

Maternal Mortality: A Five Years Retrospective Analysis from a Tertiary Care Hospital, Rajasthan, India

MADHUREEMA VERMA¹, GULSHAN BANO², TEENA NAGAR³, AJAY KUMAR SINGH⁴, RAJENDRA PRASAD NAGAR⁵

ABSTRACT

Introduction: Women die due to complications during and following pregnancy and childbirth. Most of these complications develop during pregnancy and many are preventable or treatable. Maternal mortality in developing countries acts as one of the health indicators and reflects the efficiency of the nation health system.

Aim: To analyse the cause of maternal death in tertiary care setting over a period of five years.

Materials and Methods: The present study was a retrospective, observational study, conducted over a period of five years, from April 2015 to March 2020 in the Department of Obstetrics and Gynaecology, Jhalawar Medical College, Jhalawar, Rajasthan, India. The case records and death review forms of all maternal mortality were collected from hospital records and studies. Data regarding age, parity, locality, booking status, mode of

delivery, cause of death, neonatal outcome, etc were collected in pretested proforma and then statistically analysed.

Results: There were 115 maternal deaths from April 2015 to March 2020. The average Maternal Mortality Ratio (MMR) over a period of five years was 243 per one lac live births in institute setting. Majority of maternal mortality were from toxemia (25.2%), anaemia (20.8%), haemorrhage (20.0%) and sepsis (15.7%).

Conclusion: High maternal mortality is an important issue regarding maternal care. Toxaemia (hypertensive disorder of pregnancy), haemorrhage, sepsis and anaemia are still the common cause of maternal death. It can be prevented/reduced by improving healthcare facility in rural area by ensuring round the clock availability of gynaecologist, anaesthetist, blood product, intensive care facility and timely referral of high risk pregnancies. Family welfare services should be improved to reduce unwanted pregnancy.

Keywords: Haemorrhage, Maternal mortality, Sepsis, Toxaemia

INTRODUCTION

Maternal mortality is a reflection of the care given to women by society and as an indicator for quality of health for nation. It is unfortunate that maternal death occurs during the process of childbirth and most of them are preventable. According to the World Health Organisation (WHO), a maternal death is defined as death of any women while being pregnant or within 42 days of termination of pregnancy irrespective of duration or site of pregnancy but not from accidental or incidental cause [1]. Maternal mortality in developing countries acts as one of the health indicators and reflects the efficiency of the nation [2]. This can be expressed in terms of MMR. It is defined as maternal death per 100,000 live births [3]. The major complications that account for nearly two-thirds of all maternal deaths are severe bleeding (mostly bleeding after childbirth), infections (usually after childbirth), high blood pressure during pregnancy (preeclampsia and eclampsia), complications from delivery and unsafe abortions [4].

India has committed itself to the latest united nation target for the Sustainable Development Goals (SDGs) for MMR at 70 per 100,000 live births by 2030 [3]. Government of India is trying to reduce maternal mortality through various programs like Jananisuraksha Yojana, Jananishishu suraksha etc., Maternal death audits are being conducted at institutional level, district level expert to know the cause of maternal death and to improvise healthcare, if needed.

Various delays in care are being identified, medical officers and person involved in maternal care are being trained so they can provide skilled and effective care. Transport facility is available free of cost for mothers and neonates [5]. Type of delay according to Thaddeus S and Maine D for maternal death are [6]:

- Type 1 delay-Delay in decision making to seek help.
- Type 2 delay-Delay in transport due to poor roads and unavailability of vehicles.
- Type 3 delay-Delay at institutional level.

Tertiary care centres are providing state of care for every mother. There was no study available from this institute regarding maternal mortality so, this study was conducted to assess and analyse the cause of maternal death in our institute over a period of five years.

MATERIALS AND METHODS

This was a retrospective, observational study conducted in the Department of Obstetrics and Gynaecology, Jhalawar Medical College and Hospital, Jhalawar, Rajasthan, India between April 2015 to March 2020, and analysis of the study was done from January 2021 to March 2021. This study was conducted after approval from Institutional Ethical Committee via order S.no. 15/74 dated 09-10-2020.

Inclusion criteria

- All patients either booked in present hospital or referred from government or private sector hospitals and died in present hospital within 42 days of termination of pregnancy either due to causes directly related to pregnancy, aggravated by pregnancy or unrelated to pregnancy were included as the study population.
- Those patients after admission who were referred to critical care units, other departments for continued care and later died were also included in the study.
- Those patients who were directly admitted in other department for pregnancy with other medical problems and died, they were also included in this study.
- The study subjects included those with either intrauterine or extrauterine pregnancy.

Exclusion criteria

- Those patients who died after 42 days of termination of pregnancy were excluded from the study.
- Those patients who nearly died but survived (near miss) were excluded from the study.

The case records files and maternal death review forms of all maternal deaths, who fit in the inclusion criteria were collected from the hospital medical record department and studied in detail and data were filled in pretested proforma.

After collecting relevant data, each patient's case record was scrutinised with regard to booked or unbooked, age, parity, rural or urban, mode of delivery, admission to death interval, cause of death and neonatal outcome were analysed with a view to find out the factors associated and contributing to maternal death.

Direct maternal death define as those related to obstetric complications during pregnancy, labour or puerperium (six weeks) or resulting from any treatment received i.e., pregnancy induced hypertension, haemorrhage. Indirect cause of maternal death is those associated with a disorder, the effect of which is exacerbated by pregnancy i.e., anaemia, cardiac, medical disorders [7].

The number of live births from April 2015 to March 2020 was collected year wise. MMR of institution for the study period was calculated by using the formula:

$$MMR = \frac{\text{Total number of maternal death}}{\text{Total number of live births}} \times 100,000$$

STATISTICAL ANALYSIS

The data was entered in Microsoft excel and results were expressed in terms of frequency and percentage.

RESULTS

Total number of maternal deaths that occur in the study period of five year from April 2015 to March 2020 were 115. During this period of five year, there were 47,135 live births. The MMR for the five year, period was 243 per 100,000 live births [Table/Fig-1].

Year	Maternal death	Live birth	MMR (per lac live birth)
April 2015-Dec 2015	33	9208	358.38
Jan 2016-Dec 2016	18	8380	214.80
Jan 2017-Dec 2017	16	9021	177.36
Jan 2018-Dec 2018	22	9754	225.55
Jan 2019-Mar 2020	26	10,772	241.38
Total	115	47,135	243

[Table/Fig-1]: Year wise maternal death and Maternal Mortality Ratio (MMR).

Among these 115 maternal death, majorities 49 (42.7%) were in 21-25 years age group. In present study maximum number of patients 48 (41.7%) were primigravida and 32 (27.8%) were second gravida. Maximum maternal deaths were reported 86 (74.8%) in unbooked patient as compared to booked patient 29 (25.2%) [Table/Fig-2].

Variables (%)	No. of patients	Percentage (%)
Maternal age (years)		
<20	2	1.7
21-25	49	42.7
26-30	36	31.3
31-35	22	19.1
>35	6	5.2
Locality		
Rural	85	73.9
Urban	30	26.1
Booking status		
Booked	29	25.2
Unbooked	86	74.8
Gravid status		
Primigravida	48	41.7

2 nd Gravida	32	27.8
3 rd Gravida	19	16.5
4 th Gravida	8	7
>4 th Gravida	8	7
Total	115	100

[Table/Fig-2]: Demographic, baseline and personal characteristic of patients.

Out of 115 deaths, 58 (50.4%) patients were died after vaginal delivery, only two patients died one after instrumental delivery and one after assisted breech vaginal delivery [Table/Fig-3].

Mode of delivery	No. of patients (n)	Percentage (%)
Vaginal delivery	58	50.4
Caesarean section	35	30.4
Undelivered	18	15.7
Abortion	2	1.7
Instrumental vaginal delivery	1	0.9
Assisted breech vaginal delivery	1	0.9
Total	115	100

[Table/Fig-3]: Distribution of maternal death according to mode of delivery (N=115).

Maximum number of patients 73 (63.4%) died within 12 hours of admission. Out of 115 patients, 9 (7.8%) patient died after 72 hours of admission [Table/Fig-4].

Time (hours)	No. of patients (n)	Percentage (%)
0-6	48	41.7
7-12	25	21.7
12-24	18	15.7
24-72	15	13.1
>72	9	7.8
Total	115	100

[Table/Fig-4]: Interval between admission to death.

In present study, maximum number of patients, 82 (71.3%) died due to direct cause and 33 (28.7%) died due to indirect cause. Direct and indirect causes of death are shown in [Table/Fig-5].

Causes	No. of patients (n)	Percentage (%)
Direct causes (n=82)		
Hypertensive disorder	29	25.2
Haemorrhage	23	20
Sepsis	18	15.7
Disseminated intravascular coagulation	05	4.4
Pulmonary embolism	03	2.6
Amniotic fluid embolism	02	1.7
Rupture uterus	02	1.7
Indirect causes (n=33)		
Anaemia	24	20.8
Cardiac disease	2	1.7
Jaundice	2	1.7
Respiratory distress	1	0.9
Diabetes	1	0.9
Swine flu	1	0.9
Malaria	1	0.9
Hepatitis	1	0.9

[Table/Fig-5]: Causes of maternal death (direct and indirect causes) N=115.

In present study, out of 115 patients who died, 95 patients were delivered. Neonatal outcome is shown in [Table/Fig-6]. Total of 18 patients remain undelivered and (15.7%) patients were remained undelivered and 2 (1.7%) patients had abortion.

Outcome	No. of patients (n)	Percentage (%)
Normal Live neonates	45	47.4
Intrauterine death	26	27.4
Asphyxiated neonates	24	25.2
Total	95	100

[Table/Fig-6]: Distribution of neonatal outcome.

DISCUSSION

Reducing maternal mortality is a prime healthcare goal in developing countries. Total number of maternal deaths that occurred in the study period of five year from April 2015 to March 2020 was 115. During this five year study period, there were a total number of 47,135 deliveries in our institution. Different part of country has almost similar data regarding maternal mortality. [Table/Fig-7] showed the comparisons of maternal mortality data of different states of India [8-14].

The average MMR for this study period was 243 per 100,000 live birth. This is much less than the study done by Yadav K et al., that is 471.5/100,000 and higher than the MMR of Rajasthan that is 164/100,000 [15]. The cause behind this high MMR was due to large number of referral patient in poor general condition at the time of admission.

Maximum number of maternal mortalities, 85 (73.9%) belonged to the age group of 21-30 years. This study was similar to the study done by Puri A et al., which was 71.53% [16]. In present study, maximum mortality belongs to primiparous 48 (41.7%). Similar observation (44.2%) was seen in the study done by Mediratta G et al., [17]. Maximum number of mortalities belongs to multiparous women in the studies conducted by Murthy BK et al., [18].

Proper antenatal care reduces the incidence of complications both in antenatal and intranatal period. Antenatal care help in detection of toxemia, anaemia and other disorders like diabetes, cardiac disease etc., which can alter the course of pregnancy.

In present study, 86 (74.8%) maternal death seen in unbooked cases and 29 (25.2%) maternal death seen in booked cases. Similar result was seen in the study done by Jain M et al., and Jadhav AJ and Rote PG [19,20]. In the present study, maximum number of maternal deaths 85 (73.9%) were from the rural population which was similar to the study done by Bellad MB et al., [21]. Maternal mortality was higher in rural population because of illiteracy, inadequate antenatal visits, inaccessible emergency healthcare services, lack of transport facilities and late referral.

In present study, 58 (50.4%) maternal deaths occurred after vaginal delivery and 35 (30.4%) died after caesarean section. These findings were similar to Yadav K study where he reported out of all maternal deaths, 101 (47.2%) patients delivered vaginally and 22 (10.3%) patients died who underwent caesarean section.

Maximum maternal death (83%) occurred in the postpartum period, similar result were reported in the study done by Das R et al., and Dogra P and Gupta KB [22,23]. The causes behind postpartum death were mostly the pathology which started in antenatal period may get exacerbated following the labour. It also indicates the need for continuous vigilance and prompt action of complication in postpartum period.

In the present study, majority of the women (41.7%) died within 6 hours followed by 37.3% within 7 to 24 hours of admission. Similar reports were also given by Bharaswadkar GB and Kurtadikar ML in which 36.3% died in 6 hours and 27.2% died within 7 to 24 hours of admission[24].

These findings suggests that majority of the patient reaching the tertiary care quite late, poor general condition of women on admission, late referrals or long travel time. Appropriate treatment at periphery and timely referrals to higher centre can prevent most of these deaths. Programs like basic emergency obstetrics care and skilled attendant at primary centre gives a ray of hope in reducing maternal mortality.

In present study, (71.3%) maternal death belongs to direct cause and (28.7%) were belongs to indirect cause. Direct obstetrics death includes death from hypertensive disorder (25.2%), haemorrhage (20%) and sepsis (15.7%). Similar results were seen in the study done by Oladapol OT et al., [25]. Hypertensive disorders were the most common cause of maternal death which indicate that proper monitoring of blood pressure were not done at peripheral centre, patients did not know about the warning signs usually referred in critical condition. Haemorrhage was the second most common direct cause (20%). Similar observation was seen in study done by Ps R et al., (17.4%) maternal mortality due to haemorrhage [26]. The provision of timely blood transfusion can save lives at risk due to severe haemorrhage. The availability of blood banks at all first referral units and their proper functioning are needed.

Sepsis was seen in 15.7% of the cases. Incidence of sepsis is decreased over the years due to use of higher antibiotics, early detection of infection, banning of illegal abortions and improved standard of ICU care.

Most common indirect cause of maternal death were anaemia (20.8%) , jaundice (1.7%) and cardiac disease (1.7%); Yadav K et al., reported similar results 16.3%, 1.9%, and 1.9% respectively [15]. Anaemia is a preventable disease and measures should be taken to improve status preconceptionally and during pregnancy. It also impedes the mother's ability to resist infection or cope with haemorrhage and increases the maternal morbidity and mortality.

Author's	Publication year	Setting/Place	Type of study	Sample size (n)	Results
Ashok V et al., [8]	2008	Himachal Pradesh, India	Retrospective	65	Maternal Mortality Ratio (MMR) was 345.9. Haemorrhage was most common direct and anaemia was most common indirect cause of death.
Vidhyadhar B et al., [9]	2011	Maharashtra, India	Retrospective	38	MMR was 302.9. Post-partum haemorrhage was most common direct cause and infective hepatitis is most common indirect cause of death.
Mukharjee S et al., [10]	2014	Uttar Pradesh, India	Retrospective	49	MMR was 1180. Haemorrhage was most common direct cause and anaemia was most common indirect cause of death.
Asharaf Ali M et al., [11]	2015	Karnataka, India	Retrospective	141	MMR was 215. Direct cause was responsible in 87% and indirect cause in 13% of cases.
Sethi PS et al., [12]	2017	Punjab, India	Retrospective	22	MMR was 302.5. haemorrhage was most common direct cause and anaemia was most common indirect cause of death.
Sridevi G and Shanmugavadivu L	2018	Tamil Nadu, India	Retrospective	204	MMR was 600. Eclampsia was the leading direct cause of death. Anaemia was the leading indirect cause of death.
Ramola M et al., [14]	2018	Uttarakhand, India	Retrospective	48	MMR was 671. Most of the maternal deaths were due to direct causes like haemorrhage, eclampsia followed by sepsis.
Present study	2022	Rajasthan, India	Retrospective	115	MMR was 243 per one lac live births in institute. Majority of maternal death were due to toxemia, anaemia, haemorrhage and sepsis.

[Table/Fig-7]: Comparison of maternal death in different states of India [8-14].

Present study showed that there were multiple factors contributing to maternal death. Age, parity, booking status and associated conditions etc. had influence on maternal death. Data of five year were collected and analysed. This study can help institute to plan policy regarding antenatal, natal and postnatal care of pregnant women.

Limitation(s)

It was a retrospective study and some data were not available like maternal nutrition, socio-economic status, literacy status of mother and family and accessibility of nearest healthcare centre. Detail scrutiny of each maternal data is required to assess the effect of other factors for maternal death.

CONCLUSION(S)

As most common cause of maternal death was toxemia of pregnancy (hypertensive disorder of pregnancy) followed by haemorrhage, sepsis and anaemia. Maternal death can be prevented/reduced by improving health education, and improving healthcare facility in rural area. Training of medical officers, staff nurses and ASHA workers working in rural area by programs like basic emergency obstetric care and skilled birth attendant training can help in reducing maternal mortality. Early detection of high-risk cases and timely referral to higher centre is of paramount importance.

REFERENCES

- [1] Park K. Preventive Medicine in Obstetric, Paediatrics and Geriatrics: Park's Text Book of Preventive and Social Medicine. 20th edition. Jabalpur: M/S Banarasi Das Bhanot. 2009;479-83.
- [2] Panting-Kemp A, Geller SE, Nguyen T, Simonson L, Nuwayhid B, Castro L. Maternal deaths in an urban perinatal network, 1992-1998. *Am J Obstet Gynecol.* 2000;183:1207-12.
- [3] Reproductive Health Indicators: Guidelines for their Generation, Interpretation and Analysis For Global Monitoring. WHO, 2006.
- [4] Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels JD, et al. Global causes of maternal death: A WHO systematic analysis. *Lancet Global Health.* 2014;2(6):e323-33.
- [5] Khandale SN, Kedar K. Analysis of maternal mortality: A retrospective study at tertiary care centre. *Int J Reprod Contracept Obstet Gynecol.* 2017;6(4):1610-13.
- [6] Thaddeus S, Maine D. Too far to walk: Maternal mortality in context. *Soc Sci Med.* 1994;38:1091-110.
- [7] WHO. The WHO Application of ICD-10 to Deaths during Pregnancy, Childbirth and the Puerperium: ICD-MM, 2012.
- [8] Ashok V, Santosh M, Anupa S. A study on maternal mortality. *J Obstet Gynecol India.* 2008;58(3):226-29.
- [9] Vidyadhar B, Bangal A, Purushottam A, Giri B, Garg R. Maternal mortality at a tertiary care teaching hospital of rural India: A retrospective study. *Int J Biol Med Res.* 2011;2(4):1043-46.
- [10] Mukherjee S, Mukherjee S, Sarkar RR. A six year retrospective study of maternal mortality at a tertiary teaching institute in Uttar Pradesh. *Int J Med Sci Public Health.* 2014;3:1407-09.
- [11] Ashraf Ali M, Babiitha MC, Lokeshchandra HC, Sharma KD, Zehra M, Reddy MS. A study of changing trends of maternal mortality at the tertiary care centre, MMC & RI Mysore, India. *Int J Reprod Contracept Obstet Gynecol.* 2015;4:239-42.
- [12] Sethi PS, Sharma S, Chawla I. Maternal mortality in a tertiary care centre in North India: A retrospective study. *Int J Reprod Contracept Obstet Gynecol.* 2017;6:5559-62.
- [13] Sridevi G, Shanmugavadivu L. Analysis of maternal mortality at a government teaching hospital GMKMCH, Salem, Tamil Nadu, India: A retrospective study. *Int J Reprod Contracept Obstet Gynecol.* 2018;7:5093-96.
- [14] Ramola M, Jain S, Gupta V, Bansal N, Singh P. Analysis of maternal deaths over a period of three years at a tertiary care centre of Uttarakhand, India. *Int J Reprod Contracept Obstet Gynecol.* 2018;7:1357-60.
- [15] Yadav K. A retrospective analysis of maternal deaths over a period of five year at a tertiary care hospital of central India. *Int J Reprod Contracept Obstet Gynecol.* 2018;7(1):4657-60.
- [16] Puri A, Yadav I, Jain N. Maternal mortality in an urban tertiary care hospital of North India. *The J Obstet Gynecol India.* 2011;4:280-85.
- [17] Mediratta G, Khullar H, Bhandari SK. An observational study of maternal mortality in a tertiary care hospital in New Delhi. *J Indian Acad Clin Med.* 2015;16(2):161-65.
- [18] Murthy BK, Murthy MB, Prabhu PM. Maternal mortality in a tertiary care hospital: A 10-year review. *Int J Prevent Med.* 2013;4(4):105.
- [19] Jain M, Maharaje S. Maternal mortality: A retrospective analysis of ten years in a tertiary hospital. *Indian J Prev Soc Med.* 2003;34:103-11.
- [20] Jadhav AJ, Rote PG. Maternal mortality changing trends. *J Obstet Gynaecol India.* 2007;57:398-400.
- [21] Bellad MB, Vidler M, Honnunar NV, Mallapur AS, Ramadurg U. Maternal and newborn health in Karnataka State, India: The community level interventions for preeclampsia (CLIP) trial's baseline study results. *PLOS ONE.* 2017. Doi: 10.1371/journal.pone.0166623.
- [22] Das R, Biswas S, Mukherjee A. Maternal mortality at a teaching hospital of rural India: a retrospective study. *Int J Biomed Advan Res.* 2014;5(2):114-16.
- [23] Dogra P, Gupta KB. A study of maternal mortality at a tertiary institute. *Obs Gynae Today.* 2009;115:58-60.
- [24] Bharaswadkar GB, Kurtadikar ML. Evaluation of maternal mortality and their factors in GMCH, Aurangabad, India. *Int J Contracept Obstet Gynecol.* 2018;7(3):879-82.
- [25] Oladapoi OT, Sule-Odul AO, Olatunjiil AO, Danie OJ. "Near-miss" obstetric events and maternal deaths in Sagamu, Nigeria: A retrospective study. *Reprod Health.* 2005;2(1):9.
- [26] Ps R, Verma S, Rai L, Kumar P, Pai MV, Shetty J. "Near Miss" obstetric events and maternal deaths in a tertiary care hospital: An audit. *J Pregnancy.* 2013;2013:393758.

PARTICULARS OF CONTRIBUTORS:

1. Professor, Department of Obstetrics and Gynaecology, Jhalawar Medical College, Jhalawar, Rajasthan, India.
2. Assistant Professor, Department of Obstetrics and Gynaecology, Jhalawar Medical College, Jhalawar, Rajasthan, India.
3. Associate Professor, Department of Obstetrics and Gynaecology, Jhalawar Medical College, Jhalawar, Rajasthan, India.
4. Postgraduate Resident, Department of Obstetrics and Gynaecology, Jhalawar Medical College, Jhalawar, Rajasthan, India.
5. Associate Professor, Department of Paediatrics, Jhalawar Medical College, Jhalawar, Rajasthan, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Rajendra Prasad Nagar,
House No. 3, New Master Colony, Near Trauma Centre Hospital,
Jhalawar-326001, Rajasthan, India.
E-mail: drraj_teens@gmail.com

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. No

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Oct 23, 2021
- Manual Googling: Dec 09, 2021
- iThenticate Software: Dec 30, 2021 (24%)

ETYMOLOGY: Author Origin

Date of Submission: **Oct 19, 2021**
Date of Peer Review: **Nov 29, 2021**
Date of Acceptance: **Dec 09, 2021**
Date of Publishing: **Jan 01, 2022**