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Original Research Article

Implementation of maternal near-miss guidelines in the selected district and womens hospitals of Maharashtra, India

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ABSTRACT

Background: Effective implementation of operational guidelines depends on understanding the facilitating factors and barriers which are useful for scaling up the implementation at other facilities. The objective of the present study was to document the facilitating factors and barriers for implementation of the MNM-R guidelines at the selected district and women's hospitals in Maharashtra, India.
Methods: The incidence and factors influencing MNM events in the selected hospitals were reviewed and delays based on three-delay model were identified during April 2018 to March 2022. All pregnant/post-partum women meeting eligibility criteria of MNM as per GOI guidelines were included as Near Miss cases (n=460) and interviewed. All the MNM cases were discussed during the monthly maternal death review (MDR) meetings at these hospitals.
Results: Ratio of maternal deaths to MNM was 1:2.34. Leading causes of MNM were hemorrhage (64.6%) and hypertensive disorders of pregnancy (23.0%). Level one and two delays were reported by 41.7% and 7.6% women respectively. Level three delay at referral centers and at district hospitals was reported by 15.8% and 12.2% women respectively. Corrective measures were taken care of as per the gaps identified on the basis of three delay model for prevention of these cases in future. The study findings indicate facilitating factors and barriers which need to be addressed for effective implementation of MNM guidelines at the district hospitals.
Conclusions: The study findings will help in scaling up the implementation of these guidelines across all district and women's hospitals in India and lead to their effective implementation.

Keywords: Guidelines, Implementation, India, Maternal, Near miss

INTRODUCTION

'Maternal near miss' (MNM) is defined by the World Health Organization (WHO), as, 'a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy'.[1] MNM reviews are 'proxy models' of maternal death, are less 'threatening' to the service providers as the woman survives and she can be interviewed to understand the factors which saved her from this event.

In developing countries, as the maternal mortality ratio (MMR) is declining, the concept of MNM is gaining

importance over last two decades. In India, over the past few years, the MMR has been declining steadily (130/100000 live births (LB), 122/100000 LB and 113/100000 LB for the years 2014-16, 2015-17 and 2016-18 respectively).[2] Maternal death review (MDR) as per the guidelines of Government of India (GOI) is being conducted at all the facilities. However, MNM review has many advantages over MDR. Several studies on MNM have been conducted in India and other developing countries over the past decade, using WHO criteria.[3-25] A study conducted in pilot mode across six medical colleges in India indicated that MNM reporting can yield information to improving quality of care.[26]

Subsequently, GOI released operational guidelines for MNM-review in December 2014. These guidelines are designed to use by program managers at different levels of public health system for conducting systematic MNM-review for improving quality of care and thus reduce maternal morbidity and mortality.[27] Two studies in India document the incidence of MNM cases and the experiences and challenges during implementation of operational guidelines of maternal near miss review of the Government of India at tertiary hospitals in Maharashtra.[28,29] To the best of our knowledge, no published studies have assessed the feasibility of implementing the MNM operational guidelines of GOI at district and women's hospitals in India.

With this background, the present study was conducted with the objective of assessing the feasibility of implementing the MNM-R guidelines at selected district and women's hospitals in Maharashtra, India and documenting the experiences and challenges during this process.

METHODS

An implementation research study was conducted to document the facilitating factors and barriers during implementation of MNM-R operational guidelines of GOI in two women's hospitals (Akola and Parbhani) and three district hospitals (Nasik, Nanded, and Ratnagiri) in Maharashtra, India during April 2018-March 2022. The capacity of the selected hospitals ranges from 500 to700 beds per hospital. The stakeholders at state government were involved in designing and finalizing the protocol of the study.

Sensitization meetings were arranged at all the selected hospitals in coordination with the state authorities. Staff from department of obstetrics and gynecology, medicine, intensive care unit, anesthesia, and surgery participated in these meetings. The maternal death committee at the district hospitals reviewed the MNM cases as per the operational guidelines of GOI. Intensive training was given to the project staff, research assistants (RAs) responsible for data collection. They received an overview of MNM guidelines and were sensitized to the identification of MNM cases. Trained project staff posted at all the five selected hospitals screened women with life threatening complications under guidance of obstetricians identified as nodal officers. These screened women were further categorized into MNM cases as per the eligibility criteria mentioned in GOI guidelines. The project staff visited all the wards, intensive care unit (ICU) and other departments to ensure that no MNM cases were missed.

All pregnant/post-partum women meeting criteria of MNM as per operational guidelines of GOI at the time of admission or during their hospital stay were included in the study. The criteria for identification of MNM cases as per the guidelines of GOI was- either minimum one criterion from each category- clinical findings (either symptoms or signs), investigations and interventions must be met; or single criteria that signified cardio respiratory collapse should be present. The clinical findings, investigations and interventions were put under three broad categories-pregnancy specific obstetric and medical disorders, pre-existing disorders aggravated during pregnancy and accidental/incidental disorders of pregnancy. These categories were further segregated under adverse events such as hemorrhage, sepsis; hypertension etc. Admitted pregnant/post-partum women not meeting criteria of MNM as per operational guidelines of GOI were excluded from the study.

Women were interviewed on a day prior to discharge when they were stable and their relatives' provided details if needed. The information was filled in a structured quantitative facility based MNM form as per operational guidelines of GOI. A software was developed by investigators at the NIRRCH for data entry. Data was entered by RA and approved and submitted by the nodal officer at the selected hospitals using the software. It was finally approved by investigator at NIRRCH. Data from the online software was imported and analyzed in SPSS version 19.0 (IBM, Armonk, NY, USA).

All MNM cases identified were discussed in detail during the maternal death/MNM review meeting conducted every month at the selected hospitals during the study period. Criteria for MNM cases, factors influencing MNM and delays occurring on the basis of three delay model; level one (delay in decision to seek care), level two (delay in reaching care) and level three (delay in receiving adequate health care) were reviewed in detail during these meetings. Recommendations for taking corrective measures based on the gaps identified as per the three-delay model for reducing these MNM cases were also recommended during the meetings. Corrective measures were implemented by the selected hospitals during the period of the study.

The in charge of the district/women's hospitals (civil surgeon and medical superintendents) were actively involved in the implementation of the study. At each selected hospital, a nodal officer as mentioned in the GOI guidelines was identified and he/she facilitated the implementation of the study at these hospitals. The data

collection was done by dedicated staff appointed for the study purpose. The overall co-ordination of the study was done by state government officials, NIRRCH research team Mumbai were responsible for training, supervision and monitoring of the project activities at district hospitals in Nasik, Parbhani and Ratnagiri, while a research team from a tertiary medical college oversaw the women's hospitals in Akola and Nanded.

The study was approved by the NIRRH ethics committee for clinical studies.

RESULTS

During the four-year period (April 2018 to March 2022), 460 women were included as MNM cases as per MNM-GOI guidelines. Thirty-eight per cent women belonged to the age group of 25-30 years, followed by 35.7% in age group 21-24 years. Almost two third (66.3%) women had an education level of 6th to 12th class while only 9.6% women were illiterate. Sixty-five per cent women had below poverty line (BPL) card with them. MCH services data and near miss indicators from the selected district hospitals are mentioned in Table 1.

Table 1: MCH services data and near miss indicators from the selected district hospitals (2018-2022).

Items	Hospitals					Total
	Akola	Nanded	Nashik	Parbhani	Ratnagiri	
Number of deliveries	53717	5701	20952	21294	9186	110850
Number of abortions	2459	55	701	505	418	4138
Number of maternal deaths	16	00	161	14	05	196
Number of MNM cases	125	39	181	59	56	460
Number of live births among MNM	79	37	102	24	37	279
Maternal deaths: MNM	1:7.81	0	1:1.12	1:4.21	1:11.2	1:2.34

Table 2: Distribution of MNM cases as per adverse events (n=460).

*Adverse event as per criteria	Number	Percentage
Pregnancy specific obstetric and medical disorders		
Hemorrhage	297	64.6
Hypertension	106	23
Sepsis	22	4.8
Cardiac failure (cardiomyopathy- antepartum / postpartum)	3	0.7
Postpartum collapse	6	1.3
Preexisting disorders aggravated during pregnancy		
Anaemia	50	10.8
Respiratory dysfunction	15	3.3
Other organ dysfunction#	7	1.5
Diabetic ketoacidosis	1	0.2
#-Liver, cardiac and renal dysfunction		
Incidental and accidental causes in pregnancy		
Infections	1	0.2
Anaphylaxis	6	1.3
Total	514*	

*Multiple adverse events in one woman

Out of the 460 cases, 52.8% cases were admitted as MNM and 69.8% cases were referred from lower facilities to these selected hospitals. Among the 460 cases, majority of the women [354 (77.0%)] received antenatal care (ANC), 43 (9.3%) women did not receive ANC, 39 women had ectopic pregnancies/abortions hence did not receive ANC, while for 24 women data was not available. Regarding care received during ANC, out of 354 women, blood pressure was checked for 331 women (93.5%), 317 women (89.5%) were investigated for hemoglobin levels in the blood, urine was checked in 297 women (83.8%), abdominal examination was done for 250 (70.6%) women and pallor was checked in 252 (71.2%) women. Reasons for not receiving ANC (n=43) were due to lack of awareness about ANC [33 (76.7%)], had lack of accessibility [n=2 (4.6%)], lack of funds [n=2 (4.6%)], and 4 (9.3%) had family problems.

Delivery details were known for 86.1% MNM cases (n=396). Almost all, 386 (97.4%) deliveries occurred at public health facilities while 4 deliveries (1%) were conducted at private health facilities and 6 (1.5%) women

delivered in their homes. Around 115 (29%) women had vaginal delivery and 279 (70.5%) underwent cesarean section. Out of the 396 deliveries, 358 (90.4%) were conducted by specialists, 17 (4.3%) were conducted by resident doctors while 7 (1.8%) were conducted by nurses and only 3 (0.8%) conducted by family members. Out of the 396 deliveries, 125 (31.6%) babies had low birth weight (<2500 gm), while 101 (27.1%) were very low birth weight babies (<1500 gm). In total, there were 115 stillbirths and 281 live births. Among 281 live births, 157 babies were admitted in NICU.

Maternal adverse events

The total number of MNM adverse events was found to be 514 among 460 women. Hemorrhage (64.6%) was the most common adverse event among the MNM cases, followed by hypertension (23%). Among indirect causes, anemia (10.8%) was most common followed by organ system dysfunction (1.5%) (Table 2).

Type of delay reported by MNM cases

Out of 460 MNM cases, 35.2% women reported no delay at any level. Maximum number of women (n=192) reported delay in level I, of which 176 women faced delay in seeking help. The most common reason for delay in level II (n=35) was lack of transport between health facilities (n=10). Among factors causing delay at level III, lack of blood/blood products (n=55) was the most common influencing factor for delay in referral facility while infrastructural issues (n=48) were the most common factor of delay in present facility (Table 3).

Table 3: Distribution of MNM cases according to the level of delay.

Type of delay*		Total (#n =298)	
		N	%
Delay 1 (#n=192)	Delay in women seeking help	176	91.6
	Refusal of treatment or facility	18	9.3
	Refusal of admission in facility	63	32.8
Delay 2 (#n=35)	Lack of transport from home to health care facility	7	20
	Lack of transport between health care facility	10	28.6
	Lack of communication network	4	11.4
Delay 3 with referral (#n= 73)	Infrastructural issues in Referral Facility	35	47.9
	Lack of medications, instruments, equipment's or consumables in referral facility	28	38.3
	non utilization of (available medications, instruments, equipment's, consumables) in referral facility	23	31.5
	Lack of blood/blood products in referral facility	55	75.3
Delay 3 at present facility (#n=56)	Infrastructural issues in present Facility	48	85.7
	Lack of medications, instruments, equipment's or consumables in present facility	37	66
	Non utilization of (available medications, instruments, equipment's, consumables) in present facility	5	8.9
	Lack of blood/blood products in present facility	14	25

*Multiple responses from each woman, #Number of women. No delay was noted in 20 cases and all three delays were noted in 31 cases

Table 4: Recommendation and action taken.

Level of delay	Recommendations and actions taken
Delay I	Primary level corrective measures education of women regarding ANC during pregnancy Sensitization of all family members Education of women about danger signals of pregnancy
Delay II	Alternative options of transport arranged at local level
Delay III	Properly filled referral slip strictly followed by referring hospital. (e.g. time of referring, proper diagnosis and treatment given must be mentioned) Improving quality of ANC Identification of high-risk mothers and early referral to high centre for further management Need of availability of blood products Sensitization and training of health care providers about antenatal management of patients at periphery especially early diagnosis of anemia and PIH

During the MNM-review gaps were identified as per the three delay and corrective measures were recommended accordingly which were implemented by the respective hospitals during the study period as mentioned in Table 4.

At the selected district and women's hospitals, barriers such as incomplete information in case sheets, vacant posts of human resources (specialists, gynecologists, medical officers, other staff), stringent criteria of MNM which need to be revised and a lengthy facility based MNM form) were noted during the implementation of the study. Facilitating factors such as conduction of MDR meetings at these hospitals, identification of actions to be taken as per three delay model and undertaking corrective measures to address the delays were noted. The findings of the study were disseminated and recommendations were sent to Government of Maharashtra and Government of India.

DISCUSSION

The present study describes the facilitating factors and barriers during the implementation of operational guidelines of MNM-review of GOI at the selected district and women's hospitals in Maharashtra state of India. To the best of our knowledge, this is the first of its kind study in which MNM cases were identified as per the criteria in GOI guidelines at district hospital level. Majority of the studies both internationally and in India are done at the tertiary hospital level using the WHO criteria.[3,5-15,17,18,20-24] Very few studies are conducted at district hospitals.[4,16,19,25] An unmatched case-control study was employed amongst women of childbearing age (15-49) in West Shoa Zone public hospitals in Ethiopia. Cases were identified by using modified World Health Organization (WHO) criteria to classify maternal near-miss who were admitted for childbirth or management of pregnancy related problems or within 42 days of delivery to all public hospitals in the study settings.[25]

As per WHO, there are essentially three criteria for identification of MNM, clinical criteria related to a specific disease entity, management-based criteria and organ system dysfunction-based criteria. Hence, there is possibility of more MNM cases being identified as only single amongst the above three is to be met for WHO criteria. However, guidelines of GOI mention that at least one amongst the three categories or cardiorespiratory collapse should be present. Management based criteria by WHO mostly identifies emergency hysterectomy, exploratory laparotomy and intensive care unit (ICU) admissions due to which there is possibility of more cases being classified as MNM. These cases may not be classified as MNM as per GOI guidelines. In case of WHO criteria, there may be inter-study variation in reporting due to the difference in physical and human resources available and the criteria for admission to ICU used in these facilities. The advantage of using GOI guidelines in various settings in India will ensure uniformity in identification of MNM cases and implementation of corrective measures.

In the present study, ratio of MNM to maternal deaths was 2.34:1.0. This was less as compared to other studies conducted at district hospitals (5:1), (6.2:1) in which WHO criteria was used to classify MNM cases.[4,19]

Majority of the women in the present study (77%) received antenatal care, still they were MNM cases. Hence, improving quality of care during ANC is important including monitoring patient vital signs and blood pressure, as well as checking hemoglobin and the albumin levels of urine for reducing anemia and hypertensive disorders of pregnancy.

Regarding status at admission, out of the 460 cases, 52.8% cases were admitted as MNM. Parbhani had maximum MNM cases at admission (86.4%), followed by Ratnagiri (60.7%) and Nasik (56.9%), which indicates that strengthening the first referral units (sub district and rural hospitals) to cater to basic obstetric emergencies is essential if MNM cases at admission are to be reduced at the district hospitals. The quality of care at these hospitals and also at the primary health centres (PHCs) needs to be improved. Identification of high-risk cases, proper referral and management of these cases would be crucial to reduce MNM and hence also MMR in these districts.

Leading causes of MNM were hemorrhage (64.6%) and hypertensive disorders of pregnancy (23%). Hemorrhage was reported as a leading cause in other Indian studies (40.7%, 43.9% and 42.5%) which is lesser as compared to the present study.[5,8,17] In a study conducted in Brazil, it was reported to be 40.5% which is also less as compared to the present study.[19] However, these studies were conducted at the level of tertiary hospitals. In a study in Ethiopia, hemorrhage was reported to be 30% which is quite less as compared to the present study.

Hypertensive disorders of pregnancy were reported to be 23% in the present study. Similar findings were reported in other Indian studies (23.5-33.1%) and a study conducted in Ethiopia (22.29%).[4,7,17,25] Out of these three studies, only one amongst them is conducted at district hospital level in India; remaining studies have been conducted at tertiary hospitals.[4] In a study conducted at district hospital level in India, hypertensive disorders of pregnancy are reported to be 60% while in other studies conducted at tertiary hospital level it is 38.5-61.2%.[6,8,9,16,18] In the present study, majority of participants, (64.8%) reported delay at various levels. Level one and two delays were reported by 41.7% and 7.6% women respectively. Level three delay at referral centers and at district hospitals was reported by 15.8% and 12.2% women respectively. This data was obtained as per the responses provided by the women during the interviews. Among level one delay, delay in seeking help was reported by 91.6% of women. This finding is higher than a study conducted at six tertiary hospitals of India (60.6%).[26] In a study by Reena et al, it was reported as 6.3% which is quite low as compared to the present study.[11] This may due to the setting of the study (tertiary hospital) and educational level of women in this

study conducted in Kerala, India in which 90.6% of women were educated up to higher secondary level as compared to 66.3% in the present study. Delay level two was reported by 7.6% participants in the present study which is lower than that reported by Kulkarni et al, and Purandare et al, as 20.8% and 30.3% respectively.[9,26] Level three delay at the referral centers in this study (15.8%) is much lesser as compared to a study in Mumbai (68.2%) which was conducted at tertiary hospital level.[9] Among delay three at referral facility, lack of blood and blood products was reported to be maximum in the present study, 75.3%, which is higher as compared to that reported in the study reported by Purandare et al (7.6%) conducted at tertiary hospital level.[26] The high percentage of delay three at referral and district hospitals is one of the contributory factors for the high mortality index observed in the present study (24.5%), which is similar to other Indian studies (4.3-36.5%).[3-18] However, the mortality index reported in the studies conducted at district hospitals in India is 16.34 and 13.7 respectively which is less as compared to the present study.[19] This indicates the quality of care related to blood storage and transfusion facilities in the selected referral and district hospitals in the present study needs to be improved.

For reduction of MNM events and maternal deaths in our country, interventions should be undertaken to address all the three delays and at all levels of the public health system. If the critical cases are managed appropriately at the district hospitals, load on the tertiary hospitals will also be reduced. For reducing delay one, patient and family education with focus on identification of danger signals during pregnancy and seeking care early is essential. Transport facilities need to be improved to reduce level two delay. For reducing level three delays at referral facilities, it is essential to strengthen them for dealing with basic obstetric emergencies like hemorrhage and shock. Facilities and infrastructure at the level of district hospitals also needed improvement. Availability of blood and blood products and essential medicines was an important gap to be addressed by both the referral and the district hospitals.

MNM-review (MNM-R) should be undertaken at all the district hospitals in India as per the operational guidelines of GOI to reduce MNM cases and MMR. A study conducted by Kulkarni et al documented the experiences and challenges during implementation of operational guidelines of MNM-R of the Government of India at tertiary hospitals in Maharashtra.[29] The study findings suggest that for implementation of MNMR guidelines at these tertiary hospitals, there is need of dedicated staff; revision of MNM facility based form and critical review of the criteria for identification of MNM cases.

The findings in the present study are similar to this study. However, in the above study at tertiary hospitals, MNM review could not be done during the maternal death review at these hospitals. MNM meetings were conducted separately at tertiary hospitals as the MDR committee was already overworked to review maternal deaths.

CONCLUSION

The study findings indicate facilitating factors such as conduction of MDR meetings at these hospitals, identification of actions to be taken as per three delay model, undertaking corrective measures to address the delays; and barriers such as absence of dedicated staff, stringent criteria of MNM which need to be revised and a lengthy facility based MNM form which should be shortened for the service providers at these hospitals. The study findings will help in scaling up the implementation of these guidelines across all district and women's hospitals in India and lead to their effective implementation. As the findings of the present study have been communicated to Government of Maharashtra and Government of India, there is a need of revision of these guidelines by the Government of India authorities.

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