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Original Article

Obstetrics and Gynaecology Section

Trends and Determinants of Maternal Mortality: A Seven-year Retrospective Analysis from a Tertiary Care Hospital in Kashmir, India

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ABSTRACT

Introduction: Maternal mortality remains a critical indicator of healthcare quality and access, particularly in low- and middle-income settings. Despite progress in India, regional disparities persist, with the union territory of Jammu and Kashmir facing unique challenges in timely obstetric care.

Aim: To analyse the trends, causes, and demographic distribution of maternal deaths over seven years at a Tertiary Maternity Hospital in Kashmir, India.

Materials and Methods: The present retrospective analysis was conducted at LD Hospital, Srinagar, Kashmir, India, including all maternal deaths from April 2018 to March 2025. Data on age, referral status, residence, and cause of death were extracted from hospital records and analysed using descriptive statistics.

Results: Among 151,870 live births, 173 maternal deaths occurred, yielding an overall Maternal Mortality Ratio (MMR) of 114 per 100,000 live births. MMR peaked at 141 in 2021-22 during COVID-19 disruptions and declined to 71 in 2024-25. The mean age of deaths was 29.7 years, and approximately 70% were referrals.

Conclusion: Although maternal mortality declined after 2022, preventable causes remain predominant. Strengthening referral systems and timely emergency obstetric care are essential to further reduce maternal deaths.

Keywords: Coronavirus Disease-19, Obstetric care, Postpartum haemorrhage, Referral systems

INTRODUCTION

Maternal health is widely regarded as a sensitive marker of the performance of a health system and the social development of a community. Each year, about 295,000 women die from causes related to pregnancy and childbirth, with most deaths occurring in low and middle income countries. Safeguarding the health of women during pregnancy, childbirth, and the postpartum period requires timely access to skilled care, effective referral pathways, and the consistent delivery of evidence based interventions for preventable complications [1,2].

In India, progress has accelerated over the past decade, yet important gaps persist between states and regions. The Union Territory of Jammu and Kashmir faces distinct challenges that can hinder access to care, including difficult terrain, weather related barriers, and variable availability of emergency obstetric services. These constraints make local, facility-based evaluations essential for guiding service delivery [3].

World Health Organisation defines Maternal death as the annual number of female deaths from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy and childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy [4]. The Maternal Mortality Ratio (MMR), reflecting the number of maternal deaths in relation to live births, is a crucial indicator of reproductive and maternal health services [5]. The Government of India has committed to the Sustainable Development Goals (SDGs), which set a global target of reducing the MMR to less than 70 deaths per 100,000 live births by 2030 [6]. Achieving this target requires reliable measurement of maternal deaths and trends, as well as a clear understanding of the major causes of these deaths at the subnational level [5,6].

Against this background, the authors conducted a seven-year retrospective analysis at a large Tertiary Maternity Hospital in Kashmir to study the pattern and causes of maternal deaths. The results can also provide a baseline to track progress toward the 2030 goal for reducing maternal mortality.

MATERIALS AND METHODS

The present retrospective secondary data analysis was conducted in the Department of Obstetrics and Gynaecology, Lal Ded (LD) Hospital, a Tertiary Care Maternity Hospital in Kashmir, India from April 2018-March 2025. Institutional Ethical clearance was obtained (IRBGMC-SGR/Gynae/1257).

Inclusion criteria:

- All maternal deaths that occurred in the hospital between April 2018 and March 2025 were included in the study.
- Maternal deaths were identified according to the World Health Organisation (WHO) definition [7].

Exclusion criteria: Deaths due to accidental or incidental causes were excluded from the analysis [7].

Study Procedure

Verbal Approval for the study was obtained from the in-charge head and the hospital administration prior to data collection. Relevant information was systematically extracted from multiple hospital sources, including birth registers, maternal death review forms, admission and referral logs, and archived medical records, to ensure completeness and accuracy. For each documented maternal death, details such as maternal age, place of residence, referral status, and the underlying cause of death were recorded. In addition, aggregate data on the total number of maternal deaths and live births were compiled. All information was organised on a year-wise basis, covering seven consecutive reporting years (2018-2019 to 2024-2025). This enabled the computation of annual MMR, thereby providing a comprehensive overview of trends across the study period.

Study outcomes: The primary outcome was MMR, and secondary outcome was distribution of causes of maternal death. MMR was

calculated. It is defined as the number of maternal deaths per one lakh live births [8].

STATISTICAL ANALYSIS

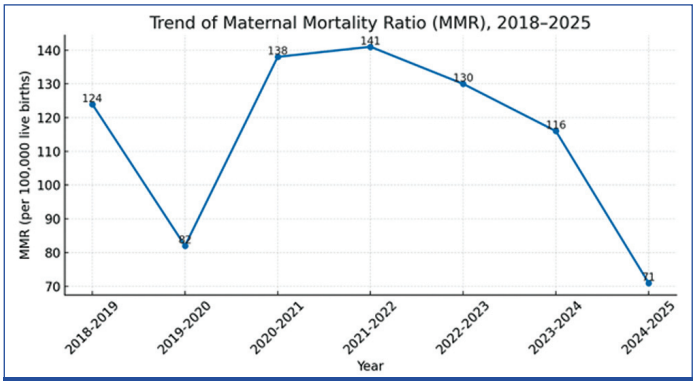
Data was entered in Microsoft excel and analysed using an appropriate statistical software. Continuous variables were summarised as mean and standard deviation. Categorical variables were expressed as frequency and percentages.

RESULTS

Across seven years, there were 151,870 live births and 173 maternal deaths at LD Hospital, yielding an overall MMR of 114 per 100,000 live births, with annual values ranging from 124 in April 2018 to March 2019 to a low of 71 in April 2024 to March 2025 [Table/Fig-1]. The trend in MMR from 2018-19 to 2024-25, expressed per 100,000 live births, is illustrated in the [Table/Fig-2]. Among women who died, the mean age (SD) was 29.7±4.57 years. About 121 (70%) patients were referrals. Maternal deaths were mostly from Baramulla 28.9% [Table/Fig-3]. Causes of maternal deaths included postpartum haemorrhage 39%, eclampsia 17%, sepsis 13% [Table/Fig-4].

Year	No. of live births	No. of maternal deaths	MMR
April 2018- March 2019	24951	31	124
April 2019- March 2020	23203	19	82
April 2020- March 2021	19602	27	138
April 2021- March 2022	22750	32	141
April 2022- March 2023	17691	23	130
April 2023- March 2024	22488	26	116
April 2024- March 2025	21185	15	71
Total	151870	173	114

[Table/Fig-1]: Year-wise distribution of live births, maternal deaths, and Maternal Mortality Ratio (MMR), 2018-2025.



[Table/Fig-2]: Maternal Mortality Ratio (MMR) Trend, Year 2018-19 to 2024-25 (per 100,000 live births).

Variables	Category	Values n (%)
Age (Years)	Mean±SD	29.69±4.57
Residence	Anantnag	29 (16.8)
	Bandipora	2 (1.2)
	Baramulla	50 (28.9)
	Budgam	3 (1.7)
	Ganderbal	4 (2.3)
	Handwara	2 (1.2)
	Kulgam	14 (8.1)
	Kupwara	30 (17.3)
	Ladakh	1 (0.6)
	Pulwama	19 (11)
	Ramban	4 (2.3)
	Shopian	6 (3.5)
	Srinagar	9 (5.2)
Patient referral status	Referred patients	121 (69.9)
	Direct patients	52 (30.1)

[Table/Fig-3]: Baseline demographic characteristics of maternal mortality cases.

Causes	Frequency (n)	Percentage (%)
PPH	68	39.0
Eclampsia	30	17.0
Sepsis	22	13.0
Pulmonary embolism	21	12.0
Severe preeclampsia	19	11.0
APH	6	4.0
Severe anaemia	5	3.0
Ectopic pregnancy	2	1.0

[Table/Fig-4]: Distribution of maternal deaths according to causes.

DISCUSSION

Reliable estimates of the MMR and its determinants are essential for planning and evaluating maternal health services. As a composite measure of access to quality antenatal, intrapartum, and emergency obstetric care, MMR functions as a sentinel indicator of health system performance. Most maternal deaths are preventable with timely, evidence based interventions and effective referral pathways [9].

Across 151,870 live births over seven years in the present study, there were 173 maternal deaths. This gives an overall facility MMR of 114 per 100,000 live births. Year-wise, MMR decreased from 124 (2018-19) to 82 (2019-20), then spiked during the year 2020-21 and 2021-22 (138 and 141), followed by a steady decline to 71 in 2024–25. The decreasing mortality trend in the present study is supported by literature [6]. This can be attributed to a combination of effective health programs, improved service delivery, and socioeconomic progress all over India. The temporary rise in 2020-22 aligns with COVID-19-related interruptions in antenatal, intrapartum, and referral services reported globally, which increased maternal deaths in 2020-21. According to WHO's 2021 global pulse survey, more than one third of countries reported disruptions to antenatal and postnatal care, which are critical services for ensuring the survival and health of pregnant women and newborns [10]. Overall, 94 percent of countries experienced some level of disruption to essential health services, particularly in life-saving emergency, critical, and operative care, which directly influences the timely management of haemorrhage, hypertensive crises, sepsis, and referrals [10]. Analyses from India showed significant reductions in institutional deliveries during and after the 2020 lockdowns [9]. This can be explained by a pandemic-related shift in both the denominator and the case mix. Compared with 2019-20, live births at the present hospital decreased from 23,203 to 19,602 (a fall of 15.5 percent), while maternal deaths increased from 19 to 27 (a rise of 42 percent). As a result, the MMR increased from 82 to 138. As a tertiary referral centre, the hospital encountered additional challenges during the pandemic. Transport restrictions, diversion of services, and delays in care seeking resulted in many women reaching the facility only when critically ill. Consequently, a disproportionate share of admissions comprised high-risk emergencies such as postpartum haemorrhage, severe preeclampsia or eclampsia, and sepsis. The concentration of these complications among a reduced number of deliveries further contributed to increased maternal mortality [11]. After 2022, the MMR declined (141 → 130 → 116 → 71) as services and referral pathways normalised, reducing delays and a high-risk case mix.

Among 173 maternal deaths, the mean age was 29.7±4.6 years. Our mean age matches multiple Indian tertiary-care studies in which the majority of maternal deaths occur in the 25-30 year age group [12,13]. Deaths were mostly from Baramulla 28.9%, followed by

Kupwara 17.3% and Anantnag 16.8%. This pattern likely reflects our catchment and referrals. These districts have larger populations, are farther from the present centre, and may have fewer nearby blood bank services with more difficult travel, which delays arrival of high-risk cases to the tertiary hospital.

In the present study, postpartum haemorrhage was the leading cause of death (39%), followed by eclampsia (17%) and severe preeclampsia (11%). This distribution is typical for a tertiary centre where women with life-threatening bleeding and hypertensive disorders are referred late. The pattern is similar to regional, national and global studies in which haemorrhage and hypertensive disorders together contribute the largest share of maternal deaths [2,6].

Limitation(s)

Firstly, the study was based on retrospective secondary data, which relies on the completeness and accuracy of hospital records. As a result, underreporting or misclassification of causes of death cannot be ruled out. Secondly, the analysis was limited to a single Tertiary Care Hospital and therefore may not fully represent maternal mortality patterns across the entire region. Also, community-level deaths and those occurring before reaching the hospital were not captured.

CONCLUSION(S)

The present seven-year retrospective analysis highlights that although the MMR at a Tertiary Care Hospital in Kashmir, India has declined in recent years, preventable causes such as postpartum haemorrhage and hypertensive disorders remain the leading contributors. Most deaths occurred among referred patients, underscoring persistent delays in referral and access to emergency obstetric care. Strengthening peripheral health facilities, improving referral linkages, ensuring timely blood transfusion and critical care services, and enhancing antenatal risk identification are essential strategies to further reduce preventable maternal deaths and sustain progress toward national and global maternal health targets.

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