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The High Dependency Unit in the Management of Critically Ill Obstetric Patients in Low Resource Countries.

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Abstract

The care of the obstetric population requiring critical care at the intensive care unit is associated with challenges that have made the establishment of obstetric high dependency units (HDU) a priority in the developed unlike low resource countries.

The objective was to evaluate the need to establish obstetric HDUs in low resource countries.

The study was a retrospective descriptive study of obstetric patients admitted into the intensive care unit of the University of Ilorin Teaching Hospital from 1st January 2010 to30th June 2013. Those that were suitable for management at a HDU were compared with those who needed ICU care. The statistical analysis was with SPSS version 20 with p-values, x2 and odds ratio; p value <0.05 was considered significant.

All the 52 patients were postpartum; 16(30.8%) were suitable for HDU care. Of the HDU eligible patients, 11(68.8%) were of low social class, 12(75%) were booked, 11(68.8%) had no further complication at ICU and mortality was 1(6.25%). Compared to those who needed ICU care, there were no statistical significance in maternal age, parity, duration of ICU admission and total cost of ICU care. There were more cases with statistical significance of organ involvement (p<0.001), severity of Glasgow coma score at admission (p<0.001), further complications at ICU (p<0.001) and maternal mortality (p<0.001) among those needing ICU care compared to those needing HDU care.

In conclusion, establishment of the HDU will reduce cost and the burden on the few ICUs in low resource countries without increasing maternal mortality.

Keywords: High dependency unit, critically ill obstetric patients, low resource countries

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Introduction

Globally, over half a million women die annually as a result of complications of pregnancy, many more suffer varying degrees of acute maternal morbidities resulting in critical maternal illness necessitating critical care at the Intensive Care Unit (ICU) during pregnancy or puerperium. Obstetric

patients requiring intensive care range from 0.2 to 0.4% of all deliveries (Anwari et al., 2004; Lapinsky et al., 1997; Kilpatrick et al., 1992) and constitute 0.4 to16.0% of all admissions into the ICU (Anwari et al., 2004; Lapinsky et al., 1997; Kilpatrick et al., 1992; Pollock et al., 2010; Rios et al., 2012). Interventions at the ICU include therapeutic interventions like antihypertensive, inotropic agents and magnesium sulphate; arterial line insertion, central venous pressure monitoring and mechanical ventilation among others. A major limitation in the low resource countries is the limited availability of ICUs and non-availability of spaces for obstetric patients since most of the ICUs are multispecialised admitting patients from all medical specialties. This is coupled with the higher cost of ICU management in relation to the endemic poverty among the populace with resource-challenged hospitals.

This brings to the fore the role of the obstetric High Dependency Units (HDU). These are higher levels of care which lie in between a general ward and ICU care (NHS 1996); it is suitable for providing basic respiratory and single organ support. It may be as small as a three bedded unit with multidisciplinary staffing (midwifery, obstetric, anesthesia) providing invasive monitoring but usually no mechanical ventilators. It has been reported that a HDU can cater for the need of at least half of the obstetric population in need of critical care and also help in cost reduction since a major issue in ICU care is the higher cost (Zeeman 2006). Therefore, there is the need to evaluate the need for HDU services in low resource countries in order to provide easier access to obstetric patients requiring critical care.

The objective of this study was to evaluate the need for the establishment of obstetric HDUs in low resource countries like Nigeria.

Materials and Methods

The study was a total population study of all obstetric patients admitted at the Intensive care unit (ICU) of the University of Ilorin Teaching Hospital (UITH), Ilorin, Nigeria from 1st January 2010 to 30th June 2013. The ICU is a multispecialised four-bedded unit with facilities for multiparameter monitoring and functioning mechanical ventilators. It receives patients from all medical and surgical units in the hospital as well as referrals from other centers.

The ICU admission register was screened and a list of all obstetric patients admitted during the study period was compiled; the case files were retrieved from the medical records department of the hospital for analysis.

The inclusion criteria were admission in the ICU during pregnancy or within 42days of its termination and the case files must be available for review. Exclusion criteria were non obstetric patients and obstetric patients whose case files were not available for review.

For this study, a HDU was defined as a critical care unit that provides all care in the ICU except mechanical ventilation. The participants suitable for HDU management were identified based on the above definition and referred to as HDU eligible and compared with those who actually required ICU care referred to as ICU eligible. The data used for this study were obtained from an audit of management of critically ill obstetric patients at the ICU of this hospital.

The data obtained included socio-demographic and obstetric parameters, indication and clinical state at ICU admission, care, complications, duration and final outcome of ICU admission. Data analysis was by using the SPSS version-20 and p-values, chi-square and odds ratio with 95% confidence interval were calculated; p value <0.05 was termed significant.

The study was approved by the UITH ethical board, sponsorship was by the researchers and there was no conflict of interest in the conduct of the study.

Results

A total of 52 case files were available for review; of these, 36(69.2%) were ICU eligible while 16(30.8%) were HDU eligible. Table 1 showed that the mean age of ICU and HDU eligible patients were 29.36±5.561 and 28.22±5.045 (p=0.766), the mean

parities were 2.00±1.585 and 1.88±1.628 (p=0.796). Also, there were no statistical significance in the booking status (p=0.131, OR 0.333, CI 0.090-1.231), level of education (p=0.232, OR 2.333, CI 0.696-7.823) and social class (p=0.506, OR 0.629, CI 0.168-2.346) of the participants.

The indications for admission into the ICU are presented in Table 2; the pattern was similar among both the ICU and HDU eligible patients with massive postpartum haemorrhage (11(30.6%) vs. 8(50%); p 0.4913) and severe preeclampsia/ Eclampsia (11(30.6%) vs. 4(25%); p 0.0707) as the two leading indications for ICU admission.

Table 3 shows the presentation, care and outcome of ICU admission. From it, 10(27.8%) ICU eligible 28(77.8%) of ICU eligible and 15(93.8%) HDU eligible were hypoxic at ICU admission (p=0.245, OR 0.23, CI 0.01-2.20). None of the HDU eligible had systolic blood pressure <90mmHg, 16(44.4%) ICU eligible and 10 (62.5%) HDU eligible had blood pressure 90-139mmHg (p=0.1472, OR 1.63, CI 1.20-2.20) while 15 (41.7%) ICU eligible and 6(37.5%) HDU eligible had systolic blood pressure ≥140mmHg (p=0.4768, OR 0.64, CI 0.16-2.58). In addition, 34(75.6%) ICU eligible and 11(68.8%) HDU eligible had organ dysfunction at ICU admission (p=0.023) while 31(86%) ICU eligible and 5(31.2%) HDU eligible had further complications at the ICU (p=<0.001). The mean durations of admission were 3.47±2.613 for ICU eligible and 3.56±3.966 for HDU eligible (p=0.923). The mean total cost of ICU admission in Naira were 48,347.22±35,370.25 for ICU eligible and 34,812.50±24,296.00 for HDU eligible (p=0.171)

Table 1: Socio-demographic characteristics of ICU and HDU eligible obstetric patients

Parameter	ICU eligible n=36 (%)	HDU eligible n=16 (%)	t-test	x^2	p-value	OR	95%CI
Mean age	29.36±5.561	28.88±5.045	0.299		0.766		
Mean parity	2.00±1.586	1.88±1.628	0.260		0.796		
Social class							
High	8(22.2)	5(31.2)					
Low	28(77.8)	11(68.8)		0.481	0.506	0.629	0.17-2.35
Booking status							
Booked	18(50.0)	4(25.0)					0.09-1.23
Unbooked	18(50.0)	12(75.0)		2.836	0.131	0.333	
Level of education							
None	13(36.1)	2(12.5)		1.54	0.3574	3.250	0.37-34.11
Primary	8(22.2)	4(25.0)		0.22	0.9999	1.000	0.11-8.93
Secondary	6(16.7)	3(18.7)		0.26	0.6913	1.560	0.21-11.93
Tertiary	9(25.0)	7(43.8)					

Table 2: Indications for admission into the intensive care unit

Indication	ICU eligible	HDU eligible	Sub total		
	n = 36 (%)	n= 16 (%)	n (%)	$_{\chi}2$	P value
Massive postpartum hemorrhage	11 (30.5)	8 (50.0)	9 (100.0)	0.474	0.4913
Severe preeclampsia/ Eclampsia	11 (30.5)	4 (25.0)	15 (100.0)	3.267	0.0707
HELLP syndrome	2 (5.6)	1 (6.2)	3 (100.0)	0.333	0.5637
Amniotic fluid embolism	2 (5.6)	0 (0.0)	2 (100.0)	-	-
Puerperal/ post abortion sepsis	2 (5.6)	1 (6.2)	3 (100.0)	0.333	0.5637
Uterine rupture	4 (11.0)	2 (12.6)	6 (100.0)	0.667	0.4142
Complication of unsafe abortion	2 (5.6)	0 (0.0)	2 (100.0)	-	-
Peripartum Cardiomyopathy	2 (5.6)	0 (0.0)	2 (100.0)	-	-

Table3: Intensive care admission, care and outcome among participants

Variable	ICU eligible n=36 (%)	HDU eligible n=16 (%)	t-test	X^2	P value	OR	95%CI
Condition at admission							
Pregnant	5(13.9)	0					
Postpartum	28(77.8)	16(100.0)		2.70	0.1582	1.57	1.26-1.96
Post abortion	3(8.3)	0		1.65	0.5411	0.00	0.00-4.53
GCS							
Mild	2(5.5)	9(56.3)					
Moderate	10(27.8)	5(31.2)		6.00	0.0401	0.111	0.01-0.93
Severe	24(66.7)	2(12.5)		4.42	0.0787	0.17	0.02-1.24
SPO_2							
Hypoxia	28(77.8)	15(93.8)					
Normal	8(22.2)	1(6.2)		1.974	0.2451	0.23	0.01-2.20
Respiratory rate							

Tachypnea	35(97.2)	14(87.5)					
Normal	1(2.8)	2(12.5)		1.926	0.2210	0.20	0.01-3.19
Pulse rate							
Normal	6(16.7)	7(43.7)					
Tachycardia	30(83.3)	9(56.3)		4.333	0.0791	0.26	0.06-1.15
Systolic BP							
<90	5(13.9)	0					
90-139	16(44.4)	10(62.5)		2.84	0.1472	1.63	1.20-2.20
≥140	15(41.7)	6(37.5)		0.51	0.4768	0.64	0.16-2.58
Organ dysfunction							
Yes	34(94.4)	11(68.8)					
No	2(5.6)	5(31.2)		6.278	0.0232	7.73	1.08-68.44
Organs involved							
1 organ	19(52.8)	8(50.0)					
≥2 organs	15(83.3)	3(18.8)		0.98	0.4824	0.47	0.08-2.51
Complication at ICU							
Yes	31(86.1)	5(31.2)					
No	5(13.9)	11(68.8)		15.307	<0.001	13.64	2.76-75.38
Mean duration of admission	3.47±2.613	3.56±3.966	-0.097		0.9232		
Mean total cost (naira)	48347±35370	34812±24296	1.388		0.1711		
Final outcome							
Alive							
Dead	12(33.3)	15(93.8)		16.20	<0.001	0.03	0.00-0.30
	24(66.7)	1(6.2)					

Discussion

In this study, 30.8% of the patients managed at the ICU were HDU eligible and would have been effectively managed at a HDU. This was similar to reports of Bhat et al., 2013 that 32.3% of ICU admissions were appropriate for HDU care and Zeeman, 2006 who concluded that a HDU care would have sufficed for 50% of obstetric patients requiring higher critical care. Thus, in the face of few ICUs in low resource countries, HDUs will reduce the burden on the ICUs as they have been shown to reduce ICU admissions as reported by Ryan et al., 2000. In addition, there was no statistical significant difference in the cost of care and duration of admission among ICU eligible and HDU eligible but managed in the ICU patients from this study. This further supports the conclusion of Zeeman, 2006 that a HDU provides opportunity for cost reduction in managing critically ill obstetric patients; bearing in mind that 68.8% of HDU eligible patients in this study were of low social class. The pattern of indications for admission into the ICU were similar between the two groups studied; thus, if established, the HDU will be

relevant as the indications or admission into them abound and PPH as the commonest indication for admission among HDU eligible participants was similar to the report of Saravanakumar et al., 2008. Among the HDU eligible women, 75% had no form of antenatal care and all were admitted for obstetric reasons. This was similar to the report from a HDU in India where 84.2% of the women had no antenatal care and 68.2% were admitted for obstetric reasons (Dattaray et al., 2013). It was not unusual that there were no statistical significance among ICU and HDU eligible women in terms of the systolic blood pressure, oxygen saturation, pulse rate and respiratory rate at admission into the ICU because these were effects of the need for systemic support which are the main criteria for critical care which are rendered at both ICU and HDU. The severity of the Glasgow coma score and multiple organ involvement may explain the statistical significance in the development of further complications after ICU admission in the two groups. This brings to the fore the distinction in the criteria for HDU care which emphasizes basic

respiratory support and single organ involvement. Thus, if these criteria are adhered to there should not be an increase in maternal mortality following the establishment of HDUs in low resource countries. The low mortality rate of 6.25% among HDU eligible patients in this study was lower than mortality rates of 12.28% from a HDU by Sarvanakumar et al., 2008.

There is no doubt that scarcity of resources for health care services in low resource countries remain a major challenge in these regions. An obstetric HDU can be a two bedded unit like reported by Ryan et al., 2000 in Dublin or 14 bedded as reported in a center by Saravanakumar et al., 2008; the size will depend on the quantification of the need, available manpower and resources in each locality. Furthermore, a survey of provision of HDU services by the Liverpool women's NHS Trust showed that majority of the HDUs were manned primarily by midwives of whom 77% of the personnel training were provided in-house (NHS 1996) with effective service delivery. Thus, in-house training could be employed with additional invited resource persons for personnel to man HDUs where release of personnel for overseas training may hinder availability of personnel in facilities in low resource countries.

Conclusion/ Recommendations

This study showed that about a third of patients admitted into ICU were HDU eligible with similar cost, duration of stay and lower mortality. We recommend the establishment of HDUs in low resource countries the size of which will depend on available resources with in-house training for

midwives who can primarily man the units with obstetrician and anesthetist supervision.

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