



www.bioinformation.net
Volume 22(9)



Research Article

Received September 1, 2026; Revised September 30, 2026; Accepted September 30, 2026, Published September 30, 2026

DOI: 10.6026/973206300225791

SJIF 2026 (Scientific Journal Impact Factor for 2026) = 8.478

2022 Impact Factor (2023 Clarivate Inc. release) is 1.9

Declaration on Publication Ethics:

The author's state that they adhere with COPE guidelines on publishing ethics as described elsewhere at <https://publicationethics.org/>. The authors also undertake that they are not associated with any other third party (governmental or non-governmental agencies) linking with any form of unethical issues connecting to this publication. The authors also declare that they are not withholding any information that is misleading to the publisher in regard to this article.

Declaration on official E-mail:

The corresponding author declares that lifetime official e-mail from their institution is not available for all authors

License statement:

This is an Open Access article which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited. This is distributed under the terms of the Creative Commons Attribution License

Comments from readers:

Articles published in BIOINFORMATION are open for relevant post publication comments and criticisms, which will be published immediately linking to the original article without open access charges. Comments should be concise, coherent and critical in less than 1000 words.

Disclaimer:

Bioinformation provides a platform for scholarly communication of data and information to create knowledge in the Biological/ Biomedical domain after adequate peer/editorial reviews and editing entertaining revisions where required. The views and opinions expressed are those of the author(s) and do not reflect the views or opinions of Bioinformation and (or) its publisher Biomedical Informatics. Biomedical Informatics remains neutral and allows authors to specify their address and affiliation details including territory where required.

Edited by P Kanguane

Citation: Bhattacharya *et al.* Bioinformation 22(9): 5791-5794 (2026)

Quality assessment of maternal death review (MDR): Strengthening surveillance and response in a tertiary care center, Central India

Vipasha Bhattacharya¹, Saumya Tiwari^{2*} & Beenu Kushwah¹

¹Department of Obstetrics and Gynecology Shyam Shah Medical College, Rewa, Madhya Pradesh, India; ²Department of Obstetrics and Gynecology, GMC Satna, Madhya Pradesh, India; *Corresponding author

Affiliation URL:

<https://ssmcrewa.ac.in/>

<https://gmcsatna.mp.gov.in/>

Author contact:

Vipasha bhattacharya - E-mail: bhattacharya12vipasha@gmail.com

Saumya tiwari - E-mail: saumyatiwari70879@gmail.com

Beenu kushwah - E-mail: drbeenukushwah@gmail.com

Abstract:

Maternal Death Surveillance and Response (MDSR) are designed to systematically identify and analyze maternal fatalities; yet facility-based reviews often remain retrospective. Therefore, it is of interest to evaluate the maternal mortality and the implementation of the WHO's MDSR framework at a tertiary care facility in Rewa. Adoption of a structured MDSR protocol, reinforced by faculty training, substantially enhanced audit quality. Detection of clinical and administrative issues increased from 13.3% to 71.7%, while actionable recommendations rose from 1.7% to 40%. Thus, data shows the effect of MDSR in enhancing maternal death reviews for evidence-based interventions.

Keywords: Maternal death, mortality, surveillance

Background:

Maternal mortality remains a critical indicator of a nation's healthcare system and its commitment to women's health [1]. It remains a significant global public health concern. India, despite substantial progress, continues to bear a significant portion of this burden, accounting for approximately 15% of global maternal deaths [2]. To address these preventable tragedies, the World Health Organization (WHO) introduced the Maternal Death Surveillance and Response (MDSR) framework in 2012 [3]. Unlike traditional Maternal Death Reviews (MDR) that often ended at the documentation stage, MDSR is designed as a continuous, action-oriented cycle [4]. This cycle consists of four essential components: identification and notification of deaths, maternal death reviews, analysis and recommendations and most critically response and monitoring [5]. The "surveillance" aspect ensures accurate data collection, while the "response" involves implementing targeted, evidence-based recommendations to prevent future occurrences [6]. However, the transition from simple reporting to a robust surveillance and response system requires systematic changes in how medical faculty analyzes and act upon these deaths [7]. Therefore, it is of interest to report strengthening the response component of surveillance to connect clinical data with essential systemic changes in high-burden areas.

Materials and Methods:

Study design and ethical considerations:

This study was designed as a hospital-based comparative study, utilizing both retrospective and prospective data collection methods to evaluate the quality of Maternal Death Reviews (MDR). The research was conducted in the Department of Obstetrics and Gynaecology at Gandhi Memorial Hospital (GMH), a tertiary care teaching facility associated with Shyam Shah Medical College (SSMC) in Rewa, Madhya Pradesh. Ethical clearance for the study was obtained from the Institutional Ethics Committee of Shyam Shah Medical College. Informed consent was maintained through the anonymization of patient records, ensuring that the identity of the deceased and their families remained confidential throughout the data analysis and reporting phases.

Study period and population:

The research analyzed a total of 120 maternal death cases, divided into two distinct study cohorts:

- [1] Group A (Retrospective/Year 1): September 2021 to August 2022 (n=60).
- [2] Group B (Prospective/Year 2): September 2022 to August 2023 (n=60).

The inclusion criteria encompassed all "maternal deaths" as defined by the World Health Organization (WHO): the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Data collection and source material:

Data for both groups were meticulously gathered from multiple institutional sources to ensure a comprehensive understanding of the clinical and systemic factors involved in each mortality case. The primary sources included:

- [1] **Inpatient Case Sheets:** Detailed clinical records of admission, treatment and cause of death.
- [2] **Facility-Based Maternal Death Review (FBMDR) Forms:** Standardized government forms used for auditing deaths.
- [3] **Death Notification Registers:** Institutional logs used for the formal reporting of mortality.
- [4] **Referral Slips:** Documentation from peripheral health centers (Primary Health Centers (PHCs) and Community Health Centers (CHCs)) to assess the quality and timing of the referral process.
- [6] Study Variables and the "Three Delays" Framework

The methodology employed the "Three Delays" model to categorize the systemic failures contributing to each death:

- [1] **Type I Delay:** Delay in deciding to seek medical care, often due to a lack of awareness regarding "danger signs," socio-economic barriers, or cultural factors.
- [2] **Type II Delay:** Delay in reaching the health facility, identifying obstacles in transportation, distance from the facility, or poor road infrastructure.
- [3] **Type III Delay:** Delay in receiving adequate care at the facility, assessing hospital-level factors such as availability of blood products, specialist staff, or equipment.

Additionally, clinical variables were analyzed, including parity (nulliparous vs. multiparous), gestational age at the time of death, mode of delivery (vaginal vs. cesarean) and the specific direct or indirect medical cause of death.

The intervention:

Quality improvement in surveillance:

A key methodological component of this study was the implementation of a revised surveillance protocol in Year 2. During the transition between Group A and Group B, medical faculty and residents received intensive training on the updated Maternal Death Surveillance and Response (MDSR) guidelines. The focus of this training was to improve the qualitative output of the FBMDR forms. Specifically, participants were trained to:

- [1] Properly identify clinical and administrative deficiencies (e.g., lack of blood, delayed surgery).
- [2] Formulate actionable recommendations rather than generic clinical summaries.
- [3] Ensure timely reporting to divisional and state-level committees to foster institutional accountability.

Statistical analysis:

The collected data were entered into Microsoft Excel and analyzed using standard statistical software. For the comparison between the retrospective and prospective groups, the Chi-Square test was utilized to determine the significance of changes in categorical variables (such as the percentage of cases where recommendations were made). A p-value of less than 0.05 was considered statistically significant. Descriptive statistics, including percentages and ratios, were used to represent the demographic distribution and the prevalence of specific causes of death.

Results:

The study analyzed 120 maternal deaths (60 in each group). The demographic distribution remained consistent across both cohorts, reflecting the specific patient population of the Rewa region. The majority of deaths occurred in the 20-30 years age group (61.67% in Group A; 58.33% in Group B). This corresponds with the peak reproductive years. Mortality in the extremes of reproductive age (<20 and >35 years) was significantly lower, primarily due to the lower volume of pregnancies in those brackets. A vast majority of the deceased hailed from rural areas (83.33% in Group A; 88.33% in Group B). This highlights the significant disparity in healthcare outcomes between urban and rural settings in Central India. Approximately 90% of the cases in both groups belonged to the Lower or Lower-Middle class according to the Modified

Kuppuswamy Scale, indicating that financial constraints and poor nutrition are pervasive underlying factors. Multiparous women (Para 2 or more) constituted the highest percentage of deaths (60% in Group A; 55% in Group B). Most deaths occurred in the third trimester or the immediate postpartum period. Specifically, 70% of the women in Group B were either in the third trimester or within 42 days of delivery at the time of death. A critical finding was the state of the patient upon arrival. In Group B, 48.33% of patients arrived in a "Critical" or "Moribund" state, often with multiple organ dysfunction or severe shock. In both groups, roughly 50% of deaths occurred within 24 hours of admission. This "Early Hospital Death" rate points to the severity of complications and the late stage at which patients are referred to a tertiary center. The clinical causes were divided into Direct and Indirect categories. Hypertensive disorders of pregnancy (Eclampsia and Pre-eclampsia) were the leading cause, accounting for 36.67% of cases in Group A and 33.33% in Group B. This was followed by Postpartum Hemorrhage (PPH) at 21.67% in Group A and 18.33% in Group B. Other direct causes included sepsis, obstructed labor leading to uterine rupture and complications from abortion. Anemia was the most significant indirect contributor, either as a primary cause or a major co-morbidity, present in over 80% of the total cases. Other indirect causes included jaundice (hepatitis in pregnancy), heart disease and pulmonary embolism. The study applied the Three Delays model to identify systemic bottlenecks. Type I Delay (Seeking Care) was identified in 53.33% of Group A and 56.67% of Group B. The primary reasons cited were lack of awareness regarding danger signs and family-level decision-making delays. Type II Delay (Reaching Facility) was Identified in 30.0% of Group A and 33.33% of Group B. Issues included lack of available transport (especially at night) and long travel distances (up to 150km) to reach Rewa. Type III Delay (Receiving Care) was present in 16.67% of cases in Group A, dropping to 10% in Group B, indicating internal improvements in triage and emergency management. The qualitative shift in the review process between the two years, as summarized is shown in the **Table 1** below In Year 1; the Facility-Based Maternal Death Review (FBMDR) forms were largely treated as administrative formalities, with minimal critical analysis. Following the implementation of the new surveillance protocol in Year 2, there was a statistically significant increase in the identification of deficiencies such as delays in blood arrangement or gaps in peripheral monitoring and a concomitant rise in specific, actionable recommendations aimed at preventing similar future tragedies.

Table 1: Quality assessment of MDR

Parameter	Group A (n=60)	Group B (n=60)	p-value
Deficiencies Identified	8 (13.33%)	43 (71.66%)	< 0.0001
Recommendations Formulated	1 (1.66%)	24 (40.00%)	< 0.0001
Divisional Level Reviews	3 (5.00%)	39 (65.00%)	< 0.0001
State Level Reviews	1 (1.66%)	13 (21.66%)	< 0.01

Discussion:

The findings of this study, conducted in the Rewa region of Madhya Pradesh, reveal systemic and clinical patterns that both align with and diverge from existing literature on maternal mortality and the efficacy of Maternal Death Surveillance and Response (MDSR). Clinically, hypertensive disorders (Eclampsia/Pre-eclampsia) were the leading cause of death (33.33% - 36.67%) mirrors the trends observed by Meh *et al.* (2022) in a decade-long analysis of maternal mortality in India [8]. Postpartum Hemorrhage (PPH) is often cited as the primary global killer, our data suggests a rising trend in hypertensive complications, similar to findings by in South India, where eclampsia surpassed PPH due to better community-level management of active third-stage labor but lagging screening for gestational hypertension [9]. As per findings of Naik *et al.* there was large discrepancy in the line-listing and reporting of maternal deaths including reporting in improper MDR formats [10].

Conclusion:

Maternal deaths in Rewa follow national medical patterns but are affected by delays in seeking and receiving care. With steady support and targeted training, the quality of maternal death reviews can improve. The WHO “surveillance and response” gap can narrow when reviews are done well and lead to action. Maternal deaths are not only biological events but also preventable social and system failures. Thus, strong, audit-based

evidence should guide policies and practices in similar low-resource settings.

Conflict of interest: NIL

Sponsorship: NIL

References:

- [1] Kidanemariam MB *et al.* *Health Policy Plan.* 2024 **39**:985 [PMID: 39096516]
- [2] Kidanemariam MB. *Health Hum Rights.* 2025 **27**:121 [PMID: 41536704]
- [3] Kodan LR *et al.* *Glob Health Sci Pract.* 2021 **9**:379 [PMID: 34234026]
- [4] Ramler PI *et al.* *Acta Obstet Gynecol Scand.* 2022 **101**:450. [PMID: 35238018]
- [5] Berg L *et al.* *Euro J Obstet Gynecol Reprod Biol.* 2022 **271**:20 [PMID: 35131631]
- [6] Whiting-Collins L *et al.* *PLOS Glob Public Health* 2024 **4**:e0002153. [PMID: 38442110]
- [7] James E *et al.* *British Journal of Surg.* 2022 **109**:znac268-046. [DOI: 10.1093/bjs/znac268.046]
- [8] Meh C *et al.* *BJOG.* 2022 **129**:515 [PMID: 34455679]
- [9] Melamud K *et al.* *Radiographics.* 2024 **44**:e230164. [PMID: 38547034]
- [10] Naik SS *et al.* *Indian J Community Med.* 2020 **45**:184. [PMID: 32905101]

Caveat Emptor is applicable among the literate community where required and possible. The publisher, its journal, editors and the internal/external reviewers take adequate steps to check, evaluate, correct, edit, revise and improve content where possible and required.