

Original Research Article

Patterns and causes of maternal mortality in tertiary care hospital in Maharashtra, India: a 10-year retrospective study

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ABSTRACT

Background: Maternal death is a catastrophe, as death of a mother can the entire family. The aim of present study is to find out major patterns, reasons and complications leading to maternal deaths.

Methods: A retrospective study was conducted for last 10 years from January 2013 to December 2022 by studying the records of a tertiary care hospital to study the maternal mortalities and complications leading to death. Maternal deaths were analyzed by considering different facets, such as age at death, gravida, locality of residence, admission death interval and direct and indirect cause/s of death, etc.

Results: During the study period, total of 107753 live births and 202 maternal deaths have been recorded. The average maternal mortality rate of last ten years was 187.46/100000 live births. Age wise maternal mortality during the study period was high in the age 19 to 25. Major direct cause of maternal mortality was postpartum hemorrhage, (23%) and major indirect cause observed was anemia (43%). Admission to death interval time indicates that delay in provision of treatment and referral to tertiary care hospital might be the reason responsible for high maternal deaths.

Conclusions: Maternal deaths can be prevented by improving the health care facilities, ensuring skilled attendants and required basic medication. This is high time to mobilize universal, national, regional, and community-based commitment to decrease maternal mortalities.

Keywords: Causes, India, Maternal mortality, Pattern, Tertiary care hospital

INTRODUCTION

Pregnancy and maternity are usual processes in the life of women passing through reproductive age. These are normally considered to be constructive and accomplishing experiences for women. But due to several reasons, women end up facing death during pregnancy, childbirth or the postpartum phase.¹ Maternal deaths have serious implications to the family, the society and the nation.^{2,3} Social, cultural and political factors together determine the status of women, their health, fertility and health seeking behavior.^{4,5} The causes due to which women die in pregnancy, childbirth and postpartum are

many layered. Behind the medical causes are the logistic causes, unavailability of resources, lack of transport and failure in health care system.

The issues of reducing maternal mortalities by improving maternal health and by providing required medical facilities are the issues emphasized in several international and national policies. Over past few decades, significant achievements in global health care with improved scientific knowledge and the obtainability of modern technology have been noticed. But, despite the efforts, maternal mortality rate reduction remains a serious challenge in the majority of developing nations.

Maternal deaths are associated with both direct and indirect obstetric causes. The direct causes include hemorrhage, hypertensive disorders, obstructed labour, sepsis and hypertensive disorders of pregnancy, which are responsible for about three quarters of maternal deaths worldwide.⁶⁻⁹ A huge majority of maternal deaths are preventable if proper health care is taken and required medication is provided. To reduce maternal mortality and morbidity, the main focus should be on implementing basic and comprehensive obstetrics care.¹⁰

Although there is consistent decline in MMR worldwide, India still contributes the largest number, that is 22% of all maternal deaths.¹² The advancement in the maternal health is still seems to be insufficient. Understanding the causes of mortality and easy access to obstetric services such as skilled birth attendance and emergency obstetric care are vital to improve maternal health. This 10 years retrospective study is aimed to study pattern and causes of maternal mortalities at our tertiary care hospital.

METHODS

This present study is a retrospective study, conducted in the Department of Obstetrics and Gynecology of Dr. Shankarrao Chavan Medical College and Hospital, Nanded, Maharashtra. The details of maternal mortalities from January 2013 to December 2022 were recorded from the maternal mortality register and analyzed by using manual data sheet considering age wise analysis, gravidity wise analysis, sociodemographic records and direct and indirect causes of maternal deaths. During the study period total 107753 live births and 202 maternal deaths have been recorded for analysis purpose. Maternal mortality ratio for the study period was calculated year wise by using the formula: Mean maternal mortality per year divided by total birth per year and multiplied by 100000. Analysis of the information gathered was done manually using collected data sheets.

Inclusion criteria

Maternal deaths occurring during the period of pregnancy and up to 42 days of postpartum period were included.

Exclusion criteria

Maternal deaths that happened due to accidental/incidental reasons were excluded.

RESULTS

During the study period from January 2013 to December 2022, total of 107753 live births and 202 maternal deaths have been recorded. The average maternal mortality rate of last ten years was 187.46/100000 live births. MMR/100000 live births observed during the years 2013 to 2015 and 2018 to 2019 was in the range of 104 to 130. (Table 1).

Table 1: Year wise live births, maternal deaths and MMR (2013 to 2022).

Year	Live births	Maternal deaths
2013	10553	11
2014	11700	15
2015	12280	16
2016	11726	26
2017	12378	27
2018	10074	12
2019	10427	11
2020	8955	20
2021	9021	39
2022	10639	25
Total	107753	202

However, during 2016 to 2017, 2020 and 2022 MMR was in the range of 218 to 235. A significant increase trend of maternal mortality was observed during the year 2021 (Figure 1).

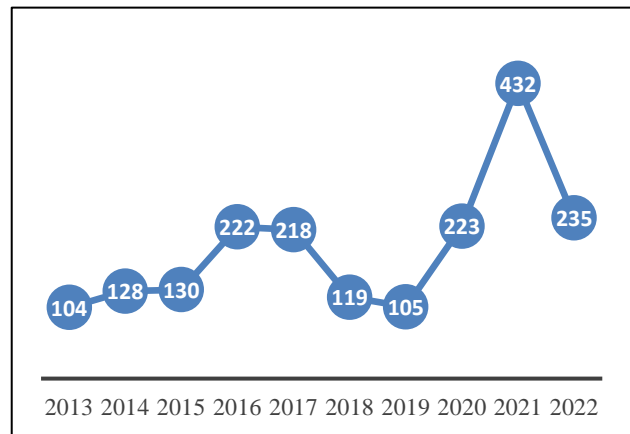


Figure 1: Year wise MMR/100000 live births.

Age wise maternal mortality during the study period was high in the age 19 to 25 i.e., 64.35%; in the age 26 to 30 it was observed 27.72%; in the age 31 to 35 it was 6.43%, however in other age groups it was less than 1%. As far as parity is data is concerned 52.97% were multigravida and 47.02% primigravida. 71.78% patients were from rural area among the mortalities occurred and 81.12% occurred at the stage of postpartum. While the admission and death interval observed 28.71% mortalities within 0 to 6 hours of admission, 17.82% mortalities within the 7 to 12 hours, 26.23% within 13 to 24 hours have been observed (Table 2).

The direct causes of maternal mortality were PPH 23%, eclampsia 22% preeclampsia 19%, APH 17%, which is followed by embolism and other causes 7% each, uterine inversion/ obstructed labour, abortion 2% each and ectopic pregnancy 1% (Table 3).

Table 2: Year wise details of socio-demographic factors, antenatal care, mode of delivery and admission- death interval.

Year/ variables	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total No & (%)
Age wise mortality											
<18	0	0	0	0	1	0	0	0	0	0	1 (0.49)
19-25	5	10	14	18	18	4	8	12	25	16	130 (64.35)
26-30	3	4	2	6	6	4	3	6	14	8	56 (27.72)
31-35	1	1	0	2	2	4	0	2	0	1	13 (6.43)
36-40	2	0	0	0	0	0	0	0	0	0	2 (0.99)
>40	0	0	0	0	0	0	0	0	0	0	0 (0.0)
Parity											
Multigravida	10	6	10	13	12	6	6	11	20	13	107 (52.97)
Primigravida	1	9	6	13	15	6	5	9	19	12	95 (47.02)
Residence											
Rural	6	15	9	20	23	7	6	18	23	18	145 (71.78)
Urban	5	0	7	6	4	5	5	2	16	7	57 (28.21)
Condition at arrival											
Unconscious	4	2	4	0	0	6	5	5	3	3	32 (15.84)
Conscious	6	13	12	24	27	6	6	15	35	21	165 (81.68)
Brought dead	1	0	0	2	0	0	0	0	1	1	5 (2.47)
Stage											
Abortion	-	1	-	-	-	-	-	1	2	-	4 (1.98)
1 st trimester	-	-	-	-	-	-	-	2	-	-	2 (0.99)
2 nd trimester	-	-	-	-	-	-	-	-	-	-	0 (0.0)
3 rd trimester	-	-	-	6	5	-	1	5	1	2	20 (9.90)
Post partum	11	14	16	20	22	12	10	12	36	23	176 (81.12)
Mode of delivery											
LSCS	2	4	7	5	6	2	4	5	17	13	65 (32.17)
Vaginal	9	11	9	21	21	10	7	15	22	12	137 (67.82)
Admission and death interval											
0-6 hrs	7	7	5	6	8	3	4	10	6	2	58 (28.71)
7-12 hrs	0	0	3	4	4	4	2	3	10	6	36 (17.82)
13-24 hrs	1	4	3	5	8	2	3	3	15	9	53 (26.23)
24-48 hrs	1	1	1	1	3	2	0	0	3	0	12 (5.94)
48-78 hrs	1	1	2	1	2	0	1	3	1	4	16 (7.92)
≥78 hrs	1	2	2	9	2	1	1	1	4	4	27 (13.36)

Table 3: Year wise number of maternal deaths due to direct and indirect causes (2013 to 2022).

Year	Direct causes																	
	Eclampsia		Preeclampsia		PPH		APH		Ectopic pregnancy		Abortion		Uterine inversion/ obstructed labor		Embolism		Others	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
2013	1	0.49	1	0.49	5	2.47	1	0.49	0	0.00	0	0.00	0	0.00	0	0.00	3	1.48
2014	2	0.99	1	0.49	8	3.96	2	0.99	0	0.00	1	0.49	0	0.00	1	0.49	0	0.00
2015	5	2.47	1	0.49	4	1.98	2	0.99	1	0.49	0	0.00	0	0.00	3	1.48	0	0.00
2016	3	1.48	9	4.45	4	1.98	3	1.48	1	0.49	1	0.49	2	0.99	2	0.99	1	0.49
2017	8	3.96	7	3.46	6	2.97	3	1.48	0	0.00	0	0.00	0	0.00	0	0.00	3	1.48
2018	5	2.47	0	0.00	2	0.99	3	1.48	0	0.00	0	0.00	0	0.00	2	0.99	0	0.00
2019	1	0.49	4	1.98	1	0.49	2	0.99	0	0.00	0	0.00	0	0.00	3	1.48	0	0.00
2020	6	2.97	2	0.99	4	1.98	4	1.98	1	0.49	0	0.00	0	0.00	0	0.00	3	1.48
2021	8	3.96	9	4.45	7	3.46	7	3.46	0	0.00	2	0.99	2	0.99	3	1.48	1	0.49
2022	5	2.47	4	1.98	6	2.97	7	3.46	0	0.00	0	0.00	0	0.00	0	0.00	3	1.48
	44	21.8	38	18.8	47	23.2	34	16.8	3	1.48	4	1.98	4	1.98	14	6.93	14	6.93

Table 4: Year wise indirect causes of maternal mortality.

Year	Indirect causes													
	Sepsis		Anemia		Jaundice		Heart disease		Cardio respiratory arrest		HELLP		Others	
2013	2	0.99	6	2.97	0	0.00	0	0.00	3	1.48	0	0.00	0	0.00
2014	2	0.99	10	4.95	0	0.00	0	0.00	2	0.99	0	0.00	1	0.49
2015	1	0.49	7	3.46	1	0.49	0	0.00	5	2.47	2	0.99	0	0.00
2016	2	0.99	10	4.95	1	0.49	0	0.00	7	3.46	4	1.98	2	0.99
2017	3	1.48	9	4.45	0	0.00	1	0.49	9	4.45	2	0.99	3	1.48
2018	0	0.00	4	1.98	0	0.00	0	0.00	5	2.47	2	0.99	1	0.49
2019	1	0.49	3	1.48	0	0.00	0	0.00	5	2.47	2	0.99	0	0.00
2020	2	0.99	8	3.46	0	0.00	0	0.00	5	2.47	3	1.48	2	0.99
2021	0	0.00	19	9.40	1	0.49	0	0.00	8	3.46	10	4.95	1	0.49
2022	2	0.99	11	5.44	0	0.00	0	0.00	5	2.47	5	2.47	2	0.99
	15	7.42	87	43.0	3	1.48	1	0.49	54	26.7	30	14.8	12	5.94

Major indirect cause observed was anemia 43% which was followed by cardio respiratory arrest 26.7%, HELLP 14.8%, sepsis 7.42%, jaundice and other causes 5.94% each while 0.49% mortalities observed due to heart diseases (Table 4).

DISCUSSION

In India, maternal mortality rate has declined over 50% from 2004 (254/100000 live births) to 2018 (113/100000 live births).¹³ However, the average maternal mortality rate of last ten years in present study was 187.46/100000 live births. Considering India's maternal mortality rate, present study MMR is observed as high. Several studies conducted in many tertiary care centers of India show MMR over 200/100000 live births.^{14,15} In tertiary care hospitals, most of the patients are referred from other health centers causing in delayed intervention. Many among them are already in critical condition at the time of admission; hence increasing the mortality ratio.¹⁶

There are several sociodemographic issues which affect maternal mortality. It is seen that women who are below poverty line, with less awareness regarding spacing of birth, inadequate antenatal care and residing in remote/distant rural areas are normally are mostly suffers. There is evidence to suggest that little access to maternity health services is an important barrier in rural areas, especially for the low-income families.¹⁷ Eclampsia, preeclampsia, hemorrhage and sepsis are found the major direct causes of maternal deaths. In fact, all these are preventable causes of maternal mortality, if provided the treatment in time. Pre-existing anaemia worsens as pregnancy advances, leading to congestive cardiac failure, inability to resist infection or cope with haemorrhage.⁹ Major direct cause of maternal mortality was postpartum hemorrhage, 23% and major indirect cause observed was anemia 43%. Similar observations have been reported by Santpure et al.¹⁸

Maternal mortality during the present study period was 64.35% in the age group 19 to 25. Similar report in the study by Murthy et al, stating 70% of maternal deaths were in the age group of 20 to 29 years.¹⁹⁻²¹ These reports indicates that teenage pregnancies are mostly associated with complications such as anemia and preeclampsia which need much attention.

The possible risk of maternal death in developed countries is about 1:4000 births that in developing is 1:15 to 1:50. The global MMR has declined from 342 in 2000 to 211 in 2017, representing a 38% reduction since 2000.²²⁻²⁴ For further reduction if MMR the United Nations has set a goal of reducing the global MMR to less than 70/100,000 live births by 2030 as part of its Sustainable Development Agenda, Goal 3 (SDG 3).²⁵⁻²⁷

It is encouraging that the maternal mortality ratio in India has declined over the years to 97 in 2018-20 from 103 in 2017-19 and 130 in 2014-2016.²⁸ India's present MMR is below the millennium development goal target and puts the country on track to achieve the sustainable development goal of MMR below 70 by 2030.²⁹ As per national health policy (NHP) 2017, the target for MMR is 100 per 100,000 live births by 2020.³⁰

To reach the goal of MMR less than 70/100000 per live births several schemes have been launched by Indian government for prenatal and postnatal care of mother, such as, Pradhan Mantri Surakshit Matritva Abhiyan [PMSMA], came in practice from June 2016, this provides comprehensive and free antenatal care on a fixed day.¹³ Surakshit Matritva Aashwasan [SUMAN] was introduces in 2019 which aimed to ensure complete quality healthcare to pregnant women and child.³¹ Besides this another initiative taken was Pradhan Mantri Matri Vandana Yojana [PMMVY] this includes a cash support scheme of Rs. 5000 which was launched in 2017 for pregnant and lactating mothers for the first living

child of the family. Labour Room Quality Improvement Initiative [Laqshya] was initiated in 2017 to improve the quality of health care in the labour room and operation theatres in obstetrics.³² Scheme Mothers Absolute Affection [MMA] was introduced in 2016 to promote breast feeding.³³ Another support MCTS/RCH portal is used for capturing data of JSY beneficiaries and other services.¹³

CONCLUSION

Maternal deaths can be prevented or reduced by improving the health care facilities in rural regions, by ensuring skilled attendants and required basic medication as most maternal deaths in rural areas are still due to postpartum hemorrhage and eclampsia. Similarly, it is necessary to increase the awareness of patients to take advantage of the schemes launched by government for antenatal and postnatal care which will help in early diagnosis of high-risk pregnancies to refer them at tertiary care hospitals in time. Also, the tertiary care hospitals must be provided the facilities for providing requisite antenatal care by all means. Timely treatment for silent killers like anemia might help in reducing maternal deaths. Nevertheless, this is high time to mobilize universal, national, regional, and community-based commitment to decrease maternal mortalities.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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