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# Maternal mortality in a tertiary care hospital: a 3-year review

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## Abstract

Motherhood is associated with multiple health risks, including maternal mortality remaining a major global public health concern, particularly in Empowered Action Group states of India, which continue to report higher levels of maternal mortality ratio. The present study aimed to analyze the clinical etiology, and systemic factors contributing in maternal deaths at a tertiary referral center of Madhya Pradesh, a state persistently elevated MMR. All recorded and reported maternal deaths (n=35) over a 3-years period were subjected to retrospective descriptive analysis. Data was extracted from institutional maternal death review registers and clinical records, including demographic features, antenatal care exposure and the immediate causes of deaths. Most of the maternal deaths (82.8%) were seen in the age group 20–29 years, and 91.4% belonged to rural backgrounds. Only 37.1% of cases were booked for antenatal care, thus highlighting the apparent deficiency in antenatal coverage. The postpartum period emerged as the highest risk phase, accounting for 60% of maternal deaths. Hypertensive diseases of pregnancy (Eclampsia) were the most common direct cause of death (42.9%), followed by obstetric haemorrhage (22.8%) and sepsis (20%). Severe anaemia was a ubiquitous indirect contributing factor, present in 68.6% of cases. The high institutional MMR is representative of role of the study centre as a tertiary "safety net" center for critically ill, unbooked rural referrals from rural and peripheral health facilities. The reduction of the "Three Delays" especially delays in receiving appropriate care, and alongside strengthening community based detection and management of anemia and eclampsia, is essential for reducing maternal mortality in this setting..

**KEYWORDS:** Maternal mortality; Risk factor; Infection disease; Hypertensive disorder.

## Introduction

Competency-Based Medical Education (CBME) Maternal health is a key indicator of public health that reflects the health status of women, families and communities. Despite the sustained global and national efforts, this issue continues to pose significant challenges that required specific responsive solution [1]. In accordance with WHO's ICD-10 definition, a maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, regardless of duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, excluding accidental or incidental causes [2]. Globally, around 75% of maternal deaths occur due to a limited number of preventable complications, notably obstetric haemorrhage, infections, hypertensive disorders in pregnancy (preeclampsia/eclampsia), complications of childbirth and unsafe abortion [3].

Maternal survival is fundamental components not only to family health but also serves as a sensitive indicator of a nation's socio-economic development and effectiveness of health care system [4]. Although India has achieved notable progress in increasing healthcare infrastructure and expanding maternal services over the last few decades, maternal mortality remains a persisting public health priority, especially in rural and socioeconomically marginalized urban areas [5]. Persistent inequalities in access to quality antenatal care, skilled birth attendance,

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emergency obstetric care and key supplies negatively impact maternal health outcomes [6]. These challenges are intensified by socioeconomic disparities, cultural barriers, poor health literacy and delay in seeking timely medical aid.

Internationally, the prevention of maternal mortality is a key objective in Sustainable Development Goal (SDG) 3.1, which aims to lower the maternal mortality ratio (MMR) to less than 70 deaths per 100,000 live births by 2030 [7]. Although the number of maternal deaths worldwide declined by almost 38% from 2000 and 2017, progress has been inconsistent with approximately 94% of maternal deaths in lower-middle income countries [8].

The MMR remains a sensitive measure of inequities in access to and the quality of reproductive healthcare. In the Indian scenario, reductions in MMR was noted from 130 per 100,000 live births during 2014–2016 to 97 in the year of 2018–2020 and further to 88 as was quoted in Sample Registration System (2020–2022) [9]. Despite, marked national progress, substantial sub-national variation in maternal mortality persists, both between and within states. The MMRs in EAG states such as Madhya Pradesh remains still higher than the national average [10]. These elevated rates reflect the combined impact of geographic barriers, lower education attainment, poverty, and systemic delay in reaching timely emergency obstetric care.

The tertiary care hospital in rural areas is the major referral "safety net" receiving severely ill obstetric patients following prolonged transfers from the peripheral health facilities. Consequently, maternal deaths recorded at these institutions often cumulative failures across the healthcare continuum rather than deficiencies in tertiary level care [11]. The collective etiology of maternal mortality is conventionally classified into direct obstetric causes which are arising from complications of pregnancy, labour or puerperium and indirect causes where pre-existing/ coexisting medical conditions are exacerbated by pregnancy [12]. The major direct causes, such as postpartum haemorrhage, hypertensive disorders, and sepsis remain the leading contributors to maternal death; while indirect causes especially severe anaemia significantly increase the risk of mortality [13].

In rural India, the "Three Delays" model—delays in decision making to seek care, delays to reach appropriate health care facility, and to receiving timely and appropriate treatment [14]. Despite the implementation of national level project such as Anemia Mukt Bharat and Surakshit Matritva AashwaSan (SUMAN), preventable maternal deaths are still persist at referral centers, indicative of inherent service delivery gaps and referral mechanisms.

In this background, the present study was conducted to evaluate maternal mortality profile at a tertiary care teaching hospital in central India. By examining the determinants of maternal deaths, including adverse outcomes, and their clinical etiologies and sociodemographic factors correlates, the study seeks to identify the gaps in maternal healthcare delivery that may exist in the region.

## Materials and Methods

Design and Setting: This retrospective descriptive research was carried out at Department of Obstetrics and Gynecology, SRVS Medical College & Hospital, Shivpuri, MP. The institution is a major tertiary referral center for five surrounding districts and provides comprehensive emergency and highly specialized obstetric care, predominately to a rural, socioeconomically disadvantaged population.

Data Collection and Sources: Data was collected retrospectively for a period of 3 years from January 01, 2022 to January 31, 2025. The information was extracted from secondary hospital sources, were primarily MMR records and official death notification forms. Additional sources included from labour room (LR) and Operation Theatre (OT) registers, discharge, inpatient charts and ICU notes, referral slips from peripheral health facilities, and records of brought dead cases.

Inclusion and Exclusion Criteria: All maternal deaths that take place during or within 42 days of post-pregnancy, delivery, or abortion as defined by the WHO.

Exclusion: Deaths due to external causes such as injury and poisoning, road traffic accidents, suicide were excluded from analysis.

Variables Analyzed: The structured preform included the following headings:

Socio-demographic profile: Age, place of residence (urban/rural) and status of booking (Booked >3 ANC visits; Unbooked if < 3 visits).

Obstetric history: Parity, gestational age at the time of death and timing of death (antepartum, intra-partum or postpartum).

Clinical variables: Presence of Anemia, mode of delivery, and primary and contributory causes of death were recorded.

Institution measurements: The total number of live births during the study period was obtained for calculation of the MMR institutional MMR [9].

Instituional MMR = (Total Maternal Deaths)/ (Total Live Births) X 100000

**Statistical methods**: Data were entered into

Microsoft Excel and analyzed using descriptive statistics. The results were presented as frequency, percentage and ratio

## Results

**Table1. Age wise distribution patients**

| Patient's age (years) | No of death in 3 years (n= 35) | % |
|---|---|---|
| <20 | 03 | 8.6 |
| 20 – 29 | 29 | 82.8 |
| 30 – 39 | 03 | 08.6 |
| > 40 | – | |

**Table 2. Area wise distribution of patients**

| Area | No of deaths | % |
|---|---|---|
| Rural | 32 | 91.4 |
| Urban | 03 | 08.6 |
| Booking status | | |
| Booked | 13 | 37.1 |
| Un-booked | 22 | 62.9 |
| Duration of pregnancy | | |
| Anti-partum | 11 | 31.4 |
| Intra-partum | 03 | 08.6 |
| Post-partum | 21 | 60.0 |

Majority (82.8%) of maternal deaths were occurred women aged 20–29 years, and a substantial proportion (91.4%) was from rural areas (women who died). Only 37.1 % of cases were classified as booked, showing an alarming deficiency of antenatal surveillance. The postnatal period was identified as the vulnerable phase, accounting 60% of maternal death [Table 1, 2].

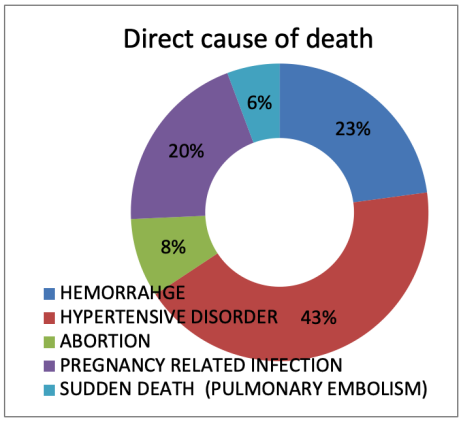


**Fig 1. Direct cause of death**

**Table 2. Area wise distribution of patients**

| Quiz Round | Rated "Most Difficult" n (%) | Mean Difficulty Score (1–5) |
|---|---|---|
| Rapid Fire | 69 (49) | 4.6 |
| Case-Based | 36 (26) | 3.9 |
| Visual Round | 22 (16) | 3.2 |
| MCQ Round | 14 (10) | 2.7 |

**Table 3. Indirect cause of death**

| Indirect causes of death | No of death | % |
|---|---|---|
| Anemia | 24 | 68.6 |
| Heart disease | 2 | 5.7 |
| Miscellaneous (TB, malaria, hepatitis etc) | 9 | 25.7 |

The classical triad of hemorrhage (23%), eclampsia (43%), and sepsis (20%) was the major direct causes of maternal deaths, whereas8.6% deaths are due to abortion and only two maternal deaths (5.7%) was due to pulmonary embolism (fig 1).

In this study period, Anemia as the most important indirect cause of maternal death 68.6%, heart disease accounted for 5.7%, of maternal death and miscellaneous cause like acute gastroenteritis malaria hepatitis accounted for 25.7% of maternal deaths as shown in Table 3. Majority of the maternal deaths occurred in the year of 2023 with 15deaths (Table 4).

**Table 4. Year wise distribution**

| Year | no of death | no of live birth | mmr |
|---|---|---|---|
| 2022 | 03 | 1777 | 168 |
| 2023 | 15 | 2957 | 507 |
| 2024 | 17 | 3071 | 553 |

## Discussion

The results of this three-year analysis represent a valuable contribution to the ongoing understanding of the remaining challenges in maternal healthcare delivery in rural Madhya Pradesh. The institutional MMR observed in this study, approximately at 400 per 100000 live births during the study period, is markedly higher as compared to the current national estimate of 88 per 100 000 live births by Sample Registration System (2019–22) [15]. However, this disparity warrants careful contextual interpretations. As a tertiary referral hospital, the study hospital is a regional "safety-net" facility in which critically ill obstetric patients are transferred from peripheral health facilities, often after considerable delays [11]. Accordingly, the elevated institutional MMR likely reflects referral bias and systemic dysfunction at primary care level rather than inadequacies in tertiary clinical management. Such "referral inflation" of maternal mortality figures is a well-recognized phenomenon in Indian tertiary care hospitals.

The hypertensive disorders of pregnancy-preeclampsia and eclampsia were found to be the most common direct cause (43%) of maternal death in the present study. This finding correlates with the recent report in western India, including Jatoth et al. (2025), which similarly emphasized hypertensive disorders as a

significant cause of severe maternal morbidity and mortality [16]. However, the percentage observed in the present study is significantly greater than that reported by Pal et al. [17] from West Bengal (14.28%), suggesting probable regional clustering of severe hypertension related diseases in the Shivpuri area. Obstetric haemorrhage (22.8%) was the second leading cause of death, a proportion notably lower than reports from other areas of southern India [18]. This perhaps reflects better adherence to active management of third stage of labour (AMTSL) at the study centre. In contrast, eclampsia is an aspect that proves to be very difficult to handle provided late referrals of patients usually in the post convulsive state [3].

Anemia was identified as a secondary contributor (68.6%) in maternal deaths. Beyond being a comorbidity, anaemia function as a physiological co-factor that exacerbates risk by reducing tolerance to haemorrhagic, infection, and hypertensive complications [19]. While national programs like Anemia Mukt Bharat have improved iron–folic acid supplementation coverage, the findings from this study suggest that these improvements have not yet translated to appreciable clinical protection for high-risk women in rural Shivpuri. This observation aligns with other studies by Jain and Maharahaje, which consistently reported anemia as the common underlying factor in maternal death [20]. The persistence of anemia emphasizes the need for early diagnosis, aggressive management and strengthens follow-up mechanism.

The predominance of rural areas (91.4%) and unbooked pregnancies (62.9%), the persistent "first delay"-delay in recognizing in the need for care and deciding to seek medical attention. Cultural attitudes to natural delivery, limited awareness of danger signs, and a lack of healthcare access all contribute towards late presentation. Similary, even in relatively high performing states, maternal deaths due to late referrals constituted the majority as seen in Kerala [21]. The observation that majority of deaths couured during the postpartum period emphasizes the vulnerability of the immediate postdelivery window, especially in home deliveries or peripheral facilities with limited opportunities for intensive monitoring and critical care capacity.

In a global perspective, our findings appear to reflect trends described by Cresswell and colleagues wherein hypertensive disorder competing with hemorrhage as leading causes of maternal deaths in referral settings [22]. However, in contrast to high-income countries where indirect cause is predominantly cardiac or neurological, indirect causes in present study were largely nutritional (anemia) and infectious (sepsis), both of which are preventable.

The majority of maternal deaths were among women aged 20–29 years, reflecting higher fertility rate in this age group rather than any increased biologic risk. This is in contrast to findings in high income countries such as Netherlands, where maternal mortality occurs more frequently among women aged >45 years [23]. The high proportion of rural, unbooked cases highlights the urgent need to improve antenatal surveillance system and comprehensive registration and follow-up of all pregnancies at a community level.

The results of this study are consistent with multiple national and international reports, and emphasizing the necessity of focused interventions. Strengthening antenatal care coverage, early detection and management of anemia and hypertensive disorders, ensuring timely referrals and promoting institutional deliveries are important. Community sensitization regarding the importance of ANC visits and postnatal monitoring must be intensified.

## Conclusion

Maternal deaths were predominantly observed among patients from rural areas, particularly those who are un-booked, illiterate patients and low socioeconomic status. Obstetric hemorrhage, eclampsia and sepsis are remaining the leading causes of maternal mortality. Strengthening primary health care services in rural areas and proper implementation of NRHM initiatives and upgrading of healthcare infrastructure at rural hospitals can potential to reduce the maternal deaths.

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