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RESEARCH ARTICLE

Retrospective Analysis of Critically ILL Obstetric Cases Admitted to Intensive Care Unit

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ABSTRACT

Objective: Pregnant women, typically young and healthy, may face life-threatening conditions during pregnancy and delivery due to obstetric complications or exacerbation of pre-existing diseases. Some may require intensive care unit (ICU) admission. This study retrospectively examines obstetric patients followed in the ICU to evaluate outcomes.

Materials and Methods: This descriptive study involved a retrospective file review of obstetric patients admitted to the ICU between January 2015 and May 2016. Data collected included patient demographics, ICU admission details, diagnoses, comorbidities, and outcomes.

Results: Out of 1,223 ICU admissions, 88 (7.19%) were obstetric patients. The maternal age was 30.97±6.02 years, and the median gestational age was 35 weeks. The most common ICU admission reasons were postpartum haemorrhage (62.5%) and hypertensive disorders (48.9%). The ICU mortality rate was 3.4%. Comorbidities were present in 26.1% of patients, with intracranial pathologies and epilepsy being the most common. Culture positivity was detected in 12.5% of patients, with Candida species being the most frequently isolated microorganism. Culture positivity and additional pathology development were found to be increased in patients who underwent procedures such as intra-arterial catheterization, central venous catheterization, intubation, and chest tube insertion ($p<0.05$).

Conclusion: This study highlights that postpartum hemorrhage and hypertensive disorders are the primary causes for ICU admission in obstetric patients, with a relatively low mortality rate of 3.4%. Early intervention and experienced multidisciplinary teams are crucial in improving maternal outcomes in critical cases.

Keywords: Intensive care unit, maternal mortality, obstetrics, postpartum hemorrhage

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INTRODUCTION

Pregnant women are typically young and healthy individuals. During pregnancy and delivery, life-threatening situations may arise due to obstetric complications or the exacerbation of pre-existing conditions. Some pregnant women may become critically ill patients requiring intensive care unit (ICU) follow-up.[1] "Critical patient" is generally known as an adjective applied to patients whose vital functions are unstable, whose vital functions are kept stable under supportive treatment, or whose general condition is likely to deteriorate. These patients, whose lives are under threat, are followed up and treated in emergency departments and the ICU.[2] Despite the developments in recent years and efforts to improve maternal health, these critical cases can sometimes result in death.

The death of mothers, generally young and healthy, results in tragic consequences.[2] According to 2020 data, maternal mortality rates per 100,000 live births are 59.1 in Mexico, 21.1 in the United States, 9.84 in the United Kingdom, and 11 in Canada.[3] In our country, it was found to be 12.6 per 100,000 live births in 2022.[4]

Treatment of obstetric patients in critical condition and in the ICU is easier.[5] Additionally, with the close follow-up opportunity in the ICU, possible complications are recognized ear-

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lier. Furthermore, there is a chance of rapid intervention in the ICU against developing complications.[6] Our study aimed to retrospectively examine obstetric patients followed in the ICU and evaluate the outcomes.

MATERIALS and METHODS

This research is a descriptive study (retrospective file search). The study was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects." Kanuni Sultan Süleyman Training and Research Hospital Ethics committee approval of the study was obtained with the decision number 2016/20 (Subject number: KAEK/2016.20.31 Date: 17.06.2016). The study was conducted between January 2015 and May 2016, in the ICU of a tertiary hospital. The files and clinical data of obstetric patients who were admitted to the ICU on these dates were retrospectively scanned and examined. Patients excluded from the study were those who were not hospitalized for obstetric reasons.

Patient characteristics such as age, gestational age (weeks), number of pregnancies and births, height, weight, body mass index (BMI), ICU admission period (antepartum/postpartum/post-abortal), type of delivery (vaginal/elective caesarean/emergency caesarean/abortion/ectopic) were noted. Their diagnoses for ICU admission and their previously known diseases, if any, were recorded in accordance with their group.

Glasgow Coma Scale (GCS), American Society of Anesthesiologists (ASA) score, and Acute Physiology and Chronic Health Evaluation II (APACHE II) scores determined during ICU admission were recorded. The total number of days they stayed in the ICU and the hospital, whether there was any mortality, and if invasive mechanical ventilation (MV) was applied, how many hours it was applied, were noted. The causes of mortality were stated in the cases that were fatal. The antimicrobial treatments received by the patients were recorded according to their groups. If culture positivity was detected, it was also noted which microorganism was isolated in which culture.

Diseases that developed after hospitalization were also identified. These additional identified pathologies were grouped as acute respiratory distress syndrome (ARDS), multiple organ failure (MOF), sepsis, disseminated intravascular coagulation (DIC), hemorrhagic shock, ventilator-associated pneumonia (VAP), and pleural effusion.

Invasive interventions (nasogastric tube, urinary catheter, thorax tube, intubation, mechanical ventilation requirement, central venous catheter, intra-arterial catheterization, renal replacement therapy, plasmapheresis, inotrope usage) performed during the period of follow-up in the ICU were identified and stated one by one. It was also noted whether blood transfusion was performed in the ICU.

Statistical Analysis

Statistical analyses were performed using SPSS version 25.0 (Chicago, IL, USA). Normality was assessed using the Shapiro–Wilk and Kolmogorov–Smirnov tests. Basic characteristics of the data were described using mean, standard deviation (SD), median, and interquartile range (IQR). Ratios of existing comorbidities in patients were calculated for descriptive purposes. Categories such as reasons for admission to the ICU and mortality reasons were analysed using counts and percentages. Fisher's Exact Test was used to determine the relationship and differences between invasive procedures, supportive treatments, culture positivity, and the development of additional pathologies.

P-Values: p-values were calculated to assess the statistical significance of the results. A p-value <0.05 was considered statistically significant.

RESULTS

During the study period, 1,223 patients were admitted to the ICU, of which 88 (7.19%) had obstetric pathologies. Throughout the same period, it was observed that 19,599 births occurred in the hospital, with 0.44% of these obstetric patients necessitating ICU follow-up. The maternal age of the cases included in the study was determined to be 30.97±6.02 years, and the median gestational age was 35 weeks (IQR: 5). The BMI value was reached in 71 patients, and the median BMI (kg/m^2) was determined as 27.34 (IQR: 4). The median number of pregnancies of the patients was 3 (IQR: 2), and the median number of births was 1 (IQR: 2).

Comorbid pathologies were detected in 23 (26.1%) of the patients included in the study. The most common comorbid diseases were intracranial pathologies and epilepsy (23.08%), and cardiac diseases (19.23%). Accompanying diseases before and during pregnancy are shown in Table 1.

The patients' indications for ICU admission and whether this admission occurred during the postpartum, antepartum, or post-abortal period were specified. Analysis revealed that 4 patients (5%) were admitted to intensive care antepartum, 82 (93%) postpartum, and 2 (2%) post-abortal. The analysis of intensive care admissions during the antepartum period revealed a variety of conditions including epileptic seizure, diabetic ketoacidosis, preeclampsia, and HELLP Syndrome. Notably, obstetric haemorrhage emerged as the predominant reason for ICU admission, constituting 62.5% of cases in

Table 1. Diseases existing before pregnancy

Comorbidity	Patient count (n)	Ratio (%)
Intracranial pathologies±epilepsy	6	23.08
Cardiac diseases	5	19.23
Diabetes mellitus	4	15.38
Thyroid diseases	3	11.54
Pulmonary diseases	3	11.54
Liver diseases	2	7.69
Kidney diseases	1	3.85
Coagulation disorders	1	3.85
Hypertension	1	3.85

our study. Following haemorrhage, hypertensive disorders of pregnancy were the second most prevalent cause, accounting for 48.9% of admissions. Placenta praevia ranked highest among obstetric diagnoses for ICU admission at 30.7%, followed by preeclampsia at 23.9%. Additionally, anaesthesia complications were noted as the primary non-obstetric reason for ICU admission, affecting 6 patients (6.8%). Table 2 presents a comprehensive breakdown of patient diagnoses and their frequency distribution.

It was observed that, of the patients admitted to the ICU, 42 (48%) were admitted after elective caesarean sections, 36 (41%) after emergency caesarean sections, 8 (9%) after vaginal births, and 2 (2%) after abortion or ectopic pregnancy.

Reproduction was detected in the culture(s) of 11 of the patients (12.5%), and the most positive blood culture was observed in 5 patients (5.7%). Urine culture growth was positive in 3 patients (3.4%), tracheal aspirate culture was positive in 3 patients (3.4%), and catheter culture was positive in 2 patients (2.3%). Other culture positivity was observed in 4 patients (4.5%) (cervix culture, wound culture, etc.). It was revealed that the most frequently isolated microorganism was Candida species, accounting for 36%.

The antimicrobial agents that all patients received while they were followed in the ICU were noted, and their percentage distributions were calculated. It was determined that cephalosporin group antibiotics were used most frequently (93.4%), and tazobactam + piperacillin derivatives ranked second (12.5%).

During ICU follow-up, additional pathology was detected in 14 of the patients (15.9%). When the developing diseases and conditions were examined: pleural effusion in 8 (9.1%) patients, ARDS in 6 (6.8%), sepsis in 5 (5.7%), MOF in 3 (3.4%), VAP in 3 (3.4%), and DIC in 2 (2.3%) patients were identified (Table 3).

Table 2. Reasons for admission to intensive care

Reasons for admission to ICU	Patient count	Ratio to all patients (%)
Obstetric		
Obstetric haemorrhages	55	62.5
Placental abruption	5	5.7
Placenta praevia	27	30.7
Placenta accreata	3	3.4
Placental rest	0	0
Uterine contraction failure	12	13.6
DIC	8	9.1
Trauma	1	1.1
Hypertensive disorders of pregnancy	43	48.9
Preeclampsia	21	23.9
Eclampsia	10	11.4
HELLP syndrome	12	13.6
Acute fatty liver of pregnancy	0	0
Sepsis	0	0
Amnion fluid embolism	0	0
Other	0	0
Non-obstetric		
Epilepsy	2	2.3
Heart valve diseases	2	2.3
Diabetic ketoacidosis	1	1.1
Haemorrhagic shock	4	4.5
Acute kidney failure	0	0
Acute respiratory failure pneumonia	4	4.5
Pulmonary embolism	0	0
Obstructive pulmonary disease (Asthma, COPD)	3	3.4
Acute cerebrovascular event	2	2.3
Anaesthesia complication	6	6.8
Other	3	3.4

ICU: Intensive care unit; DIC: Disseminated intravascular coagulation; HELLP: Haemolysis, elevated liver enzyme, and low platelet; COPD: Chronic obstructive pulmonary disease

When examining the mortality of patients, it was observed that the mortality of 2 out of 3 patients was due to DIC and hemorrhagic shock developing after postpartum hemorrhage. Table 4 shows the causes and frequencies of mortality. It was further noted that both of these patients were lost within the first 24 hours of admission to the ICU. The other 1 patient was interned with a diagnosis of HELLP and died following ARDS, sepsis, and MOF. In the analysis, the mentioned conditions—postpartum hemorrhage, DIC, and hem-

Table 3. Pathologies developed in ICU

Pathologies developed in ICU	Number of patients	Ratio to all patients (%)
Pleural effusion	8	9.1
ARDS	6	6.8
Sepsis	5	5.7
MOF	3	3.4
VAP	3	3.4
DIC	2	2.3

ICU: Intensive care unit; ARDS: Acute respiratory distress syndrome; MOF: Multiple organ failure; VAP: Ventilator-associated pneumonia; DIC: Disseminated intravascular coagulation

Table 4. Mortality reasons

Reasons	Number of patients	Ratio to non-survivor (%)
DIC	2	66.7
Haemorrhagic shock	2	66.7
Postpartum haemorrhage	2	66.7
Sepsis	1	33.3
MOF	1	33.3
ARDS	1	33.3
HELLP	1	33.3

HELLP: Haemolysis, elevated liver enzyme, and low platelet

Table 5. Relationships of invasive procedures and supportive treatments with mortality, culture positivity and development of additional pathology

	Mortality				p*	Culture positivity				p*	Development of additional pathology				p*
	Yes (n=3)		No (n=85)			Yes (n=11)		No (n=77)			Yes (n=14)		No (n=74)		
	n	%	n	%		n	%	n	%		n	%	n	%	
Urinary catheter	3	100	85	100	–	11	100	77	100	–	14	100	74	100	–
Mechanical ventilation requirement	3	100	34	40	0.071	10	90.9	27	35.1	0.001	12	85.7	25	33.8	<0.001
Intubation	3	100	31	36.5	0.055	8	72.7	26	33.8	0.017	11	78.6	23	31.1	0.001
Central venous catheterization	3	100	21	24.7	0.018	8	72.7	16	20.8	0.001	10	71.4	14	18.9	<0.001
Intra-arterial catheterization	3	100	21	24.7	0.018	8	72.7	16	20.8	0.001	11	78.6	13	17.6	<0.001
Nasogastric tube	2	66.7	9	10.6	0.040	2	66.7	9	10.6	0.040	9	64.3	2	2.7	<0.001
Inotropic usage	3	100	8	9.4	0.002	4	36.4	7	9.1	0.029	5	35.7	6	8.1	0.013
Thorax tube	0	0	3	3.5	0.900	3	27.3	0	0	0.002	3	21.4	0	0	0.003
Renal replacement therapy	1	33.3	2	2.4	0.100	3	27.3	0	0	0.002	3	21.4	0	0	0.003
Plasmapheresis	0	0	1	1.2	0.966	1	9.1	0	0	0.125	1	7.1	0	0	0.159
Blood transfusion	3	100	36	42.4	0.083	9	81.8	30	39	0.009	10	71.4	29	39.2	0.027

*: Fisher's exact test

orrhagic shock—were all considered causes of death. They were observed in 66.7% of patients with fatal outcomes, thus identified as the most common causes of mortality.

The relationship between invasive procedures and supportive treatments with culture positivity, and the relationship between these procedures/treatments and additional pathology development, were examined. The frequency of culture positivity was significantly higher in patients requiring MV, intubation, central venous catheterization, intra-arterial catheterization, inotropic drug administration, chest tube placement, renal replacement therapy, and blood transfusion ($p<0.05$). The frequency of developing additional pathology was significantly higher in patients requiring MV, intubation, central venous catheterization, intra-arterial catheterization, nasogastric tube placement, inotropic drug application, chest tube placement, renal replacement therapy, and blood transfusion ($p<0.05$) (Table 5). The median ventilation duration of 37 patients receiving MV support was observed as 12 hours (IQR: 18).

When evaluating the ASA scores, 12 patients (13.6%) were classified as ASA 2, 71 (80.7%) as ASA 3, and 5 (5.7%) as ASA 4. In terms of APACHE scores, 33 patients (37.5%) scored between 0 and 10, 35 (39.8%) scored between 11 and 20, 10

(11.4%) scored between 21 and 30, and another 10 (11.4%) had scores exceeding 31. The median GCS was 14 (IQR: 5).

While the median value of the days that our patients stayed in the ICU was 2 days (IQR: 2), the median value of the total days they stayed in the hospital was 7 days (IQR: 6).

DISCUSSION

During the period covered by our study, when the number of deliveries in the hospital where the study was conducted was examined, it was found that 88 out of all obstetric patients (0.44%) were admitted to the ICU. It was noted that in the study by Chawla et al.,[7] this rate was 0.47%, showing similarity with our result, while in the study by Rios et al.,[8] this rate was 0.81%. When comparing the ratio of obstetric patients requiring ICU follow-up to all patients followed up in the ICU, it was found to be 0.8% by Chawla et al.[7] and 3.9% by Rios et al.,[8] whereas in our study, this ratio was 7.19%. The hospital where the study was conducted serves a population of 3.5 million people in its vicinity and is renowned for its experience in obstetrics and high-risk pregnancies. Therefore, we believe that the higher ratio in our study compared to other researchers is due to the majority of high-risk pregnancies in the surrounding area seeking care at our hospital, which specializes in obstetrics and gynecology.

Of the 88 patients included in the study, 3 (3.4%) resulted in mortality. In a study examining 11,824 patients in France, this rate was 1.3%; in a study in Brazil, it was 4.7%; and in a study in Pakistan, it was 27.3%.[9–11] It was found to be 33.66% in a study in India[12] and 10.4% in a study conducted by Demirkiran et al.[1] in our country. Although it is observed that the mortality rate in obstetric patients followed in intensive care is directly proportional to the development level of the countries, we have obtained better results compared to domestic data. We think that in obstetric cases, the anesthesia, gynecology, and intensive care teams are very experienced in the subject; there are opportunities to intervene in emergencies early; and also the provision of an appropriate and adequate third-level intensive care service.

When examining the pre-existing conditions of the patients in our study before pregnancy, the most common findings were intracranial pathologies and epilepsy. We determined that the rate of comorbidities in this group during the entire peripartum period was 23.1%. In a study conducted by Rios et al.,[8] the two most common causes were hypertension and diabetes mellitus, both with a rate of 18.5%, and epilepsy was observed at a rate of 14.8%. This variation may be attributed to the sociocultural and genetic differences among populations or differences in pregnancy follow-up objectives.

When we examined the admission indications of patients who were admitted to our ICU in the postpartum period, nearly all (93%) showed that the most common indication was postpartum hemorrhage (62.5%), followed by hypertensive disorders of pregnancy (48.9%). In the study by Jain et al.,[13] hypertensive disorders were the most common (37.7%), and hemorrhages were the second most common (28.8%). Similarly, in the study by Vasquez et al.,[14] hypertensive disorders were more frequent (40%), and hemorrhages were the second most frequent (16%). We believe that this difference is due to the majority of high-risk pregnancies with placental abnormalities in our hospital's region being followed up at the hospital where the study was conducted. The observation that 30.7% of the patients in our study group were diagnosed with placenta praevia further supports these findings. In the study by Mahutte et al.,[15] obstetric hemorrhages (26%) were the most common indication for ICU admission, while hypertension (21%) was the second most common reason. In the study by Ng et al.[16] in Hong Kong, the rate of obstetric patients admitted to intensive care due to postpartum hemorrhage was 58%, and the rate of those admitted due to hypertensive disorders of pregnancy was 25%, which is similar to our results. As seen, the indications for admission to the ICU can vary depending on the medical profile of obstetric patients presenting to that hospital.

In our study, where we separately evaluated elective and emergency cesarean sections, we found that 89% of the patients underwent cesarean operations, 9% had vaginal deliveries, and 2% were post-abortal admissions. A review of the literature shows that, similarly, the majority of obstetric patients are admitted to the ICU following cesarean sections. Saha and Shakya[17] found the cesarean rate to be 70% in their study. The difference can be attributed to the high cesarean rate in our country.

CONCLUSION

In this study, we observed that a significant proportion of obstetric patients admitted to the ICU experienced critical conditions, with postpartum hemorrhage being the leading cause of ICU admission. Despite the relatively low mortality rate of 3.4%, the study highlights the importance of early interventions, experienced multidisciplinary teams, and appropriate ICU care in improving maternal outcomes. The findings suggest that obstetric ICU admissions are primarily due to hemorrhagic and hypertensive disorders, which align with patterns seen in other high-risk populations. Further research with larger cohorts is needed to explore the impact of different interventions and refine management strategies for critically ill obstetric patients.

Disclosures

Ethics Committee Approval: The study was approved by the Kanuni Sultan Süleyman Training and Research Hospital Clinical Research Ethics Committee (No: 2016/20, Date: 17/06/2016).

Informed Consent: Informed consent was obtained from all participants.

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