

## Maternal Mortality and Its Causes in a Tertiary Center

Khumanthem Pratima Devi ·  
Chanam Manglem Singh ·  
Samjetshabam Randhoni Devi

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### Abstract

**Objectives** To study the maternal mortality and the complications leading to maternal death.

**Methods** A retrospective study of hospital records and death summaries of all maternal deaths over the period from January 2000 to August 2009 was carried out.

**Results** There were a total of 80 maternal deaths out of 88,443 live births giving maternal mortality rate (MMR) of 90.45 per 100,000 live births. Unbooked and late referral accounted for 77.5 % of maternal deaths. The majority of the deaths was in 30–40-year age group and around term. Hemorrhage was the commonest cause of death (52.5 %), followed by sepsis (13.75 %) and pregnancy-induced hypertension including eclampsia (10 %).

**Conclusions** Hemorrhage, sepsis, and pregnancy-induced hypertension including eclampsia were found to be the direct major causes of death. Anemia and cardiac disease were other indirect causes of deaths.

**Keywords** Maternal mortality · Postpartum hemorrhage · Sepsis · Eclampsia · Anemia

### Introduction

Maternal death is a tragic situation as it occurs during or after a natural process. It is the leading cause of death for women of reproductive age group. The index of the quality of health care delivery system of a country as a whole or in part is reflected by its maternal mortality rate (MMR). With 16 % of the world's population, India accounts for over 20 % of the world's maternal deaths. Every minute every-day, a woman dies as a result of pregnancy and childbirth somewhere in the world. Every year, approximately 600,000 women die of pregnancy-related causes, and 98 % of these deaths occur in developing countries [1]. The MMR per 100,000 live births is estimated to be 920 in Africa, 330 in Asia, and 10 in Europe [2]. Up to 80 % of these deaths are directly due to five complications: hemorrhage, sepsis, pregnancy-induced hypertension, rupture uterus (obstructed labor), and complications of abortion. A major reason for so many deaths due to hemorrhage is because, once bleeding starts, death can occur in around 2 h compared with 10 h for eclampsia and 72 h for obstructed labour [3].

The United Nations issued 8 Millennium Development Goals (MDG); the fifth goal (MDG-5) stipulated a reduction of the MMR by 75 % by 2015 [4]. In India too, the National Health Policy, 2002 aims toward reducing the

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Khumanthem P. D., Registrar · Chanam M. S., Prof. & Head ·  
Samjetshabam R. D., Assoc. Prof.  
Department of Obstetrics and Gynecology, Regional Institute  
of Medical Sciences (RIMS), Lamphel, Imphal,  
Manipur 795001, India

Khumanthem P. D. (✉), Registrar  
C/O Dr. A.D. Sharma, Brahmapur Aribam Leikai,  
Near Water Tank, Imphal, Manipur 795001, India  
e-mail: pratimadutta09@gmail.com

MMR to 100/1 lakh by 2010, while the National Rural Health Mission (NRHM) sets similar targets to be achieved by 2012. The level of MMR in India has declined from over 750 in the 1960s to about 400 in the 1990s [5, 6]. It is roughly estimated to be about 300 in 2003, though it is above 400 in some states [7, 8]. Preventing maternal deaths remains one of the most important objectives of the National Family Welfare Program. Efforts for monitoring are limited due to lack of population-based reporting of vital events. Most of the evidence for maternal mortality is obtained through hospital data and community-based reports, both of which have limitations. By accessing the information that is available, it is possible to assess the magnitude and pattern of the health problem in the state [9]. The aim of study was to assess the MMR in the tertiary center and find out the causes leading to maternal deaths.

## Materials and Methods

The study was conducted by reviewing the records for deaths over the period from January 2000 to August 2009 in the department of Obstetrics and Gynecology at Regional Institute of Medical Sciences, Imphal. Every maternal death was scrutinized from various aspects likely to be related to death, such as age, locality of residence, parity, literacy, antenatal care, admission-death interval, and the cause of death.

## Results

During the study period, there were 80 maternal deaths out of 88,443 live births giving an MMR of 90.45 per 100,000 live births (Table 1). Seventy percent of these deaths were in the postnatal period, and 28.75 % of deaths were due to

**Table 1** Year wise distribution of maternal deaths and live births

Year	Maternal deaths	Live births	MMR
2000	5	6,833	73.17
2001	7	7,904	88.56
2002	12	8,412	142.65
2003	6	10,408	57.65
2004	8	9,868	81.07
2005	7	10,229	68.43
2006	8	10,933	73.17
2007	11	8,863	124.11
2008	6	8,900	67.42
2009 <sup>a</sup>	10	6,096	164
Total	80	88,443	90.45

<sup>a</sup> Up to August 2009 only

home delivery and late transport. As shown in Table 2, 77.5 % were unbooked and belonged to rural areas. A majority of the deaths had occurred at term (57.5 %) and were multigravida (75 %), while 57.5 % of deaths were in age group of 30–40 years. Also majority of them (77.5 %) were illiterate.

As seen from Table 3, 48 maternal deaths (60 %) had occurred within the first 24 h of admission. Analysis of the causes of death revealed that obstetrical hemorrhage is the leading cause of death (Table 4). Out of 80 deaths, 42 (52.5 %) were due to hemorrhage; sepsis-related deaths due to late referral were 11 (13.75 %); and pregnancy-induced hypertension- or eclampsia-related deaths were 8 (10 %). Amniotic fluid embolism was suspected in 3 (3.75 %) and pulmonary embolism in another 3 (3.75 %). Only one woman died because of acute uterine inversion. Among 42 deaths due to hemorrhage, 15 (18.75 %) were due to atony and 5 (6.25 %) due to antepartum hemorrhage. In about 12 (15 %), deaths were due to indirect causes like anemia, cardiovascular disease, hepatitis, asthma, epilepsy, acute renal failure, and terminal stage of carcinoma breast.

**Table 2** Maternal deaths and its characteristics

Characteristics	Groups	Maternal deaths	Percent
Age (Years)	10–20	3	3.75
	20–30	26	32.5
	30–40	46	57.5
	>40	5	6.25
Parity	Primi	20	25
	Multi (Grandmulti)	60 (16)	75 (20)
Antenatal care	Booked	18	22.5
	Unbooked	62	77.5
Locality	Rural	62	77.5
	Urban	18	22.5
Gestational age (weeks)	<20	7	8.75
	20 ≤ 37	31	38.75
	≥37	46	57.5

**Table 3** Admission to death interval

Admission death interval in hours	No. of maternal deaths	Percentage
24	48	60
24–48	14	17.5
48–72	6	7.5
>72	12	15

**Table 4** Causes of maternal deaths ( $n = 80$ )

Causes	No. of deaths	Percentage
Direct	68	85
Hemorrhage	42	52.5
Atony	15	18.75
Antepartum hemorrhage	5	6.25
Uterine rupture(Obstructed)	5	6.25
Abortion	5	6.25
Ectopic rupture	2	2.5
Following cesarean	2	2.5
Molar pregnancy	2	2.5
DIC	3	3.75
Adherent placenta	3	3.75
Sepsis	11	13.75
Pregnancy-induced hypertension	8	10
Amniotic fluid embolism	3	3.75
Pulmonary embolism	3	3.75
Acute uterine inversion	1	1.25
Indirect	12	15
Anemia	3	3.75
Cardiovascular disease	3	3.75
Hepatitis	2	2.5
Asthma	1	1.25
Epilepsy	1	1.25
Acute renal failure	1	1.25
Terminal stage of malignancy	1	1.25

## Discussion

The MMR in our present study is 90.45 per 100,000 live births, ranging from 73.17 in 2000 to 164 in 2009. Most women were from far-off places resulting in delayed intervention, and many were in poor general condition at the time of admission. Other studies from tertiary care institutions reported mortality rate of 371–4286/100,000 live births due to large number of referred cases [10]. Also some deaths which occurred outside the medical system were not included, and this led to a different incidence from the actual one occurring in the community. We might have underestimated the levels of maternal mortality, either because death reporting was incomplete or because pregnancy was underreported as a cause of death. The higher incidence of deaths is due to late referral of cases from periphery and delayed intervention. Most deaths were observed in the 30–40-year age group in the present study, whereas deaths were in the 21–30-year age group in other studies [11]. Older age group was due to late marriage, and many were grand multigravida. Sixty percent of deaths occurred within the first 24 h of admission to the hospital.

Postpartum deaths accounted for about 70%. Hemorrhage was the commonest cause of death (52.5 %), and this is comparable with most of the other studies. The availability of blood banks at all first referral units (FRUs) and their proper functioning are needed. The provision of timely blood transfusions can save many lives [12].

Hemorrhage and sepsis were the major direct killers and were comparable to other studies [8, 12]. Sepsis accounted for about 13.75 % which included both puerperal sepsis due to home delivery and septic abortion due to Medical Termination of Pregnancy done outside. Many of these lives could have been saved, if all abortions and deliveries were performed by qualified medical personnel [10]. Hypertension or eclampsia-related deaths accounted for another 10 % of deaths, which is comparable with other studies [11, 13]. The use of magnesium sulfate and early termination with medications had led to improve the scenario of eclampsia. Amniotic fluid and pulmonary embolism were responsible for 3.75 % each. Only one woman had died because of inversion of uterus, and this is similar with the study reported by Jagdish and Govind [9].

Indirect causes of death accounted for 15 %, out of which anemia and cardiovascular causes had constitute the majority. Preexisting anemia worsens as pregnancy advances leading to heart failure and death. It also impedes the mother ability to resist infection or cope with hemorrhage and increases the likelihood of her dying in childbirth by a factor of four [10]. Hepatitis accounted for 2.5 % deaths. 4.16–10.8 % deaths have been reported in other studies [10, 11].

## Conclusion

What is tragic is that most of these deaths are preventable. Maternal deaths are still high in comparison with developed countries. Sustained reductions in maternal mortality will only be possible if modern high-quality obstetric care is made available to all women through a system of professional midwifery and referral hospital care in the context of political commitment and accountability of health providers. A recent systemic review of the causes of death stressed the need for increased emphasis on prevention and treatment of obstetric hemorrhage and noted that most post-partum deaths should be avoidable by appropriate management [14]. Much needs to be done for maternal health care in rural areas, as most of the deaths reported are referral from peripheral centers. Concentrated efforts are required to obtain the missing data through improvising better and accurate data collection. Health education of masses along with good quality health care and transport facilities can prevent many deaths.

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