



Research Paper

## Comparison Between Maternal Death And Maternal Near Miss In A Tertiary Center In Eastern India

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### ABSTRACT

**Aims and objectives :** This study was conducted with the aim to find out the maternal near miss indicators of our centre and to determine the causes and nature of the maternal near miss and deaths .

**Materials and methods:** This was a prospective observational study conducted from 2019 to 2021 .All cases who met Ministry of Health and Family Welfare Government of India Guideline,2014 criteria for maternal near miss were included in this study .

**Results :**The most common direct cause of near miss in this study was hypertensive disorder of pregnancy which accounts for 84.91% (n=135) cases and 3.77% (n=6) of maternal deaths among them.

Multisystem disorder was positively associated with maternal near miss (p-value=0.005)

**Conclusion:** Hypertensive disorders in pregnancy and sepsis were the two leading direct causes of near-miss events followed by hemorrhage. Causes in near-miss and maternal mortality are similar. So, all women should have access to better quality of obstetric care to prevent, diagnose and manage the complications on time.

**Key words:** maternal near miss, maternal deaths, Ministry of Health and Family Welfare Government of India Guideline

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### I. INTRODUCTION

“Women are not dying because of diseases we cannot treat. They are dying because societies are yet to make the decision that their lives are worth saving.”

-Mahmoud Fathalla, WHO

A pregnant woman undergoes many changes physiologically and sometimes pathologically. The quality of health in obstetrics is reviewed by checking the maternal and neonatal outcomes which are the major indices of maternal health.

The standard indicator of maternal health is the Maternal Mortality Ratio (MMR) which is defined as “the ratio of number of maternal deaths per 1,00,000 live births”.As per the latest data reports of National Sample Registration System (SRS) Maternal Mortality Ratio (MMR) of India in 2016-18 is 113/1,00,000 live births, which declined from 130/1,00,000 live births showing a reduction in 17 points in 2014-16. This corresponds to saving 2,500 extra mothers annually in the 2018 when compared to the year 2016. This decline is because of the extra efforts and use of additional resources to improve our health care system.

The current MMR goal of India is to bring preventable maternal and neonatal deaths to zero. The current progress of our country to decrease the MMR has kept India on a proper path to achieve the Sustainable Development Goal target of MMR which is less than 70 per 1 lakh live births by the year 2030. Even now our country has many drawbacks in achieving the goal due to inaccessibility of health services to all the

citizens. Furthermore, complications can occur during any pregnancy and delivery, so it is important to have proper infrastructure, facilities for timely management.

Maternal mortality has been described as “Just The Tip of The Iceberg” suggesting, there is a large base to it in the form of maternal near miss (MNM) which remains undescribed. Severe acute maternal morbidity (SAMM), also known as “near miss” is defined by WHO as “A woman who survives life-threatening conditions during pregnancy, abortion, childbirth or within 42 days of termination of pregnancy”<sup>[1,2]</sup>. Early evaluation of these cases of morbidity and maternal near miss (MNM) in obstetrics would help us in further improvement of our health care system.

Maternal near miss (MNM) is more common than the maternal deaths hence a reliable quantitative analysis has to be done, which helps in implementation of changes to provide quality services.

The causes of maternal deaths categorized as direct or indirect causes. The direct causes account for about 80% of all the maternal deaths. And the rest 20% deaths are due to indirect causes. Some of the direct causes are obstetric complications of pregnancy, labour and puerperium or improper interventions, late treatment and referral. The indirect causes are listed as the presence of maternal history of past disease or and risk factors that might have aggravated during the pregnancy, any cardiovascular disease, metabolic syndromes, liver dysfunction, endocrine diseases, infections, or multi organ dysfunction. Recently covid infection has also been an emerging cause of maternal death. The various causes of maternal mortality are hypertensive disorders of pregnancy, obstructed labor, antepartum and postpartum hemorrhage, unsafe abortion practices, hemorrhage due to any cause etc. the major contributory cause is anemia which is categorized in indirect causes. There are various social factors associated with maternal mortality in India like age of the mother, age at first childbirth, history of parity, frequent pregnancies with no or less gap between two pregnancies, malnutrition, illiteracy, poverty, lack of proper services at all the places, ignorance, decrease man-power in health system, vaginal deliveries by untrained dais, poor antenatal care due to less awareness, poor sanitation, communication and lack of transport facilities, etc. [3]

Maternal deaths can be prevented by avoiding unwanted pregnancies and unsafe abortion practices. All women including adolescents, should have an access and knowledge regarding various types of contraception use, facilities to opt for safe abortion services and proper care after an abortion.

The first factor which stop women from getting the care she needs is poverty, which is quite prevalent in many parts of India. The poor women of remote areas could not get an access to good quality of health care. It is mostly seen in sub-Saharan Africa and South Asia where there is a scarcity of skilled health professionals.

The latest data shows that 90% of deliveries in most of the high income and upper middle-income countries are by the trained midwife, doctor or nurse. Moreover, more than half of deliveries in low-income countries are done in the presence of a skilled health personnel (4).

#### **Interventions for improving maternal health outcome:**

- 1) multidisciplinary approach for the care of women with high-risk medical disorder during preconception care, pregnancy, postpartum;
- 2) structural racism and the social determinants of health to be addressed;
- 3) implementation of hospital-wide safety bundles with good team training and simulation;
- 4) patient education to be provided to make them aware on early warning signs of complications of pregnancy;
- 5) maternal levels of care should be regionalized so that mothers with comorbidities are helped and delivered by specialized teams in health facilities.

#### **ADVANTAGES OF INVESTIGATING NEAR MISS EVENTS:**

Near miss cases are more common than maternal deaths.

All the near miss cases should be considered as a lesson and an opportunity to improve the quality of treatment. Near miss cases can be interviewed as the woman is available to discuss the events happened. The causes of near miss and maternal deaths are almost same. Thus, MNM cases would provide us with more important details about morbidity. This information would help in timely intervention to avoid maternal death. The investigation of severe morbidity is not much threatening to the investigator as the woman survived. MNM cases are increasingly considered as a major method to access the quality of care provided. Considering the importance of the maternal morbidity and mortality, this study aims at identifying its incidence, underlying causes and their trends in a tertiary health care centre.

## **II. Materials And Methods**

It was a prospective study conducted in the Department of obstetrics and gynaecology, IMS and SUM Hospital, Bhubaneswar from July 2019 - June 2021 over a period of two years. Life-threatening conditions related to pregnancy, delivery, and maternal mortalities after delivery till 42 days were noted after taking ethical clearance from the institute. Near-miss events were noted based on the Ministry of Health and Family Welfare

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Government of India Guideline December 2014. Data were collected. Statistical analysis was done by using the Statistical Package of the Social Sciences (SPSS) version 2.0.

The following indices were calculated:

Maternal near-miss incidence ratio=total no of near-miss cases/total no. of live births X 1000

Maternal near-miss/maternal mortality ratio

Mortality index = no. of maternal deaths /no of maternal deaths + no of near-miss cases

Maternal mortality rate

The maternal near-miss to maternal mortality ratio and the mortality index give an idea about the quality of care given at a particular institute. The higher the maternal near-miss to maternal mortality ratio, the better is the care at the given institute. A lower mortality index signifies better care at the institute.

### III. Results

The current study is a prospective facility based observational study, done at the Department of Obstetrics & Gynecology in a tertiary healthcare institute, IMS & SUM Hospital, Bhubaneswar, Odisha for a period of two years from 01<sup>st</sup>July, 2019 to 30<sup>st</sup> June, 2021. The total number of patients who consented to participate in this study during the study period was 159. The data pertaining to 159 patients has been analyzed and presented in this study. There were 2825 number of total deliveries in the study period, of which 1167 were vaginal deliveries and 1658 were caesarean sections and there were 2789 live births. The prevalence of MNM was 91.19% (n=145) among all the cases admitted in morbid condition, 8.18% of cases died (n=14).

The maternal near-miss incidence ratio was 51/1000 live births, maternal near-miss to mortality ratio was 10.35:1, and the mortality index was 0.09%.

Table 1: shows the comparison of the demographic profiles of the cases. Most of the women in this study belonged to the age group of 21 to 30 years in both maternal mortality as well as maternal near-miss cases (6.29% and 62.26%). Multiparous women were more in number in maternal near-miss cases (47.79%) and maternal deaths were more in primigravidas (4.4%). Maternal mortality was significantly high in unbooked women (8.18%). Even the booked cases had no proper antenatal records and lacked in investigations. The number of near-miss cases and maternal mortality both were more in the third trimester of pregnancy (37.74% vs 3.77%).

**TABLE 1:** Comparison of demographic profile in maternal near-miss and maternal mortality cases

Demographic characters		Maternal near miss cases (n=145)		Maternal deaths (n=14)	
		Number	percentage	Number	percentage
Age	<20	7	4.4	1	0.6
	21-30	99	62.26	10	6.29
	31-40	39	24.53	3	1.88
Parity	Primigravida	65	40.88	7	4.4
	Multigravida	76	47.79	3	1.89
	Postpartum	4	2.51	4	2.51
Booking status	Booked	18	11.32	1	0.63
	Unbooked	127	79.87	13	8.18
Gestational age	<28weeks	35	22.01	3	1.89
	28-37weeks	60	37.74	6	3.77
	37-42weeks	46	28.93	1	0.63

**TABLE 02 –FACTORS AFFECTING MATERAL OUTCOME**

Primary complication of pregnancy	MNM	MD	Total
HDP	135 (84.91%)	06 (3.77%)	141 (88.68%)
Sepsis	42 (26.42%)	14 (8.81%)	56 (35.22%)
Hemorrhage	22 (13.83%)	02 (1.26%)	24 (15.09%)
Anaemia	46 (28.93%)	06 (3.77%)	52 (32.70%)
Cardiac disease	16 (10.06%)	09 (5.66%)	25 (15.72%)
Respiratory disorder	25 (15.72%)	11 (6.92%)	36 (22.64%)
Liver dysfunction	14 (8.81%)	12 (7.54%)	26 (16.35%)
Renal disorder	06 (3.77%)	08 (5.04%)	14 (8.81%)
CNS dysfunction	02 (1.25%)	05 (3.15%)	07 (4.40%)
Endocrine dysfunction	26 (16.35%)	09 (5.66%)	35 (22.01%)
Multi-system disorder	148 (93.08%)	11 (6.92%)	159 (100%)

Table 2 showed that multi-system disorder had the maximum morbidity and mortality with 148 and 11 cases respectively. The most common direct cause of near miss in this study was hypertensive disorder of pregnancy which accounts for 84.91% (n=135) cases and 3.77% (n=6) of maternal deaths among them.

The primary complication was observed to be any utero-placental causes accounting for 94.96% (n=151) of cases with 5 maternal deaths among them. The uteroplacental causes included in this study are: Prelabour rupture of membranes leading to sepsis, labor events, previous caesarean section, obstructed labour, ruptured uterus, uterine scar dehiscence, twin pregnancies, adherent placenta. Among them previous CS was seen in 19.49% cases (n=31). Anaemia contributed to 46 cases of near miss and 6 maternal deaths. Sepsis had also been seen to have a significant association with 26.42% cases of maternal near miss (n=42) and 8.81% of deaths (n=14). It had been seen that all maternal deaths had a contributing factor of sepsis.

**TABLE 3-ASSOCIATION OF MATERNAL DISORDERS DURING PREGNANCY WITH MNM**

VARIABLE	Chi square test	DEGREE OF FREEDOM	p-value
Hypertension	0.694	1	0.405
Haemorrhage	0.008	1	0.929
Uteroplacental accidents	0.170	1	0.681
<b>Cardiac disorders</b>	<b>27.322</b>	<b>1</b>	<b>0.0001</b>
<b>Respiratory disorders</b>	<b>27.418</b>	<b>1</b>	<b>0.0001</b>
<b>Liver dysfunction</b>	<b>12.410</b>	<b>1</b>	<b>0.0001</b>
Hematological disorder	3.822	1	0.051
<b>Endocrine dysfunction</b>	<b>25.787</b>	<b>1</b>	<b>0.0001</b>
<b>Multisystem disorder</b>	<b>8.04</b>	<b>1</b>	<b>0.005</b>
Previous Cesarean section	0.266	1	0.606
<b>Infections</b>	<b>31.512</b>	<b>2</b>	<b>0.0001</b>
Anaemia	0.719	1	0.396

Table 3: showed that various organ system involvement was significantly associated with maternal morbidity. Though HDP, uteroplacental disorders and hemorrhage were major causes related to MNM, the circulatory, respiratory, liver and endocrine dysfunction had significant relation with near miss with p-value <0.005. The infections, cardiac disorders, respiratory disorders, liver disorders and endocrine disorder had a p-value of 0.0001, which suggests a significant association between organ system involvement and MNM. Multisystem disorder was positively associated with maternal near miss (p-value=0.005)

#### IV. DISCUSSION

The reduction in global maternal mortality rate to less than 70 per 1 lakh live births is a target of Sustainable Development goals by 2030. But despite efforts by government nationally and globally, the maternal morbidity and mortality remains a major challenge in the developing countries. A study on MNM cases provides useful information on the lacunae that leads to morbidity and death. It is an essential approach to identify and monitor the quality of care in obstetrics. WHO has given several approaches to define maternal near-miss. They are disease specific, organ dysfunction specific and management specific criteria.

The incidence of Maternal Near Miss in our study was 19.23 per 1000 live births, which was comparable to a study by Bansal M et al. where the incidence was 11.9/1000 live births (5). In another study conducted in Southern Ghana (6), they reported an incidence of MNM of 34.2/1000 live births which was quite high compared to our study. The changes in the incidence rates could be due to different socio-demographic places, poor maternal health care delivery systems in certain rural areas, and the quality of health services at the referral centers.

The Maternal mortality rate (MMR) in this study is 501/1lakh live births. In a study in India by Bansal M et al. (5), MMR was found to be 580/100000 live births. Woldeyes et al.(7) in their study showed MMR as 876.9/1lakh live births, Mbachu I.I. et al. in Nigeria found 1908/1lakh live births(8). The variation is again due to different demographic areas under study, mismanagement at peripheral centers where MMR is high. Our hospital, being a teaching and referral institute, we receive most of the patients in severe moribund condition. MMR is said to be high if it is more than or equal to 300 deaths per 1 lakh live births, and it is considered extremely high if it is more than or equal to 1000 deaths/1lakh live births (WHO, World Bank, UNICEF, UNFPA). Our study is conducted at a tertiary referral and teaching hospital where cases are received from different far and near peripheral units in moribund state also. Out of 159 critically ill cases, 93.08% had multisystem disorder.

The age of the patients varied from 19 years to 40 years in our study with mean age of 28.1 +/- 4.839 years. The commonest age group with severe illness in our study (table 1) was 21-30 years age group, amounting 62.26% of MNM cases and 6.29% of cases with maternal deaths. This may be due to the commonest age of pregnancy in our country, so the chance of morbidity is also high. Similar results were observed in a study conducted in Nigeria (8). But the Dutch survey showed age >35years as a significant risk factor for severe acute maternal morbidity (9). This difference is probably due to variation in different socio-cultural behaviour in different regions.

It has been observed that multigravida are slightly more common than primigravida among the critically ill patients (Table 2). The near miss events were more common in multigravidas but maternal deaths were seen to be more among primigravidas. 49.68% of patients were multigravidas who had a maternal near miss event according to our study. It was followed by Primigravida with a close margin of 45.28%. out of 14 maternal deaths in this study, 50% were primigravidas. This pattern was shown in the Bolivian study (10) where 56% near miss cases were multiparous. Our results are also comparable to Roopa P S et al. (11) and the Dutch study (9) who concluded that primiparity contributed maximum to the near miss morbidity.

Mothers with 28-37 weeks gestation faced the maximum morbidity and mortality with 41.51% near miss morbidity (table 3). But according to Bolivian study (10), 26% MNM were in early trimester. This variation is mostly due to termination of pregnancy in an illegal way in Bolivia as the country has strict rules related to pregnancy termination. In a study conducted in a tertiary hospital in India, Roopa P S et al. showed 57.2% association of third trimester with MNM morbidity (11). As late second trimester and early third trimester is the most common phase of complications, so we encountered maximum patients in that gestational age.

Our study suggests that both MNM and deaths were highest among unbooked cases. 88.05% cases were unbooked in our study. Bibi et al. (12) also identified that majority, 87% of near miss cases were unbooked which was comparable to our study. Another study by Junu S et al. (13) also concluded with similar results.

The most common cause of near miss found in this study is hypertensive disorders of pregnancy which accounts for 84.91%. It was followed by anemia (28.93%). Oppong SA et al. in their study also concluded that hypertensive disorders of pregnancy as the leading cause of maternal near miss with 41% cases (6). Roopa P S (11) and Bibi S et al. (12) had inferred in their study as hypertensive disorders of pregnancy as a major direct cause for maternal near miss (13). Though obstetric hemorrhage is leading cause of mortality, it is still a major cause of MNM. Hemorrhage was the major risk factor in Manipal study (44.2%), Ghana study (21.8%), Bastar study (43.5%). A good resource, preventive strategies and protocols to manage APH and PPH along with skilled training in obstetric emergencies can help win this battle.

## V. Conclusions

Hypertensive disorders in pregnancy and sepsis were the two leading direct causes of near-miss events followed by hemorrhage. Causes in near-miss and maternal mortality are similar. Maternal deaths mostly occurred in cases that arrived late or in moribund condition. To sum up, any low or no risk pregnant woman can develop a life-threatening complication during pregnancy with no or little warning signs. So, all women should have access to better quality of obstetric care to prevent, diagnose and manage the complications on time.

In this study, a large proportion of MNM cases were referred, which shows an untimed and improper management of obstetric emergencies at the periphery, low resources, poor referral practices and delay in seeking treatment. There should be emphasis on the implementation of Emergency Obstetric Care, Janani Suraksha Yojana, proper referral and transport services.

It is the need of the time to boost referral services so that patients can reach the hospital. As the near-miss analysis indicates the quality of health care and causes are almost similar to maternal mortality, its registry should be done.

**Conflicts of interest :**None declared

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