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Original Research Article

Fetal outcome in maternal near miss, retro-prospective study at tertiary centre

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ABSTRACT

Background: Women are not dying because of diseases we cannot treat. They are dying because societies are yet to decide that their lives are worth saving. The statement completely comprises the unawareness of the importance of maternal health existing in society. As a result of which, there is still a lag in maternal health progression. As a part and parcel, fetal health is compromised giving rise to poor fetal outcomes. Studying fetal outcomes in such near-miss cases establishes a relationship between them.
Methods: A retro-prospective observational study, conducted in the Department of Obstetrics and Gynaecology. Study involves all women who are very ill pregnant or recently delivered women who nearly died but survived a complication during pregnancy, childbirth, or within 42 days of termination of pregnancy and their fetal outcome during study period of 18 months.
Results: In a study of 3604 deliveries, MNM cases were 107 births. The MNM IR was 30/1000 live births, and the most common determinant leading to near-miss is hypertensive disorders followed by hemorrhage. Total perinatal mortality was 439 with a PNMR of 125/1000 births. Among the 107 near-miss cases perinatal mortality was seen in 29 pregnancies contributing to 6.6% of the total PNMR.
Conclusions: Fetal outcome improves with improvement in maternal health, as the maternal morbid condition is directly proportional to fetal outcome. This requires identifying and filling up gaps in the maternal health system to improve women's health, further reducing fetal morbid conditions and consumption of neonatal resources.

Keywords: Maternal near-miss, Perinatal mortality, Fetal outcome

INTRODUCTION

Maternal near-miss has emerged as an adjunct to the investigation of maternal deaths as the two represent similar pathological and circumstantial factors leading to a severe maternal outcome.[1] As near-miss 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 the quality of health care at all levels.[2] Thus, there is a need for the application of the maternal near-miss concept for the assessment of maternal health and the quality of maternal care.

The primary aim of this audit is to audit the fetal outcome in such near-miss cases and investigate their events, underlying maternal morbidity, course, the need for NICU care, and outcome. The secondary aim is to study the series of events a near-miss experience, high-risk factors/morbid conditions, and management/treatment received so that near-miss escape mortality with no residual morbidity.[3] Following statistics are studied:

MNM ratio (MNMR) refers to the number of maternal near-miss cases per 1000 live births (MNMR=MNM/LB). Maternal near-miss mortality ratio (MNM: MD) refers to the ratio between MNM cases and maternal deaths (MD). Maternal mortality ratio (MMR=MM/LB) refers to maternal mortality per 1,00,000 live births. Perinatal mortality ratio (PNMR)= number of perinatal mortality (early neonatal death+still births) per 1000 live births.

METHODS

Study type, location and duration

Current study is a retro prospective observational study conducted at the department of obstetrics and gynaecology, J. J. group of hospitals for a period of 18 months from March 2020 to August 2021.

Selection criteria

All women who are 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 fulfilling the WHO criteria admitted at the tertiary centre at the period of study.

Procedure

All the women falling under the criteria of near miss and their fetal outcome are studied retro-prospectively, their characteristics as per the near-miss proforma given by WHO are entered in an excel sheet and the data is summarized using descriptive statistics.

RESULTS

Prevalence rate

During the study period, there were 3604 deliveries. The total number of perinatal mortalities 439. Total near-miss cases were 107, MNM incidence ratio is 30/1000 births, PNMR is 125/1000 births, 6.6% of PMNR is contributed by maternal near-miss cases. In a study of 107 near-miss cases, one was twin gestation, and the rest were singleton pregnancies. Out of 108 fetal outcomes, there were 84 live births of which 5 were neonatal deaths. 24 stillbirths were observed of which 20 were macerated stillbirths and 4 fresh stillbirths.

Among the 84 live births during the study, 26 (33%) of them required admission under neonatal care unit, 12 of them were admitted due to pre-maturity with LBW, 6 with only low birth weight, 6 with respiratory distress, and 2 for prematurity with respiratory distress. 5 of them succumbed due to prematurity and extreme low birth weight. 62% of neonates who were admitted to NICU were delivered by caesarean section, 39% by vaginal birth, and 9% home delivery. About 100% of c-section, 85% of induced vaginal delivery were done for maternal indication, most commonly for eclampsia and pre-eclampsia followed by placenta previa. This suggests that prematurity, LBW, and respiratory distress are seen in neonates born to near-miss cases that were mainly iatrogenic, which were done to decrease maternal morbidity. Concluding that, maternal morbidity had a direct effect on perinatal morbidity and mortality. Of 26 neonates admitted in NICU, 66% of them required intubation and 52% required treatment with surfactant. Hospital stays varied from 1 day to 50 days. Neonates requiring intubation had a hospital stay for a mean duration of 20-30 days and those with extreme low birth weight had a maximum of 50 days of hospital stay.

Table 1: Statics of near-miss and fetal.

Indicies	N
Total no. of deliveries	3604
Total no. of live births (LB)	3488
Number of near-miss cases (MNM)	107
Number of maternal mortality cases (MM)	44
Number of total Perinatal mortalities	439
Number of total Perinatal mortalities in near-miss cases	29 out of 107
Perinatal mortality ratio (PNMR)	125/1000 live births
Near miss cases contributing to PNMR	6.6% of PNMR
Maternal near-miss incidence ratio (MNMIR=MNM/LB)	30/1000 live births
Maternal mortality ratio (MMR=MM/LB)	1261/100000 live births

On the detailed evaluation of stillbirths, it was observed that 20 (83%) of 24 intrauterine fetal demises were macerated stillbirths and 4 (17%) fresh stillbirths. On the retrograde evaluation of pregnancy course in MSB cases, it was found that about 40% of the pregnancies were unregistered and unimmunized and all of them were referred from remote peripheral centres with poor socio-economic status, most of them in their 3rd trimester. Looking into the underlying maternal co-morbid condition, 35% of the maternal near-miss had pre-eclampsia, 30% had eclampsia, 19% had abruptio placenta, 19% COVID pneumonitis, 5% placenta previa, and 5% diabetic ketoacidosis. 4MSB were seen in patients with covid pneumonitis, however, the relationship between covid and fetal effects is not very well established. 2MSB were idiopathic, and 1 case was seen in a mother with diabetic ketoacidosis.

Among the fresh stillbirths, 50% were unregistered and unimmunized. 3 of them were due to eclampsia, pre-eclampsia, and 1 case was a 1st twin in women with

tuberculosis and ARDS. It is evident from the above data, that all stillbirths had a direct effect from the underlying maternal morbid condition, establishing a causal-effect relationship between underlying maternal morbid condition and its fetal outcome. Retrospectively it was observed in 4 cases that, intra-uterine fetal demise has caused maternal morbidity. 2 of them had PPH and 2 ended up in DIC. There were 5 neonatal deaths among those who were admitted in the NICU and most of them were born to the mother with Eclampsia. 3 of them had a gestational age of 30-34 weeks, while the rest 2 were <30 weeks gestation. All of them were premature with low birth weight and had primary cause as respiratory failure with sepsis for neonatal death.

Table 2: Fetal outcome in maternal near.

Fetal outcome	Cases, N (%)
Total live births	84 (77.7)
Total macerated stillbirth	20 (18.5)
Total fresh stillbirth	4 (3.7)
Total neonatal death	5 (4.6)

Maternal near-miss

Age: The study had 37% of the NMC falling in the age group between 26-30, 29% between 21-25 years. Registration status: 87/107 cases were registered and 33/107 were unregistered. Referral status: 81% of the cases were referred and 19% were unreferred, type 1 delay seen in 22%, type 2 in 59.8%, and type 3 delay in 20%. Near miss incidence in our study is 30 per 1000 live births i.e., for every 1000 live births 30 near-miss cases escaped death. The current study has hypertensive disorders as the most common determinant leading to a near miss.

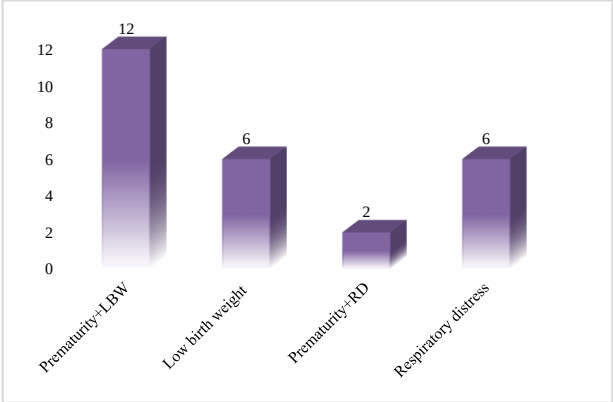

Figure 1: NICU admissions in fetuses born to near-miss case.

Following hypertensive disorder is the haemorrhagic cause, contributing 32 (30%) to near-miss, 10 (9.33%) were due to PPH, 10 (9.33%) placenta previa, 9 with abruption placenta, and 3 retained placenta/morbidly adherent placenta. The difference between haemorrhagic cause and hypertensive disorder is very narrow as many severe pre-eclampsia and eclampsia cases presented with abruptio placentae fall even into the haemorrhage category.

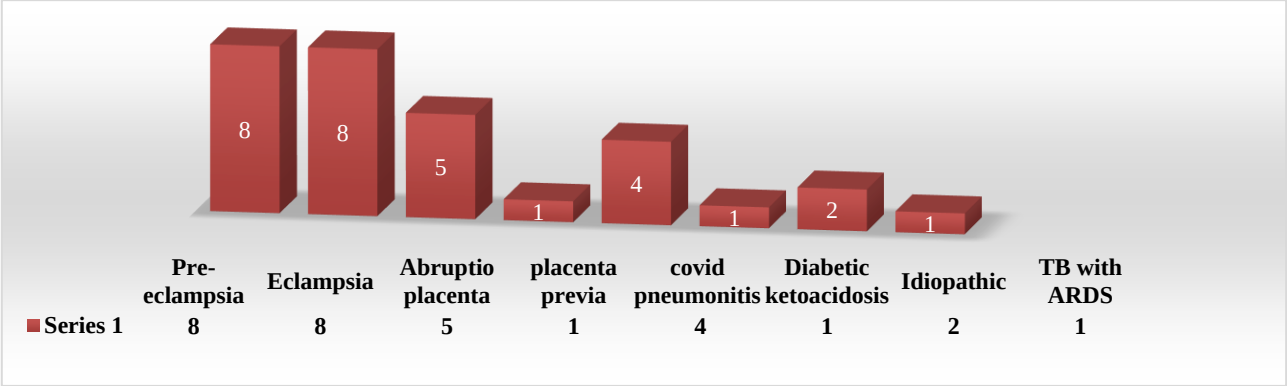

Figure 2: Underlying maternal conditions are seen in stillbirths.

The audit also involves covid cases as they fall into respiratory organ dysfunction category by WHO, near-miss cases due to COVID pneumonitis apart from other respiratory causes contribute 28 (26%) of the cases and all of them have either required intubation/NIV/oxygen support under CCU care with saturation drop of <90% for >60 min. Covid cases vary from the other respiratory causes in terms of severity, ventilatory requirements, CCU care, and their fetal outcomes. Most of the patients have had an affection of more than one organ system of which 27% of the cases had hematological dysfunction including DIC and 12% shock, 14% cases had cardiovascular dysfunction, and with 6.5% cases had hepatic dysfunction. Renal and infectious causes were seen in 7% and 4% of the cases respectively (Table 3).

Table 3: Distribution according to patient's characteristics.

Patient causes		Near miss
Age (years)		**N (%)**
≤20		7 (6.5)
21-25		32 (29)
26-30		40 (37)
31-35		19 (17)
>35		10 (9)
Gravida		
Primigravida		28 (26)
Multigravida		79 (74)
ANC/PNC status		
ANC		92 (85.9)
PNC		15 (12.5)
ANC status		
Booked		87 (81.3)
Unbooked		20 (18.69)
Admission status		
Un referred		20 (18.6)
Referred		87 (81.3)
Type of delay		
Type 1		24 (22.4)
Type 2		64 (59.8)
Type 3		22 (20.5)
Admission status		
CCU/ICU admission		86 (80.3)
Mean CCU admission		4.8166
Duration of admission		
Mean duration of CCU/ICU admission (days)	<10	85
	>10	2
Mean duration of ward admission		8.7
Blood/ blood products		
Required blood/ blood products		59 (55)
Didn't require blood/blood products		48(44.8)

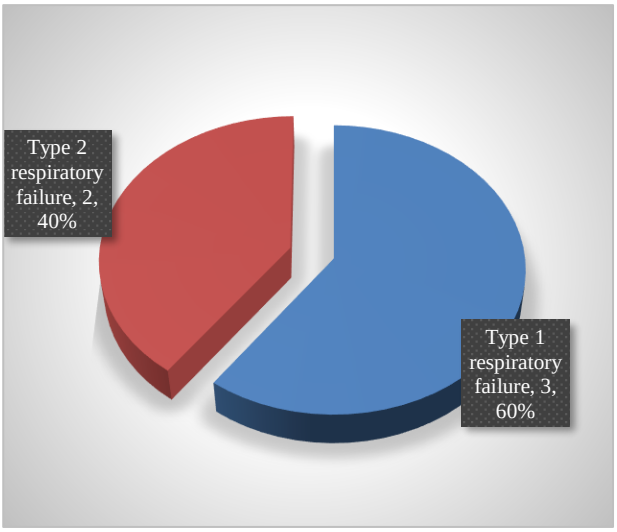

Figure 3: Cause of death in NND in MNM.

Table 4: Distribution according to primary determinants of near-miss cases.

Primary determinant	Near miss N (%)
Hypertensive disorders	39 (36)
PIH and Pre-eclampsia	23 (21.4)
Eclampsia	16 (14)
Haemorrhagic	32 (30)
Post-partum hemorrhage	10 (9.33)
Retained placenta/morbidly adherent placenta	3 (2.8)
Placenta previa	10 (9.3)
Abruptio placenta	9 (8.4)
COVID-19 pneumonitis	28 (26)
Hematological dysfunction (including DIC)	29 (27)
Cardiac disorders	15 (14)
Shock	13 (12.1)
Respiratory dysfunction (excluding COVID)	11 (10.2)
Sepsis	10 (9.3)
Renal dysfunction	8 (7.4)
Hepatic dysfunction	7 (6.5)
GDM with ketoacidosis	5 (4.6)
Infectious causes	4 (3.7)
Endocrine dysfunction	1 (0.9)
Uterine inversion	1 (0.9)

DISCUSSION

Maternal deaths form only the tip of the ice-burg while a large part of it is the maternal co-morbid conditions that remain largely undescribed. Measurement of such an important indicator of health is of paramount importance to understand the health condition of a community. Hence, WHO came with the concept of maternal near-miss to measure maternal health as an adjunct to maternal death. Near miss incidence in our study is 30/1000 live births. Multiple studies from different parts of the globe had maternal near-miss ratio depending on their socioeconomic status, availability of health resources, and health system. 25.2 per 1000 in southeast Iran, 17.8 per 1000 in Manipal, 3.83 per 1000 in Scotland, 44.3 per 1000 in Brazil, and 34 per 1000 in WHO survey, 8/1000 live births in mumbai.[4-9]

The current study has hypertensive disorders as the most common determinant leading to a near miss which is similar to the study conducted in the Mumbai, Samant et al and Punjab.[10,11] Unlike to the studies from other parts of India which had haemorrhage as the most common cause.[12-14] Hypertensive disorders in pregnancy including

HELLP syndrome account for 36.4%. Earlier studies had higher proportions of eclampsia versus pre-eclampsia but the current study including other studies has a higher proportion of pre-eclampsia over eclampsia probably

because of the enrolment of the ANC cases at the possible nearby health centres and their prompt referral has reduced the incidence of eclampsia, hence reaffirming that timely initiation of treatment reduce the morbidity and mortality.[15,16] Even though the number of women registering their pregnancy has increased, they fail to follow up regularly. Hence these women land up with end-stage disease by the time they reach a tertiary care centre. The most common cause of maternal mortality is still the hypertensive disorder, indicating that when obstetric haemorrhage is picked up at the earliest at a tertiary care centre or referred at the earliest from a peripheral centre has got better prognosis and one can escape death with timely intervention and adequate blood transfusion.[17]

The audit also involves covid cases contributing 26% of MNM and it was found that pregnant with underlying morbidity had more severe disease than others. This is similar to the Meta-analysis of 117 studies with a total of 11758 pregnant women were included. The study concluded that pregnant women are at 20times higher risk than non-pregnant women.[18] However, the relationship between the covid mother and the fetus is not very well established, one of the studies which include 77other studies reports the highest number of abortions and IUGR as an adverse effect to maternal covid and there was no association with still births.[19-22] In the contrary, another study from Iran reports the association of stills births, IUGR and premature birth in association to maternal covid.[23] In our study, although 4MSB were seen in near-miss cases with covid pneumonitis, may not establish any significant relationship between them, as the study involves only near-miss cases with no comparison group.

It is known since the beginning of modern medicine that, 'pregnancy is a pathophysiological state', termination of which can reverse many pathological conditions. Hence, judicious termination of pregnancy either by induction of labour or by caesarean section is one of the major emergency interventions that can combat mortality. The present study had 30 indicated caesarean, most of them were because of placenta previa and abruptio placentae. 20 indicated induction of labour maximum for pre-eclampsia and eclampsia. None of the studies mentions termination of pregnancy as an intervention which is a vital collaborative measure in the treatment of NMC.[24-26] Total near-miss cases were 107, PNMR is 125/1000 live births. Near miss contributes to 6.6% of PNMR. It is evident from the above data that, out of 107 pregnancies, 29 adverse fetal effects were directly due underlying maternal morbid condition, indicating the high need on improvisation of maternal health care for a better fetal outcome.[27] Maternal near-miss events can be prevented, if diagnosis and interventions are done at the earliest. Which requires recognition of gaps in health system, some of them are: failure of regular follow-ups at the registered centre. Lack of knowledge regarding dangerous signs of pregnancy. Undiagnosed or late diagnosis of underlying medical conditions. Poor infrastructure of peripheral hospitals and poor transport. Non-availability of blood, non-availability of OT, poor manpower. Increased load on tertiary centres. These gaps have to be filled to provide better health for the mother, and for the reduction of preventable maternal near-miss and mortality cases that were caused due to deficiencies in health system of the community. Improvising the maternal health is the only way for a better fetal outcome.

CONCLUSION

At the most primary level, strengthening of peripheral centres with man-power and equipment, and wider usage of tele-medicine fills up most of the health gaps. This includes health education encouraging ANC registration and regular follow up. At sub-district level, setting up 'high-risk pregnancy clinics (HRPCs)' with visits from doctors specializing in obstetrics and gynaecology will establish this multi-disciplinary approach and timely referral mechanism. The high-risk individuals can be identified at the HRPCs and referred at a stipulated time with advanced, safe and quick transport system. At district level, every district must have one tertiary care hospital to the nearby peripheral centres for the better de-centralisation of patients load rather than over-burdening the tertiary centre at metropolitan cities and to avoid delay in starting appropriate definitive management. Fetal outcome improves with improvement in maternal health, as the maternal morbid condition is directly proportional to fetal outcome. This again requires identification and filling up gaps in the maternal health system which further reduces fetal morbid condition and consumption of neonatal resources.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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