



Maternal mortality at a tertiary care teaching hospital in Goa, India: A ten years retrospective study

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Introduction

In the International Statistical Classification of Diseases and related health problems, tenth revision, 1992 (ICD-10), World Health Organization (WHO) defines maternal death as the death of a woman during pregnancy or within forty two days of termination of pregnancy, irrespective of the site and duration of pregnancy, from any cause aggravated by or related to pregnancy or its management but not from incidental or accidental causes.¹

In 2010 it was estimated that 278,000 women died from pregnancy related complications. The enormity of the matter was brought into focus with the launch of the Millennium Development Goals (MDGs) in September 2000. MDG 5 strived to improve maternal health by reducing maternal mortality by 75% and achieve universal access to maternal health services by 2015.²

Maternal mortality ratio is defined as the ratio of number of maternal deaths in a given period of time to the number of live births during the same period of time. The global maternal mortality ratio decreased from 385 deaths per 1,00,000 live births in 1990, to 216 in 2015, corresponding to a 43.9% decline and an annual continuous rate of reduction of 2.3%.³ In India the maternal mortality ratio has declined from 556 in 1990 to 174 in 2015. Annual

rate of reduction from 1990 to 2015 has been 4.6%.¹

India has made a significant progress in improving the overall health status of its population, but it is far from satisfaction.⁴ Most maternal deaths and pregnancy complications can be prevented if pregnant women have access to good quality antenatal, intrapartum and postnatal care, and if certain harmful birth practices are avoided.⁵

Studying trends in maternal deaths could help redirect efforts to tackle the prevailing dominant causes of these deaths in local settings. The aim of the present study was to determine the trend in maternal mortality at Goa medical college over a 10-year period and determine the specific causes of death.

Materials and Methods

This retrospective study was carried out in the Department of Obstetrics and Gynaecology, Goa Medical College, Goa. The study was conducted after approval from Institutional Ethical committee. Medical records of the maternal deaths that occurred between January 2006 and December 2015 were reviewed. The demographic information in the form of age, religion, residence was collected. Information on parity, booking status, referral status, mode of delivery,

admission-death time interval, time of death and cause of death was collected. The information regarding the number of live births in Goa Medical College during the study period was also collected. Results were analyzed by using ratios, percentage and proportion.

Results

In the present study, there were 90 maternal deaths among 53301 live births giving an MMR of 168.85 per 1,00,000 live births. MMR ranged from 91.52 in 2008 to 252.86 in 2015. (Table 1)

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

| YEAR | NO. OF DEATHS | PERCENTAGE (%) | LIVE BIRTHS | MMR |
|-------|---------------|----------------|-------------|--------|
| 2006 | 7 | 7.77 | 5426 | 129 |
| 2007 | 9 | 10 | 5301 | 169.77 |
| 2008 | 5 | 5.55 | 5463 | 91.52 |
| 2009 | 8 | 8.88 | 5518 | 144.98 |
| 2010 | 9 | 10 | 5398 | 166.72 |
| 2011 | 10 | 11.11 | 5350 | 186.91 |
| 2012 | 9 | 10 | 5690 | 158.17 |
| 2013 | 9 | 10 | 5044 | 178.42 |
| 2014 | 11 | 12.22 | 4970 | 221.32 |
| 2015 | 13 | 14.44 | 5141 | 252.86 |
| TOTAL | 90 | 100 | 53301 | 168.85 |

It was observed that out of the 90 maternal deaths, 31 patients (34.44%) were in the age group 26-30 years, followed by 28 patients (31.11%) in the age group 21-25 years. Only 3 deaths occurred in <20 years age group. It was observed that out of the 90 maternal deaths, 60 patients (66.66%) resided in

Goa. 30 patients (33.33%) were collectively referred from the neighbouring states i.e. Maharashtra and Karnataka. Most (81.11%) of the mothers who died belonged to the Hindu religion. (Table 2)

Table 2: Distribution of maternal deaths according to socio-demographic characteristics

| SOCIO-DEMOGRAPHIC CHARACTERISTICS | NO. OF MATERNAL DEATHS | PERCENTAGE (%) |
|-----------------------------------|------------------------|----------------|
| AGE | | |
| ≤20 | 3 | 3.33 |
| 21-25 | 28 | 31.11 |
| 26-30 | 31 | 34.44 |
| 31-35 | 15 | 16.66 |
| 36-40 | 13 | 14.44 |
| RESIDENCE | | |
| KARNATAKA | 5 | 5.55 |
| MAHARASHTRA | 25 | 27.77 |
| NORTH GOA | 23 | 25.55 |
| SOUTH GOA | 37 | 41.11 |
| RELIGION | | |
| CHRISTIAN | 9 | 10 |
| HINDU | 73 | 81.11 |
| MUSLIM | 8 | 8.88 |

In the present study, 10 cases (11.11%) were booked in Goa Medical College and 80 (88.88%) cases were referred to GMC. A total of 30 (33.33%) cases were referred from Maharashtra and Karnataka collectively. Out of the 90 maternal

deaths, 37 (41.11%) were primiparous, 40 (44.44%) were multiparous, 8 (8.88%) were primigravida and 5 (5.55%) were multigravida. There was one grand multipara. It was observed that 77 (85.55%) deaths occurred postnatally, 7

(7.77%) deaths antenatally, 4 (4.44%) deaths postabortal and 2 (2.22%) deaths intranataly. Maximum patients i.e. 43 out of 90 (47.77%) delivered vaginally. LSCS was the mode of delivery in 35 (38.88%) patients. 4 out of 90 (4.44%) patients underwent MTP/ abortion and 1

patient had an instrumental delivery. It was further observed that 39 (43.33%) patients died within 24 hours of hospital admission, 21 (23.33%) died within 2 days, 17(18.88%) patients died within 3 days and 13 (14.4%) died after 72 hours of hospital admission. (Table 3)

Table 3: Distribution of maternal deaths according to pregnancy/delivery related characteristics

| VARIABLES | NO. OF MATERNAL DEATHS | PERCENTAGE (%) |
|--------------------------------------|------------------------|----------------|
| BOOKING STATUS | | |
| BOOKED | 10 | 11.11 |
| REFERRED | 80 | 88.88 |
| OBSTETRIC SCORE | | |
| PRIMIGRAVIDA | 8 | 8.88 |
| MULTIGRAVIDA | 5 | 5.55 |
| PARA 1 | 37 | 41.11 |
| PARA 2 | 23 | 25.55 |
| PARA 3 | 15 | 16.66 |
| PARA 4 AND ABOVE | 2 | 2.22 |
| TIME OF DEATH | | |
| POSTABORTAL | 4 | 4.44 |
| ANTENATAL | 7 | 7.77 |
| INTRANATAL | 2 | 2.22 |
| POSTNATAL | 77 | 85.55 |
| TIME OF DEATH | | |
| POSTABORTAL | 4 | 4.44 |
| ANTENATAL | 7 | 7.77 |
| INTRANATAL | 2 | 2.22 |
| POSTNATAL | 77 | 85.55 |
| MODE OF DELIVERY | | |
| LSCS | 35 | 38.88 |
| VAGINAL DELIVERY | 43 | 47.77 |
| INSTRUMENTAL DELIVERY | 1 | 1.11 |
| MTP/ABORTION | 4 | 4.44 |
| UNDELIVERED | 7 | 7.77 |
| ADMISSION-DEATH TIME INTERVAL | | |
| <24 hrs | 39 | 43.33 |
| 24-48 hrs | 21 | 23.33 |
| 48-72 hrs | 17 | 18.88 |
| >72 hrs | 13 | 14.44 |

Out of the 90 maternal deaths, 83 (92.22 %) were due to direct causes. Hemorrhage, both antepartum and postpartum contributed to the maximum deaths (32.22%) among the direct causes. The other direct causes were Pre-Eclamptic toxemia and its related complications (27.77%), Sepsis (21.11%), Embolism (5.55%), Peripartum cardiomyopathy (4.44%), Acute fatty liver of pregnancy (1.11%). Amongst the indirect causes, ARDS (Acute respiratory distress syndrome) caused 3(3.33%) deaths and CCF (Congestive cardiac failure) caused 1(1.11%)

death. Two women died due to anaesthesia related complications and 1 woman died due to ART (Anti-retroviral treatment) related metabolic acidosis. (Table 4)

Anaemia was found to be the most common associated condition. Anaemia was found in 21 cases of maternal deaths. (Table 5)

Table 4: Distribution according to cause of death

| CAUSES OF DEATH | NO. OF DEATHS | PERCENTAGE (%) |
|---|---------------|----------------|
| DIRECT CAUSES | | |
| Antepartum hemorrhage | 3 | 3.33 |
| Postpartum hemorrhage | 26 | 28.88 |
| Pre eclamptic toxemia and related complications | 25 | 27.77 |
| Sepsis | 19 | 21.11 |
| Embolism | 5 | 5.55 |
| Peripartum cardiomyopathy | 4 | 4.44 |
| Acute fatty liver of pregnancy | 1 | 1.11 |
| INDIRECT CAUSES | | |
| ARDS | 3 | 3.33 |
| CCF | 1 | 1.11 |
| UNRELATED CAUSES | | |
| Anaesthesia related | 2 | 2.22 |
| ART induced metabolic acidosis | 1 | 1.11 |

Table 5: Incidence of associated medical disorders

| ASSOCIATED DISEASE | NO. OF DEATHS | PERCENTAGE (%) |
|------------------------------------|---------------|----------------|
| Anaemia | 21 | 22.22 |
| GDM | 4 | 4.44 |
| Hypothyroidism | 2 | 2.22 |
| Cyanotic heart disease | 1 | 1.11 |
| HIV (Human Immunodeficiency Virus) | 1 | 1.11 |
| Seizure disorder | 1 | 1.11 |
| SLE (Systemic Lupus Erythematosus) | 1 | 1.11 |

Discussion

Maternal mortality reduction has been an important priority of the international community. The Millennium Development Goals and the WHO 'Make every mother and child count' initiative describes the importance of maternal mortality reduction as a healthcare issue. A recent systematic review of the causes of maternal mortality and its geographic distribution has shown that the Indian subcontinent has a significantly higher maternal mortality attributable to sepsis, infection and hemorrhage.

Though maternal mortality has been the subject of a number of studies in India, very few detailed studies have been reported. A comprehensive summary of the magnitude of maternal deaths and distribution of the causes of maternal deaths is critical to plan and reform reproductive health policies. Hence we decided to conduct this large study to assess the incidence and causes of maternal deaths at Goa Medical College which is well equipped with handling the emergencies and have an adequate staff.

In the present study, there were 90 maternal deaths among 53301 live births giving an MMR of 168.85 per 100,000 live births. This is significantly lower than the MMR in Nigeria. A retrospective descriptive analysis of all cases of pregnancy related maternal deaths at the Niger Delta University Teaching Hospital Okolobiri, Bayelsa State, in the Niger Delta of Nigeria showed a maternal mortality ratio of 717.4 per 100,000 live births.⁶ Also a retrospective study conducted by Pal Amitava et al in a rural hospital in West Bengal over a period of 6 years from 1999 to 2004 showed a maternal mortality ratio (MMR) of 623.46 per 100,000 live births.⁷ Dilpreet Kaur et al conducted a retrospective study related to Maternal Mortality Ratio among 7207 consecutive live births from Jan 2001 to Dec 2005 in Christian Medical College and Hospital, Ludhiana. The Maternal Mortality ratio was 1470 per 1,00,000 live births which was alarmingly high.⁸ A descriptive retrospective review of hospital based maternal death data that was conducted at Kilimanjaro Christian Medical

Center (KCMC) between the years 2003–2012 showed an overall MMR of 492.1 per 1,00,000 live births.⁹

The reason for the low maternal mortality rate in this study is that our hospital is capable of dealing with a variety of cases including uncomplicated deliveries. Further, most maternal deaths take place at home or on the way to hospital. Therefore, the incidence and proportion of complications seen is probably very different from what occurs in the community.

In our study the MMR over the first five years (2006-2010) was 140.39 per 1,00,000 live births and the MMR over the last five years (2011-2015) was 199.53. This gradual increase in MMR may be partly due to an increase in the referrals from the neighbouring states i.e. Maharashtra and Karnataka. It was observed that out of the 90 maternal deaths, 30 patients were referred from these neighbouring states. During 2006-2010, 12 patients were referred from these states. Whereas during 2011-2015, 18 patients were referred from the same neighbouring states.

In this study, a higher number of deaths i.e. 65.55% deaths were recorded in the 21-30 years age group. Many other studies have shown similar results. Shah et al carried out a retrospective analysis of maternal deaths in a tertiary institute from Jan 2003 to Dec 2008 in Mumbai. This study showed a total of 69% deaths in the age group of 21-30 years.¹⁰ A retrospective study of all maternal deaths over the 7 year period(1999-2005) by Verma et al in a tertiary care hospital in Himachal Pradesh showed that a majority of maternal deaths were in the age group of <24 years.¹¹ Other retrospective studies done in North Kerala¹² and Bihar¹³ showed similar results.

Most of the studies on maternal mortality have shown that the multigravidas/multiparous are at a greater risk of dying due to pregnancy than the primigravidas/primiparous. But in this study, there were an equal number of deaths in both the multigravida/multiparous and primigravida/primiparous groups. The study done by Verma et al¹¹ showed similar results.

In this study, we found that 88.88% patients had not received adequate antenatal care and were unbooked cases. Only 11.11% patients were booked in Goa Medical College. Among the unbooked cases, 37.97% maternal deaths were in those who were referred from the neighbouring states i.e. Maharashtra and Karnataka. Full antenatal care includes at least four antenatal visits, at least one tetanus toxoid (TT) injection and taking iron and folic acid tablets or syrup for 100 or more days. According to the National Family Health Survey (NFHS), the percentage of women who receive full antenatal care in Goa state has increased from 57.4%(NFHS-3) to 63.4%(NFHS-4).¹⁴ A study done by B. O. Okusanya et al in Northwest Nigeria showed that 14% (9/64) and 86% (55/64) of maternal deaths were in booked and unbooked women respectively.¹⁵ Another study done in Rawalpindi by Khansa et al showed similar results i.e. majority (90.0%) of maternal deaths were amongst unbooked patients.¹⁶

Majority (85.55%) of the maternal deaths in this study were in the postpartum period while 7.77% occurred antenatally and 2.22% intranatally. There were 4.44% deaths in the postabortal period. Similar results were shown by Naheed Bano et al in 8 principal hospitals in Pakistan wherein out of the 108 maternal deaths in 2009, 78% died postnatally, 17.5% antenatally and 4.6% intranatally.¹⁷ A study by Sahaja Kittur et al in Hubli showed that 75% deaths occurred in postpartum period.¹⁸

Among the 90 maternal deaths, & died antenatally. Out of the 83 who delivered, 43 (47.77%) delivered vaginally. LSCS was the mode of delivery in 35 (38.88%) patients. 4 out of 90 (4.44%) patients underwent MTP/ abortion and 1 patient had an instrumental delivery. A study done in Mangalore by Shannon et al showed that maximum women 18(42.86%) were delivered by LSCS. 13 patients (30.96%) had a normal vaginal delivery, 3 (7.14%) had an instrumental vaginal delivery. 1 woman died following a ruptured ectopic pregnancy, 1 following a molar

pregnancy, 2 following abortions, while 4 remained undelivered.¹⁹

In this study it was observed that 39 (43.33%) patients died within 24 hours of hospital admission, 21 (23.33%) died within 2 days, 17(18.88%) patients died within 3 days and 13 (14.4%) died after 72 hours of hospital admission. In a study by Varsha Patil et al, 46.02% maternal deaths have occurred within 24 hours of admission.²⁰ A study done by Surat Zaman et al in Assam also showed similar results.²¹ The fact that most of the deaths occur in the first 24 hours of admission proves that the first few hours are the most crucial in the treatment of a critical mother. Also, since Goa medical college is the only Government tertiary care centre in Goa, most of the cases referred here are already in a critical state at admission and resuscitating such unstable patients becomes a difficult task.

In this study, hemorrhage (32.22%) was the most common cause of maternal mortality followed by pre-eclampsia (27.77%) and sepsis (21.11%). The findings are in line with published literature. Verma et al found hemorrhage (21.5%) as the most important cause of maternal mortality followed by pre-eclampsia (10.8%) and sepsis (10.8%).¹¹ Varsha Patil et al showed that Haemorrhage (28.57%) and pre-eclampsia (12.69%) are the two direct causes of maternal mortality.²⁰ In Tanzania, Eusibious et al found that Hemorrhage was the overall leading cause of maternal death, accounting for 19.2% of mortality, followed by hypertensive disorders in pregnancy (18.0%).⁹

The other direct causes were Embolism (5.55%), Peripartum cardiomyopathy (4.44%), Acute fatty liver of pregnancy (1.11%). Amongst the indirect causes, ARDS caused 3(3.33%) deaths and CCF caused 1(1.11%) death. Two women died due to anaesthesia related complications and 1 woman died due to ART related metabolic acidosis. According to a WHO systematic review by Lale Say et al, About 73% (1 771 000 of 2 443 000) of all maternal deaths between 2003 and 2009 were due to direct obstetric causes and deaths due to

indirect causes accounted for 27.5% of all deaths. Hemorrhage accounted for 27.1%, hypertensive disorders 14.0%, and sepsis 10.7% of maternal deaths. The rest of deaths were due to abortion (7.9%), embolism (3.2%), and all other direct causes of death (9.6%).²²

In this study, anaemia has been found to be the most common associated condition. Anaemia was found in 21 cases of maternal deaths. Studies done by Monica Soni et al²³, Surat Zaman et al²¹, Jadhav CA²⁴ et al showed comparable results.

Conclusion

Safe motherhood is the right of every woman. But due to some preventable and unexpected complications, many women lose their lives during pregnancy, labor and postnatally. Most of the causes leading to maternal deaths are preventable. It is necessary to identify these causes and measure the magnitude of maternal mortality in each health centre.

In the past few years there have been are very few studies on maternal mortality conducted in Goa. This study was carried out with the aim of measuring the maternal mortality ratio in Goa medical college over a period of 10 years. This study has helped in finding out the causes leading to maternal deaths. Also this study has revealed an increasing trend of maternal deaths over these 10 years. This can be explained by an increase in the number of referrals to this institute in the recent years. Also, the number of referral cases from outside the state has increased over the last few years. This is because Goa medical College is well equipped with blood bank facilities, adequate staff and good ICU facilities. But most of these referred cases are already in a critical state when they reach our hospital. Hence it becomes a herculean task to resuscitate these patients.

According to NFHS-4¹⁴, 95.8% deliveries in Goa are institutional deliveries. But only 64.4% mothers in Goa receive full antenatal care during pregnancy. This difference of almost 30% proves that most of our patients are unbooked and have not received adequate antenatal care during

pregnancy. Hence most of the underlying associated conditions like anaemia, hypertension, diabetes mellitus, cardiac disorders and subclinical infections are not detected early in pregnancy. During labor, these associated conditions will be aggravated and present as hemorrhage, sepsis, pre-eclamptic toxemia, cardiac failure and embolism.

It is necessary to tackle this issue from the grass root level. Government should undertake adequate measures to strengthen the primary health centres, sub-district health centres and the district health centres which are the main source of referrals to Goa Medical College. Facilities in these health centres are grossly inadequate with the shortage of anesthetists, pathologists and blood banks. This prevents early intervention and adequate emergency obstetric care. The health care providers should be trained well to recognize complications of pregnancy and delivery. These centres should be provided with laboratory facilities to carry out basic antenatal investigations. Also, the drugs required in antenatal care, delivery and postnatal care should be available at all times in these centres. Rapid transport facilities should be made available to all remote rural areas with easy accessibility. It is necessary even in urban areas to channel the working of emergency obstetric care.

Recognition and treatment of medical disorders in pregnancy, recognition of complications, timely referral of high risk patients and timely management of PPH will go a long way in bringing down the MMR by at least 60%. As medical professionals we are supposed to keep a record of all cases and evaluate the possible cause in the event of maternal death. Lack of consent for an autopsy prevents us from finding out the exact cause of death in most cases. The public should be educated to realize the importance of an autopsy. Post mortem examination should be conducted in all maternal deaths where the cause of death is in doubt.

If the above measures are implemented, we can bring down the MMR significantly. We all can

collectively move towards safe motherhood with simple measures. It is concluded that majority of the maternal deaths can be averted by 'proper and timely intervention of 3E's i.e., early risk screening, emergency obstetric care and efficient obstetric services.

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