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Maternal Deaths in a Tertiary Care General ICU: Clinical Profile and Referral System Challenges

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ABSTRACT

Background: Reducing maternal mortality remains a major public health objective worldwide. Pregnant women are generally young and otherwise healthy, and many can be saved if timely and appropriate medical care is provided. This becomes particularly crucial in women with severe obstetric complications or serious medical disorders during pregnancy, who often require management in specialized units such as intensive care units (ICUs) or high dependency units.

Methods: A retrospective observational study was conducted for the period 2010–2014. Data were collected from ICU case registers and the medical records department. Demographic characteristics, booking status, referral status, and direct and indirect causes of maternal mortality were analyzed to identify factors associated with adverse outcomes.

Results: During the study period, 197 obstetric patients were admitted to the ICU, of whom 74 resulted in maternal deaths. The mean age of admitted patients was 23.46 years, while the mean age of deceased patients was 22 years. Among the maternal deaths, 46 (62%) were unbooked cases and 23 (31%) were referred from nearby hospitals. Only 5 (6.7%) deaths occurred among booked patients. Haemorrhagic shock was identified as the most common direct cause of death, whereas anaemia was the leading indirect cause. The absence of ICU facilities in nearby government hospitals contributed to delayed referrals.

Conclusion: Haemorrhagic shock and anaemia were the predominant causes of maternal mortality among obstetric patients admitted to the ICU. Improving awareness regarding antenatal care, reorganizing maternal critical care services into different levels, and strengthening referral systems are essential to reduce maternal morbidity and mortality.

Key-words: Maternal mortality, Obstetric intensive care, ICU admission, Haemorrhagic shock, Sepsis

INTRODUCTION

Care of critically ill obstetric patients is unique and challenging, as it involves the simultaneous management of two lives. Such patients require coordinated care by obstetricians, anaesthetists, and critical care physicians, often under time-sensitive and resource-intensive conditions. In developing countries like India, the management of critically ill obstetric patients is further complicated by systemic constraints such as a shortage of trained manpower, limited availability of equipment, low health literacy among the population, and inadequate numbers of high dependency units and intensive care units [1].

India witnesses a high volume of childbirths, with approximately 51 newborns delivered every minute [1]. Despite improvements in maternal healthcare, maternal mortality continues to be a significant public health concern. The maternal mortality ratio (MMR) in India was reported as 93 per 100,000 live births during 2019–21, while the global MMR was estimated at 197 per 100,000 live births in 2023 [2]. These figures highlight the persistent burden of preventable maternal deaths, particularly in low- and middle-income settings.

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According to the International Statistical Classification of Diseases and Related Health Problems, Ninth and Tenth Revisions (ICD-9 and ICD-10), a maternal death refers to the demise of a woman during pregnancy or within 42 days following the end of pregnancy, regardless of gestational age or location of the pregnancy. Such deaths result from conditions directly related to, or worsened by, pregnancy or its medical management, while deaths due to accidental or unrelated causes are excluded [3].

Obstetric patients are generally young and are considered to have a favorable prognosis if timely and appropriate medical care is provided. However, life-threatening obstetric emergencies such as massive haemorrhage (blood loss exceeding 2,500 ml), eclampsia, thromboembolism, sepsis, and acute organ dysfunction involving renal, cardiac, respiratory, or neurological systems often necessitate admission to an intensive care unit [3]. Understanding the demographic profile of these patients, their antenatal care registration status, and the direct and indirect obstetric causes of ICU admission is essential for improving maternal outcomes.

A detailed evaluation of such factors can help identify gaps in existing maternal healthcare delivery, including a lack of awareness of the importance of antenatal check-ups, the need to reorganize maternal critical care services across different levels of care, and the need to strengthen active referral systems between healthcare facilities. Therefore, this retrospective study was conducted in the intensive care unit of a tertiary care hospital from January 2010 to December 2014 to assess the causes and demographic profile of maternal mortality and to contribute to strategies to reduce maternal morbidity and mortality.

MATERIALS AND METHODS

Study setting and period- A retrospective observational analysis was conducted in the Intensive Care Unit of Dr. Baba Saheb Ambedkar Medical College and Hospital, Rohini, Delhi. The study utilised hospital records on patients admitted between January 2010 and December 2014.

Study Population- All obstetric patients admitted to the ICU during the study period were included for analysis.

Data Collection- Data were collected retrospectively from ICU admission registers and records obtained from the Medical Records Department. Information regarding age, address, booking status, referral status, reason for ICU admission, and causes of death was extracted.

Inclusion Criteria

1. Obstetric patients admitted to the ICU during 2010–2014.
2. Pregnant or postpartum women (within 42 days) admitted for pregnancy-related causes.
3. Patients with complete ICU and medical records.

Exclusion Criteria

1. Admissions outside the study period.
2. Cases with incomplete or missing records.

Definitions- Direct obstetric deaths were defined as deaths resulting from obstetric complications of pregnancy, labour, or puerperium, or from interventions, omissions, or incorrect treatment related to these conditions.

Indirect obstetric deaths were defined as deaths resulting from pre-existing medical conditions or diseases developing during pregnancy that were aggravated by the physiological effects of pregnancy.

Study Variables- The variables studied included demographic profile, booking status (booked/unbooked), referral status, causes of ICU admission, and direct and indirect causes of maternal mortality.

Statistical Analysis- Data were analysed using descriptive statistics and results were expressed as percentages and mean values.

Ethical Consideration- As this was a retrospective record-based study, institutional permission was obtained and patient confidentiality was maintained.

RESULTS

During the study period from 2010 to 2014, a total of 197 obstetric patients were admitted to the Intensive Care Unit, out of which 74 resulted in maternal deaths, giving an overall ICU maternal mortality rate of 37.5%. The mean age of obstetric patients admitted to the ICU was 23.43 years, while the mean age of deceased patients was 22 years. The age of patients ranged from 17 to 35 years.

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Among the direct obstetric causes of maternal mortality, haemorrhagic shock was the most common cause of death, accounting for 17.56% of cases. Other direct causes included toxemia of pregnancy, sepsis with disseminated intravascular coagulation, placenta praevia, abortion with retained products of conception, intrauterine death, ectopic pregnancy, and obstructed labour (Table 1).

Table 1: Obstetric cases (direct causes of death)

Age Group (yrs)	Haemorrhage	Hypertension of Pregnancy	Sepsis/ DIC	Abortion/ Retained Products of Conception	Placenta Previa	IUD	Ectopic	Difficult/ Obstructed labour	Total
<20	7	2	6	2	2	3	3	0	25
20-29	7	3	6	2	2	3	1	0	24
>= 30	3	3	0	0	0	0	0	0	6
Total	22.9%	10.8%	16.2%	5.4%	5.4%	8.1%	5.4%	-	-

Among the indirect (non-obstetric) causes, anaemia was the leading cause of maternal death (9.4%). Other indirect causes included cardiovascular disorders, viral hepatitis, thromboembolic conditions, thyroid disorders, gestational diabetes mellitus, and infections (Table 2).

Table 2: Non-obstetric cases (Indirect causes of death)

Age Group (yrs)	Infection	Cardiovascular	Gestational Diabetes Mellitus	Viral Hepatitis	Thromoembolic	Anaemia	Thyroid Disorders	Total
<20	2	0	0	0	4	4	0	10
20-29	0	0		2 (HEV Ab+ve)	1	3	0	4
>=30	0	1 (Essential Hypertension & Intracranial bleed)	1	0	1	0	0	2
Total	2.7%	1.35 %	1.35 %	2.7%	8.1%	9.4%	-	-

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The causes of ICU admission among surviving obstetric patients are shown in Tables 3 and 4, depicting direct and indirect causes, respectively. The overall distribution of causes of ICU admission among obstetric patients is illustrated in Fig. 1.

Out of the total maternal deaths, 46 patients (62%) were unbooked and 23 patients (31%) were referred from nearby hospitals. Consequently, mortality among booked patients was low, with only 5 deaths (6.7%).

A survey of health facilities within a 5-km radius of the hospital revealed 36 government dispensaries and 4 Delhi government hospitals, with bed strengths of 100, 200, 250, and 300, respectively. Among these, only two hospitals had functional Intensive Care Units and blood bank facilities, while one municipal tuberculosis hospital lacked both ICU and blood bank services.

Table 3: Obstetric (Direct) Causes in Survivors

Age Gap (yrs)	Haemorrhage	Toxemia of pregnancy	SEPSIS/ DIC	Abortion unsafe/ Retained POC	Placenta/ Praevia	IUD	Ectopic	Difficult/ Obstruct labour	Total
<20	12	3	9	3	3	5	5	0	40
20-29	12	5	9	3	3	5	2	0	39
>30	5	5	0	0	0	0	0	0	10
Total	29(23.5%)	13(10.5%)	18 (14.6%)	6 (4.8%)	6 (4.8%)	10 (8.13%)	7 (5.69%)	0	

Table 4: Non-Obstetric (Indirect) Causes in Survivors

Age Gap (years)	Infection	Cardiovascular	Gestational Diabetes Mellitus	Thrombo-embolism	Thyroid Disorder	Anaemia	Viral Hepatitis	Total
<20	3	0	0	7	0	6	0	16
20-29	0	0	0	2	0	5	4	11
.>=30	0	2	3	2	0	0	0	7
Total	3, 2.43%	2, 1.62%	3, 2.43%	11, 8.94%	0	11, 8.94%	4, 3.25%	-

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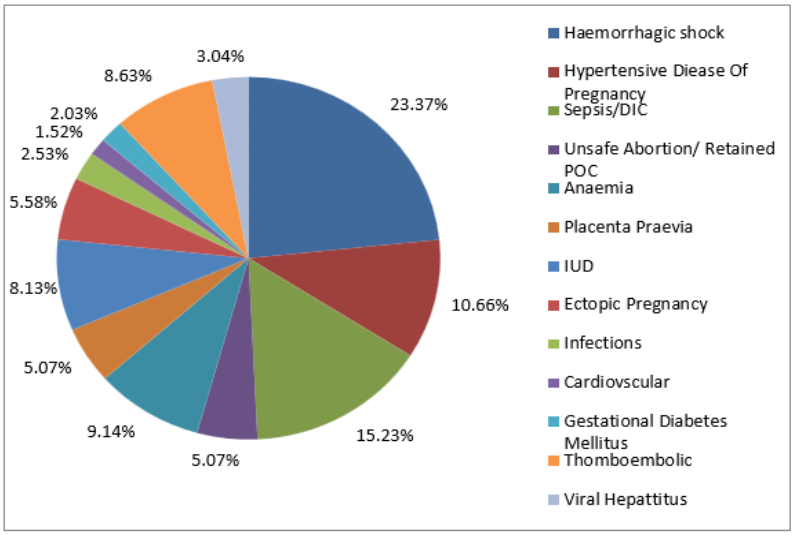

Fig. 1: Causes of Admissions of Obstetric Patients in ICU

DISCUSSION

Maternal deaths occurring in an intensive care unit are usually multifactorial. In the present study, haemorrhagic shock, sepsis, anaemia, lack of antenatal check-ups, and non-availability of intensive care facilities in nearby government hospitals were found to be important factors associated with ICU admission and maternal mortality [5].

During the period 2010–2014, a total of 197 obstetric patients were admitted to the ICU, of whom 74 died, resulting in a maternal mortality rate of 37.5% among ICU admissions. This finding is comparable to the mortality rate of 31.09% reported from a Nigerian hospital ICU [5]. The mean age of obstetric patients admitted to the ICU in our study was 23.43 years. Most patients (91.37%) belonged to the 20–29-year age group. Similar observations were reported by Rakesh *et al*., who found that 82.7% of patients were aged 21–30 years, and by Rochat et al., who found that 72% of critically ill obstetric patients were aged 21–30 years [6]. These findings suggest that women in their peak reproductive years are at greater risk of developing severe obstetric complications requiring intensive care.

In the present study, haemorrhagic shock was the most common direct cause of maternal death (17.56%), followed by sepsis (16.21%). Studies by Rochat *et al*., Bhattacharya *et al*., Patel *et al*., and Basket *et al*. have also reported obstetric haemorrhage and sepsis as leading causes of maternal mortality, with mortality ranging from 18–28% for haemorrhage and 27–30% for sepsis [7–10]. Anaemia was identified as the most common indirect cause of maternal death (9.4%) in our study.

Other direct causes included hypertensive disorders, placenta praevia, intrauterine death, ectopic pregnancy, and retained products of conception.

A study conducted at Parkland Hospital reported that 40% of ICU admissions were due to hypertensive disorders, 15% due to obstetric haemorrhage, and 40% due to medical disorders [11]. In contrast, our study showed that 14.7% of ICU admissions were due to haemorrhagic shock, while admissions due to medical disorders and hypertensive disorders were 21.3% and 10.6%, respectively.

In our study, direct causes accounted for 60.8% and indirect causes for 39.2% of maternal deaths, which is comparable to the findings of Patel *et al*., who reported 63.7% direct and 36.3% indirect causes [9]. Among the total maternal deaths, 46 (62%) were unbooked cases and 23 (31%) were referred from nearby hospitals, whereas only 5 (6.7%) deaths occurred among booked patients. Ramchander *et al.* identified the absence of antenatal care, delayed transfer to ICU, and severity of illness at admission as major predictors of maternal mortality [12]. Similar observations were noted in the present study.

The lack of ICU and blood bank facilities in nearby hospitals contributed to delayed referrals. Tayade *et al*. emphasized that establishing a well-managed high-dependency unit significantly reduces maternal mortality [13]. Strengthening antenatal care services, developing graded maternal critical care facilities, and improving referral systems are essential to reduce maternal mortality.

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CONCLUSIONS

Haemorrhagic shock was the most common direct cause of maternal death among obstetric patients admitted to the Intensive Care Unit, while anaemia was the leading indirect cause. A large proportion of deaths occurred in unbooked patients, reflecting poor awareness regarding the importance of regular antenatal check-ups. Referrals due to the lack of intensive care and blood bank facilities at nearby health centres further contributed to delays in critical care. Strengthening antenatal care services, improving the availability of intensive care and blood bank facilities at peripheral hospitals, and reorganising maternal essential services of care across different levels with an effective referral system may help reduce maternal mortality and improve obstetric outcomes.

CONTRIBUTION OF AUTHORS

Research concept– Vandana Chugh
Research design– Vandana Chugh, Deepak Bhasin
Supervision– Vandana Chugh
Materials– Vandana Chugh, Sakshi Arora
Data collection– Vandana Chugh, Sakshi Arora
Data analysis and interpretation– Pragya Bhasin, Deepak Bhasin
Literature search– Sakshi Arora
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Critical review– Deepak Bhasin
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