

Original Research Article

Evaluation of indirect causes of Maternal Mortality at Tertiary Care Center

**Dr. Toshi Bansal¹ (PG Resident), Dr. Neetu Bharang² (Associate Professor),
Dr. Nidhi Gupta³ (PG Resident) & Dr. Charu Sulakiya⁴ (PG Resident)**

Dept. of Obstetrics and Gynecology, Gandhi Medical College, Bhopal, M.P.^{1,2,3&4}

Corresponding Author: Toshi Bansal

Abstract

Background & Methods: The aim of the study is to evaluate of indirect causes of maternal mortality at tertiary care center. During the period of data collection, a total of 138 maternal mortality were recorded at the study institute; of these 88 were categorised as Direct Maternal Mortality and remaining 50 deaths were categorised as Indirect causes of Maternal mortality.

Results: The causes of death among the 50 maternal mortality cases were varied. The most common cause was anaemia, accounting for 26% of the deaths. Cardiovascular diseases were the second most frequent cause, contributing to 22% of the cases. Lower respiratory tract infections (LRTI) caused 14% of the deaths, while hepatic encephalopathy (CNS complications) and hepatitis each accounted for 8%. Tuberculosis (TB) was responsible for 6% of the deaths. Other causes included renal failure (4%), systemic amyloidosis (2%), systemic lupus erythematosus (2%), thyroid storm (2%), aspiration pneumonitis (2%), diabetes complications (2%), and pulmonary tuberculosis (2%). This diverse range of causes highlights the multifaceted nature of indirect maternal mortality, with significant contributions from both chronic and acute medical conditions.

Conclusion: The present study identified anaemia and pre-existing cardiovascular diseases as the two most common indirect cause of maternal mortality, with severe iron deficiency anaemia, Rheumatic Heart Disease (RHD) and Myocardial Infarction (MI) being the primary contributors. These conditions were identified during verbal autopsies conducted posthumously, revealing a significant gap in the initial medical assessments and documentation.

Keywords: indirect, causes, maternal & mortality.

Study Design: Cross-sectional Observational Study.

Introduction

Maternal mortality, defined as the death of a woman during pregnancy, childbirth, or within 42 days of termination of pregnancy, has long been a critical global health concern(1). Maternal health encompasses the well-being of women during pregnancy, childbirth, and the postpartum period, emphasizing the prevention, management, and treatment of complications that arise during these phases. Maternal health reflects not only the health and well-being of mothers but also serves as a barometer of a nation's healthcare infrastructure, socio-economic development, and commitment to gender equality(2). Recognizing its importance, the Sustainable Development Goals (SDGs), a set of global targets adopted by United Nations member states in 2015, includes a specific goal (Goal 3) that focuses on ensuring healthy lives and promoting well-being for all at all ages. Under this overarching goal, Target 3.1 aims to reduce the global maternal mortality ratio, thereby addressing maternal health comprehensively(3,4).

Maternal health is intrinsically tied to the overall health of a society. A high maternal mortality ratio is often an indicator of inadequate healthcare systems, lack of access to quality prenatal, intra-natal, and postnatal care, and limited availability of skilled birth attendants(5). Secondly, maternal health is deeply intertwined with socio-economic development. Improved maternal health not only contributes to better maternal and child survival rates but also has long-term economic implications. Thirdly, the maternal health indicator holds significant implications for gender equality and women's empowerment. Addressing maternal health inequalities also involves combating discriminatory practices and ensuring women's autonomy in making decisions about their reproductive health(6).

Historically, maternal mortality was primarily attributed to direct obstetric causes, which encompassed complications directly related to pregnancy and childbirth(7). Over the years, the landscape of maternal mortality has witnessed a significant shift from primarily direct causes to a growing prominence of indirect causes. This evolution reflects not only advances in medical science and healthcare but also profound changes in the socio-economic and health systems of nations. Among the various dimensions of maternal mortality, the study of indirect causes holds particular significance. While substantial progress has been made in reducing maternal mortality rates, the journey towards achieving the Sustainable Development Goals (SDGs) by 2030 necessitates a renewed and aggressive focus on addressing the indirect causes of maternal mortality(8).

Material and Methods

The study was conducted at Department of Obstetrics & Gynaecology, Gandhi Medical College, Bhopal and affiliated hospitals which served as the primary data source for maternal mortality cases. This study has received ethical approval from the Institutional Ethical Committee on Human Research of the GMC Bhopal. Study Duration: 18 months; September 2022 to February 2024 divided into following phases.

The sample will consist of cases of indirect maternal mortality occurring during data collection. Inclusion criteria encompass all cases classified as indirect maternal deaths based on established criteria by WHO and ICD-10(62). Trained researchers will conduct a comprehensive review of medical records, including antenatal, intrapartum, and postpartum

records, diagnostic tests, surgical reports, and consultations. This process aims to extract detailed clinical information pertaining to the course of the pregnancy, underlying medical conditions, interventions, and outcomes.

Result

Table 1: Distribution of Cases according to Age (n=50)		
Age Group	N	%
< 20	7	14.00
21-30	35	70.0
> 30	8	16.00
Mean, SD	26.2	5.60

The study included 50 cases of maternal mortality, with the age distribution as follows: 14% of the women were younger than 20 years, 70% were aged 21-30 years, 16% were older than 30 years. The mean age of the participants was 26.2 years with a standard deviation of 5.60 years, indicating that the majority of the cases occurred in women in their mid to late twenties.

Table 2: Distribution of Cases according to ANC Booked Status (n= 50)		
	N	%
Booked	18	36.0
Unbooked	32	64.0

Among the 50 maternal mortality cases, 36% of the women were booked for antenatal care, while 64% were unbooked. This data highlights that a majority of the maternal deaths occurred in women who did not receive regular antenatal care, underscoring the importance of comprehensive prenatal monitoring and care to reduce maternal mortality rates. The socioeconomic status of the 50 maternal mortality cases, classified according to the Kuppuswamy scale, was distributed as follows: 34% of the women belonged to the lower class, 24% to the upper lower class, 20% to the lower middle class, 14% to the upper middle class, and 8% to the upper class. This distribution indicates that a substantial proportion of the maternal deaths occurred among women from lower socioeconomic backgrounds, which may reflect limited access to healthcare resources and support.

Table 3: Distribution of Cases according to Timing of Death (n=50)		
	N	%
	Timing of Death	
Antenatal	12	24.00
Post-partum	38	76.00

The timing of death among the 50 maternal mortality cases revealed that 24% occurred during the antenatal period, while a significant 76% occurred in the postpartum period.

Table 4: Distribution of Cases according to Timing of Postnatal Death (n=38)		
Timing	N	%
< 6 Hours	8	21.05
6-24 Hours	18	47.37
> 24 Hours	12	31.58

Among the 38 postnatal maternal mortality cases, the timing of death was distributed as follows: 21.05% of the women died within 6 hours postpartum, 47.37% died between 6

and 24 hours postpartum, and 31.58% died more than 24 hours after delivery. This data indicates that nearly half of the postnatal deaths occurred within the first 24 hours after childbirth, highlighting the critical period immediately following delivery where intensive monitoring and care are essential to prevent maternal mortality.

Table 5: Distribution of Cases according to Cause of Death (n=50)		
Cause of Death	N	%
Anaemia	13	26.00
Aspiration Pneumonitis	1	2.00
Cardiovascular Diseases	11	22.00
Diabetes Complications	1	2.00
Hepatic Encephalopathy (CNS Complications)	4	8.00
Hepatitis	4	8.00
LRTI	7	14.00
Pulmonary tuberculosis	1	2.00
Renal Failure	2	4.00
Systemic Amyloidosis	1	2.00
Systemic Lupus erythematosus	1	2.00
TB	3	6.00
Thyroid Storm	1	2.00

The causes of death among the 50 maternal mortality cases were varied. The most common cause was anaemia, accounting for 26% of the deaths. Cardiovascular diseases were the second most frequent cause, contributing to 22% of the cases. Lower respiratory tract infections (LRTI) caused 14% of the deaths, while hepatic encephalopathy (CNS complications) and hepatitis each accounted for 8%. Tuberculosis (TB) was responsible for 6% of the deaths. Other causes included renal failure (4%), systemic amyloidosis (2%), systemic lupus erythematosus (2%), thyroid storm (2%), aspiration pneumonitis (2%), diabetes complications (2%), and pulmonary tuberculosis (2%). This diverse range of causes highlights the multifaceted nature of indirect maternal mortality, with significant contributions from both chronic and acute medical conditions.

Table 6: Characteristics of Women who died due to Anaemia (n=13)

Booking Status			
Booked	5	38.46	0.043
Unbooked	8	61.54	
Age Group			
21-25	4	30.77	0.068
26-30	6	46.15	
31-35	1	7.69	
>35	2	15.38	

The highest number of deaths occurred in women aged 26-30, followed by those aged 21-25, indicating that anaemia-related mortality is more common among younger women of reproductive age. A significant proportion of women who died due to anaemia had primary or high school education, indicating that anaemia-related mortality affects women across various educational backgrounds. The relatively small number of illiterate women and those with college education suggests that education levels alone do not fully mitigate the risk. Women from lower and upper-lower socioeconomic classes constitute a substantial proportion of anaemia-related deaths, reflecting the socioeconomic disparities in access to healthcare and nutrition. A significant majority of the women who died due to anaemia were from rural areas, highlighting the rural-urban disparity in healthcare access and quality. The P-value indicates a statistically significant difference, emphasizing the need for improved healthcare services in rural areas.

Cause of Anaemia	n	%
Iron Deficiency Anaemia	8	61.5
Sickle Cell Anaemia	3	23.1
Thalassemia Trait	2	15.4

In the present study, the single largest category of indirect causes of maternal mortality was anaemia (13 cases). Majority of these 13 cases had severe iron deficiency anaemia (8 cases), 3 had sickle cell anaemia, and 2 had thalassemia trait. Among the 8 women with severe anaemia: 3 women had anaemia during severe anaemia since 1st trimester and remaining 5 women had severe anaemia since 2nd trimester of pregnancy.

Table 8: Characteristics of Women who died due to Anaemia (n=13)

Booking Status			
Booked	7	63.64	0.067
Un-booked	4	36.36	
Age Group			
18-20	1	9.09	0.132
21-25	4	36.36	
26-30	5	45.45	
>35	1	9.09	
Pregnancy			

The table outlines the characteristics of 11 women who died due to cardiovascular causes. In summary, a significant portion of the women who died due to cardiovascular causes were illiterate (45.45%) and from rural areas (81.82%). Most were between the ages of 21 and 30 (81.81%) and had booked pregnancies (63.64%). The majority had single pregnancies (81.82%), and the deaths were fairly evenly distributed between normal vaginal deliveries and caesarean sections. Most deaths occurred in the third trimester (54.55%) or postpartum period (36.36%). There were notable delays in seeking and reaching care, and a significant number of women had fewer than four ANC visits.

Discussion

Maternal mortality remains a significant public health challenge, particularly in low- and middle-income countries(9). While direct obstetric causes of maternal mortality, such as haemorrhage and eclampsia, are well-documented, indirect causes such as anaemia, cardiovascular diseases, and infections are often under-recognized and inadequately addressed(10). Conducting this study is significant as it sheds light on these indirect causes, which contribute substantially to maternal mortality. By understanding these factors, healthcare providers and policymakers can implement more effective strategies to improve maternal health outcomes. The subject of indirect maternal mortality is of critical importance because it encompasses a range of non-obstetric health issues that can significantly impact maternal health. These conditions often coexist with pregnancy, exacerbating risks and complications. Analysing the prevalence and nature of these indirect causes provides valuable insights into the broader health system's challenges and highlights the need for integrated healthcare approaches that address both obstetric and non-obstetric health concerns during pregnancy.

The findings of this study have several implications for clinical practice. Firstly, there is a need for heightened awareness and early detection of non-obstetric health conditions in pregnant women. Regular screening for anaemia, cardiovascular diseases, and other chronic conditions should be integrated into routine antenatal care. Additionally, improving access to comprehensive healthcare services, particularly for women in rural and lower socioeconomic settings, is crucial. The study also underscores the importance of timely referral and effective communication between different levels of healthcare facilities to manage high-risk pregnancies more effectively.

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