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Retrospective review of critically ill obstetrical patients: a decade's experience

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Aim: To investigate the reasons for the admission of obstetrical patients to the intensive care unit (ICU) and their clinical outcomes, to compare the roles of the current scoring systems in estimating the mortality of these patients, and to determine adverse prognostic factors in critically ill obstetrical patients.

Materials and methods: Data were retrospectively obtained from obstetrical patients admitted to the ICU in our institution between January 1999 and April 2009. Demographic characteristics, Acute Physiology and Chronic Health Evaluation II (APACHE II) score, Sequential Organ Failure Assessment (SOFA) score, and Glasgow Coma Scale (GCS) score of patients at the time of their first ICU admission were recorded. Patients were divided into 2 groups for comparison: Group 1, patients who died in the ICU, and Group 2, patients who were discharged from the ICU.

Results: Preeclampsia, eclampsia, and the hemolysis, elevated liver enzymes, and low platelet count syndrome (HELLP) were the most common diagnoses requiring ICU admission (65.1%). APACHE II, SOFA, and GCS values were significantly worse in Group 1 patients compared with Group 2 patients ($P < 0.05$).

Conclusion: Scoring systems help to determine the probability of mortality in obstetrical patients. Utilizing these scoring systems may prevent both the unnecessary admission of low-risk patients and delayed ICU care for critically ill patients.

Key words: Obstetrical patients, intensive care, maternal mortality, maternal morbidity

Kritik obstetrik hastaların retrospektif değerlendirilmesi: On yıllık deneyim

Amaç: Bu çalışmanın amaçları, obstetrik hastaların yoğun bakım ünitesine (YBÜ) kabul nedenlerini ve klinik sonuçlarını araştırmak, son yıllarda yaygın olarak kullanılan skorlama sistemlerinin bu hastalarda mortalite tahminindeki rollerini karşılaştırmak ve kötü prognostik faktörleri belirlemektir.

Yöntem ve gereç: Veriler Ocak 1999 ile Nisan 2009 tarihleri arasında kurumumuzda yoğun bakıma yatırılan obstetrik hastalardan retrospektif olarak elde edildi. Demografik karakteristikler, Akut Fizyoloji ve Kronik Sağlık Değerlendirme II (APACHE II) skorlaması, Sekansiyel Organ Yetmezliği Skorlaması (SOFA) ve Glasgow Koma Skorlaması (GKS) değerleri kayıt altına alındı. Hastalar karşılaştırma için: Grup 1, YBÜ'nde ölen hastalar, Grup 2, YBÜ'nden taburcu olan hastalar olarak 2 gruba ayrıldı.

Bulgular: Yoğun bakıma en sık kabul nedeni olarak preeklampsi/eklampsi/HELLP (% 65,1) tanıları gözlendi. APACHE II, SOFA ve GKS değerleri karşılaştırıldığında Grup 1 hastaların sonuçları Grup 2 hastalara oranla istatistiksel olarak anlamlı olarak daha kötüydü ($P < 0,05$).

Sonuç: Skorlama sistemleri obstetrik hastalarda mortalite olasılığını belirleme açısından yararlıdır. Bu skorlama sistemlerinin kullanımıyla; yoğun bakımlara düşük riskli hastaların gereksiz kabulü veya kritik hastalarda gecikmiş YBÜ bakımı önlenebilir.

Anahtar sözcükler: Obstetrik hastalar, yoğun bakım, maternal mortalite, maternal morbidite

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Introduction

Maternal death is a tragic event, as pregnant women are generally young and healthy patients (1). Despite developments in diagnosis and treatment, maternal death is still a serious public health problem (2,3). The transfer of an obstetrical patient to the intensive care unit (ICU) is considered to be an indicator of maternal morbidity (4). The complications that develop during pregnancy or in the postpartum period may be life-threatening and may require ICU transfer (3).

Close ICU follow-up enables the early recognition of complications that might develop and contributes to the recovery process. Treatment of critically ill obstetrical patients is facilitated in the ICU. The prevention of hypertensive seizures (which may cause cerebral hemorrhage) by hemodynamic monitoring is one example of the importance of ICU management. In addition, specific ICU treatment protocols to prevent and treat organ dysfunction are applied at an early stage.

It is important to distinguish cases that require ICU treatment from those that may be safely monitored in intermediary care and obstetrical units. Withholding treatment in cases requiring ICU care increases maternal morbidity and mortality, while unnecessary use of resources results in significant economic losses (5,6). Morbidity and mortality scoring systems may aid in making this distinction. Such scoring systems have been developed for use with ICU patients and are primarily utilized as predictors of outcome (7,8).

Today, the significance of ICU management in preventing obstetrical related mortality and morbidity has increased. Retrospective studies provide knowledge, experience, and treatment methods on the subject, since performing prospective studies is very difficult. The aims of this study were to investigate the reasons for the admission of obstetrical patients to the intensive care unit and their clinical outcomes, to compare the roles of the current scoring systems in estimating the mortality of these patients, and to determine adverse prognostic factors in critically ill obstetrical patients.

Materials and methods

Data were retrospectively obtained from obstetrical patients admitted to the ICU in our institution between January 1999 and April 2009. Upon the patient's admission to the ICU, the demographic characteristics, maternal age, gestational age, ICU admission diagnosis, comorbidities, Acute Physiology and Chronic Health Evaluation II (APACHE II) score, Sequential Organ Failure Assessment (SOFA) score, and Glasgow Coma Scale (GCS) score of patients were recorded. After these scores were calculated, the poorest values within the first 24 h of ICU admission were included for evaluation.

Cases were evaluated by the duration of ICU stay, procedures performed in the ICU, transfusion requirements, mechanical ventilation treatment, and use of dialysis and vasopressor requirements.

Patients were divided into 2 groups for comparison: Group 1, patients who died in the ICU, and Group 2, patients who were discharged from ICU.

Statistical analysis

In the statistical evaluation of variables and categorical comparisons, Fisher's exact test or the chi-square test was used. For comparing independent variables showing a normal distribution, Student's t-test was used. For variables not showing a normal distribution, the Mann-Whitney U test was applied. Descriptive statistics for categorical variables are shown using numerical and percentage values. Variables showing a normal distribution were indicated using the mean ± standard deviation, and variables not showing a normal distribution were indicated with the median. $P < 0.05$ was considered statistically significant.

Results

A total of 6286 patients were monitored in our ICU between January 1999 and April 2009. Of the 6286 patients, 63 (1%) were admitted to the ICU for obstetrical reasons. Demographic characteristics are shown in Table 1. Of the 63 patients, 50 were discharged from the ICU and 13 (20.6%) patients died while still in the ICU.

Table 1. Patient characteristics.

	Group 1 (n = 13)	Group 2 (n = 50)
Maternal age, years (mean ± SD)	30.23 ± 6.8	28.38 ± 6.5
Gestational age, weeks (mean ± SD)	30.67 ± 12.4	31.64 ± 7.7
Number of gestations, median (min-max)	2 (0-3)	2 (1-5)
Number of labors, median (min-max)	0.5 (0-2)	1 (0-4)
Medical history, n (%)**		
Absent	9 (69.2%)*	49 (98%)
Present	4 (30.8%)*	1 (2%)

* P = 0.001

** In Group 1: Cardiac valve disease in 1 patient, hypertension and diabetes mellitus in 1 patient, acute myelocytic leukemia and hepatitis in 1 patient, and systemic lupus erythematosus in 1 patient. In Group 2: Hypertension in 1 patient.

No statistically significant difference was found between the 2 groups with regards to maternal or gestational age, gravida, and parity (P > 0.05, Table 1).

Preeclampsia, eclampsia, and the hemolysis, elevated liver enzymes, and low platelet count syndrome (HELLP) were the most common (65.1%) reasons for admission. Following these were hemorrhage (9.5%) and disseminated intravascular coagulation (DIC) (9.5%, Table 2).

In Group 1, 9 (69.2%) patients were without comorbidities, while 4 (30.8%) had comorbidities (cardiac valve disease in 1 patient, hypertension and diabetes mellitus in 1 patient, acute myelocytic leukemia and hepatitis in 1 patient, and systemic lupus erythematosus in 1 patient). In Group 2, 49 (98%) of patients were without comorbidities; only 1 patient had hypertension. When past medical history was compared, the probability of having a comorbid condition was significantly higher in Group 1 patients versus Group 2 patients (P < 0.05, Table 2).

With regards to the APACHE II, SOFA, and GCS values, Group 1 patients fared significantly worse than Group 2 patients (P < 0.05, Table 3). The sensitivity and specificity of an APACHE II score above 12.5 in determining mortality was 69.2% and 70.0%, respectively. The sensitivity and specificity of a SOFA score above 6.5 was 69.2% and 68.0%. The sensitivity and specificity of a GCS score below 12 was 53.8% and 80%.

Table 2. Reasons for admission to intensive care unit, n (%).

Pathology	Group 1 (n = 13)	Group 2 (n = 50)
Preeclampsia/eclampsia/HELLP	9 (69.2%)	32 (64%)
Postoperative hemorrhage	1 (7.7%)	5 (10%)
DIC	1 (7.7%)	5 (10%)
Ablatio placentae/placenta previa	1 (7.7%)	4 (8%)
Ectopic gestation rupture	1 (7.7%)	0
Respiratory insufficiency	0	2 (4%)
Infection	0	2 (4%)

HELLP: hemolysis, elevated liver enzymes, and low platelet syndrome, DIC: disseminated intravascular coagulation.

Table 3. Mortality/morbidity scores (mean ± SD).

	Group 1 (n = 13)	Group 2 (n = 50)	P
APACHE II score	18.15 ± 8.2	9.48 ± 7.1	0.001
SOFA score	8.77 ± 3.6	5.16 ± 3.4	0.002
GCS	9.23 ± 5.5	13.6 ± 2.9	0.001

APACHE: Acute Physiology and Chronic Health Evaluation, SOFA: Sequential Organ Failure Assessment, GCS: Glasgow Coma Scale (GCS).

The length of ICU stay was 7.69 ± 5.7 days in Group 1 patients and 7.16 ± 6.7 days in Group 2 patients. This was not found to be statistically significant. Mechanical ventilation was required in 13 (100%) patients in Group 1, with average duration of 6.46 ± 5.4 days. In Group 2, mechanical ventilation was required in 39 (78%) patients, with an average duration of 2.94 ± 4.3 days. Significantly more patients in Group 1 needed mechanical ventilation ($P < 0.05$). No statistically significant difference was found between groups with regards to transfusion of blood products (Table 4).

Other treatment protocols utilized in the ICU are illustrated in Table 5.

Discussion

Maternal mortality is the most devastating complication of pregnancy. ICU management may be necessary if life-threatening complications develop during gestation and in the postpartum period (3,7). There is a proven association between interhospital transfer and maternal death, and delays in disease diagnosis, treatment, and transfer to a higher care level (7). Thus, the significance of ICU mortality scoring systems has gradually increased.

Of the 63 obstetrical patients admitted to the ICU, 50 of the 63 were discharged while 13 patients died, a mortality rate of 20.6%. Previous studies have shown

Table 4. Intensive care monitoring values (mean ± SD).

	Group 1 (n = 13)	Group 2 (n = 50)
Period of stay in intensive care, days	7.69 ± 5.7	7.16 ± 6.8
Mechanical ventilation period, days	6.46 ± 5.4*	2.94 ± 4.3
Blood and blood product transfusion, units		
Blood	4.85 ± 5.4	2.62 ± 2.9
FFP	3.77 ± 4.8	1.70 ± 2.6
Thrombocyte	3.92 ± 6.9	1.72 ± 3.7

*$P < 0.05$

Table 5. Applications in the intensive care unit, n (%).

	Group 1 (n = 13)	Group 2 (n = 50)	P
CVP monitorization	13 (100%)	37 (74%)	0.036
IAP monitorization	13 (100%)	30 (60%)	0.006
Vasoactive agent infusion	13 (100%)	3 (6%)	<0.0001
Hemodialysis	3 (23.1%)	6 (12%)	>0.05

CVP: central venous pressure; IAP: invasive arterial pressure.

a mortality rate between 0% and 36% in obstetrical patients admitted to the ICU, depending on the country (9,10). Collop reported a 20% mortality rate (4), while Mabie reported a 3.5% mortality rate (11). Our mortality rate was relatively higher, likely due to hemodynamic instability and respiratory failure requiring mechanical ventilation.

Lapinsky reported that low mortality rates were associated with regular antenatal care (12). Inadequate or absent prenatal care substantially increases the risk of mortality (2). The majority of our patients who required ICU treatment also had inadequate prenatal care.

We found no statistically significant difference between groups in maternal or gestational age, gravida, or parity. Our results confirmed those of Bhagwanjee (13), yet contradicted those of previous studies that concluded that advanced age and high parity were associated with adverse outcomes (14,15).

In our patients, preeclampsia, eclampsia, and HELLP syndrome were the most common (65.1%) reasons for ICU admission, followed by hemorrhage (9.5%) and DIC (9.5%). These diagnoses are confirmed to be associated with increased maternal morbidity and mortality (16,17). Early diagnosis of these conditions may prevent complications or decrease their impact on survival. Determining the causes of maternal morbidity and mortality will improve our understanding of how to manage obstetrical patients in the ICU.

Panchal (3) reported that comorbidities increase morbidity and mortality rates depending on their exacerbation during gestation. Similar to results demonstrated in the literature, the presence of comorbidities was higher in Group 1 patients compared to Group 2 patients.

We found that APACHE II, SOFA, and GCS scores were all valuable in predicting mortality. An APACHE II score above 12.5, SOFA score above 6.5, and GCS score below 12 were thresholds in predicting mortality. It has been reported that APACHE II scoring may be used in determining disease severity and clinical outcome, as well as estimating mortality in obstetrical patients in ICUs (13,18,19). In the literature, an APACHE II score between 6.8 and 11 has been quoted in obstetrical cases (18,20). Our findings confirmed this with a mean APACHE II score of 9.5 in surviving patients and 18.2 in those who died (21).

The adequacy of the APACHE II score remains controversial. Although it is commonly used in ICUs, some claim that this system may not be appropriate in young and healthy pregnant women (13,22). However, no difference has thus far been reported between nonpregnant and pregnant women with regards to the use of APACHE II scoring (19). Therefore, some recommend a different scoring system for pregnant patients (13). For this reason, we evaluated the SOFA and GCS scoring systems and found a significant difference in the SOFA score between patients who survived and those who did not (5.1 versus 8.7). Similarly, Oliveira Neto demonstrated a significantly higher SOFA score in obstetrical patients who died (7). Our results confirmed those in the literature, in that the GCS score alone was as effective as APACHE II in predicting mortality (13). As in Bhagwanjee's study, the low risk of mortality in patients with a GCS score above 10 has led researchers to conclude that paying closer attention to neurologic management of patients with low GCS scores is beneficial (13).

Invasive procedures are required during ICU treatment of obstetrical patients (7,23). When compared to the general ICU population, the more frequent use of invasive monitoring in obstetrical cases is due to the higher rate of pulmonary edema and hypertensive disorders observed (8). CVP and IAP monitoring are the most commonly utilized invasive procedures in the ICU. Invasive monitoring enables early recognition of problems and the prevention of complications, thus expediting patient recovery (11). For example, renal failure may be prevented by early protective renal treatment, and cerebral hemorrhage may be averted by optimal blood pressure regulation (21). In our study, invasive monitoring (CVP and IAP) was used in both groups. As observed in the literature, the need for invasive monitoring in Group 1 was higher than in Group 2. Vasopressors were used in all patients who died; thus, we suggest that their use may be an adverse prognostic factor.

Acute cortical necrosis preeclampsia is a cause of transitory renal failure, observed in approximately 4% of preeclampsia patients with renal failure (24). In our population, acute renal failure developed in 9 preeclampsia patients (7.8%) and renal function was recovered after hemodialysis.

Conclusion

Early admission and appropriate management of critical obstetrical patients to the ICU decreases maternal morbidity and mortality. Scoring systems are helpful as predictors of mortality in critically ill obstetrical patients. The recognition of adverse prognostic factors is important for ICU admission and monitoring. By considering all of these parameters in the management of high-risk obstetrical patients, the establishment of future guidelines will decrease maternal morbidity and mortality. Use of these treatment guidelines may prevent the unnecessary ICU admission of low-risk patients and delayed ICU monitoring in critically ill patients.

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