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Richa F, Karim N, Yazbeck P. Obstetric admissions to the intensive care unit : An eight-year review. *J Med Liban* 2008 ; 56 (4) : 215-219.

ABSTRACT • BACKGROUND : Between 0.1 and 0.9% of women develop complications of pregnancy that require admission to an intensive care unit (ICU). The purpose of this study was to review all obstetric patients admitted to the ICU over an 8-year period to determine the causes and outcomes of these admissions and the frequency and causes of maternal mortality.

METHODS : This retrospective study was based on all obstetric patients admitted to the ICU at Hôtel-Dieu de France hospital (January 1998-December 2005). Data collected includes maternal age, gestational age, parity, past medical and obstetric history, delivery data, indication for ICU transfer, complications, ICU length of stay and death during hospitalization. Specific interventions were recorded.

RESULTS : A total of 15 patients were admitted during the 8 years. The frequency of admissions was 0.24% of deliveries and obstetric patients represented 0.43% of all ICU admissions. The mean duration of stay in ICU was 7 ± 5 days. The indications for admissions were preeclampsia (26.7%), sepsis (26.7%), obstetric hemorrhage (20%), cerebral encephalopathy (6.65%), amniotic fluid embolism (13.3%) and pre-existing medical problems (6.65%). Fourteen patients (93%) had invasive monitoring and 9 patients (60%) required ventilation. There were five deaths, representing 33.3% of obstetric ICU admissions.

CONCLUSION : The need for maternal intensive care should be one of the most important measure considered in the quality of maternal care. Early admission and management of critically ill obstetric patients in the ICU may decrease maternal mortality and morbidity.

INTRODUCTION

Maternal death is a particularly tragic event because pregnant women are usually young and healthy. Despite therapeutic advances during this century, deaths of preg-

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RÉSUMÉ • OBJECTIF : Entre 0,1 et 0,9% de femmes développent des complications obstétricales nécessitant une admission en réanimation (réa). Le but de cette étude est d'évaluer rétrospectivement les causes, issues et fréquence de toutes les complications obstétricales admises en réa à l'hôpital Hôtel-Dieu de France (HDF) à Beyrouth sur une période de huit ans.

MÉTHODES : Cette étude rétrospective (Jan 1998-Déc 2005) a été réalisée sur toutes les admissions obstétricales (AO) en réa à l'HDF. L'évaluation a porté sur les données suivantes : âge maternel, histoire obstétricale, âge gestationnel, parité, mode de délivrance, indications de l'AO en réa, complications, durée de séjour en réa et décès durant l'hospitalisation. Les interventions spécifiques sont notées.

RÉSULTATS : Un total de 15 parturientes ont été admises en réa en 8 ans. La fréquence des AO est de 0,24% des délivrances et les AO représentent 0,43% de toutes les admissions en réa. La durée moyenne de séjour en réa est de 7 ± 5 jours. Les indications d'AO en réa sont : toxémies gravidiques (26,7%), sepsis (26,7%), hémorragies (20%), troubles neurologiques (6,65%), embolies amniotiques (13,3%) et problèmes médicaux préexistants (6,65%). Quatorze patientes (93%) ont eu un monitoring invasif et 9 (60%) ont nécessité une ventilation artificielle. Cinq patientes sont décédées ce qui représente 33,3% des AO en réa.

CONCLUSION : Une unité de réanimation obstétricale est à considérer pour améliorer la qualité des soins périnataux. La prise en charge précoce des parturientes à risque dans une unité de soins intensifs peut diminuer le taux de morbidité et de mortalité.

nant women remain an important public health problem [1]. Maternal death has become an extremely rare event in developed countries, with rates between 5 to 10 per 100 000 deliveries [2], which has weakened its value as a quality-assurance indicator for maternity care. Current

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maternal mortality rates in developed countries were reviewed by Nagaya et al. [3] with reported incidences from 9.5/100 000 in Japan to 2.4/100 000 in Canada [4]. Between 0.1% and 0.9% of deliveries develop pregnancy-related complications requiring admission to an intensive care unit (ICU) [5].

Preeclampsia and obstetric haemorrhage are the leading causes of obstetric admissions to the ICU in the Western world and Asia [4, 6]. There is a growing evidence that admission of high risk obstetric patients to the ICU is associated with a fall in maternal mortality [5]. Some centers have obstetric ICUs but most use general ICUs to manage critically ill obstetric patients [4]. One of the indicators of maternal morbidity is transfer to an ICU [7].

Relatively few studies concerning obstetric ICU patients have been published. Scarpinato et al. [8] identified a serious lack of knowledge on obstetric critical care and called for increased reporting of data.

The aim of this study was to review retrospectively the pattern of all obstetric patients admitted to our ICU over the last eight years to determine the causes and outcomes of ICU admissions and the frequency and causes of maternal mortality.

METHODS

This institutional review board-approved study took place at Hôtel-Dieu de France, Saint Joseph University-affiliated hospital in Beirut, Lebanon, a 350-bed institution with a 28-bed ICU that includes separate medical, surgical and coronary care units. It hosts approximately 800 deliveries each year and serves as a high-risk, tertiary level III and perinatal center. The study involves the surgical ICU which is an eight-bed unit, staffed by members of the anesthesia department acting as "lead clinicians" together with trained intensive care nurses providing one-to-one patient care. None of the nurses were midwives.

This retrospective study was based on all obstetric patients who were admitted to the ICU during pregnancy or up to 42 days after delivery between January 1, 1998, and December 31, 2005. Following the ethics committee's approval, medical records were obtained for all such admissions. Coding protocol was established by the team before chart abstraction. Abstracted data included demographics (maternal age, gestational age, parity), past medical and obstetric history, prenatal history, delivery data, indication for ICU transfer, ICU complications, hospital length of stay, ICU length of stay and death during the hospitalization. Patients were grouped by antepartum or postpartum status and by admitting diagnosis.

Disseminated intravascular coagulation (DIC) was defined as low platelets ($< 100 \times 10^9/l$), decreased fibrinogen ($< 3 \text{ mg/l}$), prolonged prothrombin time (PT $> 14 \text{ s}$), prolonged partial thromboplastin time (PTT $> 40 \text{ s}$), and increased fibrin degradation products ($> 40 \mu\text{g/dl}$) [9]. HELLP syndrome was defined as a severe complication

of preeclampsia characterized by hemolysis, elevated liver enzymes and low platelet count [10]. Amniotic fluid embolism (AFE) was diagnosed on careful exclusion of other causes of acute onset of hypoxia, hypotension or cardiac arrest, and coagulopathy that occurred during labor and delivery or within 30 minutes after delivery. In fatal cases of AFE, histopathological findings were based on the detection of squamous cells or other debris of fetal origin in the maternal central pulmonary circulation [11]. Adult respiratory distress syndrome (ARDS) was defined as hypoxemic respiratory failure (arterial oxygen pressure less than 60 mmHg with a fractional concentration of oxygen in the inspired gas of at least 0.60), requiring mechanical ventilation, in which the chest roentgenogram showed bilateral alveolar infiltrates and the pulmonary artery capillary wedge pressure was less than 18 mmHg [12]. Multiorgan failure (MOF) implied failure of three or more critical physiologic systems, including respiratory, cardiac, central nervous system, hepatic or renal failure [13]. Specific interventions were recorded (arterial line, central venous pressure line, pulmonary artery catheter, ventilation, vasoactive drugs, total parenteral nutrition). All critically obstetric patients at our hospital were evaluated by consultants from critical care and admitted to the surgical ICU. Maternal mortality was used to determine outcome.

Data are presented when appropriate as means \pm SD.

RESULTS

There were 6286 deliveries at Hôtel-Dieu de France Hospital over the eight years of the study. Fifteen pregnant or postpartum women were admitted to the ICU. This constituted 0.43% of all ICU admissions and 2.4 ‰ deliveries. Five obstetric patients were transferred to our ICU from other hospitals. The mean age for all obstetric ICU admissions was 34 ± 4.5 years (range 26-44 years). Twenty-seven percent were primipara, 13% were secondipara, and 60% were multipara. The majority of obstetric patients were transferred after cesarean section (73.35%), 20% followed vaginal delivery. Only one patient (6.65%) was admitted in the antepartum period due to a noncardiogenic pulmonary edema following tocolytics. Gestational age at the time of ICU admission is shown in table I. Anesthesia was regional in 26.65% of cases and general in 66.7%. No anesthetic was given in 6.65% of cases.

TABLE I
GESTATIONAL AGE ON ADMISSION, OR AT DELIVERY BEFORE ADMISSION TO THE ICU

Gestational age	Total number	%
< 24 weeks	1	6.7
24-30 weeks	2	13.3
31-37 weeks	7	46.7
38 weeks	5	33.3

TABLE II
REASONS FOR ADMISSION
TO THE INTENSIVE CARE UNIT

Reason	Total number	%
Preeclampsia	4	26.7
Sepsis	4	26.7
Obstetric hemorrhage	3	20
Cerebral encephalopathy	1	6.65
Amniotic fluid embolism	2	13.3
Other (cardiomyopathy)	1	6.65

The reasons for admission to the ICU are summarized in table II. There were four cases of sepsis. Two patients were severely immunosuppressed and died; the first had a non-Hodgkin's lymphoma, became septic postpartum (from pneumonia) with MOF and died on the 10th day postpartum, and the second patient had an acute myeloblastic leukemia with septic shock and MOF, secondary to a severe myelosuppression after the second-line chemotherapy performed at 35 weeks' gestation. An emergency cesarean section was performed and the patient died two days postpartum. The other two patients were survivors; the first developed an aspiration pneumonia treated with antibiotics and mechanical ventilation, and the second developed a septic shock due to a pyelonephritis treated with antibiotics.

Four patients were preeclamptics. All of them had hemolysis, elevated liver enzymes and low platelets (HELLP syndrome). Acute renal failure developed in two patients who were treated with hemodialysis, with recovery on the 7th and 15th days respectively.

There were three cases of obstetric hemorrhage due to placenta praevia, placenta accreta and uterine atony. They bled more than two liters of blood. Two patients required surgical intervention and one patient had an arterial embolization to achieve hemostasis. One patient died six days after delivery with DIC and MOF because of obstetric hemorrhage, despite attempts to achieve hemostasis surgically and resuscitation with blood and blood products. She was transferred to our ICU from another hospital but her condition was unresponsive to medical treatment.

There were two admissions for suspected amniotic fluid embolism. The first patient became acutely hypoxic during cesarean section under general anesthesia. She developed a DIC and an ARDS. She died on the 5th day postpartum. Diagnosis was confirmed postmortem by finding fetal squamous cells in the maternal lung. The second was successfully resuscitated after a cardiac arrest during surgical delivery and had a postpartum hemorrhage with DIC requiring radiological intervention.

One patient was transferred from another hospital for aspiration pneumonia. A general anesthesia was requested for an urgent cesarean section with difficult intubation. This patient developed an hypoxic encephalopathy and died on the 9th day postpartum from an ARDS.

One patient was admitted to our ICU for preexisting cardiomyopathy with atrial fibrillation and pulmonary hypertension.

DIC developed in four patients, two of them died. Two patients had amniotic fluid embolism, one had hemorrhagic shock following placenta accreta and one had HELLP syndrome. Fresh frozen plasma, whole blood and platelets had been used for their treatment.

There were five maternal deaths (survival rate 66.7%) in the ICU.

Both patients with definite ARDS died, one from amniotic fluid embolism and the second from aspiration pneumonitis. The average duration of admission in the ICU was 7 ± 5 days while the average duration of admission in the hospital was 15 ± 8 days. Nine patients (60%) received mechanical ventilation (3 patients less than 72 hours) while six patients (40%) received oxygen via an intranasal catheter or facemask. Four of the 15 patients admitted to ICU developed secondary renal failure requiring hemodialysis, 11 patients needed transfusion and 14 patients needed antibiotics. Fourteen patients had invasive monitoring (central venous pressure, direct arterial pressure) but only five patients required pulmonary artery flotation catheters. No patients were readmitted following discharge from the ICU.

DISCUSSION

Pregnancy is a natural physiological process and in the majority of women, proceeds uneventfully. However, physiological and anatomical changes can cause severe morbidity and mortality in few women [14]. Maternal mortality is the most extreme adverse effect on the health of pregnant women. Complications during pregnancy or in the postpartum period can be life-threatening and require intensive care [7]. An intensive care unit offers the opportunity to improve patient care. Close observation in the ICU allows problems to be detected and in some cases, the complications may be prevented so the patient can recover more quickly. Care of critically ill patients can be managed more easily in the ICU [7].

Most women who ultimately ended up in intensive care had no prior risk factor except two patients, one with leukemia and the second with lymphoma.

In our institution, 0.16% of all deliveries needed to be transferred to the ICU. Admission from other hospitals were excluded from this figure. In other studies this rate varied between 0.10% and 0.9% [7, 15-16]. Demirkiran et al. [7] attributed their higher rate to the poor antenatal care.

Several investigators have reported that obstetric patients who have complications are selectively transferred to larger hospitals [4]. In our study, five critically ill obstetric patients were transferred to our ICU from other hospitals in which there was a lack of knowledge on the quality of perinatal care.

There was a preponderance of patients admitted after delivery in this study (94%). This is similar to the study reported by Wheatley et al. [15], which revealed that 92%

TABLE III
SPECIFIC CARE GIVEN TO PATIENTS AND CAUSE OF DEATHS

AGE (years)	Admission diagnosis	ICU stay (days)	ATB	Transfusion	Mec Vent	HD	Cause of death
32	Amniotic fluid embolism	5	+	+	+	-	DIC + ARDS
28*	Hemorrhagic shock	6	+	+	+	+	DIC + MOF
34	Lymphoma + Sepsis	10	+	+	+	+	MOF
26	Leukemia + Sepsis	2	+	+	+	+	MOF
30*	Hypoxic encephalopathy	9	+	-	+	-	ARDS

*Patients transferred from other hospitals
ICU : intensive care unit
ATB : antibiotics
Mec Vent : mechanical ventilation

HD : hemodialysis
DIC : disseminated intravascular coagulation
ARDS : adult respiratory distress syndrome
MOF : multiorgan failure

of obstetric admissions in their study were in postpartum patients. Mahutte et al. [4], Okafor and Aniebue [5] also reported a preponderance of postpartum admissions in their study.

In other studies, as in our institution, the most common indications for ICU admission were preeclampsia/eclampsia and postpartum hemorrhage [7, 15-16]. There were no admissions resulting from deep venous thrombosis or pulmonary thromboembolism in this series. Patients with preeclampsia/eclampsia accounted for 26.7% of all obstetric admissions in our study. Other studies also showed that these patients constitute the majority of obstetric admissions to ICU [5-6]. This is comparable to the admission pattern reported by Kilpatrick and Matthay [16] (22%) from the USA.

Patients with sepsis accounted for 26.7% in our study while Demirkiran et al. [7] and Umo-Etuk et al. [14] reported 9.6% and 13% of infections respectively. We attributed this high frequency to the severe immunosuppression reported in two patients due to non-Hodgkin's lymphoma and acute myeloblastic leukemia.

Obstetric hemorrhage was the second most common indication for ICU admission in this study representing 20% of obstetric admissions. Mahutte et al. [4] from Canada, Okafor and Aniebue [5] from Nigeria and Demirkiran et al. [7] from Turkey reported that obstetric hemorrhage was the commonest obstetric admission diagnosis to their ICUs at 26%, 22.2% and 30.3% respectively.

In our series, one patient (6.67%) had anesthesia-related complication resulting in admission to intensive care. Graham and Luxton [17] had three such admissions in their series, of which there was a case of respiratory failure after difficult intubation, a case of labile blood pressure intra-operatively and a case of anaphylaxis. Panchal et al. [18] quoted a 4.4% admission rate from anesthetic causes, and rated it as the sixth most common reason for admission. Tripathi et al. [19] reported a 26% admission rate from anesthetic causes, including one death.

Nine patients (60%) received mechanical ventilation which is similar to the 60% reported by Graham et al.

[17]. Cohen et al. [20] from Israel and Lapinsky et al. [21] from Canada reported 41% and 40% of mechanical ventilation respectively.

Mean length of ICU stay was higher than the reported length of stay in previous studies [2, 15]. In our study, this more prolonged stay may be attributed to the admission of more severe cases.

There were five maternal deaths in this study (mortality rate 33.3%) which is similar to the 33.3% reported by Okafor and Aniebue [5]. This rate is higher than the mortality rates reported from Europe and Asia. Kilpatrick and Matthay [16] and Umo-Etuk et al. [14] reported a mortality rate of 25% and 26% respectively, while Mahutte et al. [4] reported 2.3% and Jenkins et al. [6] 14%. Lapinsky et al. [21] attributed their low mortality rate (11%) to regular prenatal care. The majority of our patients were admitted postoperatively, which could have adversely affected the outcome in some cases. Preeclamptic/eclamptic patients might benefit from preoperative admission to the ICU for medical conditions optimization before anesthesia and surgery, instead of nursing them on the wards. There is also the need for cooperation between the obstetrician and anesthetist in the management of these high-risk patients. The availability of prenatal care may be an important factor in successful outcome in critically ill obstetric patients [21].

Two of the five deaths were transferred from other hospitals (one after an anesthetic complication and the second due to severe hemorrhage) leading to increase the rate of mortality in our hospital. The primary care of these patients were unknown. Optimum care of the circulation and respiration at an early stage can clearly minimize the incidence of multiorgan failure and late mortality in all critically ill obstetric patients. Failure to provide optimum care has been shown repeatedly by several reports [2, 5] to be associated with increased morbidity and mortality.

Although 93% of patients had invasive monitoring (central venous pressure, direct arterial pressure), only 33% of patients required pulmonary artery flotation catheters. This was similar to the series reported by

Killpatrick and Matthay [16]. In our study, severe cardiovascular dysfunction and sepsis were the indications for the use of pulmonary artery catheters.

CONCLUSION

While clinical guidelines and recommendations based on unusual events such as maternal deaths may be of limited value in medical care of the general obstetric population, information on severe acute maternal morbidity as evidenced by near miss cases and use of ICUs may help to audit the quality of maternal care in a more meaningful manner. A close follow-up of high risk patients and an optimal stabilization of their condition before intervention are well known to improve the outcome of these patients and decrease the morbidity and the mortality [1-2, 5, 7]. Physicians in the ICU should be familiar with the complications of pregnancy and should work closely with obstetricians in order to improve maternal outcome in these patients. The admission rate to intensive care and the problems faced by critically ill parturients may be reduced by providing optimal prenatal care, improving the management of hypertensive disease during pregnancy and reducing the incidence of hemorrhagic complications.

The pattern of obstetric admission to our ICU is similar to that in Europe and Asia, but the mortality rate is generally higher. Early admission of patients and availability of invasive monitors will help in reducing the mortality rate. The multidisciplinary approach has been recommended by the reports to improve patient outcome and maternal mortality.

Of course, the need for maternal intensive care should not be the only criteria considered in the quality of maternal care but it must be one of the most important ones.

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استشفاء النفاسيات في العناية الفائقة خلال ٨ سنوات

موجز : 0.1 الى 0.9 % من النفاسيات ابدن إختلاطات ولادية اضطرت حالتهم الى انعاش. هدف هذه الدراسة تقدير الاسباب استرجاعياً، سببها وعدد الإختلاطات التوليدية، تويعن في قسم الانعاش في مستشفى أوتيل ديو دو فرانس في بيروت خلال ٨ سنوات. الطرق : هذه الدراسة الاسترجاعية (كانون الثاني يناير 1998 كانون الاول 2005 ديسمبر) تمت على دخول قسم الانعاش في مستشفى أوتيل ديو.

استند التقويم على العمر وتاريخ الولادة وعمر الحمل وعدد الولادات السابقة وطريقة الخلاص وسبب دخول الانعاش والإختلاطات ومدة البقاء في الانعاش والوفيات اثناء الاستشفاء، وذكرت المداخلات النوعية.

النتائج : 15 نفاسية ادخلن الى قسم الانعاش خلال ٨ سنوات. نسبة الدخول 0.24 % بسبب الخلاص و 0.43 % نسبة دخول الانعاش عامة، مدة البقاء 7 ± 5 أيام - استطبابات الدخول : الانسمام الحم 26.7 %، الانتان 26.7 %، نزف 20 % اضطرابات عصبية 6.65 %، صمة (جلطة) امنوسية 13.3 % واضطرابات صحية سابقة 6.65 % أربعة عشرة نفاسية 93 % وضعن تحت المراقبة المشددة و 9 (60 %) اضطرن الى استعمال التهوية الآلية، توي في 5 أي 33.3 % في قسم الانعاش.

الخلاصة : وحدة الانعاش التوليدية هي هامة لتحسين الاعتناءات بعد الولادة. يجب الاهتمام الباكر بالنفاسيات اللواتي لديهن بعض الخطر في وحدة الانعاش الفائقة للاقلال من الوفيات والأمراض.