

# Treatment Results of Patients Followed in Intensive Care Unit in Severe Maternal Morbidity Cases

Hilal USLU YUVACI<sup>1</sup>, Tuba DUZCAN<sup>1</sup>, Nermin AKDEMIR<sup>1</sup>, Erman SEVER<sup>1</sup>, Selcuk OZDEN<sup>1</sup>, Arif Serhan CEVRIOGLU<sup>1</sup>, Orhan UNAL<sup>1</sup>, Funda TOZLU<sup>1</sup>, Havva SAYHAN<sup>2</sup>

Sakarya, Turkey

## ABSTRACT

**OBJECTIVE:** The aim of this study was the evaluation of the characteristics and treatment results of women, who were brought to the intensive care unit due to severe obstetric morbidity, together with severe and acute complications in pregnancy.

**STUDY DESIGN:** Pregnant and puerperal women treated in the intensive care unit of a tertiary care center during two years of time were included in this study, and their files were scanned retrospectively. Patients' demographic characteristics, length of stay, point of entry, neonatal results, birth statuses and modes of delivery, hemodynamic data, and histories were recorded. The qualitative data were evaluated by the Pearson Chi-squared, Fisher Freeman Halton, and Fisher's Exact tests.

**RESULTS:** In the two-year period, 16.728 births occurred at our hospital. 68 cases among them were accompanied with severe maternal morbidity, and 2 maternal deaths were observed in our clinic. Of the cases, 58.8% (n=40) had severe hypertensive diseases, whereas 35.3% of the cases (n=24) had obstetric complications that developed due to bleeding. While 40% of the cases (n=16) with hypertension had severe pre-eclampsia, 35% of the cases (n=14) had eclampsia and 25% (n=10) had HELLP.

**CONCLUSIONS:** The most important reasons for severe maternal morbidity are the complications related to obstetric bleeding and hypertensive diseases related to pregnancy. Early diagnosis of the obstetric complication risk factors is necessary for preventing maternal morbidity. Antenatal follow-ups and the births of high risk pregnancy patients should be performed in tertiary centers.

**Keywords:** Maternal near-miss, Obstetric complication, Maternal death, Maternal morbidity

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## Introduction

Maternal mortality statistics have been used to measure maternal health and the quality of maternity services around the world; however, in the last two centuries, maternal mortality ratios have steadily decreased in developed countries; thus, the severe maternal morbidity or near-miss (NM) rates

were suggested to be more useful indicators than mortality ratios to reveal the quality of obstetric care (1-4).

Every day, nearly 800 women die due to preventable causes related to pregnancy and birth all around the world (5); patients who develop severe obstetric complications during pregnancy, childbirth, or within 42 days of the termination of pregnancy have the probability of facing death, however, those, who receive timely and sufficient medical-surgical care, may be saved (classified as NM patients by the World Health Organization (WHO)) although a certain level of morbidities may be observed (6).

World Health Organization summarized the conditions for determining severe acute maternal morbidity for the NM obstetric patients as the result of a systematic evaluation within the scope of the literature, in order to determine maternal NM cases and enhance the obstetric care (6). These conditions are as follows: meeting the clinical criteria about the presence of a specific disease, such as severe preeclampsia or bleeding; applications such as hysterectomy or massive blood transfusion or admission to the ICU; and observing the laboratory markers or clinical symptoms of any organ system dysfunction (cardiovascular, respiration, kidney, hematology, liver, and neurologic) such as shock or defined respiratory insufficiency (6,7).

<sup>1</sup> Sakarya University Department of Obstetrics and Gynecology, Sakarya, Turkey

<sup>2</sup> Sakarya University Department of Anesthesiology and Reanimation, Sakarya, Turkey

Address of Correspondence: Hilal Uslu Yuvaci  
Sakarya University School of Medicine,  
Department of Obstetrics and  
Gynecology, 54100 Sakarya, Turkey  
hilaly@sakarya.edu.tr

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In determining the severe maternal morbidity, acceptance to an intensive care unit (ICU) can be adopted as an objective indicator (8,9). ICU admission may prevent data loss by identifying the women with the most severe illnesses and this can be a useful indicator for determining the severe maternal morbidity cases; however, patients' admission to the ICU is adjusted by various criteria, including the capacity, convenience of the ICU, and institutional guidelines; and therefore, the ICU admission ratios of pregnant or puerperal women vary depending on the country, area, and institution (10,11). ICU admission rates that are based on severe obstetric complications vary between 0.7-13.5/1000 births around the world (12).

This study aimed to evaluate the treatment types and the features of the patients who applied to our clinic, which is the referral university hospital of our city, because of severe acute complications in gestation and were admitted to the ICU due to severe obstetric morbidity.

## Material and Method

This study evaluated the pregnant and puerperal women, who applied to the Department of Obstetrics and Gynecology and were hospitalized at the ICU between January 2014 and December 2015. The files of these patients were scanned retrospectively (Project identification number: 34).

Our hospital is a tertiary referral hospital where 8.000-8.500 births take place per year. Our clinic is an important referral center for other public and private hospitals, including the ones located in nearby cities and towns. Obstetric and gynecological care are provided for 24 hours in our clinic.

The cases consisted of all of the obstetric admissions to the ICU, which were identified using the ICU and hospital computer database retrospectively. For the cases that the required data could not be obtained from the electronic records of the hospital, the medical files of the patients were evaluated manually. For this study, admissions from 14 weeks of gestation time up to 6 weeks of postpartum period were included. The collected data included demographic data, pre-existing medical or surgical conditions, obstetric history, as well as the outcome of ICU admission. The data on the duration of the stay in the ICU, hemodynamic data, transfusion amount, use of mechanical ventilation, and central and arterial monitoring, intraoperative complications of patients, who had operations, were also noted.

Number cruncher statistical system (NCSS) 2007 and PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) were used for statistical analysis. The quantitative data of the study were evaluated using descriptive statistics (mean, standard deviation, median, frequency, ratio, minimum, and maximum); and the qualitative data were evaluated by the Pearson Chi-squared, Fisher Freeman Halton, and Fisher's Exact tests. The relevance levels were evaluated as  $p < 0.01$  and  $p < 0.05$ .

## Results

In our clinic 16.728 patients delivered between January 2014 and December 2015 and 68 severe morbidity cases were followed up at the ICU, and 2 maternal deaths were observed. The average age of the patients ( $n=68$ ), who had severe obstetric morbidity, was  $28.48 \pm 5.94$ . While 73.5% ( $n=50$ ) of the patients were referred from outside health centers, 26.5% ( $n=18$ ) of the cases developed severe obstetric complications while they were at our hospital. The obstetric and demographic data of the patients are presented in table 1. The obstetric complications that were developed in severe morbidity patients are summarized in table 2. Of the cases, 58.8% ( $n=40$ ) had severe hypertensive illnesses and 35.3% ( $n=24$ ) had obstetric complications related to bleeding. 40% ( $n=16$ ) of the cases with hypertension had severe preeclampsia, 35% ( $n=14$ ) had eclampsia, and 25% ( $n=10$ ) had HELLP.

**Table 1:** The obstetrics and demographic data of the patients.

Age; Mean $\pm$ SD	28,48 $\pm$ 5,94
<25 n(%)	22 (32,4)
26-30	23 (33,8)
>31	23 (33,8)
Gravida; Mean $\pm$ SD	1,76 $\pm$ 1,08
Parity; Mean $\pm$ SD	0,64 $\pm$ 0,84
Abortus; n(%)	7 (10,3)
History; n(%)	3(4,5)
Hypertension	1(33,3)
Heart Disease	1(33,3)
Tromboembolism	1(33,3)
Antenatal follow-up;n(%)	
<3	16(23,5)
>3	52(76,5)
Birth Week; Mean $\pm$ SD	32,86 $\pm$ 8,0
<27 n(%)	8(11,8)
28-32	17(25,0)
33-37	27(39,7)
$\geq$ 38	16(23,5)
Delivery Type; n(%)	
Vaginal Delivery	12(17,6)
Caserean Sectio	53(77,9)
Abortus	1(1,5)
Ruptured Ectopic Pregnancy	2(2,9)
APGAR 1st min; Mean $\pm$ SD	6,07 $\pm$ 3,06
APGAR 5thmin; Mean $\pm$ SD	7,52 $\pm$ 3,23
Complication; n(%)	
Service patient	18(26,5)
Referral patient	50(73,5)
Maternal Death; n(%)	
Alive	66(97,1)
Exitus	2(2,9)
Cardiogenic Shock	1(50,0)
Hemorrhagic Shock and DIC	1(50,0)

**Table 2:** The obstetric complications that developed in severe morbidity patients

<b>Hypertension; n (%)</b>	<b>40(58.8)</b>
Severe Preclampsia	16(40.0)
Eclampsia	14(35.0)
HELLP	10(25.0)
<b>Bleeding; n (%)</b>	<b>24(35.3)</b>
Atonia	8(33.3)
Plasenta previa/Acreata	2(8.3)
Placental abruption	5(20.8)
Uterine Rupture	2(8.3)
Ectopic Pregnancy Rupture	2(8.3)
Postabortal bleeding	3(12.5)
Hematoma in episiotomy	2(8.3)
Chorioamnionitis; n (%)	1(1.5)
Pulmonary embolism; n (%)	1(1.5)
Dialysis; n (%)	1(1.5)
Hematologic Diseases; n (%)	3(4.4)
Gastrointestinal Disease; n (%)	1(1.5)
Cardiomyopathy; n (%)	3(4.4)
Pneumonia; n(%)	1(1.5)

Lengths of stay in the ICU varied from 1 to 26 days for these patients, however, it was  $2.77\pm 3.72$  days on average. Interventions made in the ICU and lifesaving attempts are summarized in table 3. When comparing the cases that received transfusions and those that did not, the cases' ages, delivery methods, referral vs. followed in service, and the antenatal follow-up numbers were not significantly different ( $p>0.05$ ) (Table 4). Although a statistically significant difference was not detected between referred patients' transfusions, the high transfusion rates in referred patients were conspicuous ( $p=0.088$ ;  $p>0.05$ ).

**Table 3:** Interventions and lifesaving attempts in severe morbidity patients

Intubation; n (%)	16(23.5)
CPAP*; n (%)	27(39.7)
Central Venous Catheter	36(52.9)
Peripheral Artery	30(44.1)
Cardioversion; n (%)	3(4.4)
CPR*; n (%)	3(4.4)
Blood Transfusion; n (%)	
No	31(45.6)
Yes	37(54.4)
<3 units	7(10.3)
≥3 units	30(44.1)
Blood Unit; Mean±SD	6.97±4.98
Other Blood products; Mean ±SD	4.45±3.73
FFP*Transfusion; n (%)	37(54.4)
Platelet Transfusion	3.75±5.92
; n (%)	16(23.5)
Hemodialysis; n (%)	2(2.9)
Life Saving Drug Use; n (%)	48(70.6)
Dopamin	7(10.3)
Nitroprussid	24(35.3)
Magnesium	39(57.4)
Ca Channel blocker	27(39.7)
Hypogastric artery ligation; n (%)	2(2.9)
Hysterectomy; n (%)	4(5.9)

CPAP: Continuous positive airway pressure, CPR: Cardiopulmonary resuscitation, FFP: Fresh frozen plasma

When evaluated in terms of invasive interventions applied in the ICU, there was no significant differences ( $p>0.05$ ) between the patients' delivery methods, the applied interventions, and in-between the referral and followed in-service patients, however, the ages of the cases ( $p=0.002$ ;  $p<0.01$ ) and

**Table 4:** Comparison of demographic characteristics by the number of blood product transfusion

		Transfusion			b <sup>p</sup>
		No (n=31)	<3 Units (n=7)	≥3 Units (n=30)	
Age	<25	13 (41.9)	3 (42.9)	6 (20.0)	0.309
	26-30	9 (29.0)	3 (42.9)	11 (36.7)	
	>31	9 (29.0)	1 (14.3)	13 (43.3)	
Delivery Type (n=65)	N	No (n=30)	<3(n=7)	≥3(n=28)	0.145
	Vaginal Delivery (VD)	4 (13.3)	0	8 (28.6)	
	Caserean Sectio (CS)	26 (86.7)	7 (100.0)	20 (71.4)	
Admission Type	Service patient	10 (32.2)	1 (14.3)	7 (23.3)	0.667
	Referral patient	21 (67.7)	6 (85.7)	23 (76.7)	
Antenatal	<3	6 (19.4)	3 (42.9)	7 (23.3)	0.460
Follow up	>3	25 (80.6)	4 (57.1)	23 (76.7)	

b: Fisher-Freeman-Halton Test

antenatal follow-up numbers were significantly different ( $p=0.007$ ;  $p<0.01$ ). Maternal death occurred in 2 of the cases admitted to the ICU due to severe maternal morbidity; one of these patients, who had been referred from another hospital because of postpartum hemorrhage due to uterine atony, developed DIC due to hemorrhage when she was admitted to the emergency department. Other patient, who had cardiac arrest at home, received intensive care after resuscitation from medical emergency team.

## Discussion

Despite the clear decrease in maternal mortality in developed countries, maternal morbidities such as preeclampsia, bleeding and infection continues to be one of the most common three reasons for mortality (13). In the literature, the most important reasons for NM maternal morbidity were reported as complications related to obstetric bleeding and the hypertensive diseases of pregnancy, sepsis, septic abortion, and difficult births (2,14,15,16). In a study that evaluated the results of the cases for 4 years in our country, most frequently encountered underlying maternal near miss etiologies were severe preeclampsia and HELLP syndrome (79.8%), followed by cases with postpartum bleeding (16.7%) (17). In a study that retrospectively evaluated 12 years of data in Netherlands, the main reason for ICU admission was preeclampsia (62%), followed by obstetric hemorrhage (18.3%) (18). In our study, most common the obstetric complications were hypertensive diseases of pregnancy (58.8%), followed by obstetric bleeding (35.3%), similar to the literature.

In our study, 73.5% ( $n=50$ ) of the patients were referred to our hospital from other health centers. In our study, it was observed that, the need for blood products was high in the patients transferred to our clinic; and it can be said that this may be due to the delay in the process of sending the referred patients to our clinic. This reveals that including pre-pregnancy follow-up, birth place, birth time, and the postpartum care conditions of this risky patient population should be planned during the antenatal period. Furthermore, the clinic status of the patient during the admission, delay of proper care in the unit where the birth occurred, and transfer conditions may increase the seriousness of the situation and may contribute to increases in morbidity (19,20). Early diagnosis and immediate management of the complications can be the most important measures to prevent the occurrence of mortality (21).

A significant difference was detected between invasive interventions applied in the ICU and the ages of the patients ( $p=0.002$ ;  $p<0.01$ ). This situation may be related to the increase in obstetric complications with increasing age and, accordingly, the increase in intervention possibility (Intubation, Continuous positive airway pressure (CPAP), Central venous catheter, peripheral artery, cardioversion, cardiopulmonary resuscitation (CPR), blood transfusion, lifesaving drug use, etc.). Moreover, the rate of antenatal follow-up, where inva-

sive intervention was applied, was 3 or more, which is significantly high ( $p=0.007$ ;  $p<0.01$ ). This situation may be related to the fact that these patients had high-risk pregnancies with obstetric complications. Furthermore, pregnancies in older women were found to be related with higher maternal and perinatal morbidity and mortality because of hypertension, diabetes, abnormal presentation, fetal distress in labor, cesarean section, and postpartum bleeding, which are among the other complications (22).

The patients stayed in the ICU for  $2.77\pm 3.72$  days on average; while, in other studies, this duration varied between 1 and 6.5 days (23,24). These short ICU stays in our hospital may be because the patients were young and obstetric complications have temporary features with the termination of gestation.

Our study has certain limitations. Our study was conducted retrospectively, which led to problems in obtaining follow-up data from other departments, especially for the patients with chronic diseases. Other limitations are lack of standardization in ICU receiving criteria and the treatment protocols. We think that prospective multidisciplinary studies with large series are needed to be carried out on that topic. In addition, this study was performed at a single tertiary hospital in Turkey, and therefore the patient number of the sample was small. Although it is carried out on a small number of patients, we think that this study contributes to the literature significantly.

## Conclusions

Patients, who have risk factors in terms of obstetric complications, should be diagnosed early and the follow-ups and treatments of these patients should be planned in high risk pregnancy clinics in the antenatal period. For these patients' deliveries, postnatal care should be carried out in centers with ICUs and problems such as providing necessary transportation or economic difficulties should be eliminated in order to prevent delays in the referral chains. For the mother and the fetus, getting enough intensive care service with suitable equipment is important to decrease mortality and morbidity ratios.

Understanding the concept of maternal NM patients clearly will provide a significant contribution to expanding awareness and taking the necessary measures in clinical applications, decreasing maternal mortality and increasing the obstetric care quality by caring for the mother's health. Therefore, a large number of prospective, multidisciplinary, multi-center studies on this topic are required.

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