas from rural areas with poor educational status and irregular antenatal check-ups as compared to the control group. The most common primary diagnosis in the near-miss group was obstetric hemorrhage (47.47%), while in the mortality group was eclampsia and pre-eclampsia (29.5%), obstetric h emorrhage (20.45%), and heart disease (15.9%). About 81.8% of the participants in the study group had fulfilled the near-miss criteria at the time of admission itself, while 4.5% were brought dead. **Conclusion:** The underlying risk factors have to be corrected. There should be strict screening protocols from first antenatal visit itself, and earlier referral to higher centers.

Key words: Audit; Maternal mortality; Near-miss; Rural hospital

INTRODUCTION

A maternal death is one of the most devastating complications in obstetrics, with wide-ranging medical, legal, and social implications for both the family and the staff involved. A maternal death is the death of a woman, while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, and can stem from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.[1]

A woman presenting with any life-threatening condition and surviving a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy should be considered as a near-miss or severe maternal morbidity.[2]

The aim of this study is to evaluate the characteristics of near-miss and maternal mortality cases in a tertiary care hospital as these patients provide firsthand knowledge of remote and immediate factors that may be linked to morbidity and mortality during pregnancy or within 42 days

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of its termination. It also allows initiation of awareness-based preventive strategies to enhance the quality of maternal healthcare.

The maternal mortality in India is still 122/100,000 live births despite different safe motherhood programs.[3]

Although the objective criteria for defining severe maternal morbidity vary between studies, its prevalence ranges from 0.05–1.7% in developed countries[4,5] and 0.6–8.5% in resource-limited countries.[6,7]

Aims and objectives

The objectives of this study were to evaluate the characteristics of near-miss and maternal mortality cases in a tertiary care hospital in rural India.

MATERIALS AND METHODS

The present study is a retrospective analytical case–control study, where we have analyzed the different factors associated with maternal near-miss and maternal mortality. Comparison of the same was done with a control group comprising of mothers with normal outcome. Data for the study were obtained from record section of Rampurhat Government Medical College and Hospital. Data were collected for a time period of 2 years (January 2019–December 2020).

The medical records of all maternal death cases, obstetric patients fulfilling near-miss criteria along with other obstetric patients who got admitted in critical care unit (CCU) during study period were collected. Data were obtained on mothers who had normal outcome from randomly selected bed head tickets. Data were recorded and any differences noted between groups on the following common criteria, which are in general associated with maternal outcome such as age, parity, Hb%, body mass index (BMI), primary diagnosis (obstetric or non-obstetric disease process identified to be responsible for the patient's critical illness), obstetric interventions performed, and critical care interventions performed during CCU stay (inotropic support and mechanical ventilation). Inclusion criteria for the study group are as follows:
1. All obstetric patients until 6 weeks after delivery, fulfilling near-miss criteria.
2. All obstetric patients undergoing maternal death according to definition of maternal mortality ratio (MMR).

Exclusion criteria for the study group are as follows:
1. Twin pregnancy
2. Pregnancy with congenital anomalies of the fetus
3. Death within 1 hr of admission.

Inclusion criteria for the control group:
1. All obstetric patients until 6 weeks after delivery admitted in the same time period in the Obstetrics and Gynecology department who underwent treatment and were discharged without any obvious obstetric complication.

Exclusion criteria for the control group:
1. Twin pregnancy
2. Pregnancy with congenital anomalies of the fetus.

Ethical committee
Data were collected after permission from the Institutional Ethics Committee of Rampurhat Government Medical College and Hospital.

Statistical analysis
Data for different parameters were recorded as continuous or categorical variables. Continuous variables were expressed as mean and standard deviation and categorical variables were expressed as percentage. Differences between groups were determined by t-test and Mann–Whitney U-test for continuous and Chi-square test for categorical variables. The degree of association between maternal outcome and primary obstetric condition for which the patient got admitted was calculated using Pearson's rank Correlation Coefficient. Statistical analysis was performed using SPSS (version 20.0, IBM Corporation, New York, USA).

RESULTS

Data were collected from the records section during the study period, January 2019 to December 2020. There were 99 near-miss cases and 44 maternal deaths during this period. Data were also collected on 143 patients who were admitted during the same time period and had normal maternal outcome and acted as the control group.

Table 1 compares the demographic parameters of the participants in the two groups.

The group comprising maternal near-miss and mortality cases had a mean age of 23.097±5.7142 years and BMI of 17.043±0.4572 Kg/m². About 74% had high school level education. They were mostly unbooked (96%) multigravidas (52%) from rural areas (91%) and primarily referred from peripheral health centers (78%). About 60% had a gestational age <34 weeks. Most women were anemic with mean hemoglobin for the group being 7.52±1.31 gm%.

The control group, on the other hand, had a mean age of 24.48±0.93 years and a BMI of 20.00±0.60 Kg/m².

About 99% of the participants had high school level education. They were mainly primi-gravida (78%), only 6% were unbooked, and 40% referred from peripheral health centers. About 34% had a gestational age <34 weeks. The mean Hb was 10.51±0.61 g%.

Table 2 shows that the most common primary diagnosis in the near-miss group was obstetric hemorrhage (47.47%) (maximum incidence in the ruptured uterus cases) (Pearson correlation coefficient=0.5145).

The most common primary diagnosis in the maternal mortality group was eclampsia and pre-eclampsia cases (29.5%) (Pearson correlation coefficient=0.3148), obstetric hemorrhage (20.45%) (Pearson correlation coefficient=0.2593), and heart disease (15.9%).

The conditions associated with poor maternal outcome in the control group was mainly
1. Eclampsia and pre-eclampsia (7%)
2. Heart disease (0.69%)
3. Obstetric hemorrhage (2.79%).

In our study, 15.15% of the near-miss participants required inotropic support, 9.09% needed ventilator support, and 2.02% needed cardiopulmonary resuscitation. Among the women who had maternal mortality, almost 100% were put on inotropic and ventilator support and had undergone cardiopulmonary resuscitation (CPR). In the control group, none of the patients required inotropic or ventilator support or had undergone CPR.

The vaginal delivery rate in the study arm was 27.9%, while in the control group was 69.9%.

In the study group, 12.58% of the MMR/near-miss group had ectopic pregnancies compared to 1.39% in the control population. About 33.24% had an obstetric hysterectomy, while it was nil in the control group. About 81.8% of the participants in the study group had fulfilled the near-miss criteria at the time of admission, while 4.5% were brought dead.

DISCUSSION

The present study compares characteristics of antenatal women, in whom maternal death and near-miss occurred, with those having normal outcome in a tertiary care hospital situated in one of the rural districts of West Bengal. During the study period, MMR was 223 and near-miss cases were 501/lakh live births, respectively, which were higher than the national average. CCU admission rate was 2.1% of the total admitted obstetric cases. The maternal near-miss mortality ratio which is the ratio between maternal near-miss cases and maternal deaths was 2.25.[8]

Although the mean age in our study group was similar to other Indian studies on near-miss,[9-11] a significant proportion of the primiparous women consisted of teenage girls (30%). This high teenage pregnancy ratio in the study population was due to early age of marriage and a high prevalence of child marriage. Early marriage infringed on their social and

Table 1: Comparing the demographic parameters of the participants in the two groups

Demographic characteristics	Study group (near-miss+maternal death) (n=143)	Control group (n=143)	P value
Mean age in years	23.097±5.7142	24.482±0.933	0.0045
BMI (Kg/m^2)	17.04336±0.457267	20.00629±0.603069	<0.00001
% of rural population	91% rural	45% rural	<0.00001
Education high school and above	74%	99%	<0.00001
Parity	48% primigravida	78% primigravida	<0.00001
% of unbooked cases	96% unbooked	6% unbooked	<0.00001
% of referred cases	78%	40%	<0.00001
Gestational age<34 weeks	60% (86)	34% (49)	0.0002
Hb (g %)	7.524476±1.315306	10.51748±0.614991	0.0001

Table 2: Different primary diagnosis in both groups

Primary diagnosis	Near-miss group n=99	Maternal mortality group n=44	Study population n=143	Control population n=143	P value
Eclampsia and complications like pet LVF, stroke	38 (38.38%)	13 (29.5%)	51 (35.6%)	10 (7%)	<0.00001
Sepsis	3 (3%)	2 (4.5%)	5 (3.4%)	0	
Heart disease	9 (9%)	7 (15.9%)	16 (11.1%)	1 (0.69%)	0.0029
Renal failure	1 (1.01%)				
Hemorrhagic shock	47 (47.47%)	9 (20.45%)	56 (39.1%)	4 (2.79%)	<0.00001
Pulm embolism	1 (1.01%)	5 (11.36%)			
COPD/COVID Pneumonia	1 (1.01%)	4 (9.09%)			
Metabolic Encephalopathy		2 (4.5%)			

health rights.[12,13] This picture was also reflected in our study population which had poor formal education, most did not have proper antenatal care and had moderate degree of anemia. Married adolescent girls were also less likely to use contraceptives, and poor birth spacing increased risks for low birth weight offspring. On comparing the occurrence of major obstetric complications among mothers aged 20–24 years with adolescent mothers aged 10–19 years, we found that the later had a higher risk of eclampsia, puerperal endometritis, low birth weight, and preterm delivery. The risk of maternal death for women aged 15–19 years was twice the risk for women aged 20–24 years. For those aged 10–15 years, the risk of death may be even five-fold higher, compared to women aged 20–24 years.[14]

Most women were multiparous in the study population and majority had attained multiparity by their early 20's. This led to a higher incidence of obstetric hemorrhage in the study group. The average Hb% of the women coming for delivery was between 7 and 8 g %. Due to a rapid succession of pregnancies and periods of lactation, these women suffered from iron and calcium depletion and succumbed to slightest complications during pregnancy and childbirth. There was an obvious unmet requirement for contraceptive use.

Our findings are consistent with other studies on near-miss from developing countries. The study from Sudan[15] by Alemu et al., showed near-miss cases clustered mostly among uneducated multiparous women with primary level education who were self-referred. The study from Zimbabwe by Chikadaya et al.,[16] also showed near-miss cases principally among multiparous women, with high school level education, referred from private clinics. Indian studies by Bansal et al., revealed almost equal incidence of near-miss cases in both the primigravida and multigravida.[17]

Majority of the women in the study population had to undergo early induction due to uncontrolled severe preeclampsia, eclampsia, and antepartum hemorrhage. Besides this, malnutrition, maternal urinary, and vaginal infections were contributory factors for preterm delivery in this population. This is similar to the study by Lotufo et al.,[18] which showed higher preterm births among near-miss patients.

Most cases of near-miss patients in our study had primary diagnosis of obstetric hemorrhage followed by pre-eclampsia and eclampsia. Majority of these patients had irregular antenatal check-up leading to improper management. Rupture uterus was the most common cause of obstetric hemorrhage among the near-miss patients. Most of these were referred following trial of labor in peripheral health centers or at home. Among patients in whom death occurred due to obstetric hemorrhage, a vast majority had primary postpartum hemorrhage (PPH) following mismanaged labor and delivery at peripheral health centers or at home. About 20.27% of the patients in the study group required obstetric hysterectomy due to hemorrhage, while 12.58% of these women required massive blood transfusion. Pulmonary embolism also contributed significantly to maternal death in our institute, pre-eclampsia, obstetric hemorrhage, post cesarean pregnancy in labor, and heart disease all being established risk factors for the same. This is similar to Indian studies by Chikadaya et al.,[16] Rathode et al.,[19] and Purandare et al.[20] Other international studies from developing countries by Alemu et al.,[15] and Lotufo et al.,[18] also revealed obstetric hemorrhages followed by hypertensive disorders to be the most common cause of both maternal near-miss and maternal mortality.

Shock, mostly from obstetric hemorrhage, was the most common criteria for near-miss as per our study, followed by uncontrolled eclampsia and obstetric hysterectomy. The use of vasoactive agents, obstetric hysterectomy, 5 or more units of PRBC transfusion, and use of mechanical ventilator were the leading causes for near-miss as per the study by Lotufo et al.[18] In our study population, 40.5% patients required inotropic support, 37% required ventilator support, and 32% required CPR. For cases outside India, the use of assisted ventilation varied considerably with Zwart et al.,[21] reporting 34.8%, Crozier and Wallace 45%[22], and Leung et al., 58%.[23] The use of assisted ventilation in the present study nearly matches the Indian reports by Bhadade et al.,[24] and Chawla et al.[25]

Among the patients with near-miss (83%) and maternal mortality (81.8%), majority of the women developed critical complications before admission in our hospital reflecting delay either in patients seeking help, or delay in the referral system. Most cases of PPH following prolonged labor could have been managed better had they been referred earlier. Cases of pre-eclampsia and eclampsia could have been prevented with better antenatal management. The study by Purandare et al.,[20] in India also reflected the delay in the referral system. Results suggest that there's a lack of awareness among women of this area about the importance of timely and adequate antenatal visits, availability of facilities existing at tertiary level centers, availability of different health schemes by the government regarding maternal, and child health care. Better mobilization of the population to hospitals by ANM and ASHA workers can also improve the situation.

The data that we have collected for our study is a hospital based reliable data. The sample size is adequate and collected over a span of 2 years. We have conducted this study in a tertiary level hospital which had an ICU facility and facility for most relevant investigations.

Limitations of the study

The study has certain limitations like it was retrospective in design, conducted on a single center, the population was restricted to a certain district and, hence, could not give the picture of a large geographical area.

CONCLUSION

Maternal health being a priority for any nation, a careful scrutiny into the causes of near-miss and maternal mortality will help us to correct any defects in the existing practice. Most women in our study were anemic teenagers or multigravidas from rural areas with poor educational status and irregular antenatal check-ups undergoing delayed referral and mismanagement at peripheral centers. These underlying risk factors have to be corrected.

The most common cause of near-miss was obstetric hemorrhage, mostly due to rupture uterus. Better management of labor in the peripheral referral centers, timely referral, maintaining partograph, improving the Hb status of women, and proper family planning to prevent multiparity are measures which can improve the situation. The residents need to be well trained in providing emergency obstetric care.

Since most cases in the maternal mortality group were among patients with pre-eclampsia, eclampsia and heart disease, thorough antenatal check-up, blood pressure monitoring, proper intake of medications, and timely referral to higher centers should be ensured by ASHA, ANM workers, and doctors at peripheral referral centers. Another common cause of maternal mortality being pulmonary embolism at our institution, early mobilization of post-operative patients and use of thromboprophylaxis in indicated cases should be ensured. Proper HDU, CCU, and blood bank facilities should be available. However, early strict screening protocols should be initiated from the first antenatal visit itself, and a multidisciplinary team should be set alert in tertiary care centers to initiate treatment without delay once such critical cases are admitted.

ACKNOWLEDGMENT

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