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Original Research Article

A prospective observational study of demographic profile and maternal and neonatal outcomes in emergency obstetrics

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ABSTRACT

Background: Emergency obstetric care (EmOC) is vital in reducing maternal and neonatal morbidity and mortality. Tertiary care centers serve as critical hubs for managing high-risk pregnancies and obstetric complications. Objectives were to evaluate the clinical profile, maternal morbidity, and neonatal outcomes of obstetric ICU admissions at a tertiary care center and assess associations with booking status and ICU stay duration.
Methods: A prospective observational study was conducted at Al-Ameen Medical College Hospital, Karnataka, from July 2023 to January 2025. A total of 160 obstetric ICU patients meeting inclusion criteria were enrolled. Data on age, booking status, ICU diagnosis, length of stay, delivery mode, maternal morbidity, and NICU admissions were collected and analyzed using SPSS v23. Statistical significance was set at $p<0.05$.
Results: Most patients were aged 31-40 years (43.8%) and unbooked (75%). Preeclampsia (25%), severe anemia (13.8%), and sepsis (12.5%) were the leading ICU admission causes. Maternal morbidity was significantly higher in unbooked patients ($p=0.03$). NICU admissions (27.5%) were significantly associated with ICU stay >7 days ($p=0.001$).
Conclusions: Unbooked status and preventable complications are major contributors to ICU admissions. Strengthening antenatal services and improving referral systems are essential for better maternal and neonatal outcomes.

Keywords: Antenatal care, Maternal morbidity, Neonatal outcome, Obstetric ICU, Preeclampsia

INTRODUCTION

Maternal health is a fundamental indicator of a nation's healthcare quality, reflecting the accessibility, equity, and effectiveness of healthcare delivery. In India, where the maternal mortality ratio remains a pressing public health issue, emergency obstetric care (EmOC) at tertiary care centres plays a vital role in managing severe complications during pregnancy, labour, and the postpartum period. These centres often serve as the last line of defence against preventable maternal and fetal deaths by providing timely surgical and critical care interventions.

Emergency obstetric conditions may occur without warning and demand immediate attention. The most common complications include obstructed labour, hypertensive disorders, postpartum hemorrhage (PPH), fetal distress, and previous cesarean section-related issues. A study conducted at a tertiary care hospital in Rajasthan found that obstructed labour (20.38%), fetal distress (19.62%), PPH (13.85%), and hypertensive disorders (15.38%) were the predominant emergencies. The study also reported a maternal mortality rate of 4.23% and perinatal mortality rate of 18.07%, underscoring the seriousness of these conditions and the importance of tertiary intervention.[1]

The referral process plays a key role in maternal and fetal outcomes. However, many referrals from peripheral health centres are delayed or lack proper documentation. In a study from Puducherry, referred mothers had nearly twice the odds of adverse fetal outcomes compared to those self-

referred, indicating the challenges within the current referral system.[2] Similarly, in north east India, it was found that 80% of obstetric admissions were referrals, often delayed due to transportation issues or lacking proper documentation, affecting timely diagnosis and care. Cesarean sections were performed in 47% of cases, and 21% of patients experienced referral-related delays.[3]

Such delays, particularly from rural and under-resourced areas, highlight the need for strengthening primary and secondary health facilities. A study from Uttar Pradesh reported that 59.47% of patients arrived in an exhausted state, with prolonged labour (47.71%) and pre-eclampsia (13.07%) being key reasons for referral. Emergency lower segment cesarean section (LSCS) was the most common intervention (39.86%).[4]

Emergency obstetric hysterectomy (EOH) is often a last-resort procedure used to save maternal lives in life-threatening scenarios. A six-year study in Maharashtra revealed that EOH was required in cases primarily involving atonic PPH (50%), morbidly adherent placenta (35.71%), and uterine rupture (14.28%). The study noted that 35.71% of patients had received no antenatal care, further emphasizing the preventable nature of these complications through improved primary care.[5] Another study in eastern India found placenta accreta spectrum (36.36%) to be the most frequent indication for EOH, with hypotension being the most common complication. Maternal and fetal mortality rates were both around 9%.[6]

The rising number of cesarean sections is associated with increased EOH risk. A study from Tamil Nadu confirmed that placenta accreta spectrum was the leading cause (60%) of EOH, and all patients had a history of cesarean delivery. The authors emphasized that reducing the rate of primary cesarean sections could significantly lower the risk of PAS and subsequent hysterectomies.[7]

Unjustified or convenience-based referrals contribute to the overburdening of tertiary care centres. A 2024 study from Gujarat found that 44% of referrals lacked pre-referral communication and 15% had incomplete referral slips. Despite these shortcomings, most referred mothers had favorable outcomes, with a 97.91% live birth rate and only 3.7% requiring ICU support.[8]

Nonetheless, maternal mortality in emergency obstetric situations is not uncommon. A 2022 study from Andhra Pradesh reported a maternal mortality rate of 10.6% among obstetric emergencies, with eclampsia being the most frequent cause of ICU admissions. A majority of patients were unbooked, referred from rural areas, and 67.3% were preterm pregnancies. Regular antenatal checkups and early risk identification were recommended to improve outcomes.[9]

Finally, systemic issues in the referral and emergency care system were highlighted in a pilot study from North India. Of the 232 referrals analyzed, 75.5% received suboptimal care before referral, and in 40% of cases, there was an undue delay or lack of basic intervention. Preeclampsia and anticipated premature delivery were the most common referral reasons. The study called for stricter adherence to structured referral protocols and improvement in communication between healthcare levels.[10]

Emergency obstetric cases reflect critical gaps in maternal healthcare delivery. Delays in referral, lack of antenatal care, and infrastructural limitations at peripheral centres significantly impact outcomes. A comprehensive understanding of the clinical profile and outcomes of such cases at tertiary care hospitals is essential to drive policy change and improve emergency preparedness in the Indian healthcare system.

Objective

The study aimed to assess the clinical profile, indications, and outcomes of obstetric ICU admissions, and to evaluate the association between patient factors such as booking status, gestational age, and ICU stay duration and maternal and neonatal outcomes, with the goal of improving critical care and reducing preventable complications.

METHODS

Study design

This was a prospective observational study aimed at evaluating the clinical profile and outcomes of obstetric ICU admissions. No interventions were made, and patients were observed from ICU admission to hospital discharge. The design allowed real-time, systematic data collection to assess maternal and fetal outcomes in critically ill obstetric cases.

Study setting

The study was conducted in the obstetric ICU of Al-Ameen Medical College Hospital, Vijayapura, Karnataka. As a tertiary care center, it handles high-risk obstetric referrals and has facilities for managing critically ill patients, making it an ideal setting for this study.

Study duration

The study was carried out over 18 months, from July 2023 to January 2025. This duration ensured adequate patient enrolment and allowed observation of seasonal trends and variations in obstetric emergencies and ICU admissions.

Inclusion and exclusion criteria

Inclusion criteria were women aged 18-40 years with ≥20 weeks gestation, admitted to the obstetric ICU with a stay >24 hours.

Exclusion criteria included age <18, ICU stay <24 hours, ICU readmission, and refusal to provide informed consent.

Study sampling

Purposive sampling was used. All eligible obstetric ICU patients admitted during the study period were included consecutively. This method ensured inclusion of all relevant cases without selection bias, suitable for observational research.

Study sample size

A total of 160 patients were included based on statistical assumptions with 80% power, 5% alpha, and expected incidence differences between population and study groups. The sample size ensured reliable and valid analysis of ICU outcomes.

Study groups

There were no fixed intervention groups. Patients were later categorized for analysis based on clinical variables such as antepartum/postpartum status, mode of delivery, ICU interventions, and primary cause of ICU admission.

Study parameters

Data collected included age, parity, gestational age, antenatal visits, ICU diagnosis, length of stay, delivery mode, and maternal-fetal outcomes. Diagnoses were classified as obstetric, medical, or surgical, using predefined clinical criteria.

Study procedure

Following ethics approval and informed consent, patients meeting inclusion criteria were enrolled. Data were collected using a structured proforma from ICU admission until hospital discharge, including diagnoses, interventions, and complications.

Study data collection

The primary investigator collected data prospectively through clinical observation, medical records, and patient interviews. Standard definitions were applied to ensure consistency in recording diagnoses, ICU interventions, and outcomes.

Data analysis

Data were analyzed using SPSS version 23. Descriptive statistics were used for continuous and categorical variables. Chi-square tests assessed associations, and a p-value <0.05 was considered statistically significant.

Ethical considerations

The study received ethical clearance from the Institutional Ethics Committee of Al-Ameen Medical College. Informed consent was obtained, confidentiality was maintained, and participation had no effect on clinical care provided.

RESULTS

Age distribution

Most patients were aged between 31-40 years (43.8%), followed by 20-30 years (39.4%), suggesting a high burden of critical obstetric illness in women in their 3rd decade (Table 1).

Table 1: Distribution of study patients based on age.

Age category	Frequency	Percentage
<20	27	16.9
20-30	63	39.4
31-40	70	43.8
Total	160	100

Booking status

A large proportion of ICU admissions were unbooked cases (75%), indicating inadequate antenatal care is a major risk factor for critical illness (Table 2).

Table 2: Distribution of study patients based on booking status.

Booking status	Frequency	Percentage
Booked	40	25
Unbooked	120	75
Total	160	100

Indications for ICU admission

Preeclampsia (25%), severe anemia (13.8%), and sepsis (12.5%) were the top ICU admission causes, reflecting preventable obstetric complications (Table 3).

Table 3: Distribution of study patients based on indication for ICU admission.

Causes of ICU admission	Frequency	Percentage
Preeclampsia	40	25
Severe anemia	22	13.8
Sepsis	20	12.5
Eclampsia	16	10
Placenta accreta/percreta	12	7.5
PPH	10	6.3
Acute renal failure	10	6.3
Abruption placenta	7	4.4
Uterine rupture	6	3.8
Heart disease	5	3.1
Placenta previa	5	3.1
Lung disease	3	1.9
Viral hepatitis	2	1.3
Uterine inversion	1	0.6
Retained placenta	1	0.6

Maternal morbidity

Preeclampsia (7.5%), PPH (6.3%), and septicemia (5.6%) were the most common morbidities among ICU patients, highlighting the critical need for early detection and intervention (Table 4).

Table 4: Distribution of study patients based on maternal morbidity.

Maternal Morbidity	Frequency	Percentage
Preeclampsia	12	7.5
PPH	10	6.3
Septicaemia	9	5.6
Blood transfusion	4	2.5
Antepartum hemorrhage	3	1.9
No morbidity	122	76.3

NICU admissions

Neonatal ICU admission was required in 27.5% of cases, with higher rates among unbooked and critically ill mothers (Table 5).

Table 5: Distribution based on neonatal ICU admission.

NICU admission	Frequency	Percentage
Yes	44	27.5
No	116	72.5

Association between booking status and maternal morbidity

Unbooked women had significantly higher maternal morbidity (p=0.03), emphasizing the importance of regular antenatal care (Table 6).

Association between length of ICU stay and NICU admission

NICU admissions were significantly higher in neonates of mothers with ICU stay >7 days (60%), indicating a link between maternal critical illness and neonatal risk (p=0.001) (Table 7).

Table 6: Association between booking status and maternal morbidity.

Maternal morbidity	Booked N	Booked percentage	Unbooked N	Unbooked percentage	Chi Square (χ^2) and P value
Preeclampsia	1	2.5	11	9.2	χ^2=12.65; p=0.03 (significant)
PPH	1	2.5	9	7.5	
Septicemia	0	0	9	7.5	
APH	0	0	3	2.5	
Blood transfusion	0	0	4	3.3	
No Morbidity	38	95	84	70	

Table 7: Association between length of ICU stay and NICU admission.

NICU admission	Length of ICU stay (days)						Chi Square (χ^2) and P value
	<3		3–7		>7		
	N	%	N	%	N	%	χ^2=20.01; p=0.001 (significant)
Yes	13	15.3	16	32	15	60	
No	72	84.7	34	68	10	40	

DISCUSSION

Our prospective study identified preeclampsia, severe anemia, and sepsis as the leading causes of ICU admissions in critically ill obstetric patients. We also noted that a significant proportion of the admissions (75%) were unbooked, indicating inadequate antenatal care. These findings reflect broader trends seen in international research, particularly in countries with similar healthcare challenges, and emphasize the critical role of early detection and intervention in preventing obstetric complications.

Preeclampsia accounted for 25% of ICU admissions in our study, which is consistent with a 2021 study by Benson et al on maternal anemia in the United States, which found that hypertensive disorders like preeclampsia were closely linked to adverse maternal outcomes such as ICU admissions and preterm birth. Their study also showed a direct relationship between maternal anemia and increased maternal morbidity, highlighting the need for better management of both conditions.[11] Similarly, Surovi et al in Bangladesh found hypertensive disorders, including preeclampsia, to be the primary causes of maternal near misses, emphasizing the global prevalence and impact of this condition in obstetric emergencies.[12]

In our study, we also identified severe anemia (13.8%) as a major factor contributing to ICU admissions, which aligns with a 2020 study by Harrison et al in the United States. Their study found that maternal anemia was associated with significantly higher rates of severe maternal morbidity, including the need for ICU admission, blood transfusion, and hysterectomy.[13] A study by Iordache et al in Romania also found that maternal anemia significantly increased the risk of preterm births and low birth weight, which is consistent with our findings of a higher incidence of neonatal ICU admissions among critically ill mothers.[14]

A significant finding in our study was that 75% of ICU admissions were from unbooked pregnancies, which is a major indicator of inadequate antenatal care. This finding is supported by Jariwala and Jain, who found that the majority of maternal deaths in a study conducted in Gujarat were from unbooked pregnancies, emphasizing the risk associated with lack of prenatal care.[15] Similarly, Krawczyk et al in their European study found that poor antenatal care was a major risk factor for severe maternal morbidity (SMM), noting that unbooked or inadequately booked pregnancies led to late-stage complications and delayed hospital referrals.[16]

Sepsis was identified as a significant cause of maternal morbidity in our study, accounting for 12.5% of ICU admissions. This mirrors the findings in Pérez et al, who found postpartum sepsis to be one of the most common causes of ICU admission in their study conducted in Cuba, where sepsis was associated with a high mortality rate. The need for timely identification and treatment of infections in obstetric care is critical to reducing these outcomes.[17]

Similarly, a 2020 study by Singh et al in Telangana, India, noted that obstetric hemorrhage and sepsis were significant contributors to maternal morbidity and mortality. Their findings showed that proper prenatal care and early identification of at-risk pregnancies could significantly reduce the incidence of such complications.[18]

In our study, neonatal ICU admissions were required in 27.5% of cases, with higher rates among unbooked and critically ill mothers. This finding is in line with Yadav et al, who reported increased neonatal ICU admissions in their study from western Rajasthan, where maternal preeclampsia and related complications led to worse neonatal outcomes, including higher rates of NICU admissions, preterm births, and low birth weight.[19] Similarly, Mousa et al found a higher rate of neonatal ICU admissions in pregnancies complicated by preeclampsia, highlighting the direct relationship between maternal critical illness and neonatal morbidity.[20]

Our study found a significant association between the length of maternal ICU stay and increased NICU admissions. This is consistent with Surovi et al, who noted that prolonged maternal ICU stays were associated with increased neonatal morbidity, including preterm birth and respiratory complications. This relationship is critical, as timely management of maternal complications can prevent prolonged ICU stays and reduce the risks to neonates.[12]

CONCLUSION

This prospective study highlights the critical role of antenatal care and timely referral in reducing maternal and neonatal morbidity. Unbooked status, hypertensive disorders, anemia, and sepsis were the most common causes of ICU admission. Significant associations between booking status, ICU stay duration, and NICU admissions emphasize the need for early risk detection, structured referrals, and better peripheral healthcare infrastructure. Strengthening these areas can substantially improve maternal and neonatal outcomes in emergency obstetric situations at tertiary care centers in India.

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