

Evaluation of Admission Indications, Clinical Characteristics and Outcomes of Obstetric Patients Admitted to the Intensive Care Unit of a Teaching Hospital Center: A Five-Year Retrospective Review

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Abstract

Background: Care of obstetric patients has always been a challenge for critical care physicians, because in addition to their complex pregnancy-related disease, fetal viability is considered.

Objectives: The aim of this study was to review the admission indications, clinical characteristics and outcomes of obstetric patients, admitted to the intensive care unit of Alzahra teaching hospital affiliated to Guilan University of Medical Sciences, Rasht, Iran.

Methods: This retrospective cohort study was conducted on pregnant /post-partum (up to 6 weeks) patients admitted to the ICU over a 5-year period from April 2009 to April, 2014.

Results: Data from 1019 subjects were analyzed. Overall, 90.1% of the patients were admitted in the postpartum period. The most common indications for admission were pregnancy related hypertensive disorders (27.5%) and obstetric hemorrhage (13.5%). Epilepsy (5.4%) and cardiac disease (5.2%) were the most common non-obstetric indications.

Conclusions: Pregnancy-related hypertensive disorders and obstetric hemorrhage were the main reasons for admission, and epilepsy and cardiac disease were the most common non-obstetric indications. Efforts must be concentrated on increasing antenatal care.

Keywords: Obstetric Patients, Intensive Care Unit, Admission Indication, Outcome

1. Background

Pregnancy and delivery may be associated with complications that require intensive care unit (ICU) care. There is increasing evidence that admission of high-risk obstetric patients at the ICU leads to a decrease in maternal mortality. It has been claimed that obstetric patients comprise only 0.07% to 0.074% of patients that require ICU admission, yet they have the potential for catastrophic complications (1, 2). They are admitted to the ICU for close observation to detect the problems earlier, perform invasive monitoring, increase nursing care or ventilatory support or any intervention that are not available at the wards (3, 4). Care of obstetric patients has always been a challenge for critical care physicians (2, 5). Because care of these patients is a dual job, in this condition, 2 lives are treated. As a matter of fact, in addition to pregnancy-related complications, fetal viability is also considered. Obstetric patients admitted to the ICU are young and healthy, yet their management is complex due to altered maternal physiology

and interactions of this changed condition with diseases process (6-9). A number of studies have been conducted to investigate the characteristics and outcome of obstetric treatments in Iran, however, considering the importance of the issue and lack of researches in this area, at least in the studied province, this study was designed to give a descriptive report of the status of these patients at a referral center. The results of this research may call for constructive decisions and may change plans, leading to a decrease of maternal mortality and better outcome.

2. Objectives

The aim of the current study was to determine indications (obstetric and non-obstetric) of ICU admission and outcomes of these patients in a tertiary care hospital of Rasht, Iran.

3. Methods

This retrospective study took place at Alzzahra teaching hospital of Rasht, Iran. This study was carried out after acquisition of permission from the ethics committee of the research and technology of Vice-Chancellorship of Guilan University of Medical Sciences and anonymity of the participants was preserved. Over a 5-year period, from April 2009 to April 2014, all eligible candidates were enrolled.

3.1. Inclusion Criteria

Inclusion criteria were ICU admission during pregnancy or within 42 day of delivery and complete management data available for review.

3.2. Exclusion criteria

The exclusion criteria were ICU admission after 42 days of termination of pregnancy or incomplete management data for review.

The extracted data included, maternal age, gestational age, mode of delivery, coexisting medical problems, final diagnosis, length of stay at the ICU, the need for ventilator support, maternal outcome, obstetric medical history, specific invasive care interventions, and admission indication to ICU.

The subjects were managed by the ICU team, consisting of an anesthesiologist and critical care fellows. The other medical specialty groups were consulted, if required.

3.3. Statistical Analysis

The data were scrutinized by an experienced anesthesiologist and analyzed using the SPSS version 16 software. The results were presented by descriptive statistics.

4. Results

A total of 1019 obstetric patients were admitted to the ICU during the study time, which represented 5% of all deliveries. The mean maternal age was 30.4 ± 6.65 years; 15% to 52.75% of the patients were referred from peripheral centers. Furthermore, 90.1% of them were admitted during the postpartum period. Regarding to the mode of delivery, 46.8% of the patients were admitted after elective cesarean section and 33.3% after emergency cesarean section. Overall, 90.1% of the ICU admitted patients were admitted after CS and 7.27% after NVD.

Among the subjects, 753 (73.9%) were admitted to the ICU in an emergency situation and 266 (26.1%) had an elective admission.

The most common reasons for ICU admission were pregnancy related hypertensive disorders, including preeclampsia and eclampsia (27.5%), followed by hemorrhage, including antepartum, post partum, and ruptured ectopic (13.5%) (Table 1). The most non-obstetric diagnosis to admission was epilepsy (6.2%) and cardiac disease (5.5%) (Table 2). The average length of ICU stay was 2.8 ± 1.64 days. Furthermore, 61.7% of the patients had no prior history of any disease. Seizures and cardiac disease seem to be the most common co-morbidities (Table 3). The main causes of death were multi-organ dysfunction and pulmonary emboli. Seizures and cardiac disease seemed to be the most common co-morbidities (Table 3). No invasive intervention was performed for 94.7% of the patients and the most performed intervention was tracheal intubation (2.7%) (Table 4). The most administered drugs were $MgSO_4$ and anti-hypertensive agents.

Table 1. Obstetric Admission Diagnosis

Diagnosis	Number of Patients
Hemorrhage	
Post Partum	138 (13.5%)
Antepartum	13 (1.03%)
Ruptured ectopic	49 (4.8%)
Hypertensive disorders	
Preeclampsia	280 (27.5%)
Eclampsia	58 (5.7%)
HELLP syndrome	42 (4.1%)
Sepsis	7 (0.7%)

Table 2. No Obstetric Reasons for Intensive Care Unit Admission

	Number of Patients
Epilepsy	55 (5.4%)
Chronic cardiac disease	53 (5.2%)
Arrhythmia	20 (2%)
Respiratory disease	11 (1.1%)
Trauma	5 (0.5%)
Urinary tract infection	6 (0.6%)
Encephalitis or meningitis (bacterial or viral)	1 (0.1%)

5. Discussion

Most females complete their pregnancy with no complications, yet a few of them develop unexpected events

Table 3. Concurrent Disease in Patients Admitted to the Intensive Care Unit

Disease	Number of Patients
Epilepsy	63 (6.2%)
Cardiac disease	56 (5.5%)
Hypertension	52 (5.1%)
Diabetes	51 (5%)
Hematologic disorders	41 (4%)
Thyroid disease	50 (4.9%)
Liver disease	3 (0.3%)
Respiratory disease	12 (1.2%)

Table 4. Interventions Undertaken in Intensive Care Unit

Intervention	Number of Patients
Mechanical ventilation	28 (2.7%)
Central venous catheter	25 (2.5%)
Arterial line insertion	17 (1.7%)
Chest tube insertion	10 (0.98%)

due to pregnancy and require ICU care (9). There are several similar studies with or without admission criteria, such as Apache or SOFA scoring system. This might be partly due to the characteristics of the ICUs. In the present study, as the hospital was a specified hospital for obstetrics, the admitted cases were restricted to pregnancy-related complications, which is of great importance, as two lives could be saved. On the other hand, this hospital does not have an intermittent part between general wards, with uncomplicated and healthy females, and the ICU. Considering these facts, there was control over transferring the patients to the ICU, even for accurate monitoring.

The mean distribution of age in the patients of the current study was 30.4 ± 6.65 years, while in the study conducted by Ashraf et al. (5) this was 26.34 ± 5.34 years, and in that of Lin et al. this was 31 years (10). This variation might be due to differences in cultures that effect age of marriage.

In the current study, among all deliveries, obstetric admission to the ICU represented a percentage in the upper range of the literature (2, 3, 11-13). The reason might be that the hospital of this study was a referral center with limited ICU beds and also lack of a high dependency unit, assessed based on the requirement of basic support. On the other hand, it seems that early recognition for the need of ICU care, adequate pre-ICU admission, supportive care and prompt transfer, could prevent the high prevalence of ICU admission.

The two main indications for ICU admission were preg-

nancy hypertensive disorders and obstetric hemorrhage, and the majority of studies confirm this finding (6, 7, 11, 14-24). Most of the patients had a postpartum admission that was opposite to the study of Ashraf et al.; the majority of their patients were admitted during the antepartum period (5). However, supporting the current findings, most of the authors reported a higher incidence of postpartum admission (7, 8, 14, 25). This might be related to hemodynamic changes in the postpartum period, including plasma oncotic pressure changes, increase in cardiac output and acute blood loss during delivery (26).

The world health organization (WHO) noted that "there is a story behind every maternal death or life threatening complications" (5). To evaluate the quality of maternal care, maternal mortality rate is used (16). Maternal mortality has been defined by WHO as "a death of woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy from any cause related to or aggravated by the pregnancy or its management but not from accident or incidental causes" (27). In developed countries, the average maternal mortality in the ICU is 0.1% to 3.4%, compared to developing countries (8% to 40%) (7, 25). Based on the estimation from world health organization, maternal mortality in the WHO European Region ranges from 5 to 210 deaths per 100000 live births (7). In Iran, promising results are found when comparing maternal mortality rate from 1999 to 2013, as a noticeable fall in maternal mortality rate is observed over this period. Maternal mortality decreased from 83 per 100 000 live births in 1999 to 23 per 100 000 live births in 2013. It seems that there was a considerable progression in maternal care and a higher quality care was provided for obstetric patients within these years, including reasons such as increased knowledge and awareness at the community level, health education, trained care givers to identify high risk cases and timely transfer of patients to initiate treatment with no delay.

In the current study, the maternal mortality rate was 0.3%, which was less than other studies (6, 10, 11, 15, 26, 28, 29); the authors justified the high mortality rate as a multi factorial problem, and the proposed causes might be advanced maternal age, lower gestational age, poor antenatal care, low socio economic status, delayed presentation to hospital transportation to ICU, inadequate well-trained staff and clinical mismanagement (7, 8). For example, Saif et al. (7) reported that mortality rate of obstetric patients admitted to ICU was very high in India; they expressed the major risk factors for the problem as lack of adequate antepartum care and delayed admission due to long distances. They also pointed to the following problems, effective public health services, poverty, gender disparity, unfettered fertility, and illiteracy. The average length of ICU

stays was 2.8 ± 1.64 days that compared to other studies was lower in this study (10, 15, 30). Also, mechanical ventilation was used for 2.7% of patients, it was less than the reports of other studies (5, 6, 11). Compared to similar studies, the lower mortality rate and higher admission and less need for invasive intervention with shorter ICU stay indicate that, physicians were familiar with the complications of pregnancy and nursing staff were trained with knowledge to identify the criticality of these patients, had higher level of education and awareness of the patients, which led to early admission and improvement in the management of these patients. It is believed that early consultations had an important role in the results.

To achieve significant improvement in maternal and fetal outcome, early involvement of a cooperative team was needed. This multidisciplinary team consisted of intensivists, obstetricians and clinical pharmacologists, aware of pharmacokinetics of the drugs administered during pregnancy (8, 26).

Suggestions: It is noticeable that the majority of our patients were referred from peripheral health centers and had to travel long distances, consequently losing precious time. This study highlights the need for critical units established in peripheral areas with alert staff, familiar with obstetric complications and enough equipment to perform at least the primary needed evaluation and interventions to preserve stable vital signs. After the management of the critical situation, depending to patients' condition, decisions would be made to refer the patient to a more equipped health center. This would prevent unplanned referrals and consequently better outcomes.

It is obvious that during the period of the study, there were numerous therapeutic innovation, leading to improvement of management of these patients, therefore it is suggested to design multi-center prospective studies to enroll more cases and reduce duration of the study and consequently the influence of new medical therapeutic and diagnostic modalities on the results. Up till now, most studies concerning severe maternal morbidity have been designed with ICU populations, yet it has been demonstrated that not all of these cases are referred to the ICU, therefore, to investigate for real causes for maternal morbidity and mortality in the general population, the studied population must be changed.

The authors of the current study were well aware that a prospective multi-center study, including several regions of the country, is required to have meaningful results for the entire country. This study calls for new similar researches in the future to find practical solutions.

5.1. Conclusion

This study confirmed the results of previous researches, indicating that pregnancy hypertensive disorders and obstetric hemorrhage are the main leading causes of ICU admission. Therefore, trained staffs, aware of symptoms and signs of these conditions, allow earlier admission of these high risk patients and have enough time to optimize their situation before any anesthesia and surgery intervention. Establishment of critical units with intermittent equipment in peripheral areas should be considered for earlier primary care and proper management of these cases, and allows a decrease in the admission rate to the ICU. In addition, a high dependency unit in the hospital may avoid unnecessary ICU admission. Enough trained staff, providing optimal prenatal care and giving awareness during pregnancy, improves the management of obstetrics and results in better outcomes

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Footnotes

Authors' Contribution: Farnoush Farzi designed and conducted the study, performed the data analysis, and wrote the manuscript; Ali Mirmansouri designed the study, performed the data analysis, and prepared the manuscript; Bahram Naderi Nabi designed the study, collected and analyzed the study, and prepared the manuscript; Zahra Atrkare Roshan performed the data analysis, and prepared the manuscript; Gelareh Biazar prepared the manuscript; Shima Yazdipaz prepared the manuscript and performed the data analysis.

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