



Pulmonary Medicine

DETERMINANTS OF MATERNAL NEAR MISS AMONG WOMEN ADMITTED TO TERTIARY CARE HOSPITAL, AJMER

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ABSTRACT **Background:** A woman who was close to death due to a life threatening condition that occurred during pregnancy, childbirth, or within 42 days of delivery, but she survived is known as maternal near miss (MNM). Major reasons and causes are excessive blood loss, sepsis, hypertensive disorder of pregnancy, unsafe abortion, obstructed labour, anemia, malaria, and heart disease, which are also the causes for maternal death. MNM cases are more common than maternal death cases. MNM is a surrogate indicator for maternal health. **Methodology:** It is a hospital based cross sectional study done in tertiary care hospital, Ajmer. The objective of study is to know various determinants of MNM cases who comes in Rajkiya Mahila Chikitsalya of tertiary care hospital, Ajmer. Study period was of 6 month from November 2021 to April 2022. **Results:** During study period 80 MNM cases and 18 maternal deaths were observed. Hypertensive disorders in pregnancy (Chronic hypertension, severe PIH, severe preeclampsia with signs of organ dysfunction, severe eclampsia with organ dysfunction and HELLP syndrome) was the most common causes of maternal near miss during study period. 35(43.75%) out of 80 MNM cases. out of 18 maternal death, 8 (44.44%) were due to post-partum hemorrhage(PPH), 5 (27.28%) were due to sepsis, 3 (16.67%) were due to severe anemia with CCF and 2 (11.11%) were due to hypertension complicating pregnancy. Educational status of all MNM cases, 28(35%) cases were illiterate while 52(65%) cases were literate. Among literate below primary 11(21.15%), primary 22(42.31%), secondary 15(28.85%) and higher secondary 4(7.69%) were observed. Working status of patients' majority of them were housewives 62(77.5%), while 18(22.5%) near misses were working women. There were 47(58.75%) cases from rural areas, 17(21.25%) cases were from tribal areas and 16(20%) cases were from urban areas. Most of the cases were from rural area. According to Modified Prasad classification of socio-economic status, 28 patients (35%) fall into lower class with per capita income below 1230 per month. 20 patients (25%) in upper lower class, 13(16.25%) in lower middle, 10(12.5%) in upper middle class and 7(8.75%) patient fall into category of upper class. Mean time spent for seeking treatment from onset of symptoms to reaching 1 health facility by patients was 73.71 ± 23.78 and median being 60 minutes. Mean and median time spent for travelling distance from 1 centre to 2 centre was 39.60 ± 15.94 and 30 minutes, and from last referral centre to RMC was 53.14 ± 24.05 and 60 minutes. But mean time spent from onset of symptoms to reaching RMC was 141.00 ± 45.02 and median 145 minutes observed. **Conclusion:** Identification of various maternal near miss determinants helps us in knowing the pattern of maternal death, Maternal Near Miss analysis helps us in identification of risk factors and their prevention which helps in reducing the maternal death.

KEYWORDS : MNM, PIH, PPH

INTRODUCTION

A woman who was close to death due to a life threatening condition that occurred during pregnancy, childbirth, or within 42 days of delivery, but she survived is known as maternal near miss.⁽¹⁾⁽²⁾ Maternal near miss cases are more common than maternal deaths.⁽³⁾ Complications during antenatal, natal, and the postnatal period have reduced by 38% in the last two decades, but at an average reduction is yet less than 3% per year.⁽⁴⁾ Commitment has been done by India itself for the SDGs for MMR at 70 per 1, 00,000 live births by 2030. As per National Health Policy 2017, the target for MMR is 100 per 1,00,000 live births by 2020.⁽⁵⁾ Major reasons and causes are the same for both maternal near miss cases and maternal death which are excessive blood loss, sepsis, hypertensive disorder of pregnancy, unsafe abortion, obstructed labour, anemia, malaria, and heart disease.⁽⁶⁾ Therefore study of causes responsible for maternal near miss is useful in identification of preventable factors so that maternal morbidity and mortality can be reduced. Investigating maternal near miss is less threatening to health care providers because the patient survived. Objectives of this study is to know the various determinants and underlying causes of MNM cases.

MATERIALS AND METHOD

A hospital based cross-sectional study was done, it includes all MNM (Maternal Near Miss) cases for a period of 6 month from November 2021 to April 2022 in tertiary care hospital, Ajmer. Statistical analysis was done using frequency and percentage. Continuous data was calculated as Mean $\pm$ S.D. A 'P' value <0.05 was considered as significant. A pre-tested semi-structured questionnaire was used for interviewing patients.

RESULTS AND DISCUSSION

Table:1 Most Common Causes of Maternal Near Miss (n=80) During Our Study Period

S.No.	Causes	(n)	(%)
1.	Hypertensive Disorders in Pregnancy- Chronic hypertension, Severe PIH, Severe preeclampsia with signs of organ dysfunction, severe eclampsia with organ dysfunction, HELLP syndrome	35	43.75 %

2.	Severe Hemorrhage- Hemorrhage due to RPOC and inevitable Abortion, Ruptured ectopic pregnancy, Placenta praevia, Placental abruption, intra operative hemorrhage, Rupture uterus, Severe post-partum hemorrhage, Hemorrhage due to retained Placenta, Genital tract injuries and large hematomas	33	41.25 %
3.	Severe Systemic Infection or Sepsis- Septic abortion, Puerperal sepsis, Postsurgical procedure severe infection (E.g. Cesarean section.	8	10%
4.	Very Severe Anemia- (5 or more units blood transfusion/PRBCs and multiple doses of iron sucrose)	3	3.75%
5.	Renal Dysfunction Oliguria needed multiple doses of diuretics/ dialysis, acute renal failure.	1	1.25%

Table 1 shows Hypertensive disorders in pregnancy (Chronic hypertension, severe PIH, severe preeclampsia with signs of organ dysfunction, severe eclampsia with organ dysfunction and HELLP syndrome) was the most common causes of maternal near miss during study period. 35(43.75%) out of 80 MNM cases. A highly significant association was observed between maternal near miss events and their causes ($P < 0.001$).

In our study 43.75% out of 80 maternal near miss were observed due to hypertensive disorders in pregnancy. Similar finding was observed by Oppong SA et al⁽¹⁹⁾ (2019), 41.0% of near-miss due to pre-eclampsia/eclampsia. Where as Surovi FA et al⁽²⁰⁾ (2022) observed 52.3%(23) of near-miss due to hypertensive disorder of pregnancy which was more as compared to our study. Where as Sharma C et al⁽⁸⁾ (2021), Singh V et al⁽⁹⁾ (2021) and Ps R et al⁽¹⁰⁾ (2013) observed 21.15%(11), 25.5%(39) and 23.6%(31) respectively which was less as compared to our study. 33(41.25%) maternal near miss cases were due to severe hemorrhage (Hemorrhage due to RPOC and inevitable Abortion, Ruptured ectopic pregnancy, Placenta praevia, Placental abruption, intra operative hemorrhage, Rupture uterus, Severe post-partum hemorrhage, Hemorrhage due to retained Placenta, Genital

tract injuries and large hematomas). In our study 41.25% (33) MNM cases were observed due to severe hemorrhage. Similar finding observed by Singh V et al⁽⁹⁾(2021) and Ps R et al⁽¹⁰⁾(2013) was 40.5%(62) and 44.2%(58) respectively. Where as Oppong SA et al⁽⁶⁾(2019), Surovi FA et al⁽⁷⁾(2022) and Sharma C et al⁽⁸⁾(2021) observed 12.2%(35), 31.8%(14) and 30.77%(16) respectively which was less as compared to our study. In our study 10%(8) cases of MNM were observed due to sepsis(Septic abortion, Puerperal sepsis, Postsurgical procedure severe infection E.g. Cesarean section). Similar finding was observed by Oppong SA et al⁽⁶⁾(2019). 11.1% of MNM cases due to sepsis. Where as Ps R et al⁽¹⁰⁾(2013) observed 16.3% MNM due to sepsis which was more as compared to sepsis 10% in our study. 3(3.75%) MNM cases were due to very severe anemia who required 5 or more units blood transfusion / PRBCs and multiple doses of iron sucrose. Where as Vishnoi IB et al⁽³⁾(2020) observed 13.20% cases due to very severe anemia, which was more as compared to our study. Only 1(1.25%) MNM case was due to renal dysfunction (Oliguria needed multiple doses of diuretics/ dialysis, acute renal failure). Where as Vishnoi IB et al⁽³⁾(2020) observed 2.51% cases due to renal dysfunction which was more as compared to our study.

Table: 2 Causes of Maternal Mortality (n=18) During Study Period

S.No	Cause	No. of patients(n)	(%)
1.	post-partum haemorrhage	8	44.44%
2.	sepsis	5	27.28%
3.	Severe anemia with CCF	3	16.67%
4.	Hypertension complicating pregnancy	2	11.11%

Table 2 shows that out of 18 maternal death, 8 (44.44%) were due to post-partum hemorrhage, 5 (27.28%) were due to sepsis, 3 (16.67%) were due to severe anemia with CCF and 2 (11.11%) were due to hypertension complicating pregnancy. Although maximum number of cases of maternal death were due to post-partum hemorrhage but no significant association was found as P value obtained is 0.198 which is less than 0.05.

44.44% maternal deaths due to hemorrhage was observed in our study. Similar finding was observed by Ganvir PP et al⁽¹¹⁾(2020) 41.66% maternal deaths due to hemorrhage. Where as Singh V et al⁽⁹⁾(2021), Sarkar P et al⁽¹²⁾(2020) and Rathod AD et al⁽¹³⁾(2016) observed 23.7%, 10.8% and 19.79% respectively which was less as compared to our study. 27.28% maternal deaths due to sepsis was observed in our study. Similar finding was observed by Singh V et al⁽⁹⁾(2021) and Ganvir PP et al⁽¹¹⁾(2020) 23.7% and 25% respectively. Where as Sarkar P et al⁽¹²⁾(2020) and Rathod AD et al⁽¹³⁾(2016) observed 21.6% and 18.18% respectively which was less as compared to our study. 16.67% maternal deaths due to severe anemia with CCF was observed in our study. Where as Vishnoi IB et al⁽³⁾(2020) observed 12.5% maternal deaths due to severe anemia with CCF, which was less as compared to our study. 11.11% maternal deaths due to hypertensive disorder of pregnancy was observed in our study. Where as Ganvir PP et al⁽¹¹⁾(2020) observed 8.33% maternal deaths due to hypertensive disorder of pregnancy which was less as compared to our study. Where as Singh V et al⁽⁹⁾(2021), Sarkar P et al⁽¹²⁾(2020), Rathod AD et al⁽¹³⁾(2016) and Tallapureddy S et al⁽¹⁴⁾(2017) observed 15.8%, 40.5%, 27.27% and 66.6% respectively which was more as compared to our study.

Table 3. Distribution of Maternal Near Miss Cases According to Socio-demographic Criteria

S.No	Criteria	Number of near miss cases	(%)
1.	Education	52	65%
	literate	11	21.15%
	a.Below primary	22	42.31%
	b.Primary	15	28.85%
	c.Secondary	4	7.69%
	d.Higher secondary	28	35%
	Illiterate		
2.	Occupation of mother		
	Housewife	62	77.5%
	working woman	18	22.5%
3.	Residence		
	a. Urban	16	20.00%
	b. Rural	47	58.75%
	c. tribal	17	21.25%

4.	Socio-economic status (As per modified Prasad classification)		
	I (8220 and above)	7	8.75%
	II (4110-8219)	10	12.5%
	III (2465-4109)	13	16.25%
	IV (1230-2464)	20	25%
	V (< 1230)	28	35%
5.	History of ANC visit		
	Yes	65	81.25%
	If yes, no. of ANC visit	2	3.08%
	1	15	23.08%
	2	9	13.84%
	3	39	60%
	= or >4		
	No	15	18.75%
6.	Iron and folic acid tablet consumption (n=80)		
	Yes,If Consumed, duration	60	75%
	<90 days	40	66.67%
	>90 days	20	33.33%
	No	20	25%
7.	Age at marriage	19	23.75%
	<18 yr		
	>18 yr or =18	61	76.25%

Table 3 shows distribution of maternal near miss cases according to socio-demographic criteria. On looking at the educational status of all MNM cases, 28(35%) cases were illiterate while 52(65%) cases were literate. Among literate below primary 11(21.15%), primary 22(42.31%), secondary 15(28.85%) and higher secondary 4(7.69%) were observed. Though literacy increases awareness among women regarding importance of antenatal care, iron & folic acid consumption, taking treatment during complication, institutional delivery, etc, In our study 35.71% MNM were observed to be illiterate. Similar finding was observed by Kaur N et al⁽¹⁵⁾(2016) 35% MNM illiterate. Where as Vishnoi IB et al⁽³⁾(2020) and Kumari S et al⁽¹⁶⁾(2020) observed 49.69%, and 73.9% respectively which was more as compared to our study. In our study 65% MNM were observed literate. Similar finding was observed by Kaur N et al⁽¹⁵⁾(2016) 64.29% MNM literate. Where as Vishnoi IB et al⁽³⁾(2020) and Kumari S et al⁽¹⁶⁾(2020) observed 50.31%, and 26.1% respectively which was less as compared to our study.

When we look upon the working status of patients' majority of them were housewives 62(77.5%), while 18(22.5%) near misses were working women. The association between occupation status and near-miss events is highly significant. 22.5% near misses were working women in our study. Where as Kurugodiyavar MD et al⁽¹⁷⁾(2019) observed 3.1% MNM working woman, which was less as compared to our study. 77.5% near misses were housewife in our study. Where as Kurugodiyavar MD et al⁽¹⁷⁾(2019) observed 96.9% MNM housewife which was more as compared to our study.

There were 47(58.75%) cases from rural areas, 17(21.25%) cases were from tribal areas and 16(20%) cases were from urban areas. Most of the cases were from rural area. Chi square value obtained is 23.275% and P-value <0.05 shows that these results are highly significant. 58.75% cases from rural were observed in our study. Similar finding was observed by Vishnoi IB et al⁽³⁾(2020) 61% MNM cases from rural area. 20% cases from urban area observed in our study. Where as Vishnoi IB et al⁽³⁾(2020) observed 38.99% MNM cases from urban area which was more as compared to our study.

According to Modified Prasad classification of socio-economic status, 28 patients (35%) fall into lower class with per capita income below 1230 per month. 20 patients (25%) in upper lower class, 13(16.25%) in lower middle, 10(12.5%) in upper middle class and 7(8.75%) patient fall into category of upper class.

Patients who belong to upper and upper middle class can afford delivery or treatment of minor ailments, but can't afford higher cost of complication therefore they were referred to Rajkiya Mahila Chikitsalya. A highly significant association was found between socio-economic status and maternal near miss events as P value obtained is 0.001. 35% MNM cases were from lower class in our study. Where as Kumari S et al⁽¹⁶⁾(2020) observed 70.9% cases from low class which was more as compared to our study. 16.25% MNM cases were from lower middle class in our study. Where as Kumari S et al⁽¹⁶⁾(2020) observed cases 23.3% from low class which was less as compared to

our study. 25% cases were from upper lower class in our study. Where as Kumari S et al⁽¹⁶⁾ (2020) observed cases 6.4% from upper lower class which was less as compared to our study.

Out of total near miss cases, 65 patients (81.25%) have taken antenatal visits. Out of them 2 patients (3.08%) had taken only 1 antenatal visit, 15 patients (23.08%) had taken 2 antenatal visits, 9(13.84%) patients had taken 3 antenatal visits and 39 patients had taken 4 or >4 antenatal visits. There were 60% maternal near miss cases even after taking 4 or > 4 ANC visit. This may be due to delayed or missed identification of pregnancy related complication during ANC visits. In our study mean of number of ANC was observed 3.38 ± 1.03 , where as Kurugodiyavar MD et al⁽¹⁷⁾ (2019) observed 7.41 ± 1.39 which was more as compared to our study.

Among near miss cases. Out of 80 patients who consumed Iron and folic acid tablets were 60(75%) while, 20(25%) did not consume Iron and folic acid tablets. This may be due to less Iron folic acid consumption duration in most of the patients. There were only 20 patients (33.33%) had consumed Iron and folic acid tablets for more than 90 days, while 40 patients (66.67%) consumed for < 90 days. A statistically significant association was observed between duration of Iron folic acid tablet consumption and maternal near miss events (P value=0.010)

In our study 75% cases were who consumed iron and folic acid tablets. Where as Parmar NT et al⁽¹⁸⁾ (2016) observed 67.39% cases which was less as compared to our study. In our study 33.33% of cases, consumed iron folic acid for duration of > 90 days. Similar finding was observed by Parmar NT et al⁽¹⁸⁾ (2016) 32.26% cases consumed for duration of > 90 days.

There were 61(76.25%) MNM cases who were married at age of 18 years or more than that. While 19(23.75%) MNM cases were married at age of less than 18 years. Mean $\pm$ S.D. for age at marriage among near miss was observed 18.85 ± 1.71 . Mean $\pm$ S.D. value for age at marriage among near miss was observed 18.85 ± 1.71 in our study. Similar finding was observed by Kurugodiyavar MD et al⁽¹⁷⁾ (2019) Mean $\pm$ S.D. for age at marriage among near miss 19.52 ± 2.712 .

Table 4. Time Spent for Seeking Treatment

	Mean(+ SD) (in minutes)	Median (in minutes)	Range of time spent for seeking treatment in minutes
From onset of symptoms to reaching 1 st center(n=70)	73.71 ± 23.78	60.00	20-120
From 1 st center to 2 nd center(n=25)	39.60 ± 15.94	30.00	20-60
From last referral center to RMC(n=70)	53.14 ± 24.05	60.00	30-90
From onset of symptoms to reaching RMC(n=80)	141.00 ± 45.02	145.00	20-270

Table 4 shows time spent for seeking treatment. Mean time spent for seeking treatment from onset of symptoms to reaching 1st health facility by patients was 73.71 ± 23.78 and median being 60 minutes. Mean and median time spent for travelling distance from 1st centre to 2nd centre was 39.60 ± 15.94 and 30 minutes, and from last referral centre to RMC was 53.14 ± 24.05 and 60 minutes. But mean time spent from onset of symptoms to reaching RMC was 141.00 ± 45.02 and median 145 minutes observed. This duration could have been decreased if complications or danger signs and symptoms were pre-identified.

In our study median time of 60 minutes from onset of symptoms to reaching 1st center was observed. Where as Parmar NT et al⁽¹⁸⁾ (2016) observed median time of 90 minutes from onset of symptoms to reaching 1st center which was more as compared to our study. In our study median time of 30 minutes from 1st center to 2nd center was observed. Similar finding was observed by Parmar NT et al⁽¹⁸⁾ (2016) median time of 27 minutes from 1st center to 2nd center. In our study median time of 60 minutes from last referral center to RMC was observed. Where as Parmar NT et al⁽¹⁸⁾ (2016) observed median time of 90 minutes which was more as compared to our study. In our study

median time of 145 minutes from onset of symptoms to RMC was observed. Where as Parmar NT et al⁽¹⁸⁾ (2016) observed median time of 450 minutes which was more as compared to our study.

Limitation

Local protocol for the MNM assessment is a better tool in context of local factors. More evidence-based studies must be done for the implementation of local protocol in the facility. New maternal near miss guidelines and its proper implementation by Government of India is also required.

CONCLUSION

Hypertensive disorders, Hemorrhage and sepsis are the leading causes of near miss situations. The majority of cases were near miss on arrival at Rajkiya Mahila Chikitsalya, which attribute to failure of recognition of the conditions leads maternal morbidity-Prehospital Delay. Maternal Near Miss analysis helps us in identification of risk factors and their prevention which helps in reducing the maternal death. It is a surrogate indicator for maternal health.

REFERENCES

1. Maternal Near Miss Review. Operational Guidelines 2014. Maternal Health Division, Ministry of Health & Family Welfare, Government of India.
2. Sinha M, Goel J, Sah S, Goel R, Chaurasia R. Severe acute maternal morbidity: study of epidemiology and risk factors. *Int J Reprod Contraception, Obstet Gynecol.* 2016;5(7):2141-5.
3. Vishnoi IB, Bhati I. A Study on Maternal Near Miss Cases in a Tertiary Care Centre in Western Rajasthan. *IOSR-JDMS* 2020; 19(5) Ser.3, PP06-13.
4. World Health Organization. Maternal Health - Global.
5. Maternal & Adolescent Healthcare. Chapter 3. Annual Report, 2017-2018, 25-33.
6. Oppong SA, Bakari A, Bell AJ, Bockarie Y, Adu JA, Turpin CA, Obed SA, Adanu RM, Moyer CA. Incidence, causes and correlates of maternal near-miss morbidity: a multi centre cross-sectional study. *BJOG.* 2019; 126 (6) : 755-762.
7. Surovi FA, Noor S, Ali SMI, Sultana A : Maternal Near Miss in A Tertiary Care Hospital : An Observational Study. *Chattogram Maa-O-Shishu Hospital Medical College Journal* 2022; 21 (1) : 57-60.
8. Sharma C, Yadav A, Mehrotra M, Saha MK, Tambe RR. Maternal Near Miss: Unraveling Our Experience in the Tertiary Care Hospital of Andaman and Nicobar Islands. *Indian J Community Med.* 2021; 46 (1) : 35-39.
9. Singh V, Barik A. Maternal Near-Miss as a Surrogate Indicator of the Quality of Obstetric Care: A Study in a Tertiary Care Hospital in Eastern India. *Cureus* 2021; 13(1): e12548.
10. Ps R, Verma S, Rai L, Kumar P, Pai MV, Shetty J. "Near Miss" obstetric events and maternal deaths in a tertiary care hospital: An audit. *J Pregnancy.* 2013;2013:393758.
11. Ganvir PP, Thakare S. A study on maternal near miss cases in tertiary care center, Chandrapur, Maharashtra, India. *Int J Reprod Contraception, Obstet Gynecol.* 2020;9(9):3602.
12. Sarkar P, Baidya JL, Rakshit AK. A study to assess proportion of the maternal near miss to maternal death in a tertiary care teaching hospital of North East India. *Int J Reprod Contraception, Obstet Gynecol.* 2020;9(6):2486.
13. R-athod AD, Chavan RP, Bhagat V, Pajai S, Padmawar A, Thool P. Anal/ysis of near-miss and maternal mortality at tertiary referral centre of rural India. *J ObstetGynaecol India.* 2016; 66 (Suppl 1) : 295-300.
14. Tallapureddy S, Velagaleti R, Palutla H, Satti CV. "Near-Miss" Obstetric events and maternal mortality in a Tertiary Care Hospital. *Indian J Public Health* 2017; 61 : 305-8.
15. Kaur N, Aryal S. Pattern of Severe Acute Maternal Morbidity in a Tertiary Care Institute. *J Lumbini Med Coll.* 2016; 3(2):45-49.
16. Kumari S, Kapoor G, Sharma M, Bajaj B, Dewan R, Nath B. Study of Maternal Near Miss and Maternal Mortality in a Tertiary Care Hospital. *Journal of Clinical and Diagnostic Research.* 2020, 14(4): QC01-QC06.
17. Kurugodiyavar MD, Andanigoudar KB, Bant DD, Nekar MS. Determinants of maternal near miss events: a facility based case-control study. *Int J Community Med Public Health.* 2019; 6(8): 3614-3620.
18. Parmar NT, Parmar AG, Mazumdar VS. Incidence of Maternal "Near-Miss" Events in a Tertiary Care Hospital of Central Gujarat, India. *J ObstetGynaecol India.* 2016 Oct;66(Suppl 1):315-20.