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Original Research Article

Maternal mortality: a 6-year experience of the triumph achieved and the hardships faced in a tertiary care centre of Chhattisgarh

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ABSTRACT

Background: Maternal death reflects the health care system of a country and majority of them are preventable. India's MMR declined to 103 in 2017-19. However, SDG3 targets of reducing MMR to 30 is still far and a lot has to be done to achieve it.
Methods: In this retrospective study, a 6-year analysis of the trends of maternal mortality for age group, booking status, parity, referral status, obstetric and non-obstetric causes of maternal death and the challenges faced in their management have been observed. The data obtained was tabulated and analysed for trends in maternal mortality over past 6 years.
Results: Hypertensive disorders of pregnancy remains the major obstetric cause of death with significant decline in septic abortions. Liver and respiratory disorders have surpassed anemia as the major non-obstetric cause of death. A gradual shift from pulmonary edema to emergence of AKI and CVA as the immediate cause of death has been observed.
Conclusions: Knowledge about fluid therapy, aggressive resuscitative measures and critical care management resulted in decline in cases of pulmonary edema. Improvement in anaemia at the cost of medical disorders was seen due to improved coverage of Iron folic acid prophylaxis, deworming and easy availability of blood banks. Trainings for ANMs and medical officers, early detection of warning signs, timely referrals, adolescent health clinics, improved booking status and increased institutional deliveries have led to reduction in MMR. Regular auditing of each maternal mortality can improve the scenario.

Keywords: Health Services, Hemorrhage, Maternal mortality, Non-obstetric cause, Obstetric cause, Sepsis

INTRODUCTION

Maternal death reflects the health care system of a country. It represents the growth and development of health sector, social status of women and tells a tale of women's education in society. Each and every maternal death leaves a dreadful family behind.

A pregnant woman loses her life every 11 seconds because of complications arising during pregnancy and childbirth worldwide.[1] Global MMR (maternal mortality rate) for the year 2020 is 152 per one lakh live births. Sustainable development goals (SDG3) have set an ambitious target of reducing global MMR to less than 70/1,00,000 live birth by 2030.[2]

India's achievements in reduction of maternal mortality in recent years can be considered a success story as maternal mortality has declined over the years from 677 per 100000 live births in 1980 to 103 in 2017-19.[3,4] But still 7 Indian states have very high MMR, these include Rajasthan, Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Bihar, Odisha and Assam. Although, India has experienced a significant drop in MMR, there is still a substantial room for development in Chhattisgarh with very high MMR of 160. States such as Kerala experience relatively low levels of maternal mortality with MMR of 30 in 2021 which are

comparable with developed countries like Australia, Canada, Finland, Japan who have MMR of 10 or less.[4,5]

The major causes of maternal mortality still include obstetric hemorrhage, hypertensive disorders of pregnancy, sepsis and anaemia.[6] Although a lot of improvement is observed in management of these complications due to increasing institutional deliveries, easy availability of blood products, aggressive critical care management and trained birth attendants which has led to decline in MMR. But still we are far beyond and a lot of learning is required for accurate diagnosis and immediate treatment to achieve global targets set by SDG.

In this study, we have analysed the causes directly leading to death, changing trends of maternal mortality over last 6 years in our institution and challenges faced in their management.

METHODS

Place of study

This study took place at the department of obstetrics and gynaecology, Pandit Jawaharlal Nehru Memorial Medical College and Dr. Bhim Rao Ambedkar Memorial Hospital, Raipur, Chhattisgarh.

Study design

It was a retrospective study.

Method

The variables like age, residence, referral status, booking status, obstetric profile, mode of delivery, cause of death was used to analyse the study. Information on all cases of maternal mortality were extracted from the patient's case-notes from medical record office of our tertiary care centre, the labour ward registers; the antenatal and postnatal ward registers. The data obtained was tabulated, analysed and compared with established similar studies.

Study subject

All maternal deaths which occurred after admission in Department of obstetrics and gynaecology, Dr. BRAM Hospital, Raipur, Chhattisgarh.

Study duration

The study period was from January 2016 to December 2021.

Sample size

All the maternal deaths which occurred in department of obstetrics and gynaecology over a period of 6 years from January 2016 to December 2021 have been included in the study.

Inclusion criteria

Any female death during pregnancy or within 42 days of delivery due to direct obstetric or indirect causes.

Exclusion criteria

Any female death during pregnancy or within 42 days of delivery due to incidental/accidental causes.

RESULTS

In our study, the mean maternal mortality rate calculated was 945, 675, 355, 884, 701, 603 per 1 lakh live births in the year 2016, 2017, 2018, 2019, 2020, 2021 respectively. About 81.6% and 78.4% women were referred from multiple centers in the year 2016 and 2017. This escalated to 96.2% and 93.8% in 2018 and 2019. A decrease was seen in 2020 (75.8%) and 2021 (80%).

Table 1: Year wise obstetric causes of maternal death with their percentage distribution.

Obstetric causes	2016	2017	2018	2019	2020	2021
Hypertensive disorders of pregnancy	33 (46%)	17 (33.3%)	10 (37%)	34 (52%)	22 (40%)	19 (38%)
Preeclampsia	07	06	04	12	09	05
Eclampsia	26	11	06	22	13	14
Obstetric hemorrhage	12 (16%)	14 (27.4%)	06 (22.2%)	13 (20%)	19 (32.7%)	10 (20%)
Antepartum hemorrhage	03	03	01	02	04	02
Rupture uterus	03	03	02	04	03	02
Retained placenta	00	02	00	02	02	01
Postpartum hemorrhage	06	06	03	07	10	05
Sepsis	04 (5.6%)	06 (11.7%)	01 (3.7%)	09 (13.8%)	05 (9.6%)	03 (06%)
Amniotic fluid embolism	01 (1.4%)	01 (1.9%)	00	01 (1.5%)	00	00
Total number of deaths	71	51	27	65	58	0

Table 2: Non-Obstetric causes of maternal death.

Non-obstetric causes	2016	2017	2018	2019	2020	2021
Anemia	12 (16.9%)	07 (13.7%)	06 (22.2%)	03 (4.6%)	05 (9.6%)	03 (6%)
Cardiac disease	00	01 (1.9%)	00	01 (1.5%)	02 (3.4%)	03 (6%)
Respiratory disease	05 (7%)	00	00	00	02 (3.4%)	05 (10%)
Liver disorders	03 (4.2%)	04 (7.8%)	03 (11.1%)	02 (3%)	03 (5.1%)	07 (14%)
Infection	01 (1.4%)	00	00	00	00	00

Table 3: Immediate cause of death in women presenting with hypertensive disorders of pregnancy.

Immediate cause of death in patients of hypertensive disorders of pregnancy (HDP)	2016	2017	2018	2019	2020	2021
Pulmonary edema	11 (33.3%)	08 (47%)	03 (30%)	08 (23.5%)	04 (18.2%)	02 (10.5%)
Acute kidney injury	08 (24.2%)	04 (23.5%)	02 (6.6%)	10 (29.4%)	09 (40.9%)	07 (36.8%)
Cerebrovascular accidents	10 (30.3%)	05 (29.4%)	04 (40%)	14 (41.1%)	08 (36.4%)	09 (47.3%)
Disseminated intravascular coagulation	02 (6.06%)	00	01 (10%)	02 (5.8%)	01 (4.5%)	01 (5.2%)
Total cases of HDP	33	17	10	34	22	19

Table 4: Immediate causes of death in women presenting with sepsis.

Cause of sepsis	2016	2017	2018	2019	2020	2021
Septic abortion	02 (50%)	01 (16.6%)	00	02 (22.2%)	01 (20%)	01 (33.3%)
Puerperal sepsis	01 (25%)	01 (16.6%)	01 (100%)	02 (22.2%)	01 (20%)	00
Burst abdomen	00	01 (16.6%)	00	01 (11.1%)	00	00
Multiorgan dysfunction syndrome	00	00	00	01 (11.1%)	01 (20%)	01 (33.3%)
Pyelitis	00	01 (16.6%)	00	00	00	00
Chorioamnionitis	01 (25%)	00	00	01 (11.1%)	00	00
Prolonged ventilatory support	00	02 (33.3%)	00	02 (22.2%)	02 (40%)	01 (33.3%)
Total cases of sepsis	04	06	01	09	05	03

Table 5: Immediate cause of death in women presenting with obstetric hemorrhage.

Immediate cause of death in patients of obstetric haemorrhage	2016	2017	2018	2019	2020	2021
Hypovolemic shock	06 (50%)	05 (35.7%)	01 (16.6%)	03 (23.07%)	04 (21.05%)	02 (20%)
Pulmonary edema	03 (25%)	02 (14.2%)	01 (16.6%)	02 (15.3%)	04 (21.05%)	01 (10%)
Disseminated intravascular coagulation	01 (8.3%)	03 (21.4%)	01 (16.6%)	02 (15.3%)	03 (15.78%)	02 (20%)
Acute kidney injury	02 (16.6%)	04 (28.5%)	03 (50%)	06 (46.15%)	08 (42.10%)	05 (50%)
Total cases of obstetric hemorrhage	12	14	06	13	19	10

Maximum number of deaths occurred in 21-25 years of age ranging from 42% in 2016 to 36% in 2021. Among 26-30, 31-35 and >35 years age group, the percentage was 21.1%, 11.2% and 4.2 % respectively in 2016 which changed to 30%, 18% and 2% respectively in 2021. Deaths in teenage pregnancy experienced a gradual decline ranging from 21.1% in 2016 to 14% in 2021.

In the initial 2 years, percentage of deaths was nearly equal i.e., 53.5% and 52.9% in women from rural area and 46.4% and 47% in urban area. However, 2018, 2019, 2020 had an alarming rise in deaths from rural area with 70.3%, 72.3% and 77.5% deaths respectively. This declined to 52% in 2021.

Out of all the total deaths 26.7%, 27.4%, 29.6% and 29.4% women were booked in 2016, 2017, 2018, 2019 respectively and only 18.4% in 2020. A rise is seen in the year 2021 (52%). Majority (53.5%) of deaths occurred in primigravida in 2016 which decreased to 44% in 2021. Amongst second gravida patients, 30.9% deaths occurred in 2016 and 26% in 2021. Deaths in 3rd gravida increased from 5.6% in 2016 to 20% in 2021.

Direct causes led to 70.4%, 74.5%, 62.9%, 87.6%, 79.3% and 64% of deaths in 2016, 2017, 2018, 2019, 2020 and 2021. Amongst direct causes, hypertensive disorders of pregnancy was the leading cause of death with a gradual transition from 46% in 2016 to 38% in 2021 (Table 1).

Anemia was the main non-obstetric cause of death, 16% in 2016 to 6% in 2021. Liver disorders increased from 4.2% in 2016 to 14% in 2021 (Table 2).

Pulmonary edema was the major (33.3%) immediate cause of death in women presenting with hypertensive disorders in 2016. However, a decline was seen in 2021(10.5%) (Table 3).

The women with septic abortions decreased from 50% in 2016 to 33.3% in 2021. Puerperal sepsis declined from 25% in 2016 to 20% in 2020 (Table 4).

Deaths due to hypovolemic shock was the foremost immediate cause of death in 2016 (50%) and 20% in 2021 among cases of obstetric hemorrhage. Acute kidney injury cases increased from 16.6% in 2016 to 50% in 2021 (Table 5).

DISCUSSION

The MMR in our institute declined from 945/1 lac live births in 2016 to 603/1 lac live births in 2021. Our institute being a tertiary care center is the biggest referral center of the state and serves the highest risk and critical cases. By looking on to these trends, we were able to identify the lacunae in our health care facilities and the knowledge gaps we suffer while managing such critical patients.

During the study period about 75% to 96% women were referred from multiple centers with 57% of them being referred from 1 referral center and 42% from 2 referral centers which was also seen in study by Shobha et al.[9,12] Even though percentage of referral is varied but still stand high. Sometimes due to being referred from multiple centers women are brought in such grave conditions that in spite of being a multispecialty center we feel helpless. The primary centers dealing with such women should be made well aware about the facilities which are available in their higher referral center, so that appropriate referral can be done. A woman who is already critical and needs immediate management unquestionably does not require a detour, missing the only opportunity of being saved.

Maternal mortality was maximum in the age group of 21 to 25 years also seen in study conducted by Meh et al, as majority of our patients belonged to this age group and was consistent throughout the study period.[8,12] Although deaths in teenage pregnancy gradually declined from 21.1% to 14% which may be due to improvement in female education, changing norms in society resulting in decreased number of child marriages and development of adolescent health clinics which led to proper guidance about contraceptive measures.

The number of maternal mortalities amongst urban and rural population were almost equal the year 2016 and 2017. However, in the year 2018, 2019 and 2020 nearly 70% of total deaths were seen from rural area. The reason for the decreased mortality rate in urban population points towards improvement in health care services with regards to National programs like PMSMA which caused an increase in the awareness drive by increased mass communication through the television ads, radio messages and newspaper. Perhaps understanding about availability of awareness programs, regular checkups and facilities provided are slowly evolving in the rural population. This needs to be enforced again and again.

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Booking status of pregnant women in our study was low, 26.7% in 2016 and 18.4% in 2020. This was also observed in studies by Pratibha et al.[10] It may be because of lack of knowledge and because of this, early identification of high-risk cases was not possible leading to lack of timely, early and emergency care causing high mortality rate. A drop was seen in 2020 with only 18.4% patient being booked. This might be due to advent of COVID-19 pandemic. Patient refrained from coming out of houses and also there was enforcement of nationwide lockdown which resulted in lesser number of antenatal visits.[7] Adequate counselling of patients regarding the need of antenatal care by health care workers and availability of vaccination against COVID-19 caused an increase in the hospital visits to a remarkable level of 52% in the year 2021. But still needs improvement so that golden period of management not to be missed.

Almost 50% of deaths are of primigravida as also found by Pratibha et al which may be due to as hypertensive disorder of pregnancy is mostly seen in primigravida women, due to 1st pregnancy they have delayed perception of warning signs and adoption of unsafe abortive practices.[10,11]

Amongst direct causes, hypertensive disorders of pregnancy (HDP) were the leading cause of death which was also seen in study by Shobha et al, which declined from 46% in 2016 to 38% in 2021.[9,12,14] This decline may be because of better counselling, regular and frequent blood pressure checkups, early pickup of warning signs of

eclampsia and timely initiation of anti-hypertensive and anti-convulsant drugs.

Although in 2016 pulmonary edema was the main immediate cause of death in women of HDP, leading to prolonged ventilatory support and its sequelae. Aggressive critical care management has resulted in significant improvement in this area. There has been a shift towards cardiovascular accidents (CVA) (47.36%) and acute kidney injury (AKI) (36.8%) in 2021.This transition to CVA was seen as intracerebral hemorrhage occurred at lower threshold of BP leading to a vicious cycle of prolonged ventilatory support, multi-organ failure and death. Also, delay in referrals results in worsening of the situation as many of the patients do not receive even the basic primary care at the level of their first visit to hospital. Fluid management in HDP is a double-edged sword and needs careful administration. Increase in the rate of AKI points us to gap in knowledge and rationalization about fluid management.

Obstetric hemorrhage remained 2nd leading cause of mortality as a large number of patients are referred to our hospital in view of easy availability of blood bank and critical care units. This was also seen in study by Pratibha et al.[10,14] The trend has shown an upward inclination with 16% in 2016 to 32.7% in 2020 and declined to 20% in 2021. Still large number of deliveries are being conducted at home which results in complications of traumatic and atonic post-partum hemorrhage (PPH). Many a times, there is lack of availability of basic emergency care which leads to worsening of the situation.

One of the consistent findings observed was improvement in management of pulmonary edema which was the immediate cause of death in 25% cases in 2016 and dropped down to 10% in 2021. Early identification, furosemide administration and ventilator support has played a role in it. AKI in this case also had an alarming rise from 16.6% in 2016 to 50% cases in 2021 as the initial resuscitation and replenishment of fluids was not up to the mark. There are still immense knowledge gaps in the amount of fluid to be administered to such patients. Centers and health care facilities dealing with PPH should have standard guidelines and gain understanding of fluid management.

Sepsis is also one of the direct obstetric causes of death as seen in studies by Suresh et al.[3,14] This may be because of increased prevalence of anemia, multiple referrals leading to repeated examinations increasing chances of sepsis and last but not the least injudicious use of higher antibiotics even though not required.[15-17] As a result of this, over the recent years resistance to antibiotics have been observed. Also, critical patients requiring prolonged ventilatory support acquire ventilator acquired pneumonia resulting in sepsis and death. This demands reinforcement and adoption of aseptic practices, proper surgical washing techniques and judicious use of antibiotics.

Amongst indirect causes, anemia was the leading (16.9%) cause in 2016 which was also observed in study by Suresh et al.[3] However, reduction was observed in 2021 (6%). This reduction can be seen because of the improved booking status of patients, supply of iron folic acid tablets, iron sucrose and counselling of women and family members regarding improved nutritional status. Agenda should be to diagnose and treat anemia while it is of mild and moderate degree by medications as women give ample time throughout pregnancy. High prevalence of severe anemia during pregnancy and childbirth has its own sequalae with additional hazardous complications of blood transfusion.

Overtime, mortality due to respiratory diseases have increased from 7% in 2016 to 10% in 2021. This might be due to covid related residual morbidity in patients resulting in poor lung capacity.[20] Also, a lot of knowledge is still lagging about the minute effects COVID-19 infections might have caused in pregnant females. Jaundice and liver disorders have shown a drastic increase from 4.2% to 14% as the prevalence of infective jaundice has shown an increasing trend in recent years also evident in study by Shobha et al.[9] This is because there are still customs and beliefs which causes delay in timely initiation of treatment leading to complications like hepatic encephalopathy and coagulation failure.[19] Even after aggressive blood products administration and multidisciplinary care, reversal from such critical situation becomes doubtful.

The changes observed provides useful information about still having gaps in the identification and management of patients with such morbidity. This should drive every health care worker about minute steps to be taken in this sensitive area which will cause tremendous improvement in saving a woman's life.

CONCLUSION

Pregnancy is a physiological state and hence pregnancy related deaths are preventable. Safe childbirth and quality maternal service is a basic right which every woman deserves during pregnancy. A small step taken in the right direction can cause an immense betterment in causing reduction in MMR.

Counselling for regular antenatal check-ups, early identification of warning signs, timely initiation of treatment and timely referrals are some of the steps which needs to be reiterated to minimize complications. Every pregnancy should be regarded as a high-risk pregnancy due to unforeseen complications. Most importantly, regular auditing of each maternal death should be performed to know about the minute events which can succumb any patient.

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