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Evaluation of Obstetric Patients Who Were Admitted to the Intensive Care Unit

Yoğun Bakıma Alınan Obstetrik Olguların Değerlendirilmesi

Received/Geliş Tarihi : 23.06.2017
Accepted/Kabul Tarihi : 09.08.2017

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Turkish Journal of Intensive Care published by Galenos
Publishing House.

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ABSTRACT Objective: To evaluate all obstetric patients admitted to intensive care unit (ICU).

Materials and Methods: Ninety-four obstetric patients were evaluated for age, mortality, preexisting disorders, the reason for admission, interventions performed during ICU stay, and the source of admission.

Results: The mean age was 29.1±5.5 years and the mean APACHE II score was 13.2±4.8. Most common reasons for intensive care admission were eclampsia (26%) and hemorrhage (20%). In 23 cases, there was at least one preexisting medical disorder and the most common disorder was valvular heart disease. The incidences of central venous catheterization, arterial cannulation, and hemodialysis were 39.4%, 79.8%, and 11.7%, respectively. Of the patients, 2 were admitted from the emergency room, 3 were from the ward, 55 were from operation room, and 34 patients were transferred from other hospitals. The mean length of stay in ICU was 4.7±7.1 days in patients transferred from another hospital, whereas it was 1.9±2.8 days in the patients admitted from other departments of our hospital (p<0.05). Similarly, the mean length of mechanical ventilation was 8.8±10.0 and 4.1±4.4 days, respectively (p<0.05).

Conclusion: Eclampsia and hemorrhage were the most common causes for ICU admission and mortality rate was 5.2%. In addition, the transfer from one center to another was a risk factor for maternal mortality and morbidity due to the delayed management of obstetric patients.

Keywords: Intensive care, hemorrhage, eclampsia, obstetric patients

ÖZ Amaç: Yoğun bakım ünitesine (YBÜ) kabul edilen obstetrik olguların değerlendirmektir.

Gereç ve Yöntem: YBÜ'ne kabul edilen toplam 94 obstetrik olgu yaş, mortalite, alta yatan hastalıklar, kabul nedenleri, YBÜ'de uygulanan girişimler ve geliş yerleri açısından değerlendirildi.

Bulgular: Hastaların ortalama yaşı 29,1±5,5 ve APACHE II skoru 13,2±4,8 bulunmuştur. Yoğun bakıma kabul nedenleri en sık eklampsi (%26) ve kanama (%20) olarak belirlenmiştir. Yirmi üç hastaya eşlik eden en az bir yandaş hastalık bulunmuş ve en sık karşılaşılan hastalık valvüler kalp hastalığı olmuştur. Santral ven kateteri %39,4, arter kateteri %79,8, hemodiyaliz %11,7 sıklıkla uygulanmıştır. Hastaların ikisi acil servisten, üçü servisten, 55'i ameliyathaneden ve 34'ü farklı merkezlerden devir alınmıştır. Hastane dışından alınan hastalarda ortalama YBÜ'de yatış (4,7±7,1 gün) ve mekanik ventilasyon (8,8±10,0 gün) süreleri hastanemizdeki bölümlerden alınan hastalardan (1,9±2,8 gün ve 4,1±4,4 gün) uzun bulunmuştur (p<0,05).

Sonuç: Eklampsi ve postpartum kanama en sık yatış nedenleri olarak bulundu ve mortalite %5,2 olarak gerçekleşti. Ayrıca bir başka merkezden transfer edilen olgular tedavide gecikmeye neden olmaları dolayısıyla mortalite ve morbidite için risk faktörü olarak saptandı.

Anahtar Kelimeler: Yoğun bakım, kanama, eklampsi, obstetrik hastalar

Introduction

Obstetric patients in intensive care unit (ICU) show significant differences from average ICU patients. Due to the altered physiological status and special medical problems, this group of patients is a challenge for ICU specialists. The altered physiological parameters stress the body and may suppress the response needed to overcome this situation. In addition to the diseases at the admission, diseases specific to pregnancy such as peripartum hemorrhage, hypertensive disorders of pregnancy, acute fatty liver of pregnancy, embolic and infectious problems can be seen in this group of patients (1).

Prevalence of ICU admission among obstetric patients varies between 100 and 900 in 100000 pregnancies (2). Obstetric patients make up a small portion of ICU admissions in developed countries (<2%) whereas it may rise up to 10% or higher in developing countries (3).

According to literature, need for intensive care and mortality of pregnant women differ in a wide range, 0.1-0.9% and 0-36% respectively (2). For Turkish Republic, Ministry of Health has declared maternal mortality to be 19.4 for 100000 live births in 2008 and among all women who died in hospitals, peripartum maternal deaths accounted for 1% (4). According to this report, the most frequent reasons for maternal deaths consist of hemorrhage (30.3%), hypertensive disorders of pregnancy (15.5%), infections (9.6%) and complications related to abortion (4.0%).

The aim of this study is to review the obstetric cases followed up and treated in our ICU and to determine the reasons for ICU admissions and maternal mortality.

Materials and Methods

The study was conducted under ethical principles for medical research. A total of 94 obstetric patients in need of intensive care were included in this study that were followed up and treated in Department of ICU of Akdeniz University Hospital within the 10-years period.

Data were reviewed retrospectively and following were recorded: age, vital parameters at the time of admission (heart rate, respiratory rate, body temperature, systolic and diastolic blood pressures), gestational age, gestational stage at the time of ICU admission (prepartum or postpartum), admission source (floor, emergency room, operation room or other hospitals), preexisting medical disorders, obstetric complications, reason for ICU

admission (eclampsia, preeclampsia, hemorrhage, cardiac problems, pulmonary problems, hemolysis, elevated liver enzyme levels, and low platelet syndrome, APACHE II and Glasgow coma scale scores, interventions performed in ICU (mechanical ventilation, transfusion of blood and blood products, renal support therapy, arterial cannulation, central venous catheterization, use of intravenous inotropic and antihypertensive agents), type of delivery (normal or caesarean section) and blood tests for glucose, lactate, creatinine, blood urea nitrogen, sodium, potassium, bicarbonate, hemoglobin (Hb), hematocrit, leucocyte, platelet, pH and arterial blood gases.

Presence of disseminated intravascular coagulopathy (DIC) was recorded and DIC was defined as presence of low platelets ($<100 \times 10^9/L$), decreased fibrinogen ($<3 \text{ mg/L}$), prolonged prothrombin time ($PT > 14 \text{ sec}$) and partial thromboplastin time ($aPTT > 40 \text{ sec}$) and high levels of fibrin degradation products. Acute respiratory distress syndrome (ARDS) was defined according to the Berlin definition published in 2012 (5). Renal failure was diagnosed by means of RIFLE (Risk, Injury, Failure, Loss, End stage kidney disease) classification introduced by the Acute Dialysis Quality Initiative workgroup in 2004 (6). Sepsis was determined according to the consensus definitions (7).

Statistical Analysis

JMP (JMP 7, SAS institute, Cary, North Caroline) was used as statistical software. Continuous and categorical variables were compared by using Kruskal-Wallis or Student's t test and chi-square or Fisher's exact test.

Results

Patient files of 94 obstetric patients that were followed up and treated in ICU within the 10-year period were analyzed. Mean age of the patients was 29.1 ± 5.5 years (range 18-40 years) and mean gestational age was 32.30 ± 6.50 weeks (range 10-40 weeks). Nine patients (9.6%) were in prepartum period and the rest (85 of 94, 90.4%) were in postpartum period during the admission. Caesarean section was performed in 83 out of 85 patients that were admitted in postpartum period. Mean Hb level was $10.2 \pm 2.3 \text{ g/dL}$ at the time of ICU admission. In 37 patients, Hb levels were below 10 g/dL and in 8 patients serious anemia was present ($< 7 \text{ g/dL}$). Demographic data is shown in Table 1.

Arterial blood gases were not analyzed in 9 patients. In the patients, whose arterial blood gas analysis were

performed, partial arterial oxygen pressure/fractional inspired oxygen concentration ($\text{PaO}_2/\text{FiO}_2$) ratio was calculated and the ratio was observed to be below 200 mmHg in 17 patients and below 300 in 13 patients. When classified according to $\text{PaO}_2/\text{FiO}_2$ ratios, there were no differences for length of stay (LOS) in ICU and length of mechanical ventilation (LOMV) between patients with upper and lower levels of 300 mmHg or 200 mmHg ($p>0.05$).

Table 1. Demographic variables

	n=94
Age (years)	29.1±5.50 (18-40)
APACHE II	13.2±4.8 (2-27)
Hemoglobin (gr/dL)	10.2±2.3 (4.7-14.9)
Heart rate (beats/min)	108±23 (55-180)
Gestation weeks	32.2±6.5 (10-40)
Systolic blood pressure (mmHg)	146.6±31.1 (70-220)
Diastolic blood pressure (mmHg)	84.8±22.0 (32-149)
Platelet ($\times 1000/\text{mm}^3$)	145.3±93.0 (8-396)
Lactate (mmol/L)	2.3±1.8 (0.5-8.8)
APACHE II: Acute Physiology and Chronic Health Evaluation	

APACHE II scores were calculated in 79 of 94 patients. Mean APACHE II score was 13.2 ± 4.8 (range 2-27). In 23 patients (24.5%) there was at least one preexisting medical disorder and the most common problem was valvular cardiac diseases. When classified according to the source of admission, it was seen that 2 patients (2.1%) were admitted from emergency room, 3 (3.2%) were admitted from ward, 55 (58.5%) were admitted from operation room and 34 patients (36.2%) were transferred from other hospitals. Mean LOS in ICU was 4.7 ± 7.1 days in patients transferred from other hospital whereas it was 1.9 ± 2.8 days in patients admitted from other sources ($p<0.05$). Similarly, mean LOMV were calculated to be 8.8 ± 10.0 and 4.1 ± 4.4 days, respectively ($p<0.05$) (Table 2).

The most common causes for ICU admissions were eclampsia (24 cases, 26%) and major hemorrhage (19 cases, 20%). The reasons for ICU admissions are shown in Figure 1. Three patients were admitted to ICU due to recent anesthetic complications. The complications were aspiration during intubation (2 patients) and prolonged curarisation because of pseudocholinesterase deficiency (1 patient). The patient with pseudocholinesterase deficiency was extubated without any problem afterwards. Among two patients

Table 2. Comparison according to source of admission

	Other hospital (n=34)	Our hospital (n=60)	p
Demographic data			
Age (year)	29.8±5.5	28.7±5.5	0.330
APACHE II score	13.3±4.6	13.1±5.0	0.834
LOMV (days)	4.7±7.1	1.9±2.8	0.029*
LOS in ICU (days)	8.8±10.0	4.1±4.4	0.012*
Blood transfusion, no. (%)	18 (53%)	20 (33%)	0.063
RBC, no. (%)	16 (47%)	17 (28%)	0.068
FFP, no. (%)	15 (44%)	14 (23%)	0.036*
Platelet, no. (%)	6 (18%)	8 (13%)	0.573
Interventions, no. (%)			
Central venous catheterisation, no. (%)	21 (62%)	16 (27%)	<0.001*
Arterial cannulation, no. (%)	27 (79%)	48 (80%)	0.946
Hemodialysis, no. (%)	9 (26%)	2 (3%)	0.001*
Inotropic agents, no. (%)	9 (26%)	7 (12%)	0.067
Antihypertensive agents, no. (%)	11 (32%)	10 (17%)	0.079
Mortality, no. (%)	3 (9%)	2 (3%)	.254 ^a

LOMV: Length of mechanical ventilation, LOS: Length of stay, RBC: Red blood cell, FFP: Fresh frozen plasma, APACHE II: Acute Physiology And Chronic Health Evaluation, ICU: Intensive care unit, *: Statistically significant, ^a: Inadequate sample size

admitted due to major trauma, one had intrauterine exitus. The patient was operated urgently and caesarean section was performed simultaneously. The other patient with major trauma had postpartum depression and attempted suicide on the sixth day after delivery. Both patients were discharged without any problem.

In 75 cases (80%) mechanical ventilation was performed. Mean LOMV was 2.90 ± 4.95 days. In 38 patients (40.4%) blood and blood products were used. Of patients transfused, 35.1% had red blood cell transfusion, 30.9% had fresh frozen plasma (FFP) transfusion and 14.9% had platelet transfusions. Eleven patients (11.7%) required hemodialysis for acute renal failure.

Five patients died in ICU. Caesarean section was performed in all of these patients. The reasons for death were hemorrhage, sepsis (2 cases), central nervous system infection and ARDS. Four of the patients, who died had serious underlying medical disorders and APACHE II scores were significantly higher (18.8 ± 4.2 , range 16-25) compared to average ($p < 0.05$). Of the survivors, all were discharged without any complication. One patient was readmitted after discharge. This patient had systemic lupus erythematosus and was admitted for respiratory distress after caesarean section. After 25 days of stay in ICU, the patient was discharged to ward and after four days from the discharge, she was readmitted due to hemorrhage. She stayed 5 days in ICU after readmission and was discharged to ward without any problem.

Discussion

Most of the pregnant women overcome this period of pregnancy without any problem despite a group of physiological alterations. But in a group of patients, life-threatening complications may occur and due to these

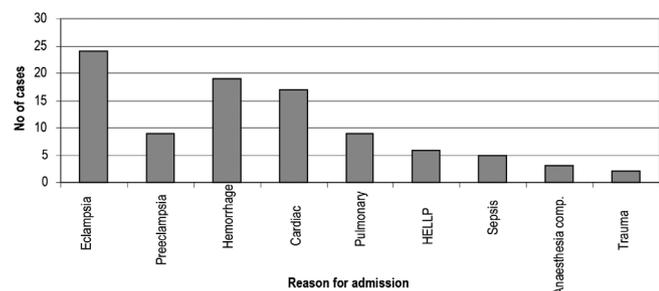


Figure 1. Reasons for intensive care unit admission
HELLP: Hemolysis, elevated liver enzyme levels, and low platelet

complications, intensive care support may be needed. Studies have shown that care of critical obstetric patients is easier in ICUs (8,9). Obstetric patients generate a small portion of ICU admissions and mortality is lower in this group compared to non-obstetric patient population (10).

Majority of obstetric patients are admitted to ICU in postpartum period. Studies indicate that antepartum admissions account for 12-45% of all obstetric admissions (2,11-13). Compatible with other studies, 90.4% of patients were postpartum admissions in our study. The leading cause of ICU admission in postpartum patients was urgent caesarean section and a great amount of these patients were transferred from other hospitals.

Obstetric patients followed in ICU's generally have lower mortality rates compared with other groups of patients. It is expressed that maternal mortality in ICU's is between 0-36% (2,14,15). Maternal mortality rate in ICU was 5.2% in our study. Deficient or inadequate antenatal care seriously rises up the risk of mortality related to pregnancy (16). Of our patients, majority were among patients getting inadequate antenatal care or were urgent cases (62 cases, 66%).

Studies have shown that prognosis may be predicted by use of APACHE II scores in obstetric patients followed up in ICU's (17,18). On the other side, Lapinsky et al. (19) suggested that pregnancy rises acute physiological scores and therefore physiological scoring systems such as Simplified Acute Physiology Score II, APACHE II and APACHE III may not predict mortality accurately. In our study, APACHE II scores were 17.4 ± 4.7 and 12.8 ± 4.7 in non-survivors and survivors, respectively. However, as non-survivor group contained only 5 patients, statistical evaluation was not performed.

Many investigators reported that pregnant patients with complications have been transferred to more advanced hospitals (2,8,14,15). It is suggested that transfer of patients to other hospitals correlate with higher mortality rates (20,21). But unfortunately, studies on pregnant patients are small both in number and sample size (2,9). In this study, 34 out of 94 patients (36%) were transferred from other hospitals because of ICU follow up demand. Mortality rate in transferred group was 9% whereas the rate was 3% in patients who were followed up and treated in our hospital.

The most common reason for ICU admission is suggested to be preeclampsia/eclampsia and postpartum hemorrhage (8,14,22,23). Eclampsia (24 cases, 25.5%) and hemorrhage

(19 cases, 20%) were the most common reasons for ICU admission in our study too.

Preexisting systemic diseases may worsen during pregnancy and this situation may be the cause of ICU admission. Medical disorders resulting in ICU admission are reported in a variety of ranges (24). These diseases consist of cardiovascular problems, diabetes mellitus, asthma bronchiale and chronic renal failure (24). The most common problems among cardiovascular diseases are valvular diseases (25). We admitted 24 cases (26%) with preexisting medical disease to ICU and as compatible with literature, valvular diseases were at top in frequency.

Indications for intubation and mechanical ventilation are well defined in literature for obstetric patients (26). Indications are the same as non-obstetric patients and include inadequate oxygenation, respiratory failure and protection of airways. Need for mechanical ventilation in pregnancy derive from different origins. Most common reasons are complications related to pregnancy (27). The ratio of mechanically ventilated patients in our study was 79.8% (75 patients) and was significantly higher than the need reported in literature (between 19-60%) (9,28). The need for higher mechanical ventilation and longer LOS in ICU may be attributed to higher urgent admissions, inadequate antenatal care and higher incidence of transfers from other hospitals. LOMV and LOS in ICU were 1.9 ± 2.8 and 4.1 ± 4.4 days in our hospital whereas they were 4.7 ± 7.1 and 8.8 ± 10.0 days in patients transferred from other hospitals, respectively. When compared for LOMV and LOS in ICU, there was a significant difference between the patients treated in our hospital and the patients transferred from other hospitals ($p=0.03$ for LOMV and $p=0.01$ for LOS in ICU).

Hemorrhage is a common problem seen during pregnancy (12,15). Despite the progress in medical technology and transfusion practice, it is still among the most encountered reasons of maternal mortality (29). Massive obstetrical hemorrhage is often seen in intrapartum or early postpartum period and is usually a result of uterine atony. The range for ICU admissions due to hemorrhage related to pregnancy is wide (15). When the studies are reviewed, it can be seen that few studies report exact values for blood loss. Nineteen patients (20.2%) were admitted to ICU for hemorrhage in our study and 17 of them were treated for intrapartum or early postpartum hemorrhage. The other two patients had gastrointestinal bleeding or intraventricular bleeding. Placental abnormality (placental retention, ablatio placenta,

placenta previa, placenta accreta) was responsible for hemorrhage in 5 cases. Hysterectomy was performed in 4 cases. Four of the patients admitted due to unceasable uterine bleeding were transferred from other hospitals. All the patients admitted for hemorrhage were discharged from ICU without any problem.

Blood or blood products were given to 38 patients (40%). In 16 cases, the amounts of products transfused were more than 10 units. Although not significant statistically, transfusion rate was higher for patients transferred from other hospitals (53% vs. 33%, $p<0.06$). When investigated in details, the use of FFP was significantly higher in patients transferred from other hospitals (44% vs. 23%, $p=0.036$).

This study has two limitations. Firstly, it has a retrospective design. Depending on this fact, some data were not available due to inadequate records. Second, it is a single center study.

Although critically ill obstetric patients account for a small portion of general ICU patients, treatment and follow up is challenging due to physiological alterations during pregnancy.

Conclusion

In conclusion, we found that transfer from one center to another is a risk factor for maternal mortality and morbidity due to delayed management of obstetric patients. Physicians in the ICU should be familiar with the complications of obstetric patients and should work closely with obstetricians in order to improve maternal outcome.

Ethics

Ethics Committee Approval: Retrospective study.

Informed Consent: Retrospective study.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.Y., A.R., M.C., Concept: M.Y., Design: M.Y., A.R., Data Collection or Processing: Y.Ç., S.K., Analysis or Interpretation: M.Y., A.R., Y.Ç., Literature Search: Y.Ç., S.K., Writing: M.Y., Y.Ç., M.C.,

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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