Original Article

A Ten Year Audit of Maternal Mortality: Millennium Development Still a Distant Goal

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ABSTRACT

Objective: To assess various causes of maternal mortality over a ten year period **Design:** Retrospective audit of hospital case records **Setting:** Tertiary care hospital **Population:** Pregnant women who expired in the premises of GTB Hospital. **Materials and Methods:** A retrospective audit of case records of maternal deaths was conducted for a ten year period (January 2005 to December 2014). **Results:** There were a total of 647 maternal deaths out of 1,16,641 live births. Sixty-eight percent (n = 445) of women were aged 21-30 years, while 10.5% (n = 68) were <20 years of age. The most common direct causes of maternal mortality were preeclampsia/eclampsia in 24.4% (n = 158), obstetric hemorrhage in 19.1% (n = 124) and puerperal sepsis in 14.5% (n = 94). With regards to indirect causes, anemia accounted for 15.3% (n = 99) mortality. There was only 1 (0.1%) mortality because of HIV/AIDS. Other notable causes of maternal mortality were infective hepatitis in 7.1% (n = 46). Tuberculosis, that is a disease of tropical countries, accounted for 3.0% (n = 20) of the total deaths. **Conclusion:** High maternal mortality in GTB hospital can be due to it being a tertiary hospital with referrals from all neighbouring states. Accessible antenatal care can help prevent these maternal deaths. Female education can be of immense help in dealing with the problem and improving the utilization of public health facilities.

Key Message: Preeclampsia/eclampsia and obstetric hemorrhage have been the main causes of maternal mortality for ages. Regular antenatal visits and the judicious training of grassroot level workers to pick-up complications early on in the pregnancy can be an effective way to deal the morbidity and mortality associated with these problems. The Janani Suraksha Yojana (JSY) and Janani Shishu Suraksha Karyakaram (JSSK) in India are pioneer steps in this direction.

Keywords: Direct and indirect causes, maternal mortality, millennium development goals

Introduction

Maternal and reproductive health caught the global eye in 1980s, with the launch of Safe Motherhood Initiative, Nairobi in 1987. Since then several National and International initiatives have been adopted to reduce the unacceptable maternal deaths, especially in low resource countries.

Globally every year over 500,000 women die of pregnancy related causes and 99% of these cases are in the developing countries. An estimated 2,89,000 maternal deaths occurred in the year 2013, indicating a decline of 45% from the levels in 1990.[1] Of the total maternal

Access this article online

Quick Response Code:

Website: www.ijcm.org.in

DOI: 10.4103/ijcm.IJCM_30_16

Cite this article as: Singla A, Rajaram S, Mehta S, Radhakrishnan G. A ten year audit of maternal mortality: Millennium development still a distant goal. Indian J Community Med 2017;42:102-6.

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Received: 02-02-16, **Accepted:** 19-12-16

deaths worldwide, sub-Saharan Africa accounted for 67% and South Asia for 24%,taking the total to 91% of the global maternal death burden in 2013.[1] At the country level, two countries accounted for one-third of global maternal deaths: India (19%, n = 56000) and Nigeria (14%, n = 40000).[1]

Various strategies have been adopted worldwide in congruence with the fifth Millennium Development Goal (MDG) which aims to reduce maternal mortality ratio (MMR) by 75% between 1990-2015 and achieve universal access to reproductive health by 2015.[2] These strategies were devised based on different phases of the reproductive cycle, primary health care principles and health care system factors. Examples of these include World Bank's Safe Motherhood Initiative,[3] WHO Mother Baby Package,[4] Mother Care Pathway to Survival[5] and WHO Making Pregnancy Safer (MPS) Initiative.[6]

The ever increasing difference in MMR between developed and developing countries highlights the fact that the countries with highest morbidity and mortality burdens have made the least progress in improving these.

MMR is not only an indicator of maternal and infant health, but also an insight into a particular country's socioeconomic state and health system.[7] In 1990, the global MMR was 400 and in India, it was 600 contributing to 27% of maternal deaths. In 2010 when the global MMR was 210, India had reduced its MMR to 178 in 2011, now contributing to 16% of maternal deaths. Globally, a decline of 47% in MMR was noted between 1990-2010, whereas in India, a decline of 70% in MMR between 1990-2011 was registered.[8] To address this issue, the Government of India launched its flagship National Rural Health Mission (NRHM) programme.

JSY program was launched in the year 2005 aiming at a 100% institutional delivery rate, especially in the vulnerable sections of society. Accredited social health activists (ASHA) workers are acting as an effective link between the government and poor, pregnant women.[8]

The success of the JSY scheme established building blocks for the JSSK scheme which was launched in 2011 with free entitlements to the pregnant women, sick newborns and infants for free delivery including cesarean section and treatment in public health institution along with free transport.[8]

To catch every pregnant women, neonate as well as infant for quality antenatal, intranatal, postnatal, family planning and immunization services; a web enabled Mother and Child Track System (MCTS) is being implemented all over the country.

Finally, a maternal death review (MDR) policy has been institutionalized across the country, both at the facility and community levels to identify the medical causes, socioeconomic cultural factors and gaps in the system which contribute to maternal deaths.

The highest rates of decline are evident from the years 2004-2006, the period just after the launch of NRHM and JSY program.

In fact, the need of the hour is more resource investment, political commitment and focused research to reduce the annual half a million unacceptable maternal deaths worldwide.[9,10]

Materials and Methods

A retrospective audit of case records of maternal deaths at GTB Hospital (Tertiary hospital) and University College of Medical Sciences, Delhi was done. The Medical Records Department (MRD) of the hospital has a separate database where all maternal deaths are recorded and updated at the end of every month. This database was accessed after institutional ethical approval. Case records were obtained from January 2005 to December 2014. All the case records were audited by the principal investigator. Information recorded was age, parity, booking and literacy status, socio-economic status, distance from residence to health care facility, reference from primary or district health care facility, cause of death and total stay in the hospital. Total number of live births was also calculated for the same time period.

Results

Six hundred forty seven (647) maternal deaths occurred out of total live births of 1,16,641 between January 2005 and December 2014, which was about 0.5% of all live births. All 647 maternal records were available for analysis. The majority of women were in the age group of 21-30 years (n = 445) (68.7%) and the mean age was 27.3 ± 4.3 years. Fifty five percent women were of parity 1-2. 54% women did not have any primary education, while 33.3% received only primary education. Six hundred and eight (93.9%) were unbooked in GTB hospital; out of these 73.6% did not have have even a single visit to any health care centre while, approximately 21.2% received some form of Antenatal checkup (ANC). Either tetanus toxoid injection or iron prophylaxis. There were almost equal antepartum and postpartum deaths (47.6%, 52.3% respectively) [Table 1].

Preeclampsia/Eclampsia (PE/E) was the most common, direct cause of maternal deaths (n = 158, 24.4%) followed by obstetric hemorrhage (n = 124, 19.9%), puerperal sepsis (n = 94, 14.5%), post-abortal complications (n = 31, 44.7%), obstructed labor (n = 12, 1.8%) and rupture

uterus (n = 19, 2.9%). Anemia was the most common (n = 99, 15.3%) indirect cause followed by cardiac disease (n = 21, 3.2%). There was only one (0.1%) casualty because of HIV/AIDS. Infective hepatitis was the most common associated cause (n = 46, 7.1%) followed by tuberculosis (n = 20, 3.0%). Anaesthetic complications, seizure disorder, road traffic accident (RTA) and uterine inversion were a cause of death in a very few patients [Table 2]. Three hundred and seven (47.4%) women died within 24 hours of presentation to the hospital and another 157 (24.2%) did not survive beyond 72 hours [Table 3]. On evaluating the charts of patients it was found that 584 women received ICU care.

Table 1: Socio-demographic characteristics (n=647)

Parameters	N (%)
Age (years)	
<20	68 (10.5%)
21-30	445 (68.7%)
31-40	134 (20.7%)
Parity	
1	206 (31.8%)
2	155 (23.9%)
3	124 (19.1%)
4	162 (14.2%)
Education	
Illiterate	350 (54.0%)
Primary	216 (33.3%)
Secondary	62 (9.5%)
Higher	19 (2.9%)
Booking status	
Unbooked	608 (93.9%)
Booked	39 (6.02%)

Table 2: Causes of maternal deaths

Parameters	N (%)
Direct	
Preeclampsia / Eclampsia	158 (24.4%)
Obstetric hemorrhage	124 (19.1%)
Puerperal sepsis	94 (14.5%)
Post-abortal complications	31 (4.7%)
Ruptured uterus	19 (2.9%)
Obstructed labor	12 (1.8%)
Ectopic pregnancy	1 (0.1%)
Indirect	
Anaemia	99 (15.3%)
Cardiac disease	21 (3.2%)
Diabetes mellitus	2 (0.3%)
Malaria	2 (0.3%)
HIV/AIDS	1 (0.15%)
Others	
Infective hepatitis	46 (7.1%)
Tuberculosis	20 (3.0%)
Anaesthetic complications	2 (0.3%)
Uterine inversion	2 (0.3%)
Seizure disorder	2 (0.3%)
Road traffic accident	2 (0.3%)
Dengue shock syndrome	5 (0.7%)
Malignancy	1 (0.1%)
Acute fatty liver of pregnancy	1 (0.1%)

Table 3: Time interval between presentation to health facility and death

Time interval	N (%)
<24 hrs	307 (47.4%)
24 hrs-3 days	157 (24.2%)
4-6 days	59 (9.1%)
>6 days	124 (19.1%)

Discussion

Globally every year over 5,00,000 women die of pregnancy related causes and 99% of these are in the developing countries. An estimated 2,89,000 maternal deaths occurred in 2013, demonstrating a decline of 45% from the levels in 1990.[1]

MMR in developing countries (240) was 15 times higher than that of developed countries (16). MMR of India according to the Census 2010-12 is 178.[11] Target MMR by 2015 is 109 for India if 5th MDG has to be achieved. MMR levels have shown a steady decline from 327 to 212 between 1999 and 2009 (38%). Widespread disparities exist across Indian states with MMR ranging from 66 in Kerala to 328 in Assam.[11] Six hundred and forty seven maternal deaths over a ten-year period in GTB hospital was because it is a tertiary level hospital with majority of the referred women receiving little or no antenatal care (93.9%) and admittance in a moribund state (n = 167). It was also seen that 357 (55.1%) women had travelled to the hospital from long distances (> 4 hours).

WHO categorizes maternal deaths into direct, indirect and unknown/undetermined.[1] PE/E was the most common direct cause (n = 158, 24.4%) in our study, same as reported by Igwegbe;[12] whereas PE/E demonstrated a decreasing trend in the audit by You *et al.*[13] Hypertensive disorders ranged second in the report by Gumanga *et al.*,[14] while Prakash *et al.*[15] found it responsible in only 12% cases. Igwegbe[12] also noted a similar number (12.5%), while Gumanga[14] found it in 8.7% of his patients. Anaemia was the most common indirect cause accounting for 15.3% of maternal deaths. Twenty-one women died of cardiac disease and two women succumbed to diabetes and its resultant complications.

An associated cause of importance in our audit was infective hepatitis, responsible for 7.1% of casualties. Most of these women were diagnosed with fulminant viral hepatitis, due to hepatitis E virus (HEV); stressing upon the need for hygiene, provision of clean drinking water and sanitation for general public. You *et al.* found liver and heart diseases as the main indirect causes of maternal deaths in China.[13]

There cannot be enough emphasis on the need for universal antenatal visits and regular contact with health care system to identify high risk factors early. . Regular ANC visits to identify signs and symptoms of severe pre-eclampsia/eclampsia, anemia, jaundice and heart disease should reduce deaths due to these causes. ANC should not just be a visit, but an opportunity for women to know the risks associated with pregnancy and the need to discuss as well as plan her options for further professional care. Developed countries have an integrated package of antepartum, intrapartum (IP) and postpartum care, whereas in developing countries maternal and child health services are operational, but there is a wide disparity in the quality of services provided. A total of 11-17% of maternal deaths occurred in the IP period, whereas 50-71% occurred postpartum.[16] So, prioritizing professional, skilled birth attendance at delivery may help us save many mothers as timely management as well as treatment do make a difference.[17]

Obstetric hemorrhage is the major cause of maternal death at home, or during transportation to the hospital.[18] One hundred twenty four (19.1%) maternal deaths occurred because of obstetric hemorrhage in our audit. Other studies have reported hemorrhage as a cause in 15 to 18% women, except You *et al*.[13] who found it in 43.8% of the cases. Median time from detection to death is 6 hours,[19] so effective community based treatments are needed in populations without access to health facilities. To address this issue, a priority system for referral and emergency treatment of these women should be set-up. Misoprostol, has been proven to be clinically effective, inexpensive and with a potential to prevent many maternal deaths.[20]

If most maternal deaths result from haemorrhage and infection, cause specific interventions and community based strategies in addition to institutional care to prevent, recognize as well as treat these conditions are needed in communities, especially those with higher MMR.

In 2006, a WHO review on maternal deaths concluded that sepsis accounted for a meagre 10%, 12% maternal deaths in Africa and Asia respectively.[18] In our audit, puerperal sepsis was responsible for 94 (14.5%) casualties. Infection is underestimated as a cause of maternal deaths since its diagnosis is difficult and requires a hospital based setup for its recognition, confirmation. A study from Malawi, showed that infection played a primary role in almost 3/4th of maternal deaths.[21] A decline in maternal mortality in Bangladesh was because of greater availability of over the counter antibiotics.[19] So, a more liberal approach to antibiotic access, especially in the poorest of countries, could be an effective strategy.

Unsafe abortions were noted in only 4.7% of the total cases as compared to 11.5% by Gumanga[14] and 4.2% by Igwegbe.[12] Access to family planning services lead to a decrease in unwanted pregnancies, which in turn decrease the rate of illegal abortions. The overall lack of contraceptive access is 50%, with a low of 4% in Europe to a high of 57% in African countries.[22] Promoting family planning and contraceptive acceptance can help bring down maternal deaths by 25-40%.[23]

A single maternal death was reported because of HIV/AIDS in GTB hospital due to advanced complications related to the disease, whereas global estimates suggest that HIV/AIDS is responsible for 10% deaths in sub-Saharan Africa and 6% in the Caribbean area.[1]

Anaesthetic complications, uterine inversion, seizure disorder, road traffic accident, malignancy, etc. together accounted for only a few maternal deaths.

Conclusion

To conclude; because of the multifactorial nature of maternal mortality, strategies designed to bring about change should involve everybody from the grassroot level to bureaucracy. The primary delays whether on the part of the mother, due to transportation or attitude of the health care facility can be abolished through advocacy, female education, prioritization of emergency referral system, improving transportation, good attitude of health workers as well as elimination of fee for service policy in obstetric emergencies. Optimal success can only be ensured if the programs are both problem and country tailored. Maternal mortality is often under reported and very few developing countries have accurate data on maternal as well as neonatal deaths, so providing concrete evidence for policy change is difficult. However, the real challenge is not development of new technology or knowledge; rather how to deliver existing services and upgrade interventions, particularly to those who are vulnerable, excluded, or difficult to reach.

Financial support and sponsorship

Nil.

Conflicts of Interest

There are no conflicts of interest.

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