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Comparison of causes of maternal near miss and maternal mortality in Mahatma Gandhi institute of medical sciences which is Tertiary care rural hospital (Januray 2016 to September 2017)

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ABSTRACT

Introduction: A mother is the foundation of a family and also the very root and foundation of a Nation. Maternal health is a matter of great importance all over the world as it defines the social status of women in a country as well as the quality of health services provided by a Nation to its people.

Materials and Methods: The study was performed in a rural tertiary care institute located in central India. After clearance from the ethical committee of the institute and approval from university for thesis synopsis was received, study was initiated on patients meeting the study requirements from a period of January 2016 to September 2017.

Result: In this study, amongst all cases of Maternal near Miss 36% were due to haemorrhage, 22.4% due to medical disorders, 21.6% due to hypertensive disorders of pregnancy, 15.2% due to infection, and 4.8% were due to labour related disorders. Investigating MNM cases will help to improve the maternal health system more as women has survived catastrophe. Positive feedback to health worker will do miracles.

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1. Introduction

A woman, a mother is the foundation of a family and also the very root and foundation of a Nation. Her health, her well being is not only the responsibility of her family but also the responsibility of the Nation. Maternal health is a matter of great importance all over the world as it defines the social status of women in a country as well as the quality of health services provided by a Nation to its people. Improvement of maternal health is also one of the Sustainable Development Goal, that calls for the significant reduction (to less than 70/lakh live births) of maternal mortality ratio by 2030.¹ In order to reduce the number of maternal deaths it is important to understand the causes leading to the deaths. The causes of maternal

death have been broadly classified by of ICD-10 as pregnancies with abortive outcome, hypertensive disorders in pregnancy, obstetric hemorrhage, pregnancy-related infection, other obstetric complications, unanticipated complications of management, non-obstetric complications, unknown/ undetermined, coincidental causes. Though the categories remain same globally, the causes vary in different countries and regions of the world Maternal Death Review (MDR) is an important strategy to improve the quality of obstetric care and reduce maternal mortality and morbidity. Analysis of these deaths can identify the delays that contribute to maternal deaths at various levels and the information used to adopt measures to fill the gaps in service.² Confidential enquiries into maternal deaths have been in use for many years in the identification of quality of care and health systems issues.³ In any setting, women who develop severe acute complications during pregnancy share

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many pathological and circumstantial factors. A proportion of them narrowly escape death and their numbers are a lot more than those who died. By evaluating these cases with severe maternal outcomes, much can be learnt about the processes in place (or lack of them) for the care of pregnant women.⁴

2. Material and Methods

The study was performed in a Rural tertiary care institute located in central India. After clearance from the ethical committee of the institute and approval from university for thesis synopsis was received, study was initiated on patients meeting the study requirements from a period of January 2016 to September 2017.

This was an observational study which was conducted prospectively.

Time frame will be 21 months.

2.1. Sample size

All the patients coming with MNM and all maternal mortality cases were included in the study. As per historical data, in the last 2 years, retrospective analysis of Maternal Mortality and Maternal Near Miss cases was done. There were 118 cases of Maternal Near Miss and 17 cases of Maternal Mortalities with live births in 2 years being 8904. So expected sample size for Maternal Near Miss was between 110-120 and Maternal Mortality around 15-20.

Sample size formula based on prevalence:

$$N = Z^2 * p(1-p)$$

$$d^2$$

Where

Z= Statistic for the level of significance 5% = 1.96

P= Prevalence of MNM from previous studies =10% =0.10

d= Error of margin =6% =0.05 (Upto 7% error of margin is allowed)

$$N = 1.96^2 * 0.10*(1-0.10) / 0.06^2$$

$$= 96$$

Total sample size of 100 patients is needed

2.2. Inclusion criteria

All the Maternal near miss cases which were diagnosed using Maternal Near Miss Review Operational Guidelines Dec 2014 by Maternal Health Division Ministry of Health and Family Welfare, Government of India from January 2016 to August 2017 in our tertiary care institution were included in the study.

Criteria for diagnosing Maternal Near Miss cases were as per Maternal Near Miss Review Operational Guidelines Dec 2014 given by Maternal Health Division Ministry of Health and Family Welfare, Government of India (Table 1).

Maternal Near Miss case should satisfy Maternal Near Miss Inclusion Criteria. For identifying and classifying MNM case there should be three criteria one from each i.e. from Clinical findings, Investigations and Interventions separately or any single criteria that indicates cardio respiratory collapse from different categories of various adverse events and disorders associated with them. The adverse events categorized are based on;

1. Pregnancy specific obstetric and medical disorders
 2. Pre-existing disorders aggravated during pregnancy
 3. Accidental / Incidental disorders in pregnancy.
- Identify adverse events in each category. For each adverse event elaborate possible disorders/ conditions or complications.

The results of investigations which make women fall under Maternal Near Miss category were identified. The interventions that saved the mother were recorded.

All maternal mortality cases were included in the study. The Maternal Mortality occurring due to accidental and incidental causes were also included in the study.

Facility Based Maternal Death Review (FBMDR) forms and Facility based Maternal Near Miss Review forms as per Government of India guidelines were filled.

2.3. Exclusion criteria

No exclusion criteria for maternal mortality as all cases were included.

Cases not satisfying MNM criteria as per Maternal Near Miss Review Operational Guidelines Dec 2014 by Maternal Health Division Ministry of Health and Family Welfare, Government of India were excluded.

3. Results

In the present study, amongst all cases of Maternal Near Miss 36% were due to haemorrhage, 22.4% due to medical disorders, 21.6% due to hypertensive disorders of pregnancy, 15.2% due to infection, and 4.8% were due to labour related disorders.

Amongst Maternal Mortality cases 34.4% were due to medical disorders, 24.1% due to infection, 13.7% due to haemorrhage, 10.4% due to hypertensive disorders of pregnancy, 13.7% due to incidental/accidental causes and 3.4% were due to labour related disorders.

In this study 72% of MNM cases and 89.7% of MM cases were from rural population and 20% of MNM cases and 10.3% of MM cases were from urban population.

In both MNM and MM patients from rural population were significantly more than urban population. (p value 0.025, < 0.05) Amongst the MNM cases, patient from urban population were significantly more than MM cases. (p value 0.012, < 0.05)

In present study, the contribution of haemorrhage, hypertensive disorders of pregnancy were significantly more in MNM than MM (p value <0.05).

On the other hand Medical Disorders and Incidental/Accidental causes were significantly more in cases of Maternal mortality than in Near Miss. (p value- 0.04 and 0.0001 respectively, <0.5). There was no significant difference in cases due to infection and labour related disorders.

4. Discussion

In the present study Maternal Mortality index was 16% similar to the overall maternal mortality index in the WHO MCS study was 16.1% and for the countries in that study with a moderate MMR, the mortality index was recorded at 5.6%.⁵

Other studies in Sudan, Egypt, Iraq, Brazil also reported similar Maternal Mortality index ranging from 7.8 to 19.5.^{6–11}

A high index (>20%) indicates low quality obstetric care for severe cases, in which more women with severe conditions die. In contrast, a low index (< 5%) indicates better quality of care, with fewer women with severe conditions dying.⁴

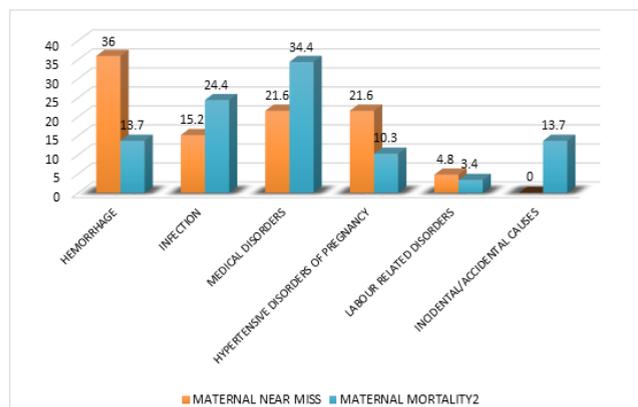


Fig. 1: Comparison of causes of maternal near miss and maternal mortality

In the present study, amongst Maternal Mortality cases 34.4% were due to medical disorders, 24.1% due to infection, 13.7% due to haemorrhage, 10.4% due to hypertensive disorders of pregnancy, 13.7% due to incidental/accidental causes and 3.4% were due to labour related disorders.

Thus medical disorders were the leading cause of maternal mortality in our study which was similar to a study conducted by Siddique et al. in Pakistan 2012 in which MNM due to medical disorders were 31%, in a study by Ali et al. in Sudan 2011, in which medical disorders contributed 25% to MM and was the 2nd leading cause of MM, 18.5% in a study in Nigeria and 17.4% in a study conducted in

Karnataka, India.^{7,12–14} Unlike other studies^{1–3,10,12,15–20} haemorrhage was not seen as a major cause of mortality in our study.

Over the years with increased vigilance and care on the preventable causes of Maternal Mortality like hemorrhage, hypertension their number and contribution to mortality seems to be decreasing whereas medical disorders like severe anemia, heart diseases, diabetes, chronic medical illnesses, ARDS and other conditions like acute pancreatitis, pulmonary hypertension etc. seems to have more contribution in the causes of Maternal Mortality.

The second leading cause of Maternal Mortality was sepsis which contributed 24.4% of the cases which was similar to a study conducted by Ali et al. in Sudan 2011, in which sepsis contributed 35% to MM and was the leading cause of Maternal Mortality.¹² Sepsis (52.2%) was the leading cause in a study conducted in Karnataka, India.¹⁴ Sepsis remained one of the major causes in many other studies conducted in developing countries like Nigeria (18%) and Pakistan (26%).^{13,16} Sepsis was seen to be 3rd leading cause of Maternal mortality contributing 11% in a study conducted by the Government of India from 1997 to 2003, 17% in a study by Montgomery et al. 2014 and other studies conducted in developing countries.^{2,3,7,12,21} According to Say et al. 2014 in their systemic analysis of causes of maternal death over the year 2003 to 2012 in 115 countries, almost all sepsis deaths were recorded in the developing countries, and the proportion of such deaths was highest at 13.7% in southern Asia.¹

In the present study the third leading cause of Maternal Mortality was haemorrhage contributing 13.7% which was similar to another study conducted in India in which haemorrhage contributed 17.4%,¹⁴ but in contrast to other studies in which haemorrhage was leading cause of Maternal Mortality.^{1–3,7,10,12,16–20}

In the present study HDPs contributed to 10.3% of the Maternal Mortality which was similar to the study conducted by the Government of India from 1997 to 2003 in which HDPs were 5% and in the systemic analysis of causes of maternal death over the year 2003 to 2012 in 115 countries by Say et al 2014 in which HDPs were 14%, and 7% in a study by Montgomery et al, 15% by Shah et al. and 16.9% by Onah et al.^{1–3,16,17}

Labour related disorders in the present study contributed 3.4% of cases which was similar to 5% in a study conducted by Ali et al, 2011 and 7% in a study conducted by Government of India.^{3,12} Some studies in Pakistan and Nigeria have reported a much higher percentage of 10–16.9%.^{13,16}

In the present study, amongst all cases of Maternal Near Miss 36% were due to haemorrhage, 22.4% due to medical disorders, 21.6% due to hypertensive disorders of pregnancy, 15.2% due to infection, and 4.8% were due to labour related disorders.

Table 1: Causes of maternal near miss and maternal mortality

		Maternal near miss		Maternal mortality	
		No.	%	No.	%
Hemorrhage	Abortion	4	3.2	1	3.4
	Ectopic	4	3.2	1	3.4
	Placenta praevia	4	3.2	0	0
	Abruption	9	7.2	0	0
	Intrapartum bleeding	4	3.2	0	0
	Postpartum bleeding	20	16	2	6.8
	Total	45	36%	4	13.7%
Infection	Antepartum	6	4.8	1	3.4
	Postpartum	13	10.4	6	20.6
	Post abotal	0	0	0	0
	Total	19	15.2%	7	24.1%
Hypertensive disorders of pregnancy	Gestational htn	1	0.8	0	0
	Pre eclampsia	2	1.6	0	0
	Eclampsia	15	12	1	3.4
	Hellp syndrome	9	7.2	2	6.8
	Total	27	21.6%	3	10.34%
Medical disorders	Anemia	14	11.2	3	10.3
	Heart disease	5	4	0	0
	Lower respiratory tract infections	1	0.8	0	0
	Ards	3	2.4	3	10.3
	Others	5	3.2	4	17.2
	Total	28	22.4%	10	34.4%
Labour related disorders	Rupture uterus	4	3.2	1	3.4
	Inversion of uterus	2	1.6	0	0
	Any other	0	0	0	0
	Total	6	4.8%	1	3.4%
Incidental/accidental cause		0	0	4	0
	Total	0	0	4	13.7%
Total		125		29	

Thus, haemorrhage was the leading cause in Maternal Near Miss cases contributing to 36% which was similar to other studies done in England, Malaysia, Sudan, Iraq, Nepal, Pakistan, India.^{9,12–14,22–26}

In the present study amongst MNM cases due to haemorrhage, postpartum haemorrhage was 44.4%, Intrapartum haemorrhage 8.8% Abruption 20%, placenta praevia 8.8%, ectopic pregnancy 8.8%. These findings were similar to a study conducted in Pakistan by Siddique et al in which PPH was 43.5%, Abruption 20.5%, placenta praevia 7.6%, ectopic pregnancy 15.3%.¹³ In a similar study conducted in Sudan by Ali et al, amongst MNM, PPH was 23.2%, Abruption 7.9%, placenta praevia 3.5%, ectopic pregnancy 4.4%.¹² In a study conducted in Malaysia, postpartum hemorrhage was 50%, ectopic pregnancy 6% and abruptio placenta 8%.²⁴ The finding that postpartum hemorrhage contributes the largest proportion is in line with the findings of other severe maternal morbidity and maternal near miss studies (23 to 48.5%).^{12,13,22,24,27,28} In our study, most of the cases of postpartum hemorrhage were due to uterine atony (55%), consistent with studies reported elsewhere.^{8,29}

The second leading cause of Maternal Near Miss in the present study was medical disorders i.e 22.4% and of all the cases of MNM due to medical disorders, MNM due to severe anaemia was 50%, 17.8% due to heart disease, 1 (3.5%) due to LRTI, 3 (10.7%) due to ARDS and 17.8% due to other causes. In another study conducted in India by Pandey et al in 2014, MNM due to medical disorders were 25.9%, of which 70% were due to anaemia, 18.2% due to heart disease 1% due respiratory illnesses and 6.9% due to other disorders.²¹ In a study conducted in Sudan by Ali et al. MNM due to medical disorders were 11.8%, 19.8% in a study in Pakistan by Siddique et al. 2012, 15% in a study in India, by Purandare et al 2013 and 7% in a study in Nepal by Rana et al 2013.^{7,13}

In the present study anaemia was seen in 57.6% of MNM cases of which 19.4% directly resulted in Maternal Near Miss. Of the medical disorders 50% was contributed by anaemia. Of the indirect causes of severe maternal outcomes, anaemia was the most common in developing countries. This was noted in the WHO MCS study as well as in other studies in developed countries.^{4,5,9}

In our study amongst both MNM and MM the contribution of medical disorders were more probably because, over the years more attention and input have been made into reducing percentage of cases of MNM and MM due to hemorrhage, hypertension and sepsis, which has reduced their contribution in the present scenario, thus making other causes more relevant.

In the present study, HDPs were 3rd leading cause of MNM. In cases of hypertensive disorders of pregnancy (21.6%) in MNM cases, 55.5% were contributed by eclampsia, 33.3% by HELLP syndrome, 7.4% by preeclampsia and 3.7% by gestational hypertension. The findings in our study was found to be in line with other studies done in Sudan, Nepal, India, Pakistan in which HDPs causing MNM were between 16-26%.^{7,13,21,22}

Eclampsia was the major cause amongst cases with HDPs in the present study similar to studies conducted in other developing countries where eclampsia contributed to more than 50% of all cases with HDPs.^{7,13,22}

In the present study Infection/sepsis contributed 15.2% of all cases of MNM which was similar to 17% in a study by Bibi et al, 2008, in Pakistan, 16.5% in a study by Amorim 2008, in Brazil, 16.3% in a study by Roopa et al, 2013, India.¹⁴

However, some studies conducted in Tanzania (4%), Brazil (10%), Pakistan (8.1%), India(4.4 – 6.5%), reported a low rate of infection amongst MNM cases ranging between 4-10%^{12,13,21} which is even lower in studies conducted in developed countries(0-2.6%).⁷

The present study was conducted in a rural setup and receives referrals from all the nearby villages and towns hence contributing to a large number of the cases of infection amongst MNM cases (78.9% of cases with infection).

In the present study labour related disorders contributed to 4.8% of all MNM cases of which rupture uterus was 66.6% and 33.3% was due to uterine inversion which was in line with a study conducted by Rana et al in Nepal in 2013 in which labour related disorders contributed to 6% of cases and 5%, 5.1% and 6% in studies conducted in Sudan, India & Brazil respectively.^{7,21} The findings in our study was lower than those of other studies conducted in developing countries which report much higher rates ranging from 9% to as high as 31%.^{10,12,13}

The case fatality rates observed in the present study were 8.1% for haemorrhage, 26% for infection/sepsis, 10% for hypertensive disorders of pregnancy, 26% for medical disorders, 14.2% for labour related disorders. Similar findings were reported in a study by Prual et al in 2000 case fatality rates reported were very high for sepsis (33%), uterine rupture (30%), eclampsia (18%) and hemorrhage (5.7%).³⁰ Kaye et al(2011)reported that case fatality rates for hemorrhage ranged from 2.8% to 27.3%,for sepsis, it ranged from 0.0% to 72.7%.¹¹ In a cross-sectional study was conducted in a tertiary care hospital of Karachi, in 2012,

case fatality rates of sepsis (35%) and miscellaneous (30%) groups were the highest.¹³

In a study by Pandey et al. (2014) case fatality was 14.7% for medical disorders, 14% for sepsis, 11% for hypertensive disorders, 12% for haemorrhage and 9% for labour related disorders which was similar for all disorders except for sepsis and medical disorders.²¹

Thus, though the prevalence of haemorrhage was more in our study case fatality rates were higher for infection and medical disorders.

5. Source of Funding

None.

6. Conflict of Interest

The authors declare no conflict of interest.

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