

# Retrospective Analysis of Obstetric Cases Admitted to Intensive Care Unit of a New University Hospital Between 2003 and 2009

## 2003-2009 Yılları Arasında Yeni Bir Üniversite Hastanesinin Yoğun Bakımına Kabul Edilen Obstetrik Olguların Retrospektif İncelenmesi

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**ABSTRACT Objective:** Although obstetric cases constitute only a minor portion in intensive care admissions, maternal mortality still continues to be a major health issue in the world. The aim of our study is to lay the groundwork for development of strategies targeting to reduce maternal deaths by defining the underlying causes. **Material and Methods:** The present study includes retrospective analysis of obstetric cases admitted during pregnancy and/or postpartum period between January 2003 and December 2009. The patients that have been referred from the Clinic of Gynecology and Obstetrics with a gynecological problem and admitted to ICU were excluded from the study. **Results:** According to the patient admission registers, the number of cases requiring ICU was found to be 168 in 5.754 deliveries. In view of the total number of ICU admissions from all departments (2.292 patients), the rate of obstetric cases was 7.33% within the whole. Therefore, the ICU admission rate was observed to be 2.919 per 100.000 deliveries. The most common reason for admission to ICU was hypertension-related causes followed by hypovolemic shock associated with postpartum haemorrhage and placental abruption. 5 cases ended up with mortality, and the mortality rate among obstetric patients admitted to the ICU was found to be 2.97%. **Conclusion:** Strategies developed for resolution of those issues, will reduce maternal morbidity and mortality by regular antenatal care, especially prenatal care for multiparous women, early ICU admission, and multidisciplinary approach. Otherwise obstetric-gynecology and Child Hospitals could be increase ICU admission rate relatively, but not affect mortality rate for tertiary care units.

**Key Words:** Intensive care; obstetrics; retrospective studies;  
hypertension, pregnancy-induced; obstetric labor complications

**ÖZET Amaç:** Obstetrik olgular yoğun bakım yatışlarının küçük bir kısmını oluşturmalarına rağmen, maternal mortalite dünyada hala önemli bir sağlık sorunu olmaya devam etmektedir. Çalışmamızda, maternal mortaliteyi azaltmak amaçlı stratejilerin geliştirilmesi için alta yatan nedenlerin belirlenmesi amaçlanmıştır. **Gereç ve Yöntemler:** Bu çalışma Ocak 2003 ile Aralık 2009 tarihleri arasında gebelik veya postpartum dönemde yatışı yapılan obstetrik olguların retrospektif incelemesini içermektedir. Kadın Hastalıkları ve Doğum kliniği tarafından jinekolojik nedenlerle yoğun bakıma yönlendirilen hastalar değerlendirme dışı bırakılmıştır. **Bulgular:** Hasta kayıtlarına göre yoğun bakım yatışına ihtiyaç duyan hasta sayısı 5754 doğum için 168 olarak belirlenmiştir. Yoğun bakıma yatırılan tüm bölümlerin toplam hastalar değerlendirmeye alındığında (2.292 hasta) obstetrik olguların yatış oranı %7,33 olarak belirlenmiştir. Bu veriler ışığında 100.000 doğum için yoğun bakıma yatış hızı 2,919 bulunmuştur. Yoğun bakıma yapılan yatışların en sık nedeni hipertansiyona bağlı nedenler olarak bulunmuştur. Bunu postpartum hemoraji veya plasenta dekolmanına bağlı hipovolemik şok takip etmektedir. 5 olgu mortal seyretmiştir ve yoğun bakıma yatırılan obstetrik olgular için mortalite oranı %2,97 olarak bulunmuştur. **Sonuç:** Bu sorunların çözümleri için geliştirilen strateji olarak; düzenli antenatal bakım, özellikle multipar gebelerin yoğun bakıma erken yatırılması ve multidisipliner yaklaşım maternal morbidite ve mortaliteyi azaltacaktır. Diğer yandan Kadın Hastalıkları ve Doğum ve Çocuk hastaneleri üçüncü basamak hastanelerde yoğun bakım yatış oranını artırmakla birlikte mortalite oranı etkilemediği kanısına varılmıştır.

**Anahtar Kelimeler:** Yoğun bakım; doğumbilim; retrospektif çalışmalar;  
hipertansiyon, gebeliğin tetiklediği; obstetrik doğum komplikasyonları

Obstetric cases may require intensive care unit (ICU) admission due to presence of foetus, altered maternal physiology, and pregnancy-related diseases.<sup>1,2</sup> While obstetric cases constitute only a minor percentage of intensive care admissions, they have clinically challenging status and this rate is 2% in developed countries and rises up to 10% in the underdeveloped countries.<sup>3</sup>

Maternal mortality still continues to be a major health issue in the world and generally varies between 55 and 920 per 100 000 live births across the world.<sup>1</sup> Determining important issues during the peripartum care, thereby increasing the quality of peripartum care, will be a guideline for development strategies to reduce the maternal mortality rates.

The aim of our study is to reduce maternal mortality by defining the underlying causes. Such retrospective studies bear importance with regard to determination of preventable risk factors and to take measures against them. The objective of this study is to perform a retrospective analysis on the obstetric cases admitted to the Intensive Care Unit of Anesthesia and Intensive Care Department, Faculty of Medicine, Kahramanmaraş Sutcu Imam University (Kahramanmaraş, Turkey), as a new university hospital regarding admission status, operational status, mechanical ventilation, transfusion status, clinical results and, as additional information, newborn status.

## MATERIAL AND METHODS

The present study includes retrospective analysis of obstetric cases admitted during pregnancy and/or postpartum period to the 6-bed anesthesia ICU of a 170-bed university hospital between January 2003 and December 2009.

The ICU of our hospital serves as a tertiary intensive care unit. A full-time specialist from the Anesthesia and Reanimation Department and an assistant from the same department attend in the ICU in which all intensive care procedures, except hemofiltration, have been being performed. Our hospital has a dialysis unit.

Information on patients involving demographic data, gestational history, reason(s) of admission, additional health problem(s) (eg. chronic hypertension, diabetes mellitus, hyperthyroidism, cardiac issues, chronic obstructive pulmonary disease etc.), history of a cesarean operation (if done, type of anesthesia), procedures and interventions performed in the ICU, length of stay in the ICU, and clinical results, were recorded. Moreover, administrations of mechanical ventilation and blood-blood products were noted, as well. As additional information, APGAR scores of newborns were reviewed.

The patients that have been referred from the Gynecology and Obstetrics Clinic with a gynecological problem and admitted to ICU were excluded from the study.

Detection of any system's dysfunction was accepted criteria of ICU admission. Detection of dysfunction in 3 or more systems (respiratory, cardiac, central nervous, haematological, hepatic, or renal) during the monitoring and treatment of patients was evaluated as a multiple organ dysfunction syndrome (MODS).

Data was presented as median (minimum – maximum) or mean ( $\pm$ standard deviation) values. Based on the obtained values, percentages were calculated. Approval of the ethics committee of the university was acquired and patient confidentiality was respected.

## RESULTS

According to the patient admission registers, following 2438 normal spontaneous vaginal and 3316 cesarean deliveries between January 2003 and December 2009, the number of patients who required intensive care was 13 and 155, respectively. The number of cases requiring ICU was found to be 168 in 5754 deliveries totally. In view of the total number of ICU admissions from all departments (2292 patients), the rate of obstetric cases was 7.33% within total admission (Table 1). Therefore, the ICU admission rate was calculated as 2919 per 100000 deliveries.

Mean age of cases included for evaluation was  $28.12 \pm 7.56$  (16-49) years. Mean gestational age at delivery was  $33.95 \pm 4.85$  (17-41) weeks.

**TABLE 1: Number of Patients delivering and admitted to ICU**

	C/S	NSVD	Total Delivery	Obstetrical Admission	Total ICU Admission
2003	152	64	216	11	142
2004	284	235	519	29	271
2005	399	327	726	41	341
2006	441	237	678	25	390
2007	545	436	1081	36	350
2008	762	614	1376	14	361
2009	733	525	1258	12	437
Total	3316	2438	5754	168	2292

C/S: Cesarean Section; NSVD: Normal Spontaneous Vaginal Delivery.

Arterial and central venous cannulations were performed for 148 and 43 patients admitted to the ICU respectively. The number of patients requiring mechanical ventilation was 32 (19%, 32/168). While 12 of those patients were extubated in the same day, the median time for staying intubated was 1 (1-5) day. Median length of ICU stay was 1 (1-14) day. The most common reason for admission to ICU was hypertension-related causes (105 patients, 62.50% of total obstetrical admissions) associated with eclampsia, preeclampsia and HELLP syndrome (43, 48 and 14 patients respectively) followed by hypovolemic shock (20 patients, 11.90% of total obstetrical admissions) associated with postpartum haemorrhage and placental abruption (11 and 9 patients respectively) (Table 2).

While 14 of 145 patients with cesarean delivery were elective cesarean cases, 131 patients were emergency operation. The most common cause of admission to ICU after emergency cesarean cases was hypertension-related (97 patients) associated with eclampsia, preeclampsia and HELLP syndrome (41, 43 and 13 patients respectively). The most common causes for elective cesarean cases were respiratory failure (8 patients, 4.76% of total obstetrical admissions) and postpartum atony (6 patients, 3.57% of total obstetrical admissions). However, obstetric diagnoses of 7 patients admitted to the ICU after delivery, could not be reached. (Table 2).

In view of chronic diseases, 4 patients had chronic hypertension, 3 had heart failure of

various degrees, 3 had valve disease (mitral valve insufficiency in 2 and tricuspid valve insufficiency in 1), 2 had bronchial asthma, and one patient had hyperthyroidism. Thus, in total, 13 patients displayed a chronic disease.

Among C/S anesthesia methods applied on the patients, general anesthesia was the most common one (79.27%). Other patients were operated under spinal anesthesia (18.93%) and epidural anesthesia (1.80%).

As an additional data; according to the acquired data, 143 newborns were included in the evaluation and the APGAR scores' are shown in Table 3. In utero newborn mortality was 2 and newborn mortality of 73 resuscitated newborn was 9. Totally 20 newborn admitted to newborn ICU. None of newborn with major anomaly was noted.

Blood - blood products were used in 25 (14.8%) patients. These patients received 33 units of whole blood, 55 units of erythrocyte suspension, 64 units of fresh frozen blood, and 37 random platelet suspensions.

**TABLE 2: Admission diagnosis of patients' with delivery status**

Diagnosis	Total Delivery	C/S
Normal patient	24	14
Respiratory failure	8	8
Postpartum atony	11	6
Postpartum eclampsia	3	-
Postpartum pneumothorax	1	-
Rupture of uterus	1	-
HELLP syndrome	14	13
Abruptio placenta	9	9
Eclampsia	48	48
Preeclampsia	43	41
Premature membrane rupture	1	-
Placenta acreata	2	2
Placenta previa	4	4
Fetal stress	9	9
Acute abdomen	3	3
In utero ex fetus (toxemia?)	2	-
Transverse position of fetus	1	1
Abortus imminence	1	1
Unknown diagnosis	7	-
Total	168	145

**TABLE 3:** Fetal assessment

Score	APGAR		Gestational age (week)*
	Minute 1 (n)	Minute 5 (n)	
0	9	11	32.18
1	1	0	–
2	4	0	–
3	2	0	–
4	6	0	–
5	2	3	31.00
6	14	5	35.40
7	37	3	33.66
8	45	9	34.89
9	23	38	35.37
10	0	74	37.12

\* For group minute 5.

While 158 of the cases were discharged to the service, 5 ended up with mortality, and the mortality rate among obstetric patients admitted to the ICU was found to be 2.97% of total obstetrical admissions (5/168). Five of the admitted cases were transferred to another center upon request of themselves or their relatives.

Diagnoses of cases ended up with mortalities were HELLP syndrome (2 patients), preeclampsia-DIC-intracranial haemorrhage (1 patient), eclampsia (1 patient), and postpartum atony (1 patient). All of these patients were multiparous. Each mortality case exhibited a rapid development of MODS. While 4 of those patients had a history of a cesarean section, one patient with postpartum atony consecutively underwent hysterectomy. One of these patients died due to HELLP syndrome, had a history of chronic hypertension. Median length of ICU stay in patients died was 2 (1-5 days) days. Mean age of these patients was found as 34.75 years. According the data, maternal mortality rate was 86.9 per 100 000 live births. All cases died in our hospital were in our critical care unit.

## DISCUSSION

Pregnancy and delivery period is a process that a problem can arise at any time. Haemorrhage and septic symptoms may be masked initially due to having the same signs with the physiology of

pregnancy. This may delay in the diagnosis and treatment. As death is sudden and unexpected at early age, maternal mortality is a tragedy and brings an enormous dolefulness for the family, especially for the father and the baby, the mother leaves behind.

Moreover, young patients and cases with a healthy medical history appear to be relatively more tolerant. However, presence of tachypnea and metabolic acidosis always indicate a problem.<sup>4</sup>

In the current study, the rate of obstetric cases among all ICU admissions was found 7.33% (168/2.292), which gives us the ICU admission rate of 2.919 per 100.000 deliveries. In the study of Vasques et al.,<sup>3</sup> the rate of obstetric patients among all ICU admissions was 10% (1571 admissions in total), whereas its rate among deliveries in the hospital was 0.7% (23.044 deliveries). This makes 699 ICU admissions per 100.000 deliveries. Demirkiran et al.<sup>5</sup> found the ICU admission rate of obstetric cases as 2.64%. Kelebek et al.<sup>6</sup> found this rate as 0.51%. Demirkiran et al.<sup>5</sup> suggests the presence of strict eligibility criteria for ICU admission. In view of this result, patients with poor overall medical conditions can be said to have been admitted to ICU by Demirkiran et al.<sup>5</sup> and Kelebek et al.<sup>6</sup> Therefore, presence of preeclampsia was not evaluated to be enough for admission, and only cases requiring respiratory and circulatory support were admitted to the ICU.<sup>6</sup> Moreover, the number of patients requiring mechanical ventilation (89.7%) and blood-blood products (86.2%) were found higher by Kelebek et al. than ours (19% and 14.8% respectively). According to the authors, in that centre, delivery unit and ICU were on the same floor, and some of the patients were monitored and pursued in the labour and delivery unit. While the mortality rate appears to be high in this system, in reality, it might render more effective use of ICU.<sup>6</sup>

Otherwise, in an Australian study,<sup>7</sup> the rate of obstetric cases over total ICU admissions was determined to be 0.38%. This value was found as a result of reviewing a period of 8 years. The differences in admission rates was explained by differing admission criteria and lack of a home care

similar to the one provided to the obstetric cases in Australia.<sup>7</sup>

ICU admission rate of obstetric cases to total admission was not so higher in our study, whereas value of 2.919 was much more higher than other studies.<sup>3,5-7</sup> The difference may be arising because of our institution being a reference hospital which receives referrals of problematic patients from other centres. Moreover, we believe that ICU admission should not be used only for respiratory and circulatory support, but also for patients requiring close monitoring. Admitting risky patients to the ICU for monitoring closely and planning the treatment may be lifesaving. Because of the monitoring performed in the ICU, problems of the patients are determined early and treatment can be planned prior to any progression of the existing problems and eruption of complications secondary to those problems. For instance, intracranial haemorrhage can be prevented by invasive arterial monitoring.<sup>5</sup> On the other hand, benefits of ICU admission are limited in patients admitted during late stages.<sup>8</sup> Otherwise there is no in-house obstetric service in our country like Australia.<sup>7</sup>

Majority of the patients admitted to the ICU were post-cesarean patients. The reason behind high number of cesarean cases in this ratio may be due to application of cesarean on patients who had problems and already required ICU treatment.

In the present study, the most common reason of ICU admission was hypertension-related problems. These were the patients that are admitted from emergency ward and have poor prenatal monitoring. Another major cause was hypovolemic shock associated with postpartum hemorrhage or placental abruption. The six most common causes of admission were described as preeclampsia-eclampsia, postpartum haemorrhage, placental detachment-placenta previa, infection, and anesthetics complications.<sup>9</sup> In another study,<sup>10</sup> the causes of ICU admission have been listed as preeclampsia-eclampsia, postpartum haemorrhagic-shock, pulmonary complications, cerebrovascular events, and amniotic fluid-clot embolism.

The number of patients required mechanical ventilation was 32 (19%) patients. Extubation of 12 patients (37.5%) in the same day indicates that a rapid postoperative recovery of respiratory problems and haemodynamic issues. We also conclude that delivering the baby also contributes to the resolution of problems associated with pregnancy such as hypertension. Demirkiran et al.<sup>5</sup> and Sriram et al.<sup>7</sup> were found this ratio as 24% and 23%, whereas Vasquez et al.<sup>3</sup> and Kelebek et al.<sup>6</sup> was found as 41% and 89.7% respectively. This difference could be based on admission criteria.

Otherwise, in our study, 148 patients were subjected to arterial cannulation, whereas only 43 patients received central cannulation. This was a result that hypertensive events were superior.

In the current study, median length of ICU stay was 1 (1-14 days) day. The reason of this short time could be delivery, primary treatment for obstetric hypertension-related condition's therapy. Otherwise, what median length of ICU stay of patients died was 2 (1-5 days) means that the process was very fast and you must do as quickly as possible what you planned to do. In a study performed by the inclusion of 14 centres in England,<sup>12</sup> median length of ICU stay was found to be 1 (1-34 days) day. Moreover, 35 of those patients did not receive ICU-specific interventions.

Development status of a country is also evaluated with maternal mortality. A maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy. While mortalities arising from accidental or incidental causes do not count, deaths from any cause related to or aggravated by the pregnancy are included.<sup>11</sup> In our study, obstetric-related number of mortalities was 5 (%2.97 of total obstetrical admissions). Depending on the underlying disease, this rate can increase up to 20-25%.<sup>4</sup> However, generally, the mortality rate appears to be around 2-3%.<sup>13</sup> In an Australian study,<sup>7</sup> no maternal death, but only several discharges with sequel, has been determined among 56 obstetric-related admissions between January 1998 and June 2006. Regarding other

causes that elevate the mortality rate; inadequate antenatal and intranatal care, late referral to ICU, problems during transfer, and incompetence of related staff on emergency obstetric approaches were mentioned.<sup>14</sup>

Considering the total number of deliveries as 5754, mortality rate was 86.9 per 100,000 deliveries in our study. According to the data collected by Ministry of Health from 615 hospitals in 53 provinces, total number of maternal mortality was 323, which corresponds to a rate of 49.20 per 100,000 deliveries.<sup>6</sup> In a study reviewing the years between 1991 and 1996, this rate has been found to be 80 per 100,000 deliveries (16/19.808) for Cerrahpasa Faculty of Medicine.<sup>8</sup> While this rate was 47 per 100,000 deliveries in the study of Shah et al.,<sup>11</sup> it generally varies between 55 and 920 per 100,000 deliveries across the world, and sub-Saharan region of Africa presents the highest rates.<sup>1</sup> The same rate has been reported to be 11.5 per 100,000 deliveries for US.<sup>15</sup> Early diagnosis and transfer of patient to reference hospital are important to decrease mortality.<sup>16</sup>

As a reference hospital, the same reason of high admission rate was acceptable for high mortality rate. Another reason of this high rate could be relatively. In our county, an Obstetric-gynecology and Child Hospital has been servicing the patients. So, many births in our county are performed in that hospital and our total birth number is low.

In the data of Cerrahpasa archives comprising the period between 1991 and 1996, most common cause of mortality was hypertension and the associated complications. Other common causes were infection, haemorrhage, and cardiac issues.<sup>8</sup> Shah et al.<sup>11</sup> reported haemorrhage, thromboembolism, amniotic fluid embolism, and fulminant hepatitis as the most common causes of mortality. As clearly observed, majority of those causes are associated with pregnancy. In the current study, most common

cause of mortality was complications associated with hypertension (4 patients). Fifth patient showed mortality due to complications associated with atony-related haemorrhage.

Moreover, pre-existing diseases increase the complications associated with pregnancy.<sup>1</sup> In only one of the cases displayed mortality, presence of pre-existing diseases may be an indicator of the benefits received by those patients from ICU monitoring and treatment. Nonetheless, in the retrospective study of Panchal et al.,<sup>10</sup> the pre-existing diseases were not found to have a significant rate compared with the control group.

A limitation of the current study may be the lack of critical care scores, like APACHE II or SAPS II. However, these scoring systems are reported to be not appropriate for obstetric patients because parameters such as tachycardia, tachypnea, anemia, leucocytosis, low thrombocyte level and low creatinine value, may produce false high predictions for mortality among obstetric admissions. APACHE II score was obtained based on the overall ICU population.<sup>17,18</sup>

In conclusion, the most common reasons for requirement of ICU admission in obstetric cases are hypertension and hypovolemia. Strategies developed for resolution of those issues, will reduce maternal morbidity and mortality by regular antenatal care, especially prenatal care for multiparous women, early ICU admission, early planning, early and aggressive intervention and multidisciplinary approach. Otherwise obstetric-gynecology and Child Hospitals could be increase ICU admission rate relatively, but not affect mortality rate for tertiary care units.

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