

Clinical Profile and Outcomes of Obstetric Admissions to the High Dependency Unit in a Tertiary Care Hospital in Kolkata, India: A Prospective Observational Study

DEBASHREE SAHA¹, INDRANI DAS², JAYDEB MANDAL³, NILANJANA CHAUDHURY⁴

ABSTRACT

Introduction: Despite substantial reductions in global and national maternal deaths, obstetric complications remain a crucial cause of maternal morbidity and mortality, especially in low- and middle-income countries. These women require early admission and appropriate management in the High Dependency Unit (HDU). Evaluating obstetric admissions to the HDU is a vital approach for monitoring critically ill women during pregnancy in a tertiary care facility.

Aim: To investigate the indications for obstetric admissions to the HDU, the various interventions required in the HDU and the final maternal outcomes in terms of morbidity and mortality.

Materials and Methods: This prospective observational study included all 485 obstetric patients admitted to the HDU over an 18-month period at a tertiary care hospital in Kolkata West Bengal, India. The study assessed outcomes related to the patients' age, booking status, past obstetric history, pre-existing medical disorders, complications during the current pregnancy and interventions performed in the HDU. Outcomes

were evaluated in terms of recovery, discharge from the HDU, need for transfer to the Critical Care Unit (CCU) and maternal deaths.

Results: A total of 485 women experienced life-threatening conditions that necessitated admission to the HDU during the study period. Among these women, 285 (58.76%) belonged to the age group of 20–29 years, and 164 (33.81%) were booked patients admitted in an emergency. Among the complications, acute kidney injury following caesarean section and postpartum haemorrhage (PPH) were observed in 17.07% of cases each. The most common indication for HDU admission was eclampsia with uncontrolled seizures, which accounted for 81 (16.70%) of cases. Of the 485 admissions, 41 (8.45%) resulted in mortality.

Conclusion: Among the 485 women admitted to the HDU, 85.36% recovered, 6.19% required a higher level of care, and 6.80% died. This study underscores the importance of access to the HDU for effectively managing and preventing morbidity and mortality in critically ill obstetric patients.

Keywords: Blood transfusion, Eclampsia, Ectopic pregnancy, Maternal mortality, Placenta previa

INTRODUCTION

In modern medicine, maternal death is a major concern for society. Despite substantial improvements in maternal healthcare services, pregnancy-related complications remain a significant contributor to maternal morbidity, particularly in developing countries. According to the World Health Organisation (WHO), approximately 295,000 women died from complications related to pregnancy and childbirth in 2017, with most of these deaths being preventable through timely and appropriate intervention (WHO, 2019) [1]. HDUs, also referred to as step-down or intermediate care units, play a pivotal role in bridging the gap between general wards and Intensive Care Units (ICUs). They provide enhanced monitoring and support for women with potentially life-threatening obstetric conditions who do not yet require full intensive care but need more vigilance than standard obstetric ward care [2]. The HDU fulfills the needs of at least half of the obstetric population requiring special care while simultaneously saving considerable expenses [3]. The diagnoses precipitating admission to the HDU include massive haemorrhage, eclampsia, sepsis, thromboembolism, acute organ dysfunction (renal, hepatic, cardiac, respiratory, neurological), and anaesthesia-related morbidities such as aspiration, anaphylaxis and muscle relaxant-related problems [4].

Regular auditing of critical cases can provide significant information about areas for improvement and is useful in identifying the gaps in the health system as well as assessing the quality of maternal healthcare. Evaluating obstetric admissions to the HDU is one of

the ways to monitor critically ill women during pregnancy in a tertiary care facility. Most existing studies [5,6] are retrospective and lack uniform definitions for severity outcomes or intervention measures. Furthermore, they concentrate on ICU/CCU care, overlooking the critical intermediary role that HDUs play, particularly in resource-limited settings. This study fills this notable gap in the literature by prospectively evaluating maternal outcomes in the HDU context, rather than retrospectively assessing ICU data, thus broadening the scope of maternal critical care research.

MATERIALS AND METHODS

The present prospective observational study was conducted between March 1, 2021, and August 31, 2022, in the HDU, Department of Obstetrics and Gynaecology, RG Kar Medical College and Hospital, Kolkata, West Bengal India. Ethical approval was obtained from the Institute's Ethical Committee (Memo No.: RKC/317 dated 11.02.2021), and written informed consent was obtained from all participants prior to the study.

Inclusion criteria: All critically ill patients admitted to the HDU during the 18-month study period were included in the study.

Exclusion criteria: Obstetric patients admitted with road traffic accidents, poisoning and those who expired within three hours of admission were excluded from the study.

Sample size: All 485 obstetric patients admitted to the HDU during the study period were included in the study.

Study Procedure

Data were collected in detail through history taking, antenatal cards, hospital records, admission records, case sheets, examination, and daily regular observation of the patients. Collected data were recorded in a pretested case report proforma. The parameters assessed included age, booking status, past obstetric history, pre-existing medical disorders, complications in the index pregnancy, indications for obstetric admissions to the HDU and the interventions performed in the HDU. The outcomes of all obstetric admissions were assessed in terms of recovery, death and the need for transfer to the CCU.

STATISTICAL ANALYSIS

The data were entered into a Microsoft Excel spreadsheet for the analysis of categorical/qualitative outcomes. Frequencies along with percentages were calculated.

RESULTS

During the 18-month study period, a total of 18,151 obstetric patients were admitted to the Department of Obstetrics and Gynaecology at RG Kar Medical College and Hospital, Kolkata, of which 485 women experienced life-threatening conditions that necessitated admission to the HDU. Among these women, 285 (58.76%) belonged to the age group 20–29 years, and 164 (33.81%) were booked patients admitted in an emergency [Table/Fig-1]. The most common indication for HDU admission was eclampsia with uncontrolled seizures, which accounted for 81 (16.70%) of cases, followed by haemorrhagic shock resulting from ruptured ectopic pregnancy, which necessitated 78 (16.08%) admissions [Table/Fig-2]. Out of the 485 admissions, 41 (8.45%) resulted in mortality. Among the 444 critically ill patients who survived, 193 had some form of medical or other co-morbidities, and 44 had two or more co-morbidities [Table/Fig-3].

Characteristics		n (%)
Age (years)	≤19	43 (8.86)
	20-29	285 (58.76)
	30-34	119 (24.54)
	≥35	38 (7.84)
Booking and admission status	No antenatal care	108 (22.27)
	Booked and elective admission	70 (14.43)
	Booked and emergency admission	164 (33.81)
	Referred from periphery	143 (29.48)
Gravidity	Primigravida	138 (28.45)
	Multigravida (G2-G3)	284 (58.56)
	Grand multigravida (≥G4)	63 (12.99)
Period of gestation	≤12 weeks	95 (19.59)
	13-28 weeks	28 (5.77)
	28-37 weeks	166 (34.23)
	37-40 weeks	74 (15.26)
	≥40 weeks	2 (0.41)
	Postpartum	120 (24.74)

[Table/Fig-1]: Demographic profile of obstetric admissions to the HDU (n=485).

Indications	n (%)
Severe preeclampsia	60 (12.37)
Eclampsia with uncontrolled fits	81 (16.70)
Haemorrhagic shock following ruptured ectopic pregnancy	78 (16.08)
Uterine rupture	13 (2.68)
Severe jaundice	8 (1.65)
Atonic PPH	40 (8.25)

Traumatic PPH	2 (0.41)
Complications following abortion	16 (3.30)
PAS*	31 (6.39)
Pelvic abscess following C/S*	4 (0.82)
Haemorrhagic shock for rectus sheath haematoma	5 (1.03)
Acute kidney injury	13 (2.68)
Puerperal sepsis	2 (0.41)
Haemoperitoneum following C/S	18 (3.71)
Placenta previa	23 (4.74)
Abruptio placentae	5 (1.03)
Hypoxemia	6 (1.24)
Haemorrhagic shock following vulval haematoma	10 (2.06)
Retained placenta in shock	11 (2.27)
Heart disease in pregnancy	38 (7.84)
Severe anaemia	12 (2.47)
Diabetic ketoacidosis	4 (0.82)
Anaesthetic complications	5 (1.03)

[Table/Fig-2]: Indications for admission to HDU (n=485).

PPH: Postpartum haemorrhage; PAS: Placenta accreta spectrum; C/S: Caesarean section

Comorbidities	Critically ill patients (n=444) (survived)	Maternal mortality (n=41)	Total (n=485)
Heart disease	24 (5.40%)	0	24 (4.95%)
PIH/Pre-eclampsia	116 (26.13%)	15 (36.58%)	131 (27.01%)
GDM/Pre-GDM	2 (0.45%)	1 (2.44%)	3 (0.62%)
Obstetric cholestasis/jaundice	4 (0.90%)	2 (4.88%)	6 (1.24%)
Anaemia	1 (0.22%)	1 (0.21%)	2 (0.412%)
Seizure disorder	1 (0.22%)	1 (2.44%)	2 (0.412%)
Combination of two or more disorders	45 (10.14%)	4 (9.76%)	49 (10.10%)
No comorbidities	251 (56.53%)	17 (41.46%)	268 (55.25%)

[Table/Fig-3]: Distribution of pre-existing medical and other comorbidities.

Within the HDU, 331 (68.25%) patients received massive blood transfusions, 167 (34.43%) were placed on mechanical ventilation, and 152 (31.34%) received MgSO₄ injections. Most patients received a combination of two or more therapeutic modalities [Table/Fig-4]. Ultimately, among the 485 obstetric admissions to the HDU, 414 (85.36%) patients were transferred to the general ward and subsequently discharged, while 33 (6.80%) patients died in the HDU. The remaining patients were shifted to the CCU for a higher level of care. Of these, 30 (6.19%) recovered, and 8 (1.65%) died in the CCU [Table/Fig-5]. Among the total of 41 maternal deaths, the most common cause was uncontrolled seizures due to eclampsia, accounting for 8 (19.50%) deaths, followed by acute kidney injury following caesarean section and PPH, which accounted for 7 (17.07%) deaths [Table/Fig-6].

Modalities of therapy	n (%)
Mechanical ventilation	167 (34.43)
BiPAP support	19 (3.92)
Massive blood transfusion	331 (68.25)
Injection MgSO ₄	152 (31.34)
Haemodialysis	37 (7.63)
Inotropic support	67 (13.81)
Cardiological management	28 (5.77)
Thromboprophylaxis	3 (0.62)

[Table/Fig-4]: Modalities of therapy in the HDU.

Outcome	n (%)
Shifted to the ward and discharged	414 (85.36)
Shifted to CCU and recovered	30 (6.19)
Shifted to CCU and death	8 (1.65)
Death in HDU	33 (6.80)

[Table/Fig-5]: Final maternal outcome (n=485).

Causes of death	n (%)
Ruptured ectopic pregnancy	1 (2.44)
Septic abortion	1 (2.44)
Intraperitoneal haemorrhage following caesarean section	2 (4.88)
DIC	5 (12.20)
Pelvic abscess following caesarean section	2 (4.88)
Acute kidney injury following caesarean section	7 (17.07)
Severe pre-eclampsia/ HELLP syndrome	5 (12.20)
Severe anaemia	2 (4.88)
PPH	7 (17.07)
Uncontrolled fits of eclampsia	8 (19.50)
Pulmonary embolism	1 (2.44)

[Table/Fig-6]: Primary causes of death (n=41).

DIC: Disseminated intravascular coagulation; HELLP: Haemolysis, elevated liver enzymes, low platelet count; PPH: Postpartum haemorrhage

DISCUSSION

During the 18-month study period, a total of 18,151 patients were admitted to the obstetric department, of which 485 (2.67%) were critically ill and required admission to the obstetric HDU. In the study by Veerabhadrapa V K et al., the HDU admission rate was 11.32% [7]. Other studies by Panda SR et al., and Gu N et al., also reported higher admission rates of 15.16% and 7.15%, respectively [8,9]. However, in a study conducted by Mamatha K the HDU/ICU admission rate was found to be 1.6% [10].

Out of the 485 obstetric patients admitted to the HDU, 58.76% belonged to the maternal age group of 20–29 years, which was consistent with findings in related studies. A study by Dattaray C et al., revealed a mean age of patients admitted to the HDU with obstetric morbidity alone and with prior medical conditions of 24.6 ± 4.23 and 24.9 ± 4.33 years, respectively [3]. Marotta C et al., found that the median age of patients admitted to the obstetric HDU was 25 years (IQR 21–30) [11]. Present study observed that 33.81% of booked cases were admitted in an emergency, while 29.48% of patients were referred from peripheral facilities. Conversely, in a study by Joshi PS et al., the majority of patients (81.22%) were unbooked [12].

In the current study, the majority of patients admitted to the HDU were multigravida, accounting for 58.56% of the total admissions. In contrast, a study by Joshi PS et al., revealed that among their 213 patients, 85 (39.91%) were primigravida, while 74 (34.74%) were second gravida [12]. The study by Roy Chowdhury R et al., showed that 228 out of 413 (55.2%) patients were primigravida, while 185 (44.8%) were multigravida [13]. In present study, 34.23% of patients were admitted at 28–37 weeks of gestation, and 24.74% were in their postpartum period during admission. This contrasts with the study by Veerabhadrapa VK et al., which found postpartum admissions (78%) were significantly higher than antepartum admissions (22%) [7]. The mean gestational age was 32.3 ± 5.5 weeks; 32% of women were >37 weeks, 43% were between 28–36 weeks, and 15% were less than 20 weeks gestation.

The current study revealed that among the total admissions to the HDU, eclampsia with uncontrolled seizures accounted for

16.70%, followed by haemorrhagic shock following ruptured ectopic pregnancy, necessitating 16.08% of admissions. In Tayade S et al., the most common obstetric reason for admission to the HDU was hypertensive disorders of pregnancy (28%), followed by obstetric haemorrhage (19%), severe anaemia (17%), and sepsis (9%) [14]. Vanitha MG et al., found that the most common indication for admission to the HDU was severe preeclampsia, accounting for 21.7% [15]. The next most common indications were cardiac disease (15%), followed by HELLP syndrome (13.3%), PPH (11.7%), and DIC/coagulopathy (10%). Antepartum haemorrhage (abruptio placentae) and complications during the third stage of labour (retained and adherent placenta) accounted for 5% of the admissions. Eclampsia and ruptured ectopic gestation accounted for 3.3% of the admissions.

The study showed that of the total admissions to the HDU, 68.25% of the patients received massive blood transfusions. Additionally, 34.43% were placed on mechanical ventilation, while 31.34% received intravenous magnesium sulfate (MgSO_4) infusions. Most patients received a combination of two or more modalities of therapy. This was similar to the findings of Charumithra N et al., in their study, where 82% of patients admitted to the HDU required Level-I critical care, followed by Level-II care, with 16.67% of patients requiring massive blood transfusions [16]. Among the women who required Level-II critical care, 90% needed monitoring in the HDU; this included patients who required magnesium sulfate infusion or intravenous antihypertensives for severe preeclampsia, and basic respiratory support to maintain saturation.

On outcome analysis, 85.36% of women were shifted to the general ward after recovery and discharged, while 6.80% of patients died in the HDU. The remaining 7.84% were transferred to the CCU for a higher level of care. In the CCU, 78.95% of women recovered, while 21.05% died. In a study by Dattaray C et al., 12.28% of patients died in the HDU, which was much higher than the rate found in the current study [3]. However, Masood A et al., reported that maternal mortality among patients admitted to the HDU was 6.4%, with uncontrolled seizures due to eclampsia accounting for 19.50% of total mortality [17]. This was followed by acute kidney injury following PPH (after Caesarean section), which was responsible for 17.07% of total deaths. DIC and severe preeclampsia/HELLP syndrome each accounted for 12.20% of maternal mortality. The study by Dattaray C et al., revealed that the causes of maternal mortality included cardiac failure in eclampsia and post-haemorrhage sepsis leading to multiorgan failure and DIC [3]. Other causes of maternal mortality among patients with pre-existing co-morbidities included acute pancreatitis, systemic lupus erythematosus with grade IV nephropathy, peripartum cardiomyopathy, hepatitis E with hepatic encephalopathy and pulmonary embolism following deep vein thrombosis. Masood A et al., found that the most common causes of maternal mortality were obstetric haemorrhage and sepsis [17]. Rheumatic heart disease and chronic liver disease were among the most prevalent pre-existing medical conditions that resulted in maternal mortality.

Limitation(s)

Detailed interviews with women referred in already moribund conditions could not be conducted regarding social determinants, significant medical history and their experiences accessing and receiving antenatal care. Follow-up of patients for the development of any long-term physical or mental complications after discharge from the hospital could not be performed.

CONCLUSION(S)

This prospective observational study highlights that timely admission to the HDU plays a critical role in managing high-risk obstetric patients, significantly contributing to favourable maternal

outcomes. Hypertensive disorders and their complications, obstetric haemorrhage and heart complications were the most common indications for HDU admission. Most patients experienced good recovery with multidisciplinary support, emphasising the value of early recognition and intervention. However, a small proportion required intensive care or experienced adverse outcomes, underscoring the need for improved antenatal care, early referral and structured protocols for managing high-risk pregnancies. Strengthening HDU services in tertiary care centres can bridge the gap between routine ward care and intensive care, improving maternal morbidity and reducing mortality.

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PARTICULARS OF CONTRIBUTORS:

1. Senior Resident, Department of Obstetrics and Gynaecology, Medical College, Kolkata, West Bengal, India.
2. Associate Professor, Department of Obstetrics and Gynaecology, Chitta Ranjan Seva Sadan, Kolkata, West Bengal, India.
3. Associate Professor, Department of Obstetrics and Gynaecology, Medical College, Kolkata, West Bengal, India.
4. Professor, Department of Obstetrics and Gynaecology, Medical College, Kolkata, West Bengal, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Jaydeb Mandal,
Konark Apartment, 48, Sreenagar Main Road, Kolkata-700094,
West Bengal, India.
E-mail: jaydebmandal013@gmail.com

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