SAR Journal of Medicine

Abbreviated Key Title: *SAR J Med*
Home page: https://sarmedjournals.com/sjm/home

ISSN 2707-773X (P)
ISSN 2709-6920 (O)

Research Article

Obstetric Patients Admitted to Anesthesiology Intensive Care Unit: A 10-Year Retrospective Review

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Article History: | Received: 09.07.2020 | Accepted: 25.07.2020 | Published: 30.08.2020 |

Abstract: ***Aim:*** To assess obstetric patients treated in anesthesiology intensive care unit. ***Methods:*** We retrospectively screened 269 patients. In all patients, gestational age, mode of delivery, parity, referring clinic, previous medical disease, diagnosis at admission, APACHE II Score and GCS score were recorded. Clinical course in intensive care unit and cause of death in non-survivors were recorded. ***Results:*** The percentage of obstetric patients treated in intensive care unit was 9.4% with a mortality rate of 3.7%. Preeclampsia, eclampsia and HELLP syndrome were leading causes for intensive care unit admission. ***Conclusion:*** Most common cause of death was postpartum bleeding and its complication.

Keywords: preeclampsia/eclampsia, cesarean section, postpartum hemorrhage, obstetric anesthesia, postpartum care.

INTRODUCTION

Maternal death remains to be an important public health issue despite therapeutic advances in current century. Majority of maternal deaths are directly related to obstetric reasons which can be prevented by periodic prenatal care by obstetricians [1, 2].

Admission to intensive care unit (ICU) is required in 0.1-0.9% of critically ill pregnant cases. Overall maternal mortality ranges from 3.4% to 21% in ICUs [3].

Although maternal death has become increasingly less common in developed countries, it is still significantly high in developing countries. Improvements in socioeconomic status and availability of high quality obstetric care are important factors in reducing morbidity and mortality among pregnant population [4].

The transfer of an obstetric patient to ICU is considered as a marker of maternal morbidity [1, 2]. Complications during pregnancy or postpartum period can be life-threatening and mandate transfer to ICU [6]. Close monitoring in ICU allows early recognition of potential problems and recovery process is more rapid [5].

The aim of present study was to assess retrospectively obstetric patients treated in ICU and to investigate frequency and causes of ICU admission as well as mortality rate.

MATERIAL AND METHOD

This study was approved by Ethics Committee of Erciyes University (Decision no:2013/645). We retrospectively reviewed patients treated for obstetric reasons in ICU of Anesthesiology and Reanimation Department of Erciyes University, Medicine School in prior ten years.

For this purpose, gestational age, mode of delivery, parity, referring clinic, previous medical disease, diagnosis at admission, APACHE II Score and GCS score were recorded in all patients.

Serious disorder (hemorrhage, preeclampsia, eclampsia, HELLP syndrome, infection etc.) and complications causing ICU admission were recorded.

In addition, length of ICU stay, invasive procedures, transfusion of blood and blood products, duration of mechanical ventilation, plasmapheresis procedures and need for vasoactive agent infusion and outcomes were assessed.

Clinical course in intensive care unit (discharge or death) and cause of death in non-survivors were also recorded. Data of survivors and non-survivors were compared.

STATISTICAL ANALYSIS

Fisher's exact test or chi-square test was used to compare categorical variables between survivors and non-survivors. Independent sample t test was used to compare variables with normal distribution whereas Mann Whitney U test was used to compare variables with skewed distribution.

Descriptive statistics are presented as count and percentage. Variables with normal distribution are expressed as mean± standard deviation while those with skewed distribution are expressed as median (min-max). A p value<0.05 was considered to be statistically significant.

RESULTS

Overall, 2834 patients were admitted to anesthesiology ICU during study period. Of these, 269 were obstetric patients, comprising 9.4% of all patients treated in ICU.

In our study, 269 patients treated for obstetric reasons in ICU were assessed. Table 1 presents demographic characteristics of the patients. There was no significant difference in demographic characteristic between survivors and non-survivors (Table 1). Of the patients treated, 259 patients were discharged from ICU while 10 patients died with a mortality rate of 3.7%.

Among non-survivors, there was congenital heart disease in one patient (10%) while there was no systemic disease in remaining 9 patients (90%).

There was no systemic disease in 243 survivors (93.8%) while there was aortic stenosis in one, diabetes mellitus in 3, epilepsy in one, chronic hypertension in 6, cardiomyopathy in one, congestive heart failure in one, mitral valve stenosis in one and deep venous thrombosis in one patient. Overall, 16 patients (6.2%) had history of systemic disease among survivors.

No significant difference was detected when medical history was compared between survivors and non-survivors regarding presence of systemic disease (p=0.626).

There was no significant difference in mode of delivery between survivors and non-survivors (p=0.336; Table 2). It was found that mortality rate was significantly higher in patients referred to ICU by another facility (p=0.027; Table 3).

The leading causes for ICU admission were preeclampsia, eclampsia and HELLP syndrome; followed by obstetric hemorrhages. No significant difference was found between survivors and non-survivors regarding cause of ICU admission (p=0.086; Table 4).

Table 5 presents APACHE II and GCS scores in groups. The GCS scores were significantly lower in non-survivors than survivors (p<0.05).

It was found that sensitivity and specificity in prediction mortality were 100% and 87.3% for APACHE II score>13 whereas 90% and 79.2% for GCS<8, respectively.

Table 6 presents length of ICU stay, duration of mechanical ventilation and blood and blood products transfusions in patients

The length of ICU stay and duration of mechanical ventilation were significantly longer in non-survivors than survivors (Table 6).

Invasive monitorization was performed in all non-survivors (Table 7). Table 7 presents need for dialysis, plasmapheresis and vasoactive agent infusion in patients.

Overall, 10 patients died in ICU. The leading cause of death was postpartum bleeding and its complications (Table 8)

DISCUSSION

In this study, the mortality rate was detected as 3.7% in patients treated for obstetric causes in anesthesiology ICU. The leading causes for ICU admission were preeclampsia, eclampsia and HELLP syndrome; followed by obstetric hemorrhages. This is the first study performed in Central Anatolian Region of Turkey.

The mortality rate varies from 0% to 36% in obstetric cases admitted to ICU depending on development level of countries [6, 7]. In studies, maternal mortality rate was reported as 1.5% in Spain, 2.3% in Israel and 4.1% in Singapore [8-10]. In a Canadian study by Lapinsky *et al*., no maternal mortality was reported [55]. Although maternal mortality rate is reported to be low in developed countries, in the study from Mumbai by Karnad *et al*., mortality rate was reported as 21.6% in one of

the largest series including 453 obstetric patients treated in ICU [11].

In a study from South Africa, Taylor *et al*. reported extremely high mortality rate (36%); however, in that series, gynecological cases (abortions) were also included to the study [7]. In a study from Nigeria, Okafor and Aniebue reported mortality rate as 33.3% [12]. In Turkey, the mortality rate was reported to be 10.4% in a retrospective study involving time period of 1995-2000 by Demirkıran *et al*. [1]. That study was conducted at İstanbul province. To best of our knowledge, there is no study reporting mortality rate at Kayseri province.

In a study, Munnur *et al*. compared two centers including one from Texas, USA and the other from Mumbai, India and reported mortality rates as 2.3% and 25%, respectively. The authors also reported that 86% of pregnant women received periodic prenatal care in USA while this rate was only 27% in India. In above-mentioned studies, high rates of mortality have been attributed to socioeconomic status, difficulty in access to healthcare services, delays in diagnosis and referral of critical conditions, illegal abortions, delivery at home and insufficient prenatal and postnatal care [11]. In addition, pregnancy in adolescence period is an important in countries such as Brazil and India, resulting in higher mortality rates [13, 14].

In our study, low mortality rate observed could be attributed to timely indication for delivery in cases with severe preeclampsia/eclampsia, prompt intervention for hypertension and its complications, early transfer to ICU for close hemodynamic monitoring in obstetric patients with hemorrhage and strong cooperation between obstetrics and ICU teams. However, the aim should be zero mortality.

Several studies show that preeclampsia and eclampsia are more incident in case of primiparity. In our study, 56% of pregnant women were primipara.

In a meta-analysis including 26 publications between 1966 and 2005, Luo *et al*. reported that risk for preeclampsia is higher by 1.4-5.5 folds in primiparas than multiparas and that risk for eclampsia is higher by 2.42 folds in primiparas than multiparas [15]. Authors suggested that the higher risk for preeclampsia can be due to immune maladaptation, angiogenetic profile, insulin resistance and genetic factors although definitive cause is unclear.

In our study, most common causes for ICU admission were preeclampsia, eclampsia and HELLP syndrome (61.7%). The second leading cause was found as obstetric hemorrhages (27.5%). In the literature, similar rates have been reported in several studies. In a study on 262 cases by Curiel-Balsera *et al*., it was reported that there was severe preeclampsia in 78% whereas HELLP syndrome in 16% and eclampsia in 6% of the patients [8]. Okafor and Aniebue reported that 50% of obstetric patients admitted to ICU had preeclampsia and eclampsia whereas 22% had obstetric hemorrhage [12].

In contrast, in a study from UAE, obstetric hemorrhage (28.4%) was leading cause for ICU admission; followed by preeclampsia-eclampsia (25%) and cardiac problems [16].

Understanding of maternal morbidity and mortality will help us to identify issues that should be focused in obstetric cases admitted to ICU. In many centers, APACHE II scoring system is used to determine disease severity and clinical outcome and to predict mortality in obstetric cases in ICU [6, 6, 13].

In our study, APACHE II score>13 was estimated as threshold value for predicting mortality. Although APACHE II scoring is frequently used in ICUs, there are studies indicating that APACHE score could be inappropriate for use in young and healthy pregnant women [16, 17]. However, in contrast to these studies, El-Solh *et al*. compared obstetric and non-obstetric female patients and reported that APACHE score in obstetric patients is as valuable as in non-obstetric patients in predicting ICU mortality [18].

In our study, GCS score<8 were estimated as threshold value for predicting mortality. In study by Bhanqwanjee *et al*., it was reported that GCS score is good marker for survival in ICUs in patients with eclampsia and that GCS scores were significantly higher in survivors than those in non-survivors [16]. In addition, authors emphasized that close neurological monitoring and management will be helpful in eclamptic patients with low GCS score.

The higher need for invasive monitoring in obstetric patients results from the fact that hypertensive disorders and complications such as pulmonary edema are more commonly observed in this group of patients [19]. Central venous pressure and intra-arterial pressure monitoring are most frequently used invasive monitorization tools in ICUs. Close monitorization with invasive monitoring can facilitate recovery process by ensuring early recognition of potential problems and preventing complications in ICUs [20]. In the present study,

invasive monitoring was employed in patients as being more frequent in non-survivors.

It was found vasoactive agent infusion was performed in 80% of non-survivors, suggesting that vasoactive agent infusion could be a poor prognostic factor. In a cohort study, Zwart *et al*. reported the rate of inotropic support as 8.8% [21].

In a review by Zeman *et al*., length of ICU stay was associated to mechanical ventilation, blood and blood product transfusions and inotropic support. In this study, we can clearly suggest that longer length of ICU stay indicates higher complication rate and poorer prognosis.

In our study, it was found that 58.7% of patients required mechanical ventilation. In previous studies, this rate ranged from 34% to 58% [23]. It was reported that the rate of need for mechanical ventilation was 40.6% in the study by Suleiman *et al*. [3], whereas 34.8% in a cohort study [21], 42% in the study by Lapinsky *et al*. [6] and 41% in the study by Cohen *et al*. [9]. In our study, the most frequent indications for mechanical ventilation were acute respiratory failure and hemodynamic instability. In our study, the rate of mechanical ventilation was higher than previously reported.

In this study, the most common cause of death was obstetric hemorrhage and its complications. Five of 10 non-survivors died due to obstetric hemorrhage and massive blood transfusion was needed in these patients. The second leading cause of mortality was intracranial hemorrhage, which was encountered in 3 non survivors. In the literature, it has been emphasized that blood pressure control is highly important in pregnant patients presented with altered mental status and seizures and that CT scan should be performed by consideration of intracerebral pathology in patients who had no improvement in consciousness following delivery.

In conclusion, hypertensive conditions induced by pregnancy and postpartum hemorrhage were frequent causes of ICU admission in obstetric patients. Mortality rate in our study was lower than previously reported from Turkey. It could be possible to reduce maternal mortality by close communication and cooperation among obstetrics, anesthesia and ICU teams.

Compliance with Ethical Standards

Esmaoglu A. Protocol/project development, Manuscript writing, Data analysis, writing/editing, Koca D. Data Collection, Data analysis, Ulgey A. Data Collection, writing/editing

Conflict of interest

Author Aliye Esmaoglu declares that she has no conflict of interest.

Author Dilek Koca declares that she has no conflict of interest

Author Ayse Ulgey declares that she has no conflict of interest

İnformed consent form

No informed consent was obtained in this study. Because. Our study is retrospective.

Funding

There is no financial support.

Ethical approval

This study was approved by Ethics Committee of Erciyes University (Decision no: 2013/645).

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