

**Research Article**

## **REVIEW OF MATERNAL MORTALITY IN AN URBAN TERTIARY CARE HOSPITAL OF NORTH INDIA**

**Saini V. and \*Gupta M.**

*Department of Obstetrics and Gynaecology, Hindu Rao Hospital, Delhi*

*\*Author for correspondence*

### **ABSTRACT**

This study was aimed at analyzing the maternal mortality trend over three years, the causes leading to maternal deaths in a tertiary care hospital and factors which are preventable. The records of maternal death from January 2010 to December 2012 (3 years) were collected and analyzed. Various factors like maternal age, mode of delivery, parity, and antenatal registration, and admission-death interval, mode of delivery and causes of deaths were reviewed. The maternal mortality ratio (MMR) was 471.54 in 2010 and declined to 225.57 in 2012. The direct causes of maternal mortality were hemorrhage (23.9%), sepsis (21.1%), amniotic fluid embolism (8.4%) and eclampsia (7%). Indirect obstetric deaths were due to hepatitis (9.8%), anemia (8.4%), respiratory diseases (8.4%), heart diseases (2.8%), CNS disease (7.04%), renal disease (1.4%) and anaphylactic shock (1.4%). Most of the deaths (81.69%) occurred in age group 20 and 30 years. Multigravida had MMR of 87.3%. Unbooked cases had maximum number of deaths (88.7%). Antenatal care, screening and management of high risk pregnancies are most important to prevent complications and maternal deaths by timely detection and intervention.

**Keywords:** *Maternal Mortality, Direct Obstetric Death, Indirect Obstetric Death, MMR, Maternal Deaths*

### **INTRODUCTION**

Everyday 800 women die from preventable causes of death. Improving maternal health is one of the 8 MDGs adopted by international community in 2000. Under MDG-5 countries are committed to reduce maternal mortality by 75% between 1990 and 2015. India is likely to miss MDG goal 5 related to maternal health as one maternal death is reported every 10 minutes in the country.

Maternal mortality is 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 but not from accidental or incidental cause (ICD-10). Maternal mortality ratio is number of maternal deaths during given time period per one lac births during same time period (4).

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.

In developing countries MMR is 240/lac and 16/lac in the developed countries. There are disparities within the country also, between high and low income groups and between rural and urban areas. Adolescents are at more risk.

In hospitals maternal mortality cases are of three main types. First who arrive in a moribund state too late to be benefitted by emergency care? Second, who could have been saved if they had timely and effective interventions? Third, women admitted for normal delivery that subsequently develop serious complications and die with or without receiving emergency care (McCarthy and Maine, 1992). These deaths in our study when analyzed in detail gave different insights into problems at various levels.

### **Aims and Objectives**

1. To calculate the maternal mortality rate in our hospital.
2. To analyze the causes of maternal mortality.
3. To suggest ways to reduce MMR.

## Research Article

### MATERIAL AND METHODS

This study was done in Hindu Rao Hospital located in north Delhi, one of the biggest tertiary care hospitals in North Delhi. It caters to both booked and un-booked pregnant patients and admissions are not restricted for any reasons. It gets referrals from nursing homes, maternity homes, and level-II hospitals for high risk care, ICU facility, blood-bank facility. The medical records of all maternal deaths occurring in the Hindu Rao Hospital between January 2010 and December 2012 were analyzed. Various factors like maternal age, mode of delivery, parity, antenatal registration, admission - death interval, mode of delivery and cause of deaths were reviewed.

### RESULTS AND OBSERVATIONS

Total 71 maternal deaths occurred between January 2010-December 2012 and live births were 19, 798 during the same time period resulting a mean MMR of 358.6 /100000. Year wise distribution of MMR is shown in Table 1. The MMR was 471 in year 2010 which declined significantly to 225 in the year 2012. Highest mortality of 81.69% was noted in age group 20 to 30 years. Multipara women (para 1 to para 3) had maximum MMR of 64.78% (46/71), while primi and grand-multipara had MMR of 15.49% (11 /71) and 19.71% (14/71) respectively.

Within 24 hours of admission 42.85% (30/71) of women died (Table 1). Most of these cases were unbooked and 23 women out of these 30 women who died within 24 hours of admission were brought in a moribund condition.

**Table 1: Showing year wise MMR, distribution according to age, parity, death-admission interval, antenatal / postnatal deaths**

	2010	2011	2012	Total
Deliveries	6370	676	7328	20458
Live births	6150	6555	7093	19798
Maternal deaths	29	26	16	71
MMR /lac	471. 54	396. 64	225. 57	358. 69
Age<20years	nil	nil	nil	nil
Age20-30years	26	19	13	58 (81. 69%)
Age>30 years	3	7	3	13 (18. 3%)
Primipara	3	6	2	11 (15. 49%)
Multipara, para1-3	24	12	10	46 (64. 78%)
Grandmulti, para>3	2	8	4	14(19. 71%)
Death within 24 hours	14	8	8	30 (42. 85%)
Death after 24 hours	15	18	8	41 (57. 74%)
Antenatal, 1 <sup>st</sup> trimester	nil	3	4	7 (9. 8%)
Antenatal, 2 <sup>nd</sup> , 3 <sup>rd</sup> trimester	9	4	4	17 (23. 9%)
Postnatal, vaginal delivery	11	14	5	30 (42. 2%)
Postnatal after LSCS	9	5	3	17 (23. 9%)
Total deaths	29	26	16	71

Maximum deaths occurred in the un-booked cases 87.3% (62/71). In booked cases (with minimum three ANC visits) deaths were only in 4.2% (3/71) and in registered cases (less than three ANC visits) deaths accounted for 7% (6/71). (Table 2)

There were 16/71 referred cases from other hospitals, maternity centers, etc. who died in our hospital. Of these referred cases three were referred in the postoperative period after LSCS in other hospitals/ nursing homes. Three were referred after vaginal delivery and 10 were referred during ANC period or in labor. Out of these 10 patients referred before delivery, 2 had vaginal delivery, 3 had LSCS and 5 died before delivery.

## Research Article

In the booked cases there were only 3 deaths. The reasons included haemorrhage in one case and from indirect causes in 2 cases. In the un-booked cases there were 62 deaths. The causes of death in this group include hemorrhage (13/62), sepsis (14/62), embolism (6/62), eclampsia (5/62) and other indirect causes (24/62). However, in the registered cases, with less than 3 visits there were total 6 deaths. Three occurred because of hemorrhage, 1 from sepsis and 2 from indirect causes (Table 2)

Most of the deaths occurred in postnatal period 66.1% (47/71). Thus it should be realized that postpartum period is quite vulnerable to these events. However in all the cases in our study the complications leading to death started before or during delivery. There was only 1 case of postpartum death with uneventful antenatal and intra-natal period because of postpartum cardiomyopathy. Antenatal deaths were in 33. 8% (24/71) of total deaths. These also included deaths during early pregnancy (7/24) due to incomplete abortion, septic abortion. (Table 1)

Direct obstetric deaths occurred in 60.5% (43 /71). The causes responsible for it were hemorrhage 23. 9% (17/71), sepsis 21.1% (15/71), eclampsia 7% (5/71) and embolism 8.4% (6/71). (Table 3)

Indirect obstetric deaths occurred in 39.43% (28/71) women and included deaths due to hepatitis 9.8% (7/71), anemia 8.4% (6/71), respiratory diseases 8.4% (6/71), heart diseases 2. 8% (2/71), CNS disease 7.04% (5/71) renal disease 1.4% (1/71), anaphylactic shock 1.4% (1/71) as shown in Table 3

**Table 2: Direct and indirect obstetric deaths in booked, un-booked and registered cases**

	Booked cases	Unbooked cases	Registered cases	Total
<b>Total deaths</b>	3	62	6	71
<b>Direct causes</b>				
Haemorrhage	1	13	3	17
Sepsis	Nil	14	1	15
Embolism	Nil	6	Nil	6
Eclampsia	Nil	5	Nil	5
<b>Indirect causes</b>	2	24	2	28

**Table 3: Direct and Indirect causes of maternal deaths, year wise**

	2010	2011	2012	Total
<b>Direct causes</b>				
Haemorrhage	8	5	4	17
Sepsis	3	6	6	15
Eclampsia	1	3	1	5
Embolism	3	2	1	6
<b>Indirect causes</b>				
Respiratory disease	2	2	2	6
Hepatitis	4	3	0	7
Anemia	4	1	1	6
Heart disease	1	1	0	2
Renal disease	1	0	0	1
Anaphylactic shock	0	1	0	1
CNS disease	2	2	1	5
Total indirect deaths	14	10	4	28
Total direct deaths	15	16	12	43
Total maternal death	29	26	16	71

## DISCUSSION

India's average MMR in 2009 was 212 (Office of Registrar General, India, 2011) and has declined to 178 in a survey conducted in 2010-2012 (data from registrar general published in Live mint and the wall street journal, 30/01/2014). In our study MMR had declined from 471.5 in 2010 to 225.5 (almost 50% decline) in 2012 showing a good progress. This pace of decline if maintained can reach the MDG5 targets of 109

## Research Article

by 2015. However the MMR in our study still remains quite high, more than our national average because our health facility is a referral tertiary hospital for various maternity centers, nursing homes and other level II hospitals which do not have ICU and blood-bank facilities and multi-specialty care. Being a government hospital there is no restriction on admissions inspite of non-availability of beds, antenatal booking etc. Study by Puri *et al.*, (2011) 2003-2006 of same hospital observed MMR ranging between 926 in 2003 and 377 in 2006. Over the years MMR has decreased significantly in our hospital because of continuous training of medical and paramedical staff, early intervention, improvement in blood-bank facilities, availability of blood components, dedicated separate gynae casualty.

Janani SurakshaYojana promotes institutional deliveries but not antenatal care so many un-booked patients with complications and many a times in moribund state reach hospital which could have been saved by timely access to skilled care and interventions. Various studies done in India in the last 15 years have shown wide variation in MMR ranging from 47 to 625 births (Bhaskar *et al.*, 2013; Jadhav and Rote, 2007; Jain and Maharajah, 2003; Onakewha and Gharoro, 2008; Patel *et al.*, 2005; Shah *et al.*, 2008). Most of women who died were in age group of 20-30 years (81.69%) suggesting that these deaths occurred in prime and most reproductive part of life. In our study deaths occurred in 84.49% multipara, reflecting the need to strengthen family planning services so that every pregnancy is wanted and planned. Our hospital is promoting postpartum CuT insertion after vaginal and LSCS delivery besides offering other postpartum contraceptives so that inter-conception spacing is increased leading to recovery of maternal health before next pregnancy. In grand-multipara (more than three) maternal deaths occurred in 19.71% because of the decrease in number of grand-multipara women compared to primi-gravida and multigravida.

Analyzing the 3 deaths in the booked case group, it appears that inspite of timely report by the patients to hospital and timely intervention the deaths could not be prevented. In 2012 however there was no death in the booked patients.

In the registered group, analysis of deaths revealed that regular antenatal checkups could have prevented deaths of these patients. Regular antenatal check- ups helps to identify high risk pregnancies, associated medical disorders, improves anemia, prevents eclampsia and gives an opportunity for counseling of patients to adopt contraceptives and safe abortion services.

Deaths in early pregnancy (7/71) due to septic abortion, incomplete abortion, ectopic pregnancy, invasive molar pregnancy signify the need for early antenatal care, safe abortion practices, timely access to health care facility before irreversible shock sets in.

**Table 4: Various studies showing direct and indirect causes of maternal deaths**

Author Cause	Direct cause	Haemorrhage	Sepsis	Toxemia	Indirect	Anemia	Jaundice	Heart disease	Miscellaneous
Murthy <i>et al.</i> , (2013)	72.5%	26.66%	18.33 %	26.66%	27.5%	10%	9.16%	3.33%	5%
Vidhyadhar <i>et al.</i> , (2001)	50%	21.05%	7.89 %	10.52%	50%	2.63%	21.05%	13.15%	13.15%
Yadav <i>et al.</i> , (2013)	73.19%	43.6%	12.67 %	33.09%	26.81%	55.7%	23.06%	-	21.07%
Wadhwa <i>et al.</i> , (2013)	51.3%	16.2%	15.9 %	10.8%	48.7%	-	22.2%	16.6%	-
Salhan <i>et al.</i> , (2000)	60%	18.18%	14.54 %	16.3%	40%	27.27%	-	-	-
Puri <i>et al.</i> , (2011)	55.38%	12%	24%	18%	14%	13%	14%	-	-
Present Study	60.5%	23.9%	21.1 %	7%	39.43%	8.4%	9.8%	2.8%	9.8%

## **Research Article**

Direct obstetric deaths occurred in 60.5% (43 /71) in our study (Table 3). Deaths from hemorrhage were in 23.9% (17/71) of cases. As per WHO, 2007 (WHO, 2010) 25% of all maternal deaths world-wide are due to hemorrhage whereas in various Indian studies incidence of hemorrhage varied from 12% (Puri *et al.*, 2011) to 43.6% (Yadav *et al.*, 2013). 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. All direct obstetric deaths were in un-booked except for one woman who was a booked case. No death occurred in 2012 in booked women.

In our study indirect obstetric deaths occurred in 39.5% (28/71) women and included deaths due to hepatitis 9.8% (7/71), anemia 8.4% (6/71), respiratory diseases 8.4% (6/71), heart diseases 2.8% (2/71), CNS disease 7.04% (5/71), renal disease 1.4% (1/71), anaphylactic shock 1.4% (1/71). Various other studies (Table VII) have mentioned similar causes of indirect obstetric death as in our study. Jaundice was the commonest indirect cause of maternal death in our study whereas anemia was the commonest cause in other studies (Bhaskar *et al.*, 2013; Salhan *et al.*, 2000; Yadav *et al.*, 2013).

Various preventable causes are hemorrhage, sepsis, hypertensive disorders, anemia, and anesthesia complications. Antenatal booking can prevent maternal deaths due to eclampsia, pre-eclampsia, severe anemia and various associated medical disorders.

Every maternal death was analyzed to know cause of death and to take measures to prevent these deaths. As majority of deaths occurred in un-booked cases, community level approach is required. Antenatal care starting early in pregnancy, detection and managing pregnancy complications, detection and treatment of associated medical disorders, institutional deliveries , proper referral facility and emergency transport, timely intervention, access to contraceptives and safe abortion services can prevent most of the deaths. Many women (23/71) were referred in moribund state and in irreversible shock and could not be saved even at our tertiary care hospital. These women could have been saved, had they received obstetric and medical care in time.

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. Education, hygiene, good nutrition, adopting a two child norm will go a long way to improve maternal health and mortality.

## **REFERENCES**

- Bhaskar K Murthy, Mangala B Murthy and Priya M Prabhu (2013).** Maternal Mortality in a Tertiary Care Hospital. A 10 year Review. *International Journal of Preventive Medicine*. **4** (1) 105-109.
- Jadhav AJ and Rote PG (2007).** Maternal mortality–changing trends. *Journal of Obstetrics and Gynaecology of India* **57** 398-400.
- Jain M and Maharajah S (2003).** Maternal mortality: A retrospective analysis of ten years in a tertiary hospital. *Indian Journal of Preventive and Social Medicine* **34** 103-11.
- McCarthy J and Maine D (1992).** A framework for analyzing the determinants of maternal mortality. *Studies in Family Planning* **23**(1) 23-33
- Office of Registrar General, India (2011). Special Bulletin on Maternal Mortality in India 2007-09: Sample registration system, June.
- Onakewhor JU and Gharoro EP (2008).** Changing trends in maternal mortality in a developing country. *Nigerian Journal of Clinical Practice* **11**(2) 111-20. .
- Pal A, Ray P, Hazra S and Mondal TK (2005).** Review of changing trends in maternal mortality in a rural medical college in West Bengal *Journal of Obstetrics and Gynaecology of India*. **55** 521-4.
- Puri A, Yadav I, Jain N (2011).** Maternal Mortality in an Urban Tertiary Care Hospital of North India *Journal of Obstetrics and Gynaecology of India* **61** 280-285
- Salhan S, Sharma M and Suri J (2000).** Maternal mortality in a tertiary hospital. *JOSH*. **7** 78-79
- Shah RJ, Ali I, Banday A, Fazili A and Khan I (2008).** Analysis of maternal mortality in a small teaching hospital attached to tertiary care hospital. *Indian Journal Community Medicine* **33**(4) 260-2.

**Research Article**

**Vidyadhar B, Bangal A, Purushottam A, Giri B and Garg R (2001).** Maternal Mortality at a Tertiary Care Teaching Hospital of Rural India. *International Journal of Biological and Medical Research* **2**(4) 1043-46

**Wadhwa L, Gupta S and Jain A (2013).** Demography and aetiological profile of maternal mortality cases at a tertiary care centre of India-five and half years retrospective analysis. *Indian Journal of Medical Specialties* **4**(2) 238-242

**WHO (2010).** Trends in maternal mortality:1990 to 2008. Estimates developed by WHO, UNICEF, UNFPA and the world bank. *World Health Organization, Geneva 2010.*

**Yadav K, Namdeo A and Bhargava M (2013).** A retrospective and prospective study of maternal mortality in a rural tertiary care hospital of central India. *Indian Journal of Community Health* **25**(1) 16-21.