

## **Original Research Article**

### **Facility Based Maternal Death Review at Tertiary Care Teaching Hospital - An Observational Study**

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**Abstract:** High Maternal mortality continues to be a challenge in reaching MDG 5 target. India still has not shown satisfactory progress in its MDG 5 achievements. Maternal death audit is a way to understand the hurdles and bottlenecks in reaching the target. The main objective is 1.To analyze the number and causes of maternal deaths at Pravara Rural hospital during study period 2.To find out the avoidable factors in causation of maternal deaths 3. To ascertain the role of various contributory factors in maternal deaths 4.To suggests remedial measures to improve the maternal health and reduce maternal deaths. A Retrospective and Prospective observational study was carried out at Pravara Rural hospital over a period of two years. Systematic Analysis of all maternal deaths during four and half year period (2011-2015) was done using Maternal Death Review system in relation to causes, contributory factors, and associated socio epidemiological factors. The results were analyzed by using qualitative and quantitative methods of analysis. In results there were 56 maternal deaths during study period with maternal mortality ratio of 208 per one lakh live births .Two third of the deaths were due to direct causes and remaining due to indirect causes. Postpartum hemorrhage and hypertensive diseases were the two common direct causes, where as acute respiratory distress syndrome, hepatitis were the common indirect causes of maternal deaths. All maternal deaths took place among the women of rural area. Sixty six percent out of maternal deaths were seen in unbooked cases. Most of the deaths (57.90%) occurred in illiterate women. Maximum number of maternal deaths (67.8%) were noted in women from lower socio economic class. Majority of the patients (78.57%) died in postpartum period. Sixty six percent of the deaths were due to direct cause and 33.92% deaths due to indirect cause. In conclusion, the Obstetric haemorrhage, hypertension, Liver and kidney diseases were mainly responsible for maternal mortality. It can be reduced by optimum antenatal and intranatal care. Facility based maternal death review can pinpoint the bottlenecks in implementation of maternal health programme implemented by government through National Rural Health Mission (NRHM).

**Keywords:** Maternal mortality, Millennium development goal, and Facility based maternal death review, maternal health, National Rural Health Mission, Maternal Mortality Ratio (MMR).

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#### **INTRODUCTION-**

The United Nations Millennium Development Goals are a list of eight international goals that all member states have agreed to reach by the year 2015 [1]. The fifth millennium development goal concerns improving maternal mortality ratio (MMR) by 75%.Recent reviews of MDGs revealed that the MMR globally decreased by 47%( global scenario) and 60% (Indian scenario) between 1990 and 2013 [2]. At the current rate of decline, predicted MMR for 2015 is 149.The current MMR of Maharashtra is 87 [3].

Maternal Mortality (maternal death) is defined as “the death of a woman while pregnant or within 42 days of termination of pregnancy (World Health Organization, 2010).” In India 190 / lakh MMR was

present in 2013 [4]. According to the latest global estimates, 289,000 women died during 2013 due to maternal causes [2]. The WHO has reported that two-thirds of maternal deaths occur in just 11 countries, with India topping that list: India at 17 percent (50,000) [5]. India’s projected goal is to reduce the maternal mortality ratio from 437 per 100,000 live births to 109.The global MMR in 2013 was 210 maternal deaths per lakh live births. According to the estimates the MMR has reduced from 212 per lakh live births in 2007-09 to 178 per lakh live births in 2010-12, a reduction of 34 points over a period of three years [6]. The lifetime risk of maternal death in India as in 2013 is 1 in 190 [7].

A facility-based maternal death review entails auditing maternal deaths that occur in health facilities, while a community-based maternal death review (or verbal autopsy) involves interviewing family members about maternal deaths that occur outside health facilities. The challenging nature of measuring maternal mortality has made it necessary to perform an action-oriented means of gathering information on where, how and why deaths are occurring and what kind of actions are needed to be taken [8].

#### **AIM**

To improve maternal health and reduce maternal morbidity and mortality (MDG 5 GOAL) by analyzing and finding out the factors, that contribute in causation of maternal deaths.

#### **OBJECTIVES**

1. To analyze the number and causes of maternal deaths at Pravara Rural hospital during study period.
2. To ascertain the role of various contributory factors in maternal deaths.
3. To find out the avoidable factors in causation of maternal deaths.
4. To suggest remedial measures to improve the maternal health and reduce maternal deaths.

#### **MATERIAL AND METHODS**

**STUDY DESIGN:** Descriptive observational study

#### **STUDY SETTING:**

Study was carried for two a period of years from October 2013 to September 2015 in the Department of Obstetrics and Gynecology and Pravara Rural Hospital, Loni. Pravara Rural Hospital is attached to Rural Medical College Loni, which is situated in a rural setting of Maharashtra State of India. The hospital drains majority of complicated and high risk cases from the neighboring townships and villages. An average of seven to eight thousand deliveries takes place in the hospital per year. Hospital has blood bank facility with adequate blood and blood component availability, except the platelets and cryo-precipitates.

#### **STUDY POPULATION AND DATA COLLECTION**

1. Study population comprised of all antenatal women who availed services at PRH during study period.
2. Pravara Rural Hospital provides tertiary care to approximately 20lakh of rural population residing in Ahmednagar district of Maharashtra.
3. Data collection was done from labor room record and hospital Medical record section. All maternal deaths between 01/01/2011 and 31/07/2015 were included in the study. Maternal deaths were confirmed from the maternal death register ( $n = x$ ). Total number of deliveries during the same period

were recorded ( $n = y$ ). For the purpose of the estimation of maternal mortality ratio, the denominator considered was the total live births in the study period.

#### **SELECTION CRITERIA:**

##### **Inclusion Criteria:**

1-All maternal deaths reported at Pravara Rural Hospital during five year study period.

##### **Exclusion Criteria:**

1-Maternal deaths reported to casualty as brought dead.

#### **METHODOLOGY**

##### **Facility based maternal death review at Pravara Rural hospital**

Maternal death review system was established at Pravara Rural hospital, which is a tertiary care teaching hospital, with all state of art facilities for patient care. Maternal death review committee was established comprising of senior faculty members from department of Obstetrics and Gynecology, Medicine, Medical superintendent, Matron, Social worker, Intensivist and forensic medicine expert.

The committee meetings were held on monthly basis and as and when required to discuss the issues related to maternal deaths. All maternal deaths were also discussed at departmental level, in which the resident doctor and the faculty member of the respective unit presented the case for finding out the probable cause of maternal death and any deficiency/lacunae/delay in provision of the care at the level of the facility. The information related to socio demographic profile, contributory factors and the treatment received by the patient before reaching to the hospital and in the hospital was critically analyzed. The case was discussed in constructive and non threatened manner, with the aim to find out the cause of death, factors that have contributed to death and possible measures that could have prevented the death. All discussion findings were noted down and shared with the local and district health authorities for taking necessary steps for preventing its recurrence in future.

It was a retrospective and prospective study of 4 years 9 months duration (January 2011-July 2015) that was conducted at Pravara Rural Hospital; it was carried out over a period of 2 years from October 2013 to September 2015, after obtaining the necessary approval from institutional ethical committee. In this study, a maternal death was defined as the death of any woman from any cause while she was pregnant and up to forty-two days after termination of pregnancy, regardless of the length and site of pregnancy (i.e. intra-uterine or ectopic).

**Maternal Mortality Ratio:**

Number of maternal deaths during a given time period per 100,000 live births during same period.

**Maternal Mortality:**

The death of women while pregnant, or within 42 days of termination of pregnancy from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (PARK, 2015)[3].

**Sources of data collection:**

Information was collected from the individual case sheet of the woman or from the registers maintained in the labour room, operation theatre, medical record section and different wards of the Pravara rural hospital. Previous antenatal care record was reviewed to find out the details of antenatal care woman received during index pregnancy.

Relevant data of every maternal death reported by Pravara Rural Hospital during a period of 5 years from 2011 to 2015 was collected in a structured Performa. Every maternal death was analyzed in relation to various aspects likely to be related to maternal death, such as age, locality of residence, parity, socio-economic status, literacy, booked status, status of the woman at the time of death(delivered /undelivered), admission-death interval and the cause of death. Every maternal death was analyzed to find out any possible delay in either seeking care or receiving care at the health facilities.

The details of treatment received, ICU admissions, Blood transfusions required, Invasive monitoring, and ventilatory support were analyzed. The reliability of data was cross checked with central death register of the institute and district maternal death record maintained by the government.

**Variables:**

The information was collected on the following variables: age at the time of death and gestation in weeks, educational status, marital status, socio-economic status, number of previous births, number of antenatal visits, place of delivery, mode of delivery and duration of hospital stay using the software Excel. Deaths were classified as direct, indirect, unknown causes and late maternal deaths. A direct maternal death was defined as a death that resulted during pregnant condition, labour, delivery or postpartum. An indirect maternal death was defined as a

case in which pregnancy exacerbated a pre-existing disease condition. Whether the maternal deaths were avoidable and the contributory factors for such deaths. (“Avoidable factors”) The factors which contributed to the death of the women or those administrative lacunae, had they been corrected in time, could have saved the life of the women were considered as “Contributory factors” factors of maternal All such factors were analyzed to find out their individual contribution as well as how many of such factors operated together at the time of a woman’s death.

**Data compilation:**

Important information was transferred to the master chart before statistical analysis. Data was analyzed by finding percentage, ratio and after applying Z test of significance.

**RESULTS**

There were 28,273 deliveries during the study period. During the same period, fifty six mothers lost their lives, while being pregnant or within 42 days of termination of pregnancy. (Table 1)The Maternal Mortality Ratio was 208/1, 00,000 live births. There were 56 maternal deaths during the five year study period with a maternal mortality ratio of 208 per 1, 00,000 live births. All maternal deaths took place among the women from rural area. Sixty six percent of maternal deaths were seen in un-booked cases. Most of the deaths (57.90%) occurred in illiterate women. Maximum number of maternal deaths (67.8%) was noted in women from lower socio economic class. Forty eight percent deaths took place in the age group of 19-24yrs. Higher risk of maternal mortality was seen among grand multi-paras. Fifty nine percent women were in third trimester. Fifty nine percent women died after normal vaginal delivery. Majority of the patients (78.57%) died in postpartum period. Majority of the patients were referred to this hospital in moribund state there was 66.07% deaths due to direct cause (Table 2) and 33.92% deaths due to indirect cause.(Table 3) Haemorrhage was the leading cause of direct obstetric death. Atonic post partum being the most common cause. Most of these women had reported with features of irreversible shock. Severe pregnancy induced hypertension; pulmonary embolism and sepsis were the other causes. Acute respiratory distress syndrome was the most common indirect cause of death.

There was a decreasing trend of maternal deaths except for year 2013

**Table- 1: Year Wise Maternal Deaths**

Year	Total number of Deliveries	Total number of Live births	Total number of deaths	Percentage
2011	4881	4674	19	33.92%
2012	6087	5805	9	16.07%
2013	7489	7120	18	32.14%
2014	5670	5365	5	8.92%
2015	4146	3914	5	8.92%
Total	28273	26878	56	100

**Table-2: Distribution Of Maternal Death In Relation To Direct Cause**

Cause	Number (N=37)	Percentage
A) Hemorrhage	20	54.05%
1.PPH	9	24.32%
2.Abruption	4	10.81%
3.Rupture Uterus	3	8.10%
4.Placenta Preavia	2	5.40%
5.DIC	2	5.40%
B) Hypertension	8	21.62%
1.Eclampsia	5	13.5%
2.Severe Pre-eclampsia	3	8.10%
C) Pulmonary Embolism	3	8.10%
1.Post LSCS	3	
D) Sepsis	6	16.21%
1.Antepartum / Intrapartum	4	10.81%
2.Puerperal Sepsis	2	5.40%

Post partum haemorrhage (24.32%), Eclampsia, Pre eclampsia (21%) and Antepartum haemorrhage (16%) were the common causes of direct maternal deaths Out of 37 maternal deaths due to direct causes, 20 (54.05%) were due to haemorrhage, 8 (21.62%) were due to

hypertension, 6(16.21%) were due to sepsis and 3(8.10%) were due to pulmonary embolism. Postpartum haemorrhage (9), Eclampsia (5), Abruption (4), and Pulmonary Embolism (3) were predominant direct causes of maternal deaths.

**Table-3: Distribution of Maternal Death Due to Indirect Cause**

Cause	Number (N=19)	Percentage
Acute Respiratory Distress Syndrome (ARDS)	5	26.31%
Hepatitis/ Hepatic encephalopathy	3	15.78%
Acute Renal Failure (ARF)	3	15.78%
Anemia	2	10.52%
Heart disease	2	10.52%
Viral Encephalopathy	1	5.26%
Intestinal Obstruction/Peritonitis	1	5.26%
Fulminant Hepatic Failure	1	5.26%
Pneumonia	1	5.26%

**Table-4: Fetal Outcome in Relation to Maternal Deaths**

Fetal Outcome	Number (N=48)	Percentage
Still birth	11	22.91%
Live birth	30	62.5%
Intra uterine fetal demise/missed abortion	7	14.58%
Total	48	100%

Out of forty four women who delivered, 30 (62.5%) gave birth to live baby and 11 (22.91%) had still birth.(Table 4)

It was observed that significant number of cases (46.42%) had one or the other form of delay in seeking or receiving care before death.(Table 5) Analysis of all maternal deaths as per ‘Three Delay

Model’ revealed that thirty eight cases had avoidable factors. In twenty six cases there was delay in decision making to seek care. Ignorance on the part of the patient or her family was responsible for delay. Eight deaths were seen due to delay in reaching care, mainly due to lack of transport facilities. Remaining four deaths were due to delay in receiving care.(Table 6)

**Table -5: Showing Maternal Deaths In Relation To Delay In Seeking Or Receiving Care**

Three Delay Model	Number (N=56)	Percentage
Delay in decision to seek care	26	46.42%
Delay in reaching the hospital	8	14.28%
Delay in initiating appropriate treatment	4	7.14%
Total	38	100%

**Table 6: Contributory Factors In Causation Of Maternal Deaths**

Contributory factors	No. of cases	Percentage
Poverty	48	85.71%
Lower educational status / Illiteracy	45	80.35%
Rural residence	55	98.21%
Transport inadequacy	14	25%
Poor health seeking behaviour	47	83.92%
Ignorance	30	53.57%
Lack of antenatal care	24	42.85%
Delay in referral	18	32.14%
Delay at health facility	08	14.28%
Anaemia / Under nutrition	40	71.42%
Poor general condition at the time of admission	26	46.42%

## DISCUSSION

Rural women face a series of constraints that prevent necessary care leading to higher risks during pregnancy and birth. The experiences of rural women vary significantly from those of urban women, who are often able to afford and access proper care throughout pregnancy and delivery. There are various causes for death of a pregnant woman. In addition to the medical causes, there are logistic causes, deficiencies in the health care delivery system, lack of transport facilities, especially in the remote and hilly, tribal areas etc. Further compounding these problems, there are social, cultural & political factors which together determine the status of women, their health, fertility and health seeking behaviour.

It was observed that, majority of deaths could have been prevented, if these women had registered themselves early in pregnancy and had received regular antenatal check up. Most of the deaths due to hypertension and other medical disorders could have been easily prevented by timely referral to tertiary care hospital. Upgrading the facilities at Rural Hospitals and Tertiary care centers can go a long way in avoiding the deaths due to direct causes. Facility based maternal

death review system improves vigilance among health care providers; create awareness about the importance and sensitivity of the issue and helps in improving the quality of health care at the institution and at periphery. Feedback about the review to government helps in tackling in bottlenecks in implementation of maternal health care delivery system.

Observations of the present study were shared with the local health government, so that necessary steps can be taken to improve the maternal health and avoid the maternal deaths due to preventable causes. Data will also be used to identify and take necessary steps in regard to the facility related factors like infrastructure and manpower, that contribute to maternal deaths. This will help in reaching the “Millennium Development Goal-5” in the study population. In spite of the tall claims by the government and other agencies regarding reduction in Maternal Mortality Ratio (190/ 1, 00,000 live births) in 2013, it was observed that Maternal Mortality Ratio (208/1, 00,000 live births) was high in the present study. Maternal death is an avoidable tragedy and most often maternal deaths are due to three delays : delay in deciding to seek care, delay in reaching care in time,

and delay in receiving treatment. Maternal death rate are still high when compared to the developed part of the world.

When the mother is brought dead to the hospital or where the cause of death cannot be reasonably be ascertained, autopsy would help in knowing the cause of death. When maternal death is a consequence of unsafe or criminal abortion, medico legal autopsy would be advisable though not widely practiced. Maternal Death Review, which is being implemented at the community level, facility level, district and state level can throw light in identifying gaps in the existing health care delivery system, prioritize and plan for interventional strategies and help to reconfigure the health services to prevent future maternal deaths.

Government of India has initiated the JSY (Janani Suraksha Yojana) scheme and encourages rural women for institutional delivery with incentives, care through ASHA workers, and NRHM encourages skilled birth attendants for partograph management of labour. Maternal deaths due to hypertensive disorders in pregnancy, obstetric hemorrhages, medical disorders in pregnancy like severe anaemia, hepatitis, heart disease can be prevented to a large extent, only if antenatal women with high risk factors are motivated to attend a tertiary care centre at an early date, for early diagnosis, admission and management. Health education of the community, good quality health care, early referral, availability of blood and improvement in transport facilities can prevent many deaths.

Female illiteracy, early marriages and teenage pregnancies, poor socioeconomic background, rural location, un-booked status and high parity have shown their direct influence on maternal mortality. Delay at all three levels as described in Three Delay Model, were noticed in the present study.

## CONCLUSION

Obstetric haemorrhage, hypertension, Liver and kidney diseases are mainly responsible for maternal mortality. Facility based maternal death review system help in finding out the bottlenecks in the existing maternal and child health care delivery system. It brings a sense of responsibility in all stakeholders involved in delivery of MCH care. It is feasible and cost effective strategy to reach Millennium development target 5 in extended time frame. Any attempt to lower MMR must take into consideration the following measures:

1. Early registration of pregnancy
2. At least four antenatal check-ups
3. Dietary supplementation, including correction of anaemia
4. Prevention of infection and haemorrhage during puerperium

5. Prevention of complications, e.g., eclampsia, malpresentations, rupture uterus
6. Treatment of medical conditions, e.g., hypertension, diabetes, tuberculosis, etc
7. Anti-malaria and tetanus prophylaxis
8. Promotion of clean delivery practices
9. Promotion of institutional deliveries for women with bad obstetric history and risk factors
10. Promotion of family planning- to control the number of children to not more than two, and spacing of births
11. Identification of every maternal death and searching for its cause
12. Provision of safe abortion services
13. Analysis of every maternal death through maternal death audit, either at community level (verbal autopsy) or at the institutional level should be carried out.

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