



## Factors Associated with Maternal Near-miss Among Women Admitted in A Rural Hospital: A Single-Center Study

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### Abstract

**Background:** Maternal Near-miss (MNM) is one of the related concepts to maternal mortality. MNM is a special category of survivors, whose stories provide unique insights and valuable information on maternal mortality. Characterizing near-miss morbidity is valuable for monitoring the quality of hospital-based obstetric care and should be calculated regularly for planning, monitoring, and evaluating provided maternal healthcare. **Objectives:** The study aimed to observe the factors like patterns and predictors related to maternal near-miss in our demographic. **Material & Methods:** This cross-sectional observational study was conducted at the Department of Obstetrics and gynaecology, Sirajgonj Medical College and Hospital, Sirajgonj, Bangladesh. The study duration was 1 year, from June 2019 to May 2020. During the study period, a total of 1277 deliveries were conducted at the study hospital, among which, 69 cases were of MNM. **Results:** The rate of maternal near-miss in our study was 5.41% of the total admitted maternal pregnancy cases. The maternal near-miss mortality ratio (MNM: 1 MD) was 1:13.8. Out of the 69 near-miss cases, 82.6% of women met the MNM criteria already at admission, and another 17.4% of near-miss cases were distributed: 10.1% developed near-miss after admission within the first 12 hours of the hospital admission, whereas the occurrence of MNM after 12 hours of the hospital admission was observed in 7.3% of cases. **Conclusions:** MNM cases are alarmingly high. Hypertensive disorders of pregnancy and obstetric hemorrhage were the two main direct obstetric causes of near-misses that require strict and quick management protocols. A proper antenatal check-up to discourage early marriage and pregnancy and timely referral to well-equipped health facilities with logistic support is necessary for saving human life.

**Keywords:-** Magnitude; Pattern and Predictor; Maternal; Mortality.

## INTRODUCTION

Maternal mortality is just the tip of the iceberg; the base of the iceberg is maternal near-miss

(MNM) morbidity, which remains undescribed.<sup>[1]</sup> The WHO defines an MNM case as a woman who nearly died but survived a complication that occurred during



pregnancy, childbirth, or within 42 days of termination of pregnancy.<sup>[2]</sup> The WHO has proposed a package of 25 severity markers including combined different criteria based on clinical signs, laboratory tests, and management parameters that met the need for consensus criteria, which can be used all over the world. Standardization of the MNM definition established by WHO helps in a better description of the MNM, especially in undeveloped countries.<sup>[3]</sup> The prevalence of near-miss cases is estimated to be 5.6 to 7.5 per 1000 hospital-based delivery and the overall maternal near-miss mortality ratio is 9:1.<sup>[4]</sup> The reduction of maternal mortality was one of the eight-millennium development goals. The target of MDG 5 was to reduce the MMR by 75% from 1990 to 2015.<sup>[5]</sup> The reduction of maternal mortality to 70 by 2030 is set as goal 3 in sustainable development goals by the UN.<sup>[6]</sup> In developing countries, MNM cases often arrive at referral hospitals in a critical condition.<sup>[7]</sup> Obstetric hemorrhage, hypertensive disorders of pregnancy, sepsis, embolism, and unsafe abortion are usually the main causes attributed to MNM conditions.<sup>[8]</sup> The risk factors of severe maternal morbidities have been identified as maternal age >34 years, social exclusion, non-white, hypertension, previous PPH, delivery by emergency cesarean section, multiple pregnancies, and antenatal admission to hospital. Induced abortions conducted by untrained village midwife (DAI) is still a major cause of morbidity in developing countries.<sup>[9]</sup> Neonatal Outcomes of the near-miss cases were identified as majorities are live births, one third may be stillborn.<sup>[10]</sup> Although the incidence of maternal mortality during Caesarean delivery remains very low, the rate of severe maternal morbidity

is increasing.<sup>[11]</sup> The present study aspired to enhance the knowledge of the health practitioners about the nature of the MNM problem. Concurrently, the outcome of the study provides a relevant source of information for administrative authority in the selection of priorities of maternal healthcare interventions that can save a significant number of mothers' lives at Women's Health Hospital and other tertiary care hospitals. The investigation of severe maternal morbidity (SAMM) and maternal near-miss (MNM) along with their associated risk factors play an important role in the global reduction of maternal mortality. Not many studies regarding this topic have been conducted in Bangladesh. So, this study will certainly serve as a guide for clinicians in the selection of priorities regarding maternal healthcare and suggest the best possible interventions that can save a significant number of mothers' lives.

## OBJECTIVES

- To estimate the incidence of Maternal Near-miss cases in the Sirajganj Medical College
- To find out the socio-demographic characteristics of study patients of MNM cases.
- To investigate comorbidities like organ dysfunction, obstetric hemorrhage infections, and hypertensive disorders along with maternal Near-miss cases.

## MATERIAL AND METHODS

This cross-sectional observational study was conducted at the Department of Obstetrics and gynaecology, Sirajgonj Medical College and Hospital, Sirajgonj, Bangladesh. The study duration was 1 year, from June 2019 to May

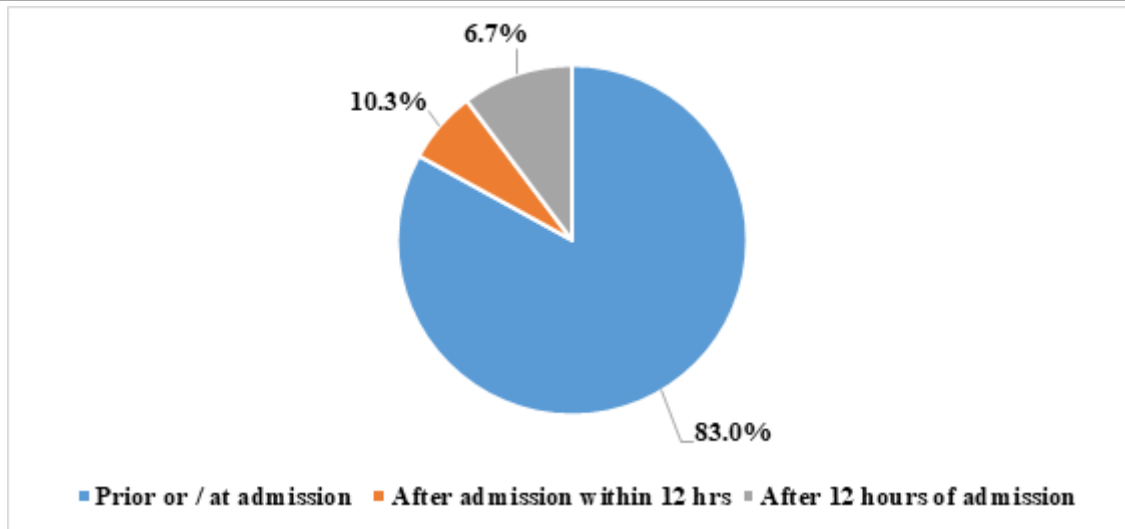
2020. The study was conducted with maternal near-miss cases admitted to the study hospital during the study period. In total, 1277 deliveries were conducted at the study hospital during the study period, among which, 69 cases were of maternal near-miss. The subjects of the present study were selected from among those who met at least one of the WHO criteria for MNM case in desertification during her pregnancy, delivery, or within 42 days after delivery was eligible in the study; eligibility was not restricted by gestational age at which complications occur (Panel-A) WHO criteria for maternal near-miss. This was carried out by checking different criteria of the WHO criteria for screening MNM cases through a daily visit to obstetric wards inpatient department, the emergency unit, and ICU, provided that the case had fulfilled just one of the WHO MNM identification criteria (Panel A). Statistical analysis of the results was obtained by using window-based computer software devised with Statistical Packages for Social Sciences (SPSS-22).

## RESULTS

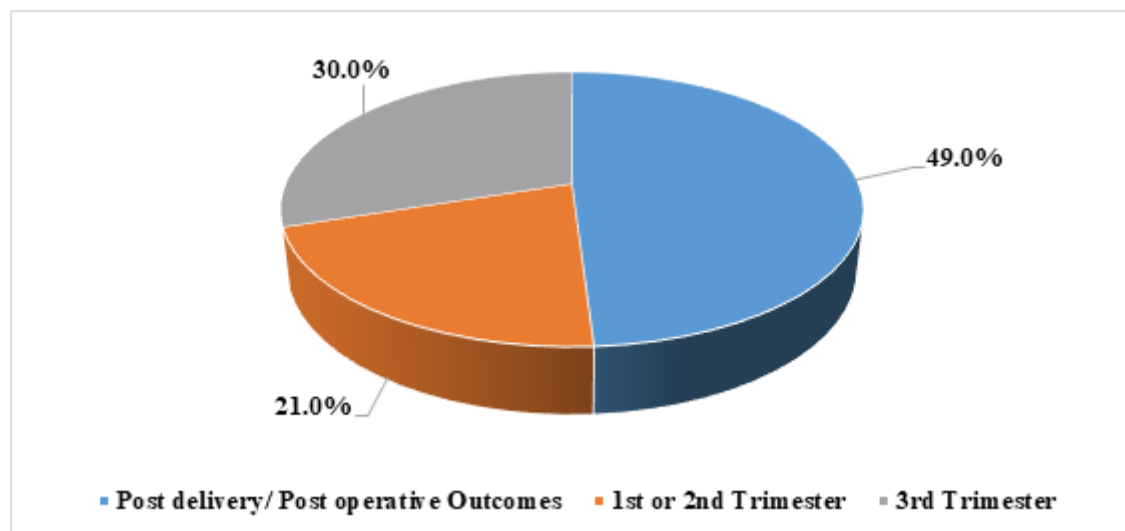
During the study period, a total of 1277 patients were admitted to the Department of Obstetrics and Gynecology at the study hospital. Among the admitted patients, the total number of maternal near-miss cases was 69. During the 12 months of the study, there were 1277 deliveries and 69 MNM cases. The rate of maternal near-miss cases among the admitted patients was 5.41%. The total number of maternal deaths was 5. The maternal near-miss mortality ratio (MNM: 1 MD) was 1:13.8. Out of the 69 near-miss cases, 82.6% of women met the MNM criteria already at admission, and another 17.4% of near-miss cases were distributed: 10.1% developed near-miss after admission within the first 12 hours of the hospital admission, whereas the occurrence of MNM after 12 hours of the hospital admission was observed in 7.3% of cases. Figure II shows that more than half of the MNM cases (49%) were admitted to the hospital after delivery or postoperative outcomes. About 30% were admitted in the third-trimester phase of their pregnancy, whereas the remaining (21%) were admitted in the first or second trimester phases.

**Table 1:** Distribution of Maternal near-miss indices

<b>Maternal near-miss indices</b>	<b>n=1277</b>
Total number of deliveries	1277
Total number of maternal near-miss cases	69
The maternal near-miss rate among the admission	5.41%
Total number of maternal deaths	5
Maternal near-miss mortality ratio (MNM: 1 MD)	1:13.8



**Figure 1:** Distribution of maternal near-miss women according to the presence of any near-miss criteria on admission (N=69)



**Figure 2:** Distribution of maternal near-miss women according to the gestational time on admission. (N=69)

**Table 2:** Pattern of maternal near-miss among Study Population (N=69)

Category	n	%
Pregnancy-induced hypertension	31	44.90%
Postpartum Hemorrhage	19	27.50%
Eclampsia	18	26.10%
Retained placenta	12	17.40%
Eclampsia Related complication	9	13.00%
Antepartum Hemorrhage	7	10.10%

Ruptured uterus	5	7.20%
Ruptured Ectopic pregnancy	5	7.20%
Prolonged/obstructed labour	5	7.20%
Uterine atony	5	7.20%
Severe pre-Eclampsia	4	5.80%
Pulmonary edema	4	5.80%
Placenta previa	4	5.80%
HELLP syndrome	3	4.30%
Abruptio placenta	3	4.30%
Renal Failure	2	2.90%
Cervical tear/trauma	2	2.90%
Impending uterine rupture	2	2.90%
Infections	2	2.90%

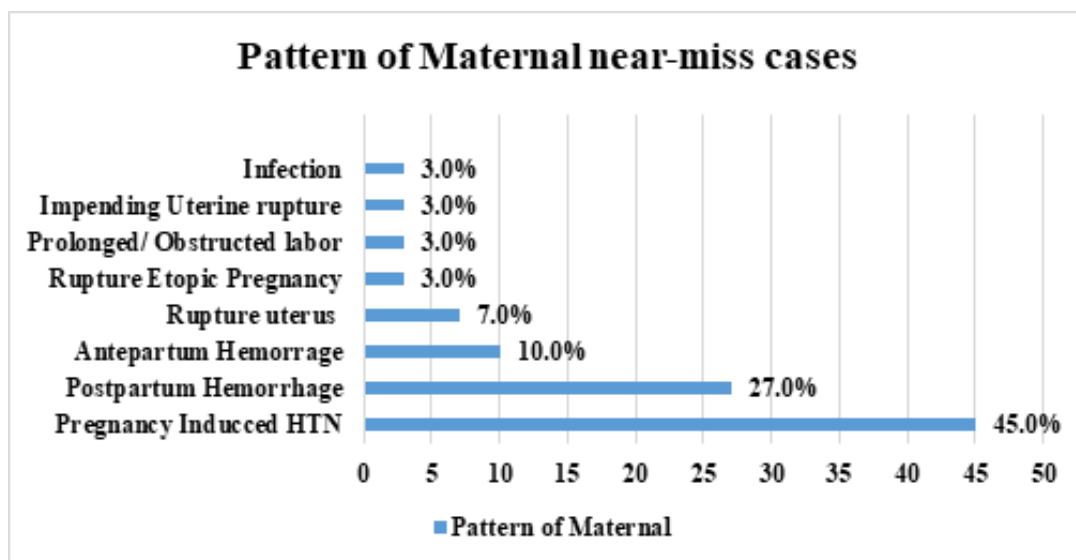


Figure 3: Pattern of maternal near-miss cases (N=69)

Table 3: Presentation of maternal near-miss cases (N=69)

Presentation	n	%
<b>Clinical presentations</b>		
Excessive PV bleeding	26	37.7
Convulsion	23	33.3
Severe lower abdominal pain	21	30.4
H/O Home trial	13	18.8
High fever	4	5.8
Loss of consciousness	4	5.8
DM/GDM	3	4.3
Cardiac disorders	2	2.9



<b>Examination</b>		
Hypertension	34	49.3
Tachycardia	13	18.8
Hypotension	12	17.4
RR >40 for > 60 minutes	11	15.9
Pallor	11	15.9
Moderate	8	11.6
Severe	3	4.3
Jaundice	9	13.4
De-saturation (Oxygen saturation <90% for 9 >60 mins)	9	13.4
Hyperthermia (Temp. >38.5°C/101.3°F)	4	5.8
<b>Investigations</b>		
Variable	Mean±SD	
Hb%	9.7 gm/dl ±2SD	
Platelet count	167000/cmm of blood ±2.5SD	
RBS	5.7 mmol/ L±1.5SD	
S. Creatinine	1.1±1SD	
S.Electrolyte	Na 133mmol/L ±1.5SD	
	K 3.8 mmol/L ±2.5SD	
	Cl 102 mmol/L ±1SD	

**Table 4:** Distribution of Maternal Near-miss cases according to socio-demographic characteristics

Category	Frequency	
<b>Age</b>		
<20	17	24.6%
20-29	31	44.9%
30-39	19	27.5%
40-49	2	2.9%
<b>Residence</b>		
Rural	58	84.1%
Urban	11	15.9%
<b>Maternal Education</b>		
No formal	38	55.1%
Primary	18	26.1%
Secondary	7	10.1%
More than secondary	6	8.7%
<b>Maternal Occupation</b>		
Housewife	60	87.0%
Service	9	13.0%
<b>Husband Education</b>		
No formal(Illiterate)	38	55.1%





Primary	12	17.4%
Secondary	8	11.6%
More than secondary	11	15.9%
<b>Husband Occupation</b>		
Farmer	44	63.8%
Government job	3	4.3%
Self-employment	19	27.5%
Unemployed	3	4.3%
<b>Monthly Income</b>		
Low income	47	68.1%
Middle income	14	20.3%
High income	8	11.6%

## DISCUSSION

Investigating MNM in any setting is a newly recognized tool that identifies women at the highest risk of MD and helps allocate resources well, especially in low-income countries.<sup>[12,13]</sup> Among the admitted patients the total number of maternal near-miss cases was 1442, Rate of maternal near-miss cases among the admitted patients was 4.86%. This is also similar to other studies conducted in Sri Lanka (5.5/1000), a meta-analysis in the USA (0.42%), Brazil (4.4/1000), and the WHO systematic review (0.4%- 8%).<sup>[14]</sup> The rates were higher in Rwanda (21.5/1000LB), and Kathmandu (23/1000).<sup>[15]</sup> The wide variation in results was due to different criteria used for identifying near-miss events. This study strictly adhered to the WHO 2009 criteria. Near-miss rates are generally found higher in resource-poor settings.<sup>[16]</sup> The incidence of near-misses in the present study was much higher than those of other countries, at 14.5, 12.9, 12.1, and 4.3 per 1000 live births.<sup>[17]</sup> In addition, the incidence ratio was higher than 12 per 1000 births in the Moroccan study,<sup>[18]</sup> and higher than 8.3 per 1000 births in the study by Souza et al.<sup>[19]</sup> In addition, these rates were very high when compared with

other high-income countries; it showed that the incidence ratios for near-misses in Scotland and Italy were 3.8 and 2.1 per 1000 births, respectively.<sup>[20]</sup> However, our results were much lower than the high estimated MNM ratios that have been found in Southeast Iran and India.<sup>[21,22]</sup> the estimated ratio ranged from 25.2–105 to 33–120 per 1000 births, respectively. This variation might be reflecting the underutilization of maternal health services and obstetric delay, which may be because of low literacy, poor health-seeking behavior, delayed decision at the family level, and poor transportation facility.<sup>[22]</sup> In the present study hypertensive disorders of pregnancy were the first most common direct causes of near-miss (44.9%), whereas hemorrhagic disorders of pregnancy were the second observed causes (37.6%). This finding is in agreement with other studies in Egypt where hypertensive disorders of pregnancy were 43.9% and in some developing countries.<sup>[23,24]</sup> However, this was inconsistent with the result of the study by El-Gazzar,<sup>[23]</sup> conducted in the same studied hospital, as well as the result of Kasr Al-Aini Hospital, in which obstetric hemorrhage (54.2%) was the first main cause of MNM.<sup>[25]</sup>

The high percentages of hypertensive disorders and obstetric hemorrhage cases are probably due to deficiency of magnesium sulfate, lack of availability of the proper amount of blood, and delay in management.<sup>[26]</sup> However, Qayed et al.<sup>[27]</sup> reported that nearly one-quarter of the MDs in Assiut governorate were due to hypertensive diseases during pregnancy. Most of the patients in the maternal near-miss case presented with excessive P/V bleeding (37.7%). Other presentations were convulsion (33.3%), and severe lower abdominal pain (30.4%). H/O home trial by untrained dai (18.8%), high fever (5.8%), and loss of consciousness (5.8%). GDM/ DM (4.3%) and cardiac disorders (2.97%). In this study, 49.3% of patients were hypertensive region 90% for >60 mins were found 13.4% patients. This is consistent with studies of developing countries (Ijadunola et al.) Ijadunola et al. found in their study, that presenting complaints were excessive P/V bleeding (40.7%), high fever (3.8%), and convulsion (31.3%). In that study 51.2% of patients were hypertensive and desaturation was found in 12.5% of patients. Most of the patients were anemic (15.9%). Mean hemoglobin percentage was 9.7 gm/dl 2SD, platelet count was 167000/cm of blood 2.5SD, RBS was 5.7 mmol/L +1.5SD, S. Creatinine was 1.1± 1SD. Saleh WF et al. found in their study that the mean hemoglobin percentage was 8.3 gm/dl ±2SD, platelet count was 185000/cm of blood +2.5SD, RBS was 6.3 mmol/ +1.5SD, S. Creatinine was 1.2+ 1SD. This is also consistent with this study. Special care management is needed for those suffering from pre-existing comorbidities. The cardiac disorder was the most common indirect cause of MNM (48.8%) [Table 3]. This was consistent with studies of

developing countries.<sup>[28,29]</sup> Special care management is needed for those suffering from pre-existing comorbidities. The study results revealed that cardiovascular and respiratory dysfunctions were the main dysfunctions that occurred (33.7 and 30.5%, respectively), whereas multiple organ dysfunctions represented about half of all cases and these results are consistent with those found in some studies conducted in Arab,<sup>[30,31,32]</sup> and developing countries. Regarding socio-demographic factors, the majority of the participants were between the age of 20-29 years, while 27.5% were from 30-39 years. 84.1% of the participants lived in rural areas. This greatly impacted the available health care for them, causing MNM in most cases. This was similar to the findings of another study that observed the majority of MNM case incidence from rural areas.<sup>[33]</sup> Over half the participants of the present study were illiterate, while 17.4% only had education up to primary levels. These findings were in line with the locality of Sirajganj with its conservative view toward women having an education. The findings were also supported by an Ethiopian study.<sup>[33]</sup> It was observed that 87% of the participants were housewives, which was understandable considering the study was conducted in a rural area. 68% of the participants were from low-income families, while 20.3% were from middle-income families. Only the remaining few were from high-income families. This was also understandable as high-income families can afford better maternal care and suffer fewer risks compared to low-income families. Before H/O C/S, a referral from other health facilities and first delay (delay to seek health care) were significantly associated with MNM. The





majority of cases were admitted due to dystocia. It repeated 57.1% of MNM. Its occurrence is higher compared to finding in Pakistan and Nigeria, where it accounted for 14.8% and 23% of maternal near-miss respectively.

### Limitations of the Study

The present study was conducted in a very short period due to time constraints and funding limitations. The small sample size was also a limitation of the present study.

## CONCLUSIONS

A maternal near-miss case is a life-threatening condition. Common causes of the maternal near-miss case are pregnancy-induced hypertension, obstetric hemorrhage, ruptured uterus, ruptured ectopic pregnancy, prolonged/obstructed labor, impending uterine rupture, and infections. Early marriage, Illiteracy, low socioeconomic condition, adolescence pregnancy, lack of antenatal visit, gestational age of fewer than 37 weeks, and

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traveling from a remote area are all predictors of maternal near-miss cases. Timely referral to well-equipped health facilities with logistic support is necessary for saving human lives.

### Recommendation

This study can serve as a pilot to much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

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