

Original Article

A Retrospective Study to find out Factors Affecting Maternal Mortality in a Tertiary Care Hospital in Ahmedabad City, Gujarat

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Background : Data pertaining to preventable causes of maternal mortality are valuable in each set up to design interventional steps for the significant reduction of the maternal mortality ratio.

Objectives : (1) To study the trend on Maternal Mortality Rate (MMR); (2) To find out the factors for the Maternal Mortality.

Material and Methods : A retrospective cross-sectional study of maternal death was conducted in the Obstetrics Department of Tertiary Care Hospital of Ahmedabad city. The data of total 9 years from 1st April 2013 to 31st January 2021 were taken in the study. Epidemiological factors and causes affecting maternal mortality were assessed through pretested questionnaire that includes parity, duration between admission and mortality etc.

Results: Maternal Mortality Rate (MMR) was 180.2 per 1 lac live births during the study period. Young mothers aged 20 to 30 years (78.5%), and rural residence (76.6%), multiparous mothers (66.7%) were at risk for Maternal Mortality. Obstetric haemorrhage (25.8%) was the most common cause whereas COVID-19 pandemic later on were indirect causes contributing to Maternal Mortality. Conclusion: Great Care should be taken for high-risk pregnancy like young age, multiparous women and also of postpartum women. Postpartum haemorrhage was the commonest direct cause of Maternal Mortality. Strengthening of existing obstetric care facilities, facility for easy transport, appropriate referral linkages are keys to reduce Maternal Mortality to further extent.

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Key words : Maternal mortality, Postpartum haemorrhage, COVID-19, Multiparous, High risk.

Health of women remains an overwhelming challenge, particularly in the developing world like India. It is a crucial situation that requires urgent attention and scrutiny, eliminating preventable cause of mother's mortality is a prime objective of maternal death scrutiny, surveillance and response¹. Maternal death is described as "the death of a female at the time of pregnancy, childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or provoked by pregnancy or its any form of management, but not from any accidental or incidental causes"².

Maternal Mortality is a reflection of the standard of care that is provided for obstetric service and quality by healthcare system. Among total maternal deaths of world occurred during pregnancy and childbirth, India

Editor's Comment :

- Ending preventable cause of maternal deaths can only be achieved if all reproductive females have accessibility to a core subset of excellent maternal health interventions spanning across the continuum of quality care from periconceptual to postpartum period. Reduction of maternal mortality from preventable causes is a main indicator in the Sustainable Development Goals.

accounts for 20% of them. Globally about 800 women die every day of preventable causes related to pregnancy and childbirth. Maternal Mortality has been reduced from 130 to 113 per 100,000 live births from the year 2014-16 to 2016-18 as per Sample Registration System report by Registrar General of India³ which is significantly behind the target of less than 100 maternal deaths per 1 lac live births by 2015 as mandated in Millennium Development Goals (MDGs)⁴. Estimated 44,000 women's death annually in India that were due to causes that are related to pregnancy and childbirth such as severe bleeding, infections, complications from delivery and pregnancy induced hypertension and its complication such as severe pre-eclampsia, eclampsia. Most of these causes were preventable in nature⁵. There is a much need of skilled manpower such as trained health professionals and health worker and also improved quality of care during and after delivery to avoid these preventable causes of maternal death.

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As per World Health Organization (WHO) announcement, identification of barriers that is cause for limited access to higher quality treatment facility and addressed at all levels of the health system to improve the health of the mother and outcome of pregnancy. Maternal health improvement is one of the important targets for Sustainable Development Goal (SDG) and an important issue that require to be addressed urgently⁶. The foremost target of the SDG is the reduction of the Global Maternal Mortality ratio to lower than 70 per one lac live births by the year 2030⁷.

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. With objective of assessment of the causes of Maternal Mortality and to recommend the various measures to reduce the mortality among mothers.

MATERIAL AND METHODS

A retrospective cross-sectional study of maternal death was conducted in the Obstetrics Department of Tertiary Care Hospital of Ahmedabad city. The data of total 9 years from 1st April 2013 to 31st January 2021 were taken in the study. Each case was analyzed with respect to age, parity, antenatal registration, residence, mode of delivery, duration between admission of patient to mortality etc. Direct, indirect, associated causes and socio-demographic factors contributing to mortality were assessed and systemically analyzed through Epi Info™ Version 7.2. Statistical analysis like Percentage, Rate were calculated.

Maternal Mortality Ratio (MMR) was calculated by occurrence of total maternal deaths per among one lac live births.

RESULTS

Table 1 shows that in the present study the maximum number of maternal deaths, 73 (78.5%) occurred in the age group of 20-30 years followed by 14 (15%) deaths above 30 years of age. Young age group were involved due to early marriage, poverty and nutritional deficiency. 72% of deaths were in unbooked patients and belonged to rural areas 76.3%. About 30% of the maternal deaths occurred within

Characteristics	No of patient	Percentage
Age :		
Up to 19 years	06	6.4
20 – 30 years	73	78.5
>30 years	14	15
Parity :		
Primipara	28	30
Multipara	62	66.7
Grand-multi	03	3.2
Registration :		
Unbooked	67	72
Booked	26	27.9
Residence :		
Rural	71	76.3
Urban	22	23.7
Delivery :		
Abortions	4	4.3
Undelivered	23	24.7
Home delivery	16	17.2
Delivery hospital	50	53.7
Admission to mortality interval :		
<1 hour	09	9.7
1 to 6 hours	28	30.1
6 to 12 hours	17	18.3
12 to 24 hours	11	11.8
24 hours to 7 days	23	24.7
>7 days	05	5.3

6 hours of admission in the hospital, pointing to the critical condition in which they were brought, while 24.7% yield within 7 days (Fig 1).

As shown in Table 2, out of total maternal deaths, 29.1% were in antenatal period, out of them most of were from far-off area resulting in delayed treatment and intervention and women were in poor general condition at the time of admission.

As shown in Table 3, Direct obstetric causes were responsible for 61(65.6%) deaths, ie, obstetric complications of pregnancy, labour and puerperium. Among them, Haemorrhage 24 (25.8%), hypertensive disorders 19 (20.4%) and Sepsis 18(19.3%) were leading direct causes of mortality.

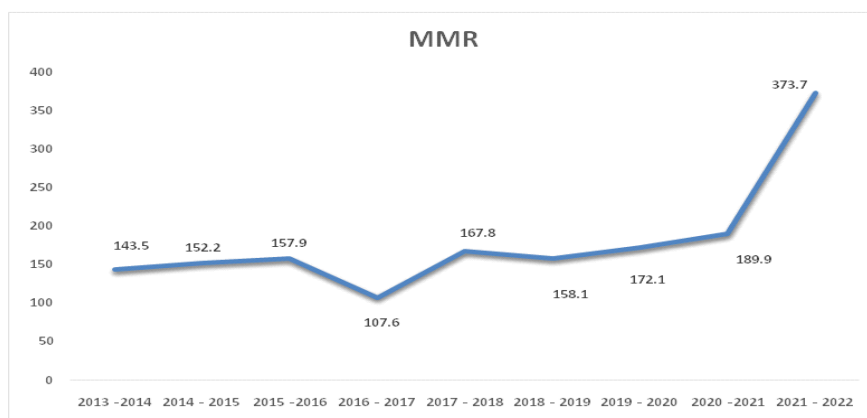


Fig 1 — Trend of Maternal Mortality Rate

Year	Antenatal	Intrapartum	Postpartum
2013	2	0	5
2014	3	0	5
2015	3	1	4
2016	0	1	5
2017	0	0	10
2018	4	1	4
2019	5	0	7
2020	4	1	8
2021	6	4	10
2013-2021	27 (29.1%)	8 (8.6%)	58 (62.4%)

Around 34.4% of maternal death was due to indirect cause that is the result of pre-existing disease that developed during pregnancy, which are not due to direct obstetric cause but are aggravated by physiological effect of pregnancy. One of the most significant cause was anaemia (7.5%) (Fig 2).

DISCUSSION

Of maternal deaths 73 (78.5%) occurred in 20-30 years age group such results were found in the study conducted by Parmar M *et al*⁸. Females having young age were at higher risk due to early age of marriage, poor families and malnutrition. 72% of deaths were in unbooked patients and belonged to rural areas 76.3%, increased number of maternal death in unregistered patients were noted in the study by Bhaskar K *et al*⁹. About 30% of the maternal deaths occurred within 6 hours of admission in the hospital, pointing to the critical condition in which they were brought, while 24.7% yield within 7 days.

Amongst total Maternal Mortality, 29.1% occurred in antenatal period, out of them most of were from area that were too far resulting in delayed management of case due to late arrival at health facility and pregnant females were in critical condition at the time of presentation. Sitaula S *et al* also noted that delayed referral and poor obstetric care was the main reason

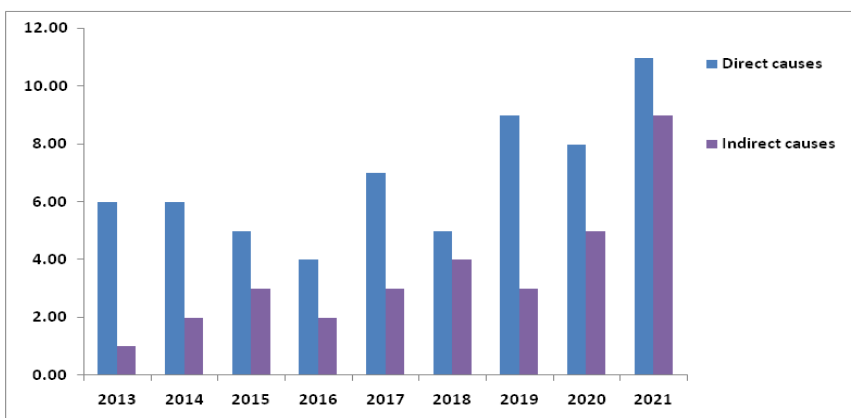


Fig 2 — Year-wise distribution of causes of death (Direct or Indirect)

Direct cause 61(65.6%)	No of patients	Percentage
Haemorrhage	24	25.8%
Hypertensive disorder	19	20.4%
Sepsis	18	19.3%
Indirect cause 32(34.4%) :		
Anemia	7	7.5%
COVID-19 infection	7	7.5%
Heart disease	5	5.4%
Swine flu	4	4.3%
ARDS	3	3.2%
Hepatitis	2	2.2%
ARF	2	2.2%
Amniotic fluid embolism	1	1.1%
Pulmonary embolism	1	1.1%

for postpartum deaths¹⁰.

Direct obstetric factors(complication developed during pregnancy, labour or puerperium)were responsible for 65.6% deaths. Among them, Haemorrhage (25.8%), Hypertensive disorders (20.4%) and Sepsis (19.3%) were major direct causes of maternal deaths. Other similar studies have shown variation in direct obstetrical deaths, 66.7% in a study by Verma K *et al*,¹¹ and 68.70% by Kulkarni *et al*¹².

Around 34.4% of maternal deaths were due to indirect causes resulting from pre-existing disease that developed during entire Antenatal period of Pregnancy, which are not due to direct obstetric cause but are provoked by Physiological effect of pregnancy. One of the most important causes was low haemoglobin level (anaemia) (7.5%). Other studies conducted by Ashok V, *et al* shows same anemia related death rate¹³. Heart failure and sudden death may occur due to pre-existing anemia in pregnant women. It also reduces the maternal ability to resist most of the infectious organism and cope up with severe blood loss¹⁸. Hepatitis accounted for 3.4% deaths which were tested HEV positive and eventually complicated with Hepatorenal Syndrome. 4.16% deaths have been reported in study of Bedi N *et al*¹⁴.

The MMR of the studied hospital was 180.2 per 1 lac live births, which was significantly higher compared to national statistics as such institutions being a higher treatment care center where most of women (antenatal or intra natal) were referred from rural hard to reach areas leads to delayed rate of hospitalization and subsequent management. Many other comparative studies showing the varying MMR such as Shobha G *et al*-234.6,¹⁵ Barsode S *et al*-

185.16¹⁶. Majority were multiparous (66.7%) as compared to primiparous women (30%). Similarly Nair A, *et al* reported 52.2% and 42.6% women multipara and primipara respectively¹⁷. Significantly higher number of pregnancies and short interval between successive pregnancies together adversely affect the maternal health and responsible for high fatality among mothers. Out of delivered patients, 12.9% were delivered in other hospital (PHC, UHC) and 12.2% home delivery found. Most of these were delivered without the services of a trained midwifery personnel. Deaths from incomplete and septic abortions were noted (4.3%) which might be due to lack of education, social stigma and delayed hospitalization. Such type of deaths can be minimized with proper awareness regarding contraceptive uses, family planning and medical termination of pregnancy (Table 1). Antenatal deaths can be prevented with early detection of warning signs of high-risk pregnancy such as Preeclampsia, Eclampsia, Placenta previa, Abruptio placenta, Intrauterine Death of Fetus (IUFD) etc, which requires early referral, easy transport and timely intervention at Tertiary Care Hospital where easy availability of blood bank and high-quality obstetric care by trained health personnel is made possible. Postpartum deaths reported for about 60% of total and 12 of them were delivered at other hospital and referred to this institution with complication in postpartum period.

Other similar study done by Khandale SN *et al* found that three types of delay in referral of the patients to other higher centers leading to very high mortality among mothers¹⁸. Unfortunately, in most of the cases, type-1 delay of decision making to get help was the culprit.

Many direct obstetric causes were responsible (65.6%) for maternal death. Postpartum Haemorrhage is sudden, unpredictable and more serious in multiparity women. PPH also needs distinct focus because it may lead to mortality speedily if no provision for prompt life-saving procedure and care. It has the shortest reported episode to death interval (Table 1). Detection of antepartum haemorrhage and its advance management, referral to higher care center, active management of third stage of labour, detection of postpartum haemorrhage with appropriate surgical intervention and supportive treatment in HDU prevents many haemorrhage related maternal deaths. Gestational Hypertension particularly pre-eclampsia with severe features and its complication like HELLP syndrome causes more maternal morbidity and mortality (20.4%). Such mortality in our present study primarily found due to fail to detect associated

symptoms/complications and late referral to higher treatment centre. Detection of Pre-eclampsia should be during scheduled antenatal visits and management should be appropriately done before onset of convulsions and other life-threatening sequelae. Out of total 18 Maternal Mortality due to sepsis, 5 were due to puerperal sepsis and 3 were from unsafe abortions which may result of poor hygiene and untreated Reproductive Tract Infections (RTIs). Uses of higher antibiotics and maintaining aseptic precautions during labour and postpartum period with counseling about proper hygiene to the patients can prevent Septicemia related deaths. To avoid abortion related maternal deaths all woman including adolescents needs access to contraception, safe abortion services delivered by qualified medical personnel and quality post abortal care.

Since December 2019, the whole world has faced a universal crisis after the finding a novel coronavirus, SARS CoV-2 that causes COVID-19, a disease with predominantly involving respiratory system. Current study finding showed that so far there have been 7.5% maternal deaths due to COVID-19 in 2020-2021, out of which 4 patients were admitted due to lack of O₂ saturation. Decision regarding termination of pregnancy in terms of emergency Cesarean Section was carried out for better outcome of mothers. However, the case was documented with death for which anaesthesia related complication could also be the reason. To put this in context, 4.3% H1N1 related maternal death in a 12 months period (Swine flu endemic in India, 2015). Here, it is reasonable to anticipate that the situation in 2020-21(373.7), were suddenly increasing MMR contribute significantly of COVID-19 effect on pregnancy, childbirth and postpartum period (Fig 2). Pandemic context and the prioritization of COVID-19 on resource allocation within the Healthcare System may also impair antenatal quality of care by creating barriers to access routine antenatal appointments and laboratory tests. After WHO pandemic mandate, expert recommendations and guidelines from associations were released focusing management during pregnancy and postpartum period of mother¹⁹.

CONCLUSION

Various factors responsible for maternal morbidity and mortality are preventable. Regular antenatal care, early detection of high-risk factors, timely intervention and referral to a Tertiary Care Hospital is needed. Aseptic precautions during operative procedures, use of antibiotics and proper operative techniques are to be used to minimize sepsis. All Antenatal women must

be educated regarding availability of Medical Termination of Pregnancy (MTP) services, which prevents incomplete and septic abortions. Death related to Hypertensive disorders of pregnancy and Obstetric haemorrhage can be prevented with early detection and availability of 24 hours blood bank facility at First Referral Unit (FRU). Apart from medical intervention, social, cultural, education, financial factors play crucial role in decreasing maternal death. Education regarding late marriage, contraceptive use, spacing pregnancy and limiting family size are important to save many lives. Equally important is to upgradation of the status of females in the society with emphasis on literacy and general health awareness.

National Health Mission (NHM) plays a significant role in achieving the lower Maternal Mortality by improving facilities of health care, hospital deliveries and timely refer high-risk pregnant women. The network of well-trained ASHA workers should be strengthened which form a link between pregnant women and health system. There is a need to address the nutrition of girls during their adolescence period for improvement as these are the girls who will be a mother of tomorrow.

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Approval of Institutional Ethical Committee:
Approved

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