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Original Research Article

Maternal mortality in a tertiary care hospital: a five-year review

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ABSTRACT

Background: This study was aimed at analyzing the maternal mortality ratio over five years, the causes leading to maternal deaths in a tertiary care hospital and factors which are preventable.
Methods: The records of maternal death from August 2010 to July 2015 (5 years) were collected and analyzed. Various factors like maternal age, parity, literacy, place of residence, antenatal registration, admission-death interval, mode of delivery and causes of deaths were reviewed.
Results: The mean maternal mortality ratio (MMR) was 1039. The direct causes of maternal mortality were hemorrhage (22.4%), eclampsia (21.2%), sepsis (18.78%) and amniotic fluid embolism (8.48%). Indirect obstetric deaths were due to hepatitis (10.9%), anemia (3.6%), respiratory diseases (6.06%), heart diseases (3.03%), CNS disease (5.45%). Most of the deaths (69.7%) occurred in age group 20 and30 years. 63.6% were multigravida and 85.4% were unbooked cases.
Conclusions: Antenatal care, screening and management of high risk pregnancies are most important to prevent complications and maternal deaths by timely detection and intervention.

Keywords: Direct obstetric death, Indirect obstetric death, Maternal deaths, Maternal mortality, MMR

INTRODUCTION

According to the World Health Organization (WHO), "A maternal death is defined as death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by pregnancy or its management" (ICD10). Direct maternal death is the result of a complication of pregnancy, delivery or management of the two. Indirect maternal death is a pregnancy related death in a patient with a pre-existing or newly developed health problem unrelated to pregnancy or non-obstetrical deaths.[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. The current maternal mortality ratio (MMR) in India is 167 and in Punjab it is 141 per100,000 live births.[2] The progress in maternal health has been uneven, inequitable, and unsatisfactory. The risk of a woman dying as a result of pregnancy and childbirth during her lifetime is about 1 in 6 in Afghanistan compared with 1 in 30,000 in Northern Europe.[3]

In 2015, regional MMRs ranged from approximately 12 maternal deaths per 100,000 livebirths for high-income regions to approximately 546 maternal deaths per 100,000 live births for sub-Saharan Africa. Country-specific MMR estimates ranged from 3 (Finland) to 1360 (Sierra Leone) per 100,000 live births. There were 24 countries that had a MMR of more than 400 maternal deaths per 100,000 live births.[4] United Nation (UN) report card on Millennium Development Goal 5 concluded that little progress had been made in sub Saharan Africa where half of all maternal deaths take place. The progress shown by the South Asian countries

including India which accounts for 25% of all maternal deaths is also not impressive.[5]

Most of the evidence for maternal mortality is obtained through hospital data and community based reports, which are situated mostly in urban areas, whereas most of the maternal deaths are from rural areas. This study was done to analyse maternal mortality in a tertiary medical college hospital situated in Punjab where a large number of patients are referred from rural parts of Punjab and Haryana. This study was done to assess the local causes of maternal mortality and suggest remedial measures to reduce the same.

Aims and objectives of present study were to calculate the maternal mortality rate in our hospital, to assess the epidemiological aspects of maternal mortality, to assess the causes of maternal mortality and to suggest ways to reduce the MMR.

METHODS

Our Hospital is a urban tertiary care cente and gets a large number of referrals from maternity homes, Primary health centers from rural parts, civil hospitals of Punjab and also from Haryana. The present study is a 5 year retrospective study from August 2010 to July 2015 conducted in the department of Obstetrics and Gynecology, Government Medical College, Patiala and following points were noted: Age, gravidity and parity, literacy and socioeconomic status, place of residence and antenatal care provided, cause of death.

Descriptive data was tabulated as absolute figures and percentages. The details of number of live births from August 2010 to July 2015 were collected from labor ward register and case files. Maternal mortality ratio for the study period was calculated by using the formula.

MMR= (Total no of maternal deaths/ Total no of live births)X100000

Mean maternal mortality ratio for the study period was calculated by calculating mean of yearly MMR of the entire study period.

RESULTS

During the study period of 5 years from August 2010 to July 2015, there were a total of 15879 births and 165 maternal deaths.

Table 1: Year wise MMR, distribution according to epidemiological characteristics.

	2010-11	2011-12	2012-13	2013-14	2014-15	Total
Live births	2199	2282	2785	3437	3460	15879
Maternal deaths	26	28	22	53	36	165
MMR/lac	1182	1227	790	1542	1040	1039
Age						
<20yrs	5	2	1	7	6	21 (12.7%)
20-30yrs	14	23	19	35	24	115 (69.7%)
>30yrs	7	3	2	11	6	29 (17.6%)
Parity						
Primipara	7	11	8	24	10	60 (36.4%)
Multipara 1-3	9	13	9	19	19	69 (41.8%)
Para>3	10	4	5	10	7	36 (21.8%)
Residence						
Rural	11	14	15	31	22	92 (55.7%)
Suburban	3	7	3	11	4	28 (15.7%)
Urban	12	8	4	12	10	47 (28.5%)
Literacy status						
Illiterate	13	19	14	36	25	107 (64.8%)
Education upto primary	8	5	4	8	5	30 (18.2%)
>primary	5	4	4	9	6	28 (16.9%)
Belonging to						
Patiala district	10	11	8	13	6	48 (29.1%)
Other districts	13	16	8	31	30	98 (59.4%)
Other States	3	1	6	9	0	19 (11.5%)
Brought by						
108 ambulance	7	18	11	35	30	101 (61.2%)
Govt ambulance	10	7	3	2	2	24 (14.5%)
Private vehicle	9	3	8	16	4	40 (24.24%)

The mean maternal mortality ratio in the study period was 1039/100000 live births. This high MMR is because of a large number of referrals of critically ill patients to our hospital. The epidemiological characteristics of maternal deaths are shown in Table 1.

Maximum maternal deaths (69.9%)were reported in the age group of 20 to 30 years. More deaths were reported in multiparous women (63.6%) as compared to Primiparas (36.4%). This is because of higher number of admissions and deliveries of multiparous women compared to primiparas. Majority of maternal deaths were reported in women from rural areas (55.7%) and15.7% patients were from suburban population. 64.8% of maternal deaths were reported in illiterate women. Most maternal deaths (83.33%) were reported in women with low socioeconomic status. 61.2%were brought by 108 ambulance, 14.53% by govt ambulance and 24.4% came by private vehicle. 59.4% of deaths were amongst patients belonging to neighbouring districts of Punjab and 11.5% patients were from other states. Out of a total of 165 patients,160 (96.9%) were referred and only 5 patients came directly and out of five patients who came directly 3were booked patients out of which 1had pulmonary embolism,1 had postpartum eclampsia and third had secondary PPH. Rest two came directly with massive APH and shock with no ANC record.

Table 2: Direct and indirect obstetric deaths in booked, un-booked and registered cases. Patients having no antenatal visit were labelled unbooked, those having 3 or more visits booked and less than 3 as registered.

	2010-11	2011-12	2012-13	2013-14	2014-15	Total deaths	Percentage
Unbooked	19	25	12	28	15	99	57.6
Registered	7	3	5	16	12	43	24.8
Booked	0	0	5	9	9	23	13.9

Table 3: State of pregnancy and condition of patient at the time of admission, admission– death interval, place of delivery, haemoglobin level.

Condition of patient at the time of admission	2010-11	2011-12	2012-13	2013-14	2014-15	
Very sick	20	25	18	43	24	130 (78.78%)
In shock	6	1	4	7	8	26 (15.75%)
GC fair	0	2	0	3	4	9 (5.45%)
Hospital stay						
<2hours	3	6	6	6	6	27 (16.36%)
2-24 hrs	10	14	12	19	14	69 (41.8%)
>24 hrs	13	9	4	27	16	69 (41.8%)
State of pregnancy at the time of admission						
Antenatal< 12 weeks	1	1	1	2	2	7 (4.24%)
Antenatal	20	21	16	22	26	105 (63.6%)
Postnatal	5	6	5	29	8	53 (32.1%)
Place of delivery/abortion						
Rajindra Hospital	12	13	4	11	17	57 (34.5%)
Private hospital	2	1	1	6	2	13 (7.88%)
CHC/CH/PHC	1	1	3	16	3	24 (14.54%)
Home	3	4	1	11	5	21 (12.7%)
Not delivered	8	9	13	9	9	50 (30.3%)
Hemoglobin level at the time of admission						
Less than 4g%	3	4	1	8	4	20 (12.1%)
4g%-7g%	10	11	8	10	13	52 (31.5%)
7g%-9g%	5	8	9	20	5	44 (26.6%)
More than 9g%	8	7	6	15	14	49 (29.7%)

Maximum maternal deaths were reported in patients who had no antenatal checkup (57.6%) or 1or 2 ANC visits (24.8%) with ANM or dai or unqualified person, only 13.9% had 3 or more visits as shown in Table 2.

As described in Table 3, 94.5 % patients came in very sick condition. Out of which 15.75% were in shock at the time of admission. 58.16% (96) patients died within 24 hrs including 27 (16.36%) who died within 2hrs of admission.

105 (63.6%) patients were antenatal at the time of admission. Out of which 57 delivered or aborted but the complication was already present in antenatal period. 53 (32.1%) patients were admitted in postpartum state out of which 21 (12.7%) patients had home delivery, 8 had LSCS and 3patients had cesarean hysterectomy and were referred postoperatively. 21 were referred after vaginal delivery by private or govt. hospital. 7 patients were with early pregnancy of 6-8 weeks duration out of which 2 had D and C by unqualified person, 2 had MTP pill at home, 2 patients had severe respiratory disease and one had ectopic pregnancy with hepatic encephalopathy.

Table 4: Direct and indirect causes of maternal deaths, year wise.

Direct causes	2010-11	2011-12	2012-13	2013-14	2014-15	Total	Percentage
Haemorrhage	6	8	4	11	8	37	22.4
Eclampsia /preeclampsia	5	8	6	9	7	35	21.2
Sepsis	4	3	5	12	7	31	18.78
Embolism	2	2	2	5	3	14	8.48
Indirect causes							
Respiratory disease	2	1	1	3	3	10	6.06
Hepatitis	4	2	2	7	3	18	10.9
Heart disease	0	1	2	2	0	5	3.03
CNS disease	3	1	0	4	1	9	5.45
Renal ds							
Anemia	0	2	0	0	4	6	3.63
Total direct deaths	17	21	17	37	25	117	70.9
Total indirect deaths	9	7	5	16	11	48	29.1

70.2% (116) patients had haemoglobin level less than or equal to 9 gm%. 72 (43.6%) were severely anemic with 20(12.1%) patients having hemoglobin less than 4gm.

As shown in Table 4 of all maternal deaths 70.9% were due to direct obstetric causes. The classical triad of hemorrhage (22.4%), eclampsia/preclampsia (21.2%), and sepsis (18.78%) were the major direct causes of maternal deaths, whereas 8.48% maternal deaths were due to other causes.

In the study period, 29.1% of maternal deaths were due to indirect causes like respiratory diseases (6.06%), liver disease (10.9%), heart disease (3.03%), CNS problems (5.45%) and anemia (3.63%). Though anemia was the cause of death in 3.63% patients but it was a contributing factor in 70% patients who had moderate to severe anemia.

DISCUSSION

Maternal mortality is an index of reproductive health of the society. Avoidance of unwanted births, proper antenatal care by trained staff supported by institutional quality care and delivery coupled with the empowerment of women has made maternal deaths during pregnancy a rare phenomenon in the industrialized world. In the developing world, however, it is still a commonly encountered phenomenon.

High incidence of maternal deaths reflects poor quality of maternal services, late referral and low socioeconomic status of the community. Various studies done in India in the last 15 years have shown wide variation in MMR ranging from 47/100000 to 625/100000 births.[6-12] Jain M has reported a very high MMR of 2270/100000.[7] The mean Maternal mortality ratio in the present study was 1039/100000 births. This study has a high MMR, which could be due to the fact that our hospital is a tertiary care hospital and receives a lot of complicated referrals from rural areas of Punjab and Haryana at a very late and critical stage.

In present study, 69.7% of maternal deaths were in the age group of 20 to 30 years, as highest numbers of births are reported in this age group. Similarly, 63.6% of maternal deaths were reported in multiparous patients. More maternal deaths were reported in women from rural areas (71.4%), unbooked patients (85.4%), illiterate women (64.8%), and women belonging to low socioeconomic status (83.33%). All findings are similar to studies by Bhaskar et al, Jadhav et al, Jain et al, Onakewhor et al, Saini et al.[7-9,11,12]

12.7% patients had home delivery and came very late for seeking medical help in critical condition.

In unbooked patients, analysis revealed that regular antenatal checkups could have prevented these deaths by identifying high risk pregnancies and associated medical disorders. The regular ANC helps to improve anemia, prevent eclampsia and gives an opportunity for counseling of patients to adopt contraceptives, safe abortion services and institutional deliveries.

Deaths in early pregnancy 7/165 (4.24%) due to septic abortion, incomplete abortion, ectopic pregnancy signify need for early antenatal care, safe abortion practices, timely access to health care facility.

Table 5: Various studies showing direct and indirect causes of maternal deaths.

Author	Direct Cause	H'age	Sepsis	Toxemia	Indirect	Anemia	Jaundice	Heart disease	Miscellaneous
Murthy et al	72.5%	26.66%	18.33%	26.66%	27.5%	10%	9.16%	3.33%	5%
Yadav et al	73.19%	43.6%	12.67%	33.09%	26.81%	55.7%	23.06%	-	21.07%
Wadhwa et al	51.3%	16.2%	15.9%	10.8%	48.7%	-	22.2%	16.6%	-
Puri et al	55.38%	12%	24%	18%	14%	13%	14%	-	-
Saini et al	60.5%	23.9%	21.1%	7%	39.43%	8.4%	9.8%	2.8%	9.8%
Present study	70.9%	22.4%	18.8%	21.2%	29.1%	3.6%	10.9%	3.03%	11.5%

In present study, 70.9% of maternal deaths were due to direct causes. Hemorrhage (22.4%), eclampsia/preclampsia (21.2%), and sepsis (18.78%) were the major direct causes of maternal deaths in various Indian studies Incidence of hemorrhage varied from 12% (Puri et al) to 43.6% (Yadav et al).[6,14] Most of these patients died because of hypovolemic shock due to late referral/ arrival at hospital or delay in volume replacement because of non- availability of blood and blood components at primary level. Even today large number of maternal deaths is due to the classical triad of hemorrhage, sepsis, and eclampsia. All these are preventable causes of maternal mortality, provided the treatment is instituted on time.

Unfortunately, in many cases (94%), patients were referred in critical condition when they reached hospital. Many patients had to travel a distance of 70 to 80 kilometers in a private vehicle to reach our tertiary center. Most of these deaths are preventable if patients are given appropriate treatment at periphery and timely referred to higher centers. Training of medical officers and staff nurses working in rural areas by programs like basic emergency obstetrics care (BEMOC) and skilled attendant at birth (SAB) training along with equipment and drugs gives a ray of hope of reducing maternal mortality.

Indirect causes accounted for 29.1% of maternal deaths in our study. Respiratory disease, jaundice, heart disease, CNS problems and anemia were responsible for 6.06%, 10.9% 3.03%, 5.45% and 3.63% of maternal deaths respectively. Hepatitis was commonest indirect cause in our study. Various other studies (Table 5) have mentioned similar causes of indirect obstetric death as in present study.

Various preventable causes are hemorrhage, sepsis, hypertensive disorders, and anemia and anesthesia complications. Antenatal booking can prevent maternal deaths due to eclampsia, pre-eclampsia, severe anemia and various associated medical disorders. Early detection of high risk pregnancies and referring them to a tertiary center at the earliest can reduce the complications. National Health Mission (NHM) can play a major role in reducing maternal mortality by advocating institutional deliveries and timely referral of high risk cases.

CONCLUSION

Even today most maternal deaths are seen in patients from rural areas, unbooked, illiterate patients and patients from low socioeconomic status. Hemorrhage, eclampsia and sepsis are the major causes of maternal deaths. Improvement in primary health care in rural areas and proper implementation of NHM programs and up gradation of hospitals in rural areas can definitely bring down the number of maternal deaths. Maternal death reviews in the institute followed by review at zonal level, making strategies for early booking, identification of high risk pregnancies, timely referral and timely obstetric interventions will help to improve maternal health and hence prevent maternal deaths.

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