

Obstetric intensive care admissions: a four-year review in a Tertiary Care Centre

Abstract

Objective: To review of obstetric patients admitted to intensive care unit (ICU) in a tertiary care center and to assess the prevalence, causes and outcome of critically ill obstetric patients in ICU. **Methods:** In this retrospective study, obstetric ICU admissions in a University hospital over four-year period from January 20005 to April 2009 were analyzed. **Results:** The incidence of obstetric admissions to the ICU represented 1.6% of deliveries. All of the patients were admitted to the ICU postpartum. Pregnancy induced hypertension (64%) and obstetric hemorrhage (30%) were the two most common reasons for the ICU admission. The most common interventions were magnesium sulphate infusion (53.9%), mechanical ventilation (48%), and blood transfusion (52.9%). Maternal mortality rate was 8.8% with 44% of hemodynamic instability and multiple organ failure and with 44% of acute respiratory distress syndrome as the main causes of death. **Conclusion:** The most common cause of ICU admission were pregnancy induced hypertension and obstetric hemorrhage. Improved management strategies to these problems and increasing antenatal care may significantly decrease the maternal and fetal mortality rate in obstetric patients admitted to the ICU.

Keywords: Intensive care unit, obstetric patient admissions, hypertension, hemorrhage

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Condensation:
Obstetric patients in intensive care unit.

Introduction

Admission of critically ill obstetric patients to the intensive care unit (ICU) occurs in approximately 0.07-0.9% of deliveries^(1,2,3,4). However they can reach up to 10% or more in developing countries⁽⁵⁾. The reported mortality rate of critically ill obstetrics patients admitted to the ICU ranges from 0 to 36%^(6,7). The main reasons for admission are mainly pregnancy-induced hypertension (21-76%) and obstetric hemorrhage (15-33%)⁽⁸⁾, the remainder included medical disorders and other causes.

The incidence of severe maternal morbidity seems to have increased over the last decade⁽⁹⁾.

The aims of this study were:

(1) To review all obstetric patients admitted to our ICU over the last four years;

(2) Analyze the risk factors, frequency and the ob-

stetric and medical reasons of obstetric patients associated with an ICU admission;

(3) To determine our ICU outcomes including perinatal and maternal mortality over the past four years.

Material and Methods

The Intensive Care Unit at Ondokuz Mayıs University Medical Faculty, Samsun is a 12-bed tertiary care combined medical and surgical intensive care unit. The monthly ICU admission ranges from 45 to 70 patients with approximately 80% of them suffering from surgical illnesses. The ICU is staffed by intensive care specialists, anesthetists who are the primary physicians for all patients. All nurses are registered and many of them are critical care registered nurses. The Obstetric Service of the hospital provides 1440

Table 1 Primary diagnosis

Admission Diagnoses	Frequency n (%)
Pre-eclampsia	15 (13.7%)
Eclampsia	26 (25.5%)
HELLP	25 (24.5%)
*AFLP	1 (1.0%)
Pulmonary embolism	2 (2.0%)
Postpartum bleeding	31 (30%)
Septic abortion	2 (2.0%)
Total	102 (%100)

*AFLP: Acut Fatty Liver of Pregnancy

deliveries per year. In ICU, all obstetric patients are closely followed during their course by a staff obstetrician in addition to ICU team.

Data Collection

The patients were identified through a medical record search. Data collected included demographic data, obstetric history, details of this pregnancy, past medical data, indication for ICU transfer, hospital length of stay and procedures performed in ICU, laboratory data, gestational age, complications during pregnancy, way of delivery and pregnancy outcome, maternal mortality, development of adult respiratory distress syndrome (ARDS), organ failure, daily Acute Physiology and Chronic Health Evaluation II score (APACHE II). The APACHE II score, calculated by adding the total points for the acute physiology score (heart rate, systolic blood pressure, temperature, oxygenation, respiratory rate, arterial pH, serum sodium, po-

tassium and creatinine, hematocrit, white blood cell count and Glasgow Coma Score), age score and chronic health score, use of mechanical ventilation (MV) was retrieved from the ICU records. The specific interventions recorded were direct arterial and central venous pressure (CVP) line, mechanical ventilation, vasoactive drugs used (norepinephrine, dopamine), tube thoracostomy were noted together with such events as HELLP (hemolysis, elevated liver enzymes and low platelets) syndrome, disseminated intravascular coagulation (DIC), ARDS and other organ dysfunction. ARDS was defined according to the American-European Consensus Conference on ARDS⁽¹⁰⁾ and sepsis, SIRS, septic shock were defined according to the American College of Chest Physicians and the Society of Critical Care Medicine⁽¹¹⁾. Critical care diagnosis was divided into three categories:

1. Hemodynamic instability;
2. Respiratory failure;
3. Neurologic dysfunction.

Data were subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS) 13.0. Data are presented as mean \pm standard deviation. The Ethics Committee of the hospital approved the study.

Results

Out of the total of 6120 deliveries during the four year period, 102 obstetric patients were admitted to the ICU, giving a frequency of admission of 16 per 1000 deliveries. There were a total of 2710 ICU admissions during the same period, thus obstetric patients represented 3.7% of all ICU admissions.

All of the obstetric patients were admitted to the ICU in postpartum period as follows: 78 of these patients were admitted during the same day postpartum, and 24 women were admitted to the ICU between postpartum 1 and 5 days. The mean age of

Table 2 ICU Admitting Diagnosis

Primary Diagnoses	Respiratory Failure n= 51	Hemodynamic instability n= 41	Neurologic Dysfunction n= 3
Pre-eclampsia (15)	8	7	
Eclampsia (26)	12	12	2
HELLP (25)	15	9	1
AFLP *(1)	1	-	
Pulmonary embolism (2)	2		-
Postpartum bleeding (31)	10	21	-
Septic Abortion (2)	1	1	-
Total (102)	49	50	3

AFLP*: Acute Fatty Liver of Pregnancy

patients' was 30±7 years (19-47 years). The mean parity was 2±2 (0-9). The mean duration of stay in ICU was 3.54±5.0 days (1-42 days) and APACHE II score was 3-22 (8±5).

The most common diagnosis of obstetric patients in ICU was pregnancy induced hypertension (64%), followed by obstetric hemorrhage (30%) There were 26 cases of eclampsia (25.5% of all obstetric ICU admissions) and 15 cases of pre-eclampsia (13.7% of all obstetric ICU admissions). HELLP Syndrome was in 25 cases (24.5% of all obstetric ICU admissions). Major cause of obstetric hemorrhage was postpartum bleeding 30% (n=31) (Table1).

Seventy-nine patients were delivered by cesarean section, twenty-two patients were delivered by vaginal delivery and there was one septic abortion. Of these 102 patients, nine obstetric patients were admitted to the ICU after hysterectomy. Hysterectomy was performed during cesarean section (cesarean hysterectomy) in five of these nine patients and hysterectomy was performed after vaginal delivery in three of these nine patients. The last hysterectomy was performed due to septic abortion.

The women were classified according to primary diagnosis for ICU admission in table 2. Hemodynamic and respiratory complications were the most

Table 3 Interventions in the Intensive Care Unit

Interventions	N (%)
Mechanical Ventilation	48 (47.0%)
Blood Transfusion	54 (52.9%)
Positive Inotrope Agent Usage	20 (19.6%)
Magnesium Usage	55 (53.9%)
Arterial Line	21 (20.5%)
Central Venous Line	19 (18.6%)
Sedation	38 (37.2%)

common reasons for ICU admission, accounting the 97.1% of all obstetric admissions. Neurologic complications were responsible for 2.9% of admissions.

Interventions carried out in the intensive care unit were shown in table 3. The most common interventions during ICU admission were magnesium sulphate administration (n=55), mechanical ventilation (n=48), transfusion of blood product (n=54). While

Table 4 Causes of death in obstetric patients in ICU

No	Age	Diagnosis	Parity	APACHE II	Op	Cause for admission	Additional disease	E (U)	FFP (U)	Inotrope agent	Time in ICU (day)
1	35	Septic Abortion	G6P5	15	TAH	DIC+ Septic Abortus+ ARDS	Pleural effusion/ Hypertension	48	66	Yes	42
2	34	Eclampsia	G3P3	8	C/S	Hemodynamic instability	Pulmonary Embolus	2	1	Yes	12
3	26	Postpartum bleeding	G4P4	8	C/S	Hemodynamic instability	No	4	4	Yes	2
4	25	Eclampsia	G3P2	8	C/S	Intraserebral hematoma	No	0	0	No	13
5	23	Eclampsia	G1P1	22	C/S	ARDS + Unconscious	Pleural effusion	15	16	Yes	7
6	32	HELLP	G3P3	18	No operation	ARDS+ Unconscious	No	2	6	No	2
7	30	Postpartum bleeding	G1P1	21	C/S	ARDS	No	10	18	Yes	2
8	25	Postpartum bleeding	G1P1	14	C/S	Hemodynamic instability	No	12	10	Yes	2
9	30	HELLP	G3P3	19	C/S	Hemodynamic instability	No	2	3	Yes	5

E: Eritocyte, FFP: fresh frozen plasma, C/S: Cesarean section, ARDS: Acut Respiratory Distress Syndrome, DIC: Disseminated Intravascular Coagulation

positive inotrope agent was used for twenty patients, thirty eight patients were sedated. A central venous line was required in nineteen of the women, systemic arterial line was in twenty-one.

Packed red blood cells, fresh frozen plasma, platelets and cryoprecipitate infusions were also used for obstetric patients. Blood transfusion was given to 54 (52.9%) obstetric patients with a mean of 2.87 ± 5.84 units of packed red blood cells and 6.07 ± 9.69 units of fresh frozen plasma. 38 of patients were given 1-4 units red blood cells and also 16 of patients were given more than five units of red blood cells.

The total number of maternal deaths was nine in the obstetric patients admitted to the ICU in four years period. Our obstetric mortality rate of patients admitted in ICU was 8.8%. Causes of death are shown in table 4.

Three of patients (two patients with pregnancy induced hypertension and one patient with obstetric hemorrhage) died because of development of ARDS; four patients (two patients with pregnancy induced hypertension and two patients with obstetric hemorrhage) died due to hemodynamic instability. One of the remaining patients died due to development of disseminated intravascular coagulation after septic abortion and the other was due to intracerebral hematoma formation as a complication of eclampsia.

Among the 101 viable pregnancies, (only one pregnancy was at 10 weeks of gestation ended with septic abortion) there were 16 deaths due to perinatal complications mainly preterm delivery giving a perinatal mortality rate of 15.8% among the obstetric patients admitted to ICU.

Discussion

Despite a series of physiological alterations in pregnancy, most women complete their pregnancies uneventfully, but a fraction of them develop complications, sometimes life-threatening, that requires intensive care treatment. An intensive care unit offers the opportunity to improve patient care. Close observation in the intensive care unit allows problems to be detected earlier and in some cases, the complications to be prevented so the patient can recover more quickly.

A total of 1.6% of our deliveries needed transfer to the ICU. This is similar to some published reports⁽¹²⁾, but higher than others from developed countries where the ICU admission rate as low as 0.1%^(13,14,6). In Mabie and Sibai⁽¹²⁾ reported that their ICU was designed as an obstetric ICU. So convenient location of their unit promoted more obstetric patient admission. We can compare the severity of our patients with Mabie and Sibai⁽¹²⁾ study group by comparing mechanical ventilation need and ICU stay. The mechanical ventilation rate was 12% in Mabie and Sibai's group while in our group it was 47%. The ICU stay was 2.5 and 3.5 days respectively. These variations between published reports might be due to criteria for ICU ad-

mission, presence of high dependency unit and major morbidity definition by ICU team. Socio-economic status and prenatal care have also considerable effects on obstetric complications and outcome⁽¹⁵⁾. In the present report, the relatively high ICU admission rate might be lack of high dependency unit or more complicated pregnancies due to irregular antenatal follow up of our pregnant women. Forty-seven percent of mechanical ventilation requirement and forty-four percent of more than 48 hour ICU stay might suggest the former is the main reason for high ICU admission rate. In addition, obstetric patients who experience complications are selectively transferred to our hospital from smaller hospitals. Thus, receiving more critically ill obstetric patient transfers from smaller hospital may increase the obstetric ICU admissions.

The most common cause of admission to the ICU in present report was pregnancy hypertensive disease. Sixty-four (64%) patients were admitted to the ICU with pregnancy induced hypertension, five of them died. Wheatley et al⁽¹⁶⁾ and Mabie and Sibai⁽¹²⁾ reported the rate of pregnancy induced hypertension as 66% and 46% respectively. Although some studies reported that hemorrhage was the leading cause of obstetric admission to the ICU^(1,17), in other series^(12,18) the most common reason for ICU admission was pregnancy induced hypertension. Primigravida have a higher incidence of pregnancy induced hypertension than multipara⁽¹⁹⁾. In our report, hemorrhage was the second leading cause of ICU admission. Thirty-one patients admitted to the ICU following obstetric hemorrhage. Even though massive blood transfusion and hysterectomy were carried out in eight of these patients, three patients could not be saved because of their late arrival to the hospital and of the already advanced haemodynamic alterations and other coagulation disorders-DIC, as well as installed MSOF.

Nine maternal deaths occurred in this study giving a mortality rate of 8.8%. In other studies the mortality rates of obstetric patients admitted to the ICU range from 0 to 36%^(6,7,18,20,21,22). Different maternal mortality rates of the studies may come from the heterogeneity of the studies and the changes in the severity of diseases. The most common reasons for ICU admission were hemodynamic instability and respiratory failure, accounting for 97.1%. These findings are similar to series of Lapinsky et al.⁽⁶⁾ and Bekele et al.⁽²³⁾.

In the present study, there are some limitations. First, the data were collected retrospectively. Second, the sample size was small for statistical analysis. In addition, antenatal care of obstetric patients admitted to ICU is an important and modifiable risk factor for ICU mortality rate^(6,24,25,26,27). Lack of antenatal data makes it impossible to identify preventable conclusions from our study.

Our low APACHE scores do not correlate with our maternal mortality rate but it is difficult to interpret them. Although the APACHE II score is commonly used

in the ICU, it might not be appropriate for pregnant women who are generally young and healthy⁽²⁸⁾ but some other reports suggest that APACHE II score predicts the illness severity in the pregnant patient⁽²¹⁾. In the APACHE II scoring system certain important variables like platelet count, liver enzymes are not included. Another limitation of the APACHE II scoring system is its inability to predict mortality in obstetric patients; lower, higher or appropriate prediction of mortality have been reported^(21,29). So APACHE II scoring system is inaccurate for use in an obstetric population.

In conclusion, although most of the obstetric patients admitted to ICU are younger, their mortality rate and need for mechanical ventilation are approximately equal to the general ICU patients, indicating that the obstetric patients met the criteria for admission

as the other nonobstetric patients and required intensive care.

Early and aggressive intervention in the management of pregnancy-induced hypertension and obstetric hemorrhage could significantly lower maternal mortality.

Improved management strategies especially to pregnancy-induced hypertension, obstetric hemorrhage and septic complications and increasing antenatal care may significantly decrease the maternal and fetal mortality rate in obstetric patients admitted to the ICU.

Intensive care specialist should be familiar with the common complications of pregnancy and should work closely with obstetricians in order to improve maternal and fetal outcome. ■

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