

## Obstetric high dependency care in a District General Hospital in the United Kingdom

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**Objective:** To assess the utilization of Obstetric HDU, including indications and frequency of admissions, clinical management of patients and maternal outcomes.

**Methodology:** This retrospective cohort study was conducted at District General Hospital in North East of England. All the patients who were admitted to HDU/ICU from January 2011 to February 2013 were identified through HDU admission register. Data including indications for admissions, duration of stay, clinical management of patients and foeto maternal outcomes were recorded and was analysed using Microsoft Excel.

**Results:** The rate of HDU admission was 0.58%. 91% of patients had obstetrics indications for admission to HDU with major obstetrics

hemorrhage and hypertensive disorders of pregnancy being the two most common causes for admissions. There was no maternal mortality and long term maternal morbidity. Neonatal ICU admission rate was 24% and 12% had intra uterine fetal death.

**Conclusion:** Critical illness in pregnancy and puerperam is most likely related to obstetric causes. On site obstetrics HDU can provide expert obstetric care and critical care management with additional advantage of midwifery support. (Rawal Med J 201;43:267-271).

**Key Words:** Obstetrics High dependency care, postpartum haemorrhage, pre-eclampsia.

### INTRODUCTION

Critical illness in pregnant or puerperal women is uncommon but represents a potentially complex and rapidly escalating clinical situation. Patients may deteriorate, become complex and difficult to manage very quickly. Successful management relies on adequate staffing, skill mix and training and prompt access to critical care facilities including on-site obstetric HDU and ICU Level 2 and Level 3.<sup>1</sup>

The reported incidence of obstetric patient's admission to ICU varies between 1 to 9 per 1000 deliveries.<sup>2-4</sup> On-site level 2 facilities within Labour Ward (obstetric HDU) provides concurrent availability of expert obstetric care and critical care management while keeping mother and baby together. The availability of obstetric HDU has shown a tendency towards reduction in the number of General ICU admissions<sup>5</sup> as many potential admissions might be appropriately managed in the HDU setting on labour ward.<sup>6</sup> The aim of this study was to review obstetric HDU utilization including indications

and frequency of admissions, clinical management of patients and maternal outcomes at our center.

### METHODOLOGY

This is a retrospective cohort study was conducted in the Diana Princess of Wales Hospital in Grimsby, which is a part of Northern Lincolnshire and Goole Hospitals, NHS Foundation Trust. The study recorded data from January 2011 to February 2013. General ICU Level 2 and Level 3 care are available in the main hospital. The maternity unit has delivery rate of average 2750 per year. It incorporates a one-bedded obstetric HDU with the recommended equipment except facilities for invasive monitoring.<sup>7</sup> The obstetric HDU is staffed by Registered Midwives supervised by Advanced Midwifery Practitioners. The immediate medical cover includes the Obstetric and Anaesthetic teams. The hospital Obstetric team is comprised of 6 consultants, 8 Registrars and 6 Senior House Officers. There is a Critical Care outreach team,

which is easily approachable.

The data collected included indications for hospital and HDU admissions, admission gestation, ante natal versus post natal HDU admissions, clinical management of the patients admitted to HDU, duration of stay in HDU /hospital and maternal outcome. The study was approved by the Trust audit department. Patients were identified by HDU admission register. Case notes were retrieved by Trust audit department. Data were recorded and analyzed in Microsoft Excel.

## RESULTS

During study period, 5608 mothers delivered at the maternity unit while 33 patients were admitted to HDU with admission rate of 0.58%. Four patients were admitted to general ICU for level 3 care (0.07%) and subsequently transferred back to HDU for step-down care. Of total 37 patients admitted to HDU and ICU, 32 notes were retrieved and included in the study. The background characteristics and duration of stay are shown in Table 1.

**Table 1. Background Characteristics of patients admitted to HDU/ICU(N=32).**

	Mean	Range	Number (%)
Age (years)	29.2	18 - 39	
Parity	1.1	0 - 5	
Gestational age at admission (weeks)	36.5	26 - 41	
Singleton Pregnancies			29 (90%)
Twin pregnancies			3 (10%)
IVF pregnancies			2 (6%)
Stay in HDU care (hours)	24	6 - 56	
Total hospital stay (days)	4	2 - 7	

31(97%) patients were antenatal on admission. One patient was delivered at home and was admitted with a postpartum hemorrhage. All 28 patients who were admitted to HDU were transferred to a general ward for subsequent care. There was no transfer from HDU care to general ICU for level 3 care. Indications for admissions to HDU/ICU are shown in Table 2.

**Table 2. Indications for Admission to HDU/ICU care.**

Obstetric Indications (N= 29, 91%)	Number (%)
Major obstetric haemorrhage	15 (47%)
Major obstetric haemorrhage+ pre-eclampsia	6 (19%)
Pre-eclampsia	6 (19%)
Uterine Rupture	2 (6%)
Non Obstetric Indications (N=3, 9%)	
SVT with Maternal hypotension	1 (3%)
Pneumonia	1 (3%)
SLE with progressive inflammatory Myelitis	1 (3%)
Causes for admission to Hospital(N=32)	
Cause	Number (%)
Ante partum haemorrhage	4 (12.5%)
Elective Caesarean Section	6 (19%)
Headache	3 (9.5%)
Induction of Labour	3 (9.5%)
Labour	6 (19%)
Community midwife referral with pre-eclampsia	6 (19%)
SROM	2 (6%)
Shortness of breath	1 (3%)
Post-Partum Haemorrhage	1 (3%)

Of note, 91% of patients were admitted due to obstetric causes with major obstetric hemorrhage being the most common indication for admission. Any blood loss in excess of 1000 ml was defined as major obstetric hemorrhage which further can be subdivided in to moderate (1000-2000ml) and severe >2000 ml.<sup>8</sup> Three patients had a major obstetric hemorrhage with an average blood loss of 5500 ml. One patient was admitted to ICU with supraventricular tachycardia and maternal hypotension. The maximum duration of stay in the ICU was 36 hours (mean 16 hours).

There was no maternal death. One patient underwent hysterectomy. The longest maternal hospital stay was 7 days. No long term maternal morbidity was noted. Regarding fetal outcomes, 7 babies were admitted into Neonatal ICU (NICU) due to prematurity. Among those babies who were admitted to NICU, two were delivered due to placenta praevia; one at 29 weeks and other at 35 weeks of gestation. Four babies were delivered prematurely due to severe pre-eclampsia; one at 26 weeks, two at 31 weeks and one at 32 weeks. One baby was delivered prematurely due to progressive systemic lupus erythematosus at 35 weeks needed NICU admission. There were 4 intra uterine fetal

deaths (12%); 3 as a result of massive abruption and 1 due to uterine rupture.

**Table 3. Obstetric outcomes.**

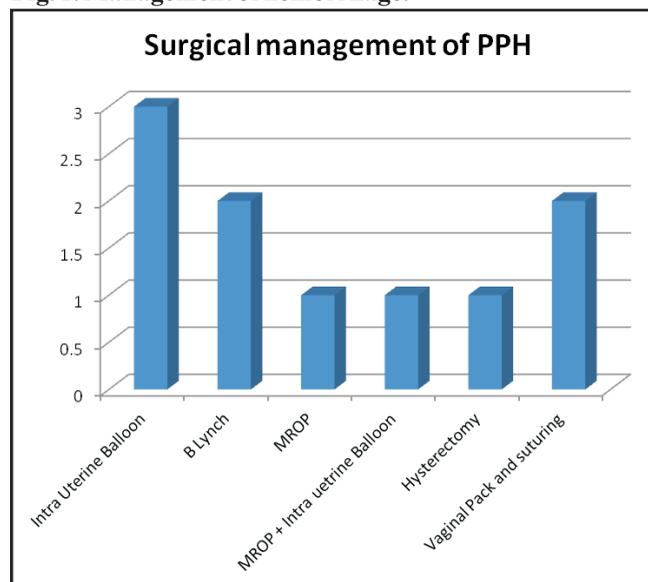
Mode of delivery (N=32) Number (%)	Indications for Caesarean section (N=19) Number (%)	
<b>Caesarean Section</b> <b>19(59%)</b>	Severe Pre-eclampsia 3(16%)	
Emergency	Previous 2 Caesarean 3(16%)	
13	Previous 3 Caesarean +placenta praevia 1(5%)	
Elective	APH 2(11%)	
6	Fetal distress 2(11%)	
<b>Instrumental delivery</b>	Suspected uterine rupture/scar dehiscence 2(11%)	
5(1%)	Breech presentation 1(5%)	
<b>Normal vaginal delivery</b>	Transverse lie 1(5%)	
8(25%)	Cord presentation twin1/MCDA	
	Twins 1(5%)	
	Failed instrumental 1(5%)	
	Bradycardia twin 2 1(5%)	
	SLE with progressive inflammatory myelitis 1(5%)	
<b>Fetal outcome in singleton pregnancies (n=29)</b>	<b>Mean</b>	
<b>Range</b>	<b>Number (%)</b>	
Fetal Weight (grams)	600-4720	2882
NICU admissions	7/29 (24%)	

**Table 4. Clinical management of patients admitted to ICU/HDU (N=32).**

Major Obstetric Haemorrhage (N=21) Number (%)	Mean	Range
<b>Post-Partum Haemorrhage</b> <b>16 (76%)</b>		
Atonic PPH	9	
Traumatic & atonic PPH	4	
Retained abnormally adherent Placenta	2	
Placenta accrete	1	
<b>Antepartum haemorrhage due to placenta praevia 2 (9.5%)</b>		<b>1500-9000</b>
<b>Antepartum haemorrhage due to abruption 3 (14.5%)</b>		<b>1 – 14</b>
<b>Estimated Blood Loss (ml)</b>		
<b>Blood products transfusion 18 (86%)</b>	<b>2885</b>	<b>1 – 6</b>
Packed red cells (units) 18 (86%)	3.5	
FFP 4 (19%)	3	1 – 2
Platelets 2 (10%)	1.5	
Cryoprecipitate 3 (14%)	2.6	2 – 4
<b>Hypertensive disorders of pregnancy (N=12)</b>	<b>Mean</b>	<b>Range</b>
No of antihypertensive medications used (100%)	2	1 – 3
Use of magnesium sulphate 8 (67%)		
Fluid restriction achieved 12 (100%)		
<b>No of Patients developed DIC 2 (6%)</b>		
<b>No of patients developed HELLP 2 (6%)</b>		
<b>No of patients received thromboprophylaxis 32 (100%)</b>		

Pharmacological measures controlled bleeding PPH in 6(37%) patients. 10 (63%) needed surgical intervention; intra uterine balloon tamponade, B Lynch tamponade suture and vaginal packing were commonest measures used (Fig. 1).

**Fig. 1. Management of hemorrhage.**



Regarding management of severe pre-eclampsia, the trust follows the Yorkshire regional guidelines for its management.<sup>9</sup> This involves adequate control of blood pressure. Oral labetalol is our most common first line agent. When an additional drug is required, nifedipine is our drug of choice with hydralazine is only indicated in cases where labetalol is contraindicated. In our study, mean of 2 antihypertensive were used to control blood pressure with a range of 1 to 3 anti hypertensives. The Yorkshire guidelines instruct fluid restriction to 80 mL/hour in the peripartum period. This has led to a low rate of pulmonary edema in the mothers. This is in part is due to our tolerance of a low urine output. We allow up to 8 hours, with the equivalent of up to 80mls urine output in any 4 hours block, before intervention. In our study, only two patients had oliguria lasting more than eight hours needing intervention. Eight patients were given Magnesium sulphate in our study in severe pre-eclampsia to prevent Eclampsia. Thromboprophylaxis is essential to prevent potentially life threatening thromboembolic event. In our patients, 100%

achievement of thromboprophylaxis was seen. Details of management of patients with severe pre-eclampsia is shown in Table 4.

Among 12 patients with hypertensive disorder of pregnancy, six had concurrent major obstetric hemorrhage, two developed hemolysis, elevated liver enzymes and low platelets (HELLP), and 2 had deranged renal function with raised creatinine levels that resolved without need for dialysis. Two patients needed oxygen therapy during their HDU stay. One patient had pneumonia and other had previous history of pulmonary embolism.

## DISCUSSION

For every maternal death, there are approximately 118 events of 'near miss mortality' or 'severe maternal morbidity' (SMM).<sup>10</sup> Irish data from the NPEC Severe Maternal Morbidity (SMM) Audit for 2011 reported an overall incidence of SMM of 3.8/1000.<sup>11</sup> The UK Department of Health defined HDU as a level of care in between a general ward and an intensive care unit (ICU).<sup>12</sup> The provision of HDU beds in every consultant led obstetric unit in UK was recommended by the 1985-87 confidential enquiry into maternal mortality report.<sup>13</sup>

The basis for this recommendation is that obstetric causes account for the majority of critical illness and subsequent HDU admissions in an obstetric population.<sup>5,14</sup> In our study, 91% patients had obstetric related causes for admissions with major obstetric hemorrhage and hypertensive disorders together accounted for 85% of cases. These findings are in line with the review of 30 studies by Zeeman who identified that the most common contributors for intensive care unit admission are hypertensive disorders and massive obstetric haemorrhage.<sup>15</sup>

Major obstetric hemorrhage was found to be the commonest cause for severe maternal morbidity by Scottish Confidential Audit of Severe Maternal Morbidity.<sup>16</sup> It had an incidence of 5.0 per 1000 live births.<sup>16</sup> The Royal College of Obstetricians and Gynaecologists recommends early resort to surgical intervention if pharmacological measures fail to arrest bleeding.<sup>8</sup> In our study, 63% of patients needed surgical interventions along with pharmacological treatment to secure hemostasis.

Hypertensive disorders of pregnancy was the second main contributor to HDU admissions, after major hemorrhage in our study. Following recommendations by UK confidential enquiries in to maternal mortality,<sup>17</sup> Yorkshire regional guidelines for the management of severe pre-eclampsia and eclampsia were established to avoid the diversity in the care of these women across the region.<sup>9</sup> These guidelines are followed by our unit. They also addresses the complex issues of fluid management in these patients which can be a challenging situation as the risk of pulmonary oedema is a major concern. Fluid restriction to 80 ml /hour was implemented and, only two patients (6.2%) developed oliguria which is comparable to regional results.<sup>18</sup>

Pathophysiology of pre-eclampsia and Eclampsia differs from many of the other pathologies dealt with in level 3 intensive care. Level 2 Obstetrics HDU is a better placed to manage these women with direct management by obstetricians and midwives in conjunction with Obstetrics anesthetist unless there is clear evidence of need for ventilation. The Confidential Enquiry into Maternal Mortality report from 1988-1990 documented that high dependency facilities were inadequate across the UK.<sup>19</sup> Two subsequent surveys have established that the dedicated obstetric HDU provision was limited to 39-41% of consultant led obstetrics units in UK.<sup>20,21</sup>

## CONCLUSION

On site obstetric HDU has numerous benefits. It allows women to be cared by obstetricians with detailed knowledge in pregnancy related complications which compromise the major patient category. Their care by qualified midwives facilitates appropriate fetal monitoring in the antenatal setting. Obstetric rather than general HDU care allows bonding between mother and the new born; this may enhance recovery. Therefore, the availability of in-house dedicated obstetric HDU facilities for all maternity units is recommended.

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Conception and design: Ayesha Anwar  
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