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Original Article

Utilization of obstetrics High Dependency Unit (HDU) in a tertiary care centre

Ranita Roy Chowdhury, Gairik Bera✉, Manidip Pal

ABSTRACT

Backgrounds: High Dependency Unit (HDU) is widely available in India for management of critically ill obstetric patients. This study is focused on identifying utilization, indication of admission, interventions and gestational outcome in Obstetric HDU.

Methods: A retrospective observational study was carried out from 1st Sept 2019 to 31st Aug 2020 in Obstetrics HDU of College of Medicine & JNM Hospital, WBUHS, Kalyani.

Results: Out of a total 9936 obstetric cases, admission to HDU was 413 (4.1%). About 265(64%) of the HDU cases were referred from peripheral hospitals and 66 cases (15.9%) were found to be booked on admission. Hypertensive disorder (31.4%), antepartum hemorrhage (4.8%), postpartum hemorrhage (4.8%) were the most common indications for HDU admission. About 392 (94.9%) patients were parturient and rest antenatal. Maternal mortality was found to be 4.1% (n=17) and stillbirth rate 6.5% in this study. 386 (93.5%) patients were discharged satisfactorily while1.7% of the HDU cases were referred to tertiary care hospital.

Conclusion: Establishment of HDU accentuated the recovery time of critically ill patients and reduced the Maternal Mortality ratio (MMR).

Key words: Critically ill, fetomaternal, HDU, maternal mortality

Introduction

The antenatal period and delivery are considered to be a physiological process. However it has certain life threatening complications. It appears without any prior warning signs in many occasions. There are about 118 life threatening events of 'near miss mortality' or 'severe acute maternal morbidity' (SAMM).[1] The global prevalence of SAMM ranges from 0.015 to 8.23%. SAMM is defined as severe life threatening obstetric complications necessitating urgent medical intervention in order to prevent likely death of mother.[2] High dependency

Dept of Obs & Gyn
College of Medicine & JNM Hospital
WBUHS, Kalyani
✉ email: gairikbera10@gmail.com

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unit (HDU) has a paramount importance in managing these 'SAMM or near missed cases'. An HDU is defined as a level of care which lies in between a general ward and an intensive care unit (ICU).[3] Similar studies have been conducted in different parts of India to evaluate out the utilization rate of Obstetric HDU.[4,5]

Materials and Methods

A retrospective observational study was carried out from 1st September 2019 to 31st August 2020 in the Obstetrics HDU of College of Medicine and JNM Hospital, WBUHS, Kalyani, a tertiary care referral institute in Nadia district of West Bengal that mainly serves the underprivileged rural community. The study is intended to review the utilization of obstetric HDU - indication of admission, interventions and fetomaternal outcome. This is a dedicated 10 bedded HDU with 2 ventilators was set up to cater the impending catastrophic obstetric complications. Patients with varied spectrum of obstetric morbidity as well as medical complications were included in the study. An obstetric morbidity is defined as the one originating from any cause related directly to pregnancy or its management during antenatal, intranatal or post natal period up to 6 weeks post delivery. On the other hand, medical morbidity refers to all complications arising from any pre-existing medical conditions.

Patient demographic factors included age, parity and period of gestation; relevant data regarding the need for HDU admission; management, intervention, and final outcomes were recorded, reviewed and statistically analysed. Regular clinical monitoring of the patients was carried out following the operational guidelines. The women discharged from HDU were regularly reviewed up to two months. Obstetric events were defined by the standards of Williams Obstetrics 24th Edition.[6]

Inclusion criteria

The Scope of Obstetric HDU: Following conditions may require admission in obstetric HDU[13]

OBSTETRIC COMPLICATIONS	MEDICAL COMPLICATIONS
□ Pregnancy/Labor Pain with Severe Anemia (< 7 gm %) and its complications □ Accidental Hemorrhage- Placental Abruption, Couvelaire Uterus □ Placenta Previa □ Adherent Placenta and other placental Abnormalities □ Postpartum Hemorrhage □ Obstetric Hysterectomy □ Severe Pre-eclampsia/ Hypertensive Crisis /Eclampsia □ Broad Ligament Hematoma □ HELLP Syndrome □ Perforation during abortion □ Sepsis & Systemic Inflammatory Response Syndrome (SIRS)	□ Pregnancy with Gestational Diabetes □ Pregnancy with Diabetic Ketoacidosis □ Pregnancy with Cardiac Diseases □ Pregnancy with Jaundice □ Pregnancy with Thyrotoxicosis □ Pregnancy with Thyroid Storm and Pregnancy with other Endocrinal Crisis □ Post-operative ARF and other renal problems □ Pregnancy with Dengue □ Pregnancy with complications of Malaria □ Pregnancy with Thrombophilia □ Pregnancy with Asthma and other respiratory problems.

OBSTETRIC COMPLICATIONS	MEDICAL COMPLICATIONS
□ Multiple Gestation with complications Pregnancy with OHSS (Ovarian Hyper Stimulation Syndrome) □ Pregnancy with complications due to Uterine Anomaly and Pathologies □ Pregnancy with Appendectomy or any other surgical emergency □ Hydatidiform Mole □ Pregnancy with Trauma □ Ruptured Ectopic □ Postoperative patients requiring hemodynamic monitoring and intensive nursing care	□ Pulmonary edema due to perioperative fluid overload, CCF, complication of severe pre-eclampsia or tocolytic therapy etc. □ Pregnancy with DIC □ Burns during Pregnancy □ Pregnancy with Cancer

Many other such conditions which may require admission of pregnant woman in obstetric HDU may be present, and these need based admissions should be made based on the clinical judgment.

Results:

Out of the total 9936 obstetric admission in obstetrics ward, 413(4.1%) required HDU admission. Record review revealed that 265(64%) of these were referred in cases with obstetric complications. A total of 392(94.9%) post partum patients were admitted whereas only 21(5.1%) were antenatal. A significant number of patients were unbooked cases.

Detailed study of the record review revealed that most of the patients (340, 82.3%) were between 19 to 35 years; 55(13.3%) teenage pregnancies and 18 (4.3%) were elderly females. About 129 (31.2%) of them were delivered at term,

Table1

Demographic factors			N=413 (%)		
Age (years)	< 19 19-35 > 35		55 (13.31) 340 (82.32) 18 (4.35)		
Gestational age (weeks)	< 20 20-28 28-37 > 37		87 (21.06) 12 (2.91) 185 (44.79) 129 (31.23)		
Gravida Primi Multi			228 (55.21) 185 (44.79)		
Antenatal	Postnatal	Booked	Unbooked	Referred in	Referred out
21 (5.08%)	392 (94.92%)	66 (15.98%)	347(84.02%)	265(64.1%)	7(1.69%)

Table 2

Pregnancy outcome	Number of HDU admissions
Vaginal delivery	22 (5.33%)
LSCS	263 (63.68%)
Abortion	5 (1.21%)
Ectopic	73 (17.68%)
Stillbirth	27 (6.5%)

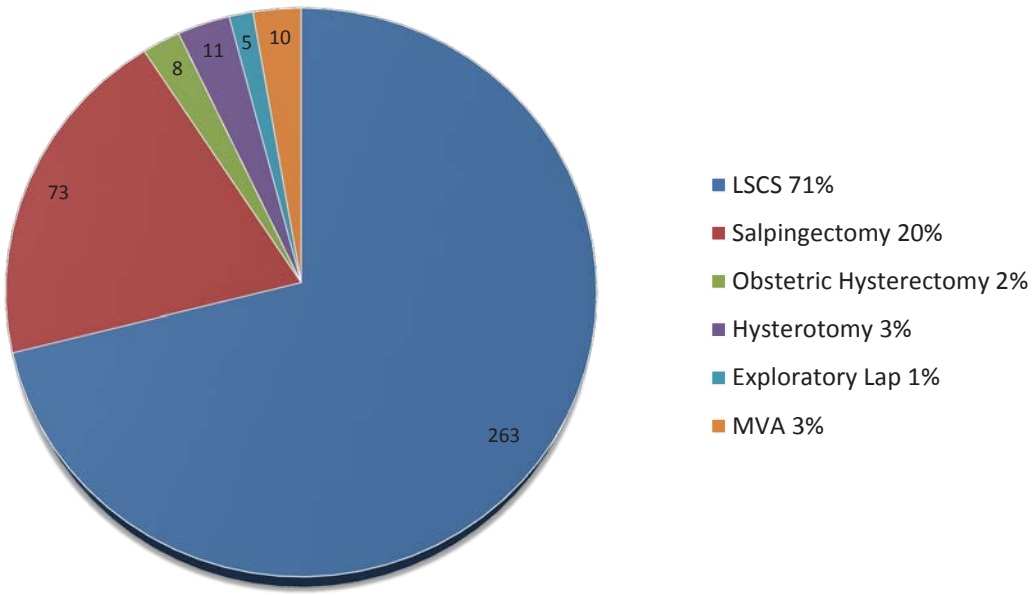
Table 3: Utilisation of obstetric HDU as per diagnosis

Indications of admission	Cases (n= 413)
Sepsis	10 (2.42%)
Severe Pre-eclampsia	88 (21.30%)
Eclampsia	42 (10.17%)
Placenta Previa	12 (2.91%)
Abruptio Placenta	08 (1.93%)
Uterine Perforation	03 (0.72%)
Uterine Rupture	07 (1.69%)
Pregestational diabetes mellitus	05 (1.21%)
Gestational diabetes mellitus	14 (3.39%)
Disseminated intravascular coagulopathy	07 (1.69%)
Jaundice	12 (2.91%)
Heart Disease	03 (0.72%)
Post partum haemorrhage	20 (4.84%)
HELLP syndrome	02 (0.48%)
Respiratory Failure	08 (1.93%)
Acute kidney injury	04 (0.97%)

185 (44.8%) were born after the period of viability but before term and 87 (21%) of patients before 20 weeks of gestation (Table 1).228 (55.2%) patients were primi gravida while 185 (44.8%) were multi gravida. The booked category accounted for only 66 (16%) out of 413 admissions which means the rest 347 (84%) were unbooked (either received no prior antenatal care or visited the health care system fewer than 4 times). A majority of patients 263 (63.7%) were delivered by caesarean section whereas 22 (5.3%) delivered vaginally and only 5 (1.2%) cases were that of abortion (Table 2). Out of the 370 patients who had undergone obstetric intervention, 73 (17.6%) were salpingectomy, 11(2.6%) hysterotomy, 10 (2.4%) manual vacuum aspiration for molar pregnancy, 8 (1.9%) obstetric hysterectomy and 5(1.4%) exploratory laparotomy cases (Fig 1).

The diagnosis at admission or the cause of referral as depicted in table 3 was mostly due to hypertensive disorders of pregnancy

Figure 1: Obstetric Interventions



including both severe pre-eclampsia and eclampsia constituting 130 (31.5%) of them followed by postpartum hemorrhage 20(4.8%), antepartum hemorrhage 20 (4.8%), gestational diabetes mellitus14 (3.4%), while uterine perforation, rupture uterus, jaundice in pregnancy, respiratory failure, acute kidney injury, HELLP syndrome and disseminated intravascular coagulopathy accounted for the rest. A meagre percentage (1.9%) of critically ill was diagnosed with pre-existing medical morbidity like heart disease 3 (0.7%) and pre-gestational diabetes mellitus 5(1.2%). The table 3 also illustrates the indications for HDU utilisation as already mentioned above.

The severe pre-eclampsia and eclampsia were treated with magnesium sulphate 75 (18.2%), anti hypertensive agents 137(33.2%) and other routine post operative medications. Interventions of the patients required during the HDU stay (Table 4) included antibiotics in all 413 (100%) cases, blood products in 145 (35.1%), inotropes in 30 (7.3%) patients and hemodialysis in 5(1.2%) of them.. All acute kidney injury (AKI) patients underwent dialysis. All cases of kidney injury were due to acute hemorrhagic shock. About 3 (0.72%) out of 413 of them in the last one year were intubated for ventilatory support. Out of those requiring mechanical ventilation first one was due to intraoperative hemorrhage in morbid adherent placenta , one case of postpartum hemorrhage (PPH) with profuse bleeding and last one due to sepsis. Overall mortality was 17 of total 413 cases (4.1%) and the cause of death is being eclampsia, PPH, Disseminated intravascular coagulopathy (DIC) constituting 17.64% each followed by sepsis and acute hepatic failure 11.76% each respectively. Uterine rupture, perforation, abruption and heart disease took toll of 4 more patients taking the death rate to 4.1% (17 out of 413) in HDU. Out of the 396 remaining, 7 (1.7%) patients were referred to tertiary hospital having multispecialty departments, 3 (0.7%) had taken discharge against doctor's advice and around 386 (93.5%) patients had successfully recovered and discharged from hospital.

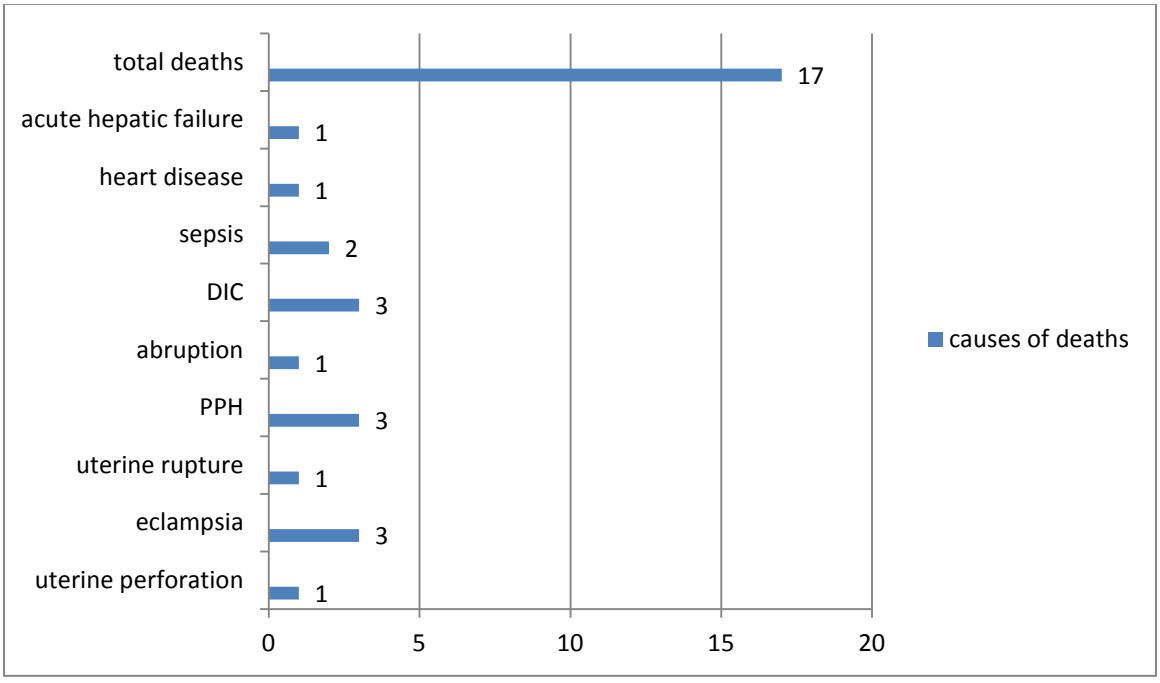
Table 4: Interventions undertaken in HDU

Intervention	Total	Survived	Death
Antibiotics	413 (100%)	396 (95.88%)	17 (4.11%)
Blood Product	145 (35.11%)	139 (33.66%)	6 (1.45%)
Inotropes	30 (7.26%)	20 (4.84%)	10 (2.42%)
Haemodialysis	5 (1.21%)	3 (0.72%)	2 (0.48%)
Mechanical Ventilator	3 (0.72%)	1 (0.24%)	2 (0.48%)
Antihypertensive	137 (33.17%)	134 (32.45%)	3 (0.72%)
Anticonvulsant	75 (18.16%)	71 (17.19%)	4 (0.97%)

Table 5: Recovery rate and outcome of HDU patients

Outcome	n= 413
Discharged satisfactorily	386 (93.46%)
Referred to super specialty centre	7 (1.69%)
LAMA (left against medical advice)	3 (0.72%)
Death	17 (4.12%)

Figure 2: Causes of Death



Discussion

In the last one year study period 6624 mothers delivered their babies in this institute and 413 patients required HDU admission thereby the overall admission rate in HDU was 62.4 per 1000 deliveries. This is reasonably high when compared to data from other institutes of this region which was 11.2/1000 deliveries as well as from Western India, where it was 5.4 per 1000 deliveries.[4,5] There is a number of variation even in developed countries ranging from 26.7 in 23 years in UK [7], 10.2 in 4 yrs in Dublin, Ireland[8] to 1.3 in 10 yrs in Hong Kong.[9] In spite of the socio-economic disparity between these nations the results were interestingly comparable. However there is paucity of data regarding HDU requirements for obstetric complications from South Asian and other the developing countries of the world. The reason behind lower utilisation of HDU is delayed and limited accessibility to health care system and availability of HDU services; which in turn leads to higher mortality rate in the developing countries. Thus this is not the real picture of HDU utilisation.

Only patients with pregnancy induced complications were found suitable as indications for admission to HDU. In absence of proper post operative recovery ward many patients clinically judged to have milder complications were also transferred to HDU for proper monitoring. It was for benefit of those patients in case of unforeseen complications.

Hypertensive disorders which included severe pre-eclampsia and eclampsia (31.5%) accounted for the majority of indications followed by postpartum hemorrhage (4.8%), antepartum hemorrhage (4.8%), gestational diabetes mellitus (3.4%), and sepsis (2.4%). The most common cause of PPH was atonicity. Most cases of antepartum hemorrhage were either due to placenta previa (2.9%) or abruptio placenta (1.9%) . Hemorrhage, sepsis and hypertensive disorders are the major causes of PPH in India. Pre-eclampsia and sepsis was mainly puerperal or postoperative and following septic abortion. Morbidly adherent placenta and PPH patients were managed by obstetric hysterectomy, high dose antibiotics, blood and blood products as and when necessitated. Out of the total 413 patients 84% were unbooked cases with either no or minimum antenatal care. On analyzing the data teenage pregnancy 13.3% was found to be associated with the hypertensive patients. In another study in Kolkata important causes of obstetric HDU admission were septicemia 35%, PPH 29.1% and hypertension 21% which supports our findings of PPH and hypertensive disorder occupying the topmost spot.[5] The state has a maternal mortality ratio of 98 per one lakh live births (SRS 2016-2018) and the health care delivery system is striving hard to improve the quality of maternal care and reduction of maternal mortality. In rural India majority of deliveries are still conducted at home or in a health care facility with minimum infrastructure. Consequently unsupervised deliveries, dogmatic traditional approaches during child birth, inadequate use of oxytocics and underlying anemia in teenagers continue to make PPH responsible for almost 28% of maternal mortality in India. Malnutrition and anemia contribute to hemodynamic compromise arising due to blood loss during childbirth which in turn increases the maternal morbidity. Poverty, ignorance, lack of timely diagnosis and delayed in recognition of HELLP and eclampsia and its inappropriate management is the probable cause of hypertensive HDU admissions. Apart from these failure to recognize pre-existing heart disease and diabetes also contributes to maternal morbidity, cardiac failure, prolonged hospital stay and increased recovery time. Emergency obstetric admissions included eclampsia, APH, uterine perforation, sepsis and

medical complications like heart failure and pregestational diabetes mellitus significantly increased the maternal morbidity. One study also established the direct causes of MMR based on SRS of 2004-2006.[11] Most of the postpartum patients were following caesarean section (63.7%) or laparotomies following salpingectomy for ruptured ectopic pregnancy (17.7%). The antenatal patients were fewer in numbers with a better recovery rate. Analysis revealed 47.7% preterm deliveries out of total HDU admission and the stillbirth rate was 6.5%. Most of the term babies thrived well. The stillbirth and preterm birth shared some common factors like hypertensive disorders, diabetes and APH. In the present study postpartum hemorrhage, eclampsia and disseminated intravascular coagulopathy (DIC) were the leading causes of maternal mortality followed by sepsis which confirms the fact of death due to direct obstetric causes as per sample registration survey 2016-2018. Causes of maternal mortality were cardiac failure in eclampsia and post hemorrhage sepsis leading to multi-organ failure and DIC.[5] DIC in our study was a consequence of massive obstetric hemorrhage resulting from both PPH and APH. Maternal mortality was 4.1% and stillbirth rate 6.5% of HDU admission. While other study reported to be 12.3% and 17.5% respectively.[5] Severe pregnancy-induced hypertension/eclampsia, massive hemorrhage and sepsis were the common obstetric complications for ICU admission in a third study conducted in Western India. Pulmonary edema, acute respiratory distress syndrome and acute lung injury were the common indications for mechanical ventilation.[12] In our patients, mechanical ventilation was initiated based on a worsening cardio respiratory profile intraoperatively in a case PPH, another case morbid adherent placenta and sepsis. Interestingly it was observed that unbooked patients referred from rural areas were reported to have the worst prognosis.[11]

Maternal mortality was taken as the only end point outcome of this study. Since the inception of HDU in our hospital on 29th June 2017, the maternal mortality ratio has drastically reduced from 284.05 per lakh in 2012 to 161.53 per lakh in 2019. A health facility based study carried out in 4 districts of West Bengal in the year 2002 found that only 29.9% of the estimated number of complications (which is 15% of all births) was managed in the Emergency Obstetric Care facilities including both basic and comprehensive ones.[14] A mammoth 85.7% complications contributed to a case fatality rate of 1.7%. Comparing this with our current study we can well conclude that certain measures like improvement of monitoring system and skill based training availed in HDU are much needed to reduce the maternal mortality.

There was a paucity of data regarding the follow up of patients referred to super specialized centers which in turn affected the final outcome evaluation. Inadequate record of follow up of all preterm neonates and the antenatal discharge from the HDU is the limitation of the study. We also could not do any comparative analysis of obstetric complications with nonobstetric ones due to the same reason.

Conclusion

Hypertensive disorder was the most common indication for admission to HDU. Delayed identification and referral were the important obstacles. There is a need for thorough booking of all pregnant mothers at peripheral centres and regular check-up for early identification of complications and timely management which in turn will reduce the cost of treatment as well as the need for HDU admission. Introduction of HDU has facilitated better postoperative management of critically ill mothers and reduced the incidence of maternal mortality significantly in our centre. Thus establishing

high dependency units (HDU) along with provision of proper infrastructure in all tertiary care centre could be the major stepping stones on the pathway to maternal safety and an "Atmanirbhar Bharat".

Conflicts of interest: Nil

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