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Maternal mortality at a tertiary care teaching hospital of rural India

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Abstract
Background: Death of a woman during pregnancy and child birth is an extremely tragic event. It is a waste of a precious life that leaves great feeling of grief and pain for the family and hospital staff and has devastating influence on the community overall. Maternal Mortality Ratio (MMR) is a very sensitive index that reflects the quality of reproductive care provided to the pregnant women in that country. Maternal morbidity and mortality can be prevented by awareness of reproductive health in a community, availability, and utilization of organized antenatal care, skilled intrapartum management and careful postnatal follow up.
Aim: Objective of the study was to analyze the pattern of maternal mortality over the period of five years in a tertiary level hospital in rural Maharashtra receiving high risk referred patients form periphery.
Methods: A retrospective hospital based study of 81 maternal deaths over a period of 5 years from January 2012 to December 2016 is carried out. The information regarding demographic profile and reproductive parameters were collected and results were analyzed by using percentage and proportion.
Results: Over the study period, there were 37242 live births, giving a MMR of 217.4/1,00,000 live births. Postpartum hemorrhage and sepsis were the leading direct causes while anemia was indirect leading cause. Most of the women died within 24 hours of admission. The 20 to 24 years age group and illiterate group was mainly affected**.**
Conclusions: Hemorrhage, Eclampsia and sepsis are the major causes of maternal deaths. Improvement in primary health care in rural areas and proper implementation of NRHM programs and up gradation of hospitals in rural areas can definitely bring down the number of maternal deaths.

Keywords: Maternal mortality, Eclampsia, septicemia, hemorrhage, pulmonary embolism, antenatal care

Introduction
Maternal mortality is defined as the death of any woman while being pregnant or within 42 completed days of termination of pregnancy, irrespective of the duration or site of pregnancy, from any cause related to or aggravated by pregnancy, but not from accidental or incidental causes [1]. Almost half a million women die every year from complications during pregnancy and childbirth. About 99% of these women are from developing world with over 90% concentrated in Africa and Asia. Maternal mortality is defined as maternal death rate per 1, 00,000 live births. The current maternal mortality ratio (MMR) in India is 167/100,000 live births [2]. The tragedy is that these deaths are largely preventable. India is among those countries, which has a very high maternal mortality ratio. Maternal mortality ratio in India was 256 per 1,00,000 live births in 2006, which declined to 167 per 1,00,000 live births by 2013; which is far above the desired figure of 100 per 1,00,000 live births as per the objectives of Millennium Development Goals (MDGs) [2]. Also there is no uniformity for MMR within India, some states like Assam have highest figure of 300 and some states like Kerala achieved desired figure of less than 100 as per Millennium Development Goals. Maternal mortality is a human right issue. The measures to prevent and reduce maternal mortality cannot be and should not be provided only to those who are able to pay for it. The magnitude of the problem should be recognized by the community and the government and serious efforts should be made to handle it.
The purpose of this study was to identify the pattern of maternal deaths in last 5 years, their associated risk factors and to suggest the improvement in the approaches to prevent maternal morbidity and mortality in this regard at our tertiary care setup.

Materials and Methods
This study was carried out in department of obstetrics and gynecology at government medical college Latur, located in rural Maharashtra.

All the maternal deaths both direct and indirect were included from January 2012 to December 2016. Case records of all the women were thoroughly evaluated and data collected regarding age, parity, educational level, socio economic and booking status and place of delivery. Also admission to death interval, delivery to death interval, place of delivery recorded. Duration of the pregnancy and clinical condition of the patient and the fetus at the time of admission studied. Management received at and after admission was evaluated. The cause of death and the risk factors leading to it were noted. Results were analyzed by using percentage and proportion.

Results

Total no. of live births during the study period was 37,242 while total no. of maternal deaths were 81. Maternal Mortality Ratio was 217.4 /1, 00,000 live births.

It is observed from table 1 that out of total 81 deaths, 33 (40.74%) were in the age group of 20-24 years followed by 25 (30.86%) deaths in 25-29 years & 16 (19.75%) deaths observed in mothers less than 20 years of age.

It is observed that majority of mothers, 53 (65.43%) resides in rural area fallowed by urban 17 (20.98%) and urban slum 11 (13.58%).

Majority deaths, 46.91% in mothers doing household works fallowed by landless laborers (41.97%) and farmers (8.64%). Skilled group was least affected in this study.

Majorities (44.44%) were illiterate and 37% had studied up to primary and secondary level. In one case patient was graduate. In 14 cases details about education not available.

Table 1(a): Age wise distributions of maternal deaths

Age in years	No. of patients (n-81)	Percentage (%)
<20	16	19.75
20-24	33	40.74
25-29	25	30.86
30-34	4	4.93
>35	3	3.70

Table 1(b): Residence wise distribution of maternal deaths

Residence	No. of patients (n-81)	Percentage (%)
Urban	17	20.98
Urban slum	11	13.58
Rural	53	65.43

Table 1(c): Distribution according to occupation

Occupation	No. of patients (n-81)	Percentage (%)
Landless Laborers	34	41.97
Skilled	2	2.46
Household work	38	46.91
Farmer	7	8.64

Table 1(c): Literacy and Maternal Deaths

Education		No. of patients (n-81)	Percentage (%)
Illiterate		36	44.44
Literate	Primary	18	22.22
	secondary	12	14.81
	graduate	1	1.23
Details not available		14	17.28

As seen from table 2, out of total 81 deaths, 6 (7.40%) women died within 1 hour of admission; 22 (23.45%) between 2-12 hours of admission; and 18 (18.51%) between 12-24 hours of admission and 35 (50.61%) after 24hours of admission.

Out of 81 maternal deaths, 66 deaths seen in delivered group. 3 (4.54%) women died within 1 hour of delivery, 14 (21.21%) between 2-12 hours, 11 (16.66%) between 12-24 hours and 38 (57.57%) after 24 hours of delivery.

Maximum deaths 39 (59.09%) have occurred who delivered at tertiary care centre. Majority (81.48%) deaths occurred in the post-partum period; followed by (11.11%) in the 2nd trimester and 7.4% in the 3rd trimester. No deaths observed in the first trimester in this study.

Out of 81 deaths, 68 (83.95%) had booked status and 13 (16.05%) had unbooked status. By parity, 42 (51.85%) were primigravida and 39 (48.14%) were multigravidas.

Table 2(a): Admission to death interval

Admission to death interval	No. of patients (n-81)	Percentage (%)
0-1 hour	6	7.40
2-12 hours	22	23.45
12-24 hours	18	18.51
>24 hours	35	50.61

Table 2(b): Delivery to Death Interval

Delivery to death interval	No. of patients (n-66)	Percentage (%)
0-1hour	3	4.54
2-12 hours	14	21.21
12-24hours	11	16.66
>24 hours	38	57.57

Table 2(c): Place of Delivery

Place of delivery	No. of patients (n-66)	Percentage (%)
PHC	5	7.57
SDH	3	4.54
RH	5	7.57
Tertiary care centre	39	59.09
PVT hospital	12	18.18
Home delivery	2	3.03

Table 2(d): Delivery Status

Delivery status	No. of patients (n-81)	Percentage (%)
Delivered	66	81.48
Undelivered	15	18.51

Table 2(e): Stage of Pregnancy at the Time of Death

Stage of pregnancy	No. of deaths (n-81)	Percentage (%)
0-12 weeks	0	0
13-28	09	11.11
29-40	06	7.40
postpartum	66	81.48

Table 2(f): Gravid/parity

Gravida/parity	No of patients (n-81)	Percentage (%)
1	42	51.85
2	25	30.86
3	10	12.34
>4	4	4.9

Table 2(g): ANC status

ANC status	No of patients (n-81)	Percentage (%)
Registered	68	83.95
Unregistered	13	16.05

As evident from table no. 3, hemorrhage and sepsis were the leading causes and seen in 14 (17.28%) patients each. Eclampsia was the cause of death in 11 (13.58%) cases.10 (12.34%) patients died due to indirect cause anemia.

Respiratory failure and cardiopulmonary arrest responsible for 7 (8.64%) deaths each. 5 (6.17%) patients died due to hepatitis. 4 mother died due to burn and its complications. In this study 2 patients died due to H1N1 infection. Heart problems responsible for 4 deaths.

Table 3(a)

Cause of death		No. of maternal deaths (n-81)	Percentage (%)
Direct	Embolism	2	2.46
	Hemorrhage	14	17.28
	Shock	2	2.46
	Sepsis	14	17.28
	Respiratory failure	7	8.64
Indirect	Heart disease	3	3.70
	Hepatitis	5	6.17
	Anemia	10	12.34
	Convulsion disorder	1	1.23
	HELLP	2	2.46
	Burns	4	4.93
	H1N1	2	2.46
	SVT	1	1.23
	Cardiopulmonary arrest	07	8.64
	Eclampsia	11	13.58

Discussion

Maternal mortality is a global health problem. The magnitude of the problem is different from country to country depending upon its resources. Maternal mortality is best shown by maternal mortality ratio. Maternal mortality ratio is total number of maternal deaths per 100,000 live births. Maternal mortality reflects a nation's health status. Hemorrhage, hypertensive disorders of pregnancy and its complications, sepsis, obstructed labor and ruptured uterus and unsafe miscarriages are five leading causes of maternal deaths in developing countries. All these risk factors are preventable through proper understanding, diagnosis and timely management of pregnancy, labor and puerperium. WHO analysis of causes of maternal deaths in Asia, a systematic review shows hemorrhage to be responsible for

30.8% of maternal deaths, hypertension and its complications causing 9.1% of the maternal deaths, infections and sepsis, causing 11.6% of maternal mortality, while unsafe abortions cause 5.7%, obstructed labor 9.5% and pulmonary embolism 4% of maternal mortality [3].

In the present study, there were 81 maternal deaths amongst 37,242 deliveries, giving a MMR of 217.4 per 1, 00,000 live births. MMR in our study seems higher because this is a tertiary care teaching institute located in an undeveloped rural marathwada region of Maharashtra. Admissions of moribund cases referred from periphery have inflated this mortality ratio, like other teaching institutions of India. Other similar studies from tertiary care institution reported MMR ranged between 213 to 879 per 1, 00,000 live births [4, 5, 6, 7, 8, 9, 10, 11].

In the present study, maximum number of maternal deaths (40.74%) were in the age group of 20 -24 years fallowed by 30.86% deaths in 25-29 years which is comparable to studies by Dilpreet Kaur *et al*. and Verma Ashok *et al*, Jadhav *et al*. [8, 12, 13]

In the present study, out of the 81deaths, 42 (51.85%) deaths were among primigravida and 39 (48.14%) among multigravidas, similar to that reported by the other studies, Agarwal *et al.* reported that high deaths among multiparas (43%) than the primiparas (25%); Purandare *et al*. observed that out of the 30 deaths, 21 were multigravida and 9 were primigravida [6, 20].

65.43% of maternal deaths belonged to rural area areas which is comparable to studies by P. Padmanabhan *et al.* and Amitav Pal *et al*. [4, 15].

In our study most of the patients have been illiterate resides at rural and urban slum areas and belongs to lower socioeconomic class. There is lack of knowledge, poor accessibility of health care services, inadequate transport, non-availability of blood and trained persons in rural areas. These are the contributory factors for maternal deaths.

Majority patients (84%) were unbooked in this study. Complications occur as the patients have irregular antenatal visits and are referred in critical condition to tertiary hospitals. The present study is comparable to a study by L. O. Aghoja *et al*. where >70% of maternal deaths were unbooked cases. In studies by Dilpreet Kaur *et al*, Amitav Pal *et al*. and Verma Ashok *et al*. more than 80% maternal deaths were unbooked [4, 8, 12].

In the present study, maximum (81.68%) deaths occurred in the Post-partum period; followed by (11.11%) in the 2nd trimester, 7% deaths observed in 3rd trimester. there is no death in 1st trimester of pregnancy. Purandare *et al*. showed that (73.33%) in the post-partum period followed by (26.66%) during the ante-partum and (3.3%) during intra-partum period [6]. Thomas *et al*. showed that deaths in the 1st, 2nd and 3rd trimester and post natal/post-abortal were 3.5%, 9.7%, 31.9% and 54.9% respectively [17].

In the present study, six women died within one hour of admission; 22 (23.45%) between 2-12 hours of admission. 18 (18.51%) deaths between 12-24hrs of admission and 35 (50.61) deaths observed after 24hrs of admission. These findings are Similar to other studies, Sikdar *et al.* reported that 48 (19.7%) died within first 12 hours of admission and another 30 (12.5%) died within next 12 hours; 78 (32.2%) died within 1 day, 58 (23.8%) died within 1-3 days, 39 (16%) died in between 4 to 7 days [14]. Agarwal *et al*. revealed that 44% died within 24 hours of admission and 22% within 12 hours of hospital stay [20]. Purandare *et al*. showed that among the 30 deaths, 3 died within 30 minutes of admission, 14 died between 30 minutes and 6 hours, 7 died between 6 and 24 hours and remaining 6 died after 24 hours of admissions [6].

Table 3(b)

Cause of death		No. of maternal deaths (n-81)	Percentage (%)
Direct	Embolism	2	2.46
	Hemorrhage	14	17.28
	Shock	2	2.46
	Sepsis	14	17.28
	Respiratory failure	7	8.64
Indirect	Heart disease	3	3.70
	Hepatitis	5	6.17
	Anemia	10	12.34
	Convulsion disorder	1	1.23
	HELLP	2	2.46
	Burns	4	4.93
	H1N1	2	2.46
	SVT	1	1.23
	Cardiopulmonary arrest	07	8.64
	Eclampsia	11	13.58

In the present study, highest deaths observed due to direct causes hemorrhage and sepsis (17.28%), followed by Eclampsia (13.58%), anemia (12.34%). Respiratory failure and cardiopulmonary arrest accounts for 7% deaths. Hepatitis, pulmonary embolism responsible for 5% and 2% deaths respectively. 2 deaths occurred due to H1N1 virus. Sengupta *et al*. shows the direct causes, hemorrhage (12.40%) and sepsis (17.82%) and among the indirect causes, hepatitis (29.93%) followed by anemia (17.82%) responsible for maternal deaths [18]. Purandare *et al*. observed that among the direct causes, hemorrhage in 70.83% of deaths; followed by septicemia (3.3%) and among the indirect causes, anemia in 55.3%; hepatic disorders in 3.3% and pulmonary embolism accounting for 6.67% deaths [6].

Thomas *et al.* noticed that among the direct causes, hemorrhage in 20.15% and sepsis in 17.4% and among the indirect causes, hepatitis in 11.9% followed by pulmonary in 7.6% [17]. Pregnant women are more likely to develop life-threatening complications with H1N1 infection and at higher risk than non-pregnant population [19].

Conclusion

Hemorrhage, Eclampsia and sepsis are the major causes of maternal deaths. Improvement in primary health care in rural

areas and proper implementation of NRHM programs and up gradation of hospitals in rural areas can definitely bring down the number of maternal deaths.

Deaths in pregnancy and during labor do not occur instantaneously. Timely recognition of the problem, early referral and skilled care at medical facilities will help a lot to decrease this very high maternal mortality ratio. Other underlying causes like socio-economic disparity, rural-urban differences, education level of women, caste and gender-based inequity etc. are a real hurdle to any attempt made to reduce maternal deaths in the country. Further, there is marked difference in the maternal mortality rates at the state levels, with some states heading towards achieving the set targets while some are still struggling at the initial stage. It is therefore the time to look at the maternal and reproductive health not just as a medical event but rather a social phenomenon, where contextual factors play an equally important role.

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