

A Five-Year Review of Obstetric Admission to Intensive Care Unit at Hatyai Hospital

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Objective: To ascertain the prevalence, characteristics, and outcomes of obstetric patients admitted to the intensive care unit (ICU) at Hatyai Hospital.

Materials and Methods: A retrospective medical chart review of all pregnant women and postpartum patients at less than 42 days admitted to the ICU between October 2014 and September 2019 was done.

Results: There were 32,613 deliveries in Hatyai Hospital during the five-year study period, with 137 obstetric patients admitted to the ICU. The prevalence of obstetric ICU admissions was 0.42%. The main reasons leading to ICU admission were postpartum hemorrhage at 56.93%, followed by pregnancy-induced hypertension at 14.60%. Mechanical ventilation, at 86.13%, was the most common intervention in ICU admissions, with a five-year mortality rate of 3.64%.

Conclusion: The prevalence of obstetric ICU admissions was 0.42%. Postpartum hemorrhage and pregnancy-related hypertension with complications were the two common obstetric indications for ICU admissions. The maternal mortality rate was low. A multidisciplinary team approach is mandatory in the care of obstetrical emergencies.

Keywords: Maternal mortality; Pregnancy-induced hypertension; Postpartum hemorrhage; Intensive care unit

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Maternal mortality is an essential measure of the effectiveness of a healthcare system. Most cases of maternal death occurred in the intensive care unit (ICU).

Because of physiological changes of pregnancy when obstetric patients have complications, these increase the chances of morbidity and mortality even though the patients are often young. These changes present an exclusive challenge to the obstetric team and the need for intensive care⁽¹⁾.

Liabsuetrakul et al suggested that substandard care impacted maternal morbidity and mortality⁽²⁾.

Management of critically ill obstetric patients in the ICU requires a multidisciplinary team, and maternal deaths can be reduced by high-quality

patient care⁽³⁾.

Worldwide admission rates of obstetric patients to ICUs were 0.24 to 3.97%^(1,4-6), while the maternal mortality rate in Thailand was 17.15 to 20.64 per 100,000 live births between 2015 and 2020⁽⁷⁾.

The most common cause of death was postpartum hemorrhage (PPH), and most deaths occurred in the Regional Health Office 12⁽⁷⁾. Since Hatyai Hospital is the largest referral center under the Ministry of Public Health, Thailand, in the region, the prevalence, characteristics, and outcomes of obstetric patients admitted to the ICU were ascertained.

Materials and Methods

The present study was approved by the Institutional Review Board of Hatyai Hospital (protocol number: 91/2563). A retrospective study was conducted between October 2014 and September 2019. All pregnant women admitted to the ICU and postpartum patients less than 42 days were included. The multidisciplinary team at the hospital managed all patients.

Data collection

The electronic hospital database and medical records were reviewed. The following data were

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Table 1. Patient medical history characteristics

Characteristic	Total (n=137)
Age (years); mean±SD	31.01±6.84
Weight (kg); mean±SD	65.90±13.76
Height (cm); mean±SD	154.90±5.88
BMI; mean±SD	27.14±5.31
Smoker; n (%)	2 (1.46)
Drug abuse; n (%)	1 (0.73)
Comorbidities; n (%)	29 (21.17)
Hypertension	7 (5.11)
Diabetes mellitus	5 (3.65)
Heart disease	5 (3.65)
HIV infection	2 (1.46)
Asthma	3 (2.19)
Systemic lupus erythematosus	2 (1.46)
HBV infection	2 (1.46)
Hematologic disease	4 (2.92)
Myoma uteri	4 (2.92)
Thyroid disease	4 (2.92)
Kidney disease	3 (2.19)
Pancreatitis	2 (1.46)
Pulmonary tuberculosis	1 (0.73)
Upper gastrointestinal bleeding	1 (0.73)

SD=standard deviation; BMI=body mass index; HIV=human immunodeficiency virus; HBV=hepatitis B virus

collected:

1. General data: age, body weight, height, body mass index (BMI)
2. Comorbidities: such as hypertension, diabetes mellitus, HIV infection, asthma, heart disease, and systemic lupus erythematosus (SLE)
3. Obstetric history
4. ICU history: including indications of ICU admission, medical interventions, progression in ICU, length of stay, and treatment results.

Data analysis

Epidata software version 3.1 was used for data collection. Statistical analyses were performed using SPSS Statistics, version 16.0 (SPSS Inc., Chicago, IL, USA) for the Mann-Whitney U test and Fisher's exact test. Categorical data were displayed as percentages, while continuous data were reported as mean, standard deviation (SD), or median. For all analyses, p-value of less than 0.05 was considered statistically significant.

Results

Prevalence

There were 32,613 deliveries in Hatyai Hospital

Table 2. Patient obstetric history characteristics

Characteristic	Total (n=137)
Pregnancy-related; mean±SD	
Gravidity	3.10±1.99
Parity	1.74±1.65
Abortion	0.35±0.68
Week of gestation (weeks)	30±10
Antenatal care; mean±SD	6.00±4.72
Number of antenatal cares; n (%)	121 (88.32)
Mode of delivery; n (%)	
Normal labor	41 (29.93)
Elective caesarean section	8 (5.84)
Emergency caesarean section	86 (62.77)
Instrument-assisted	2 (1.46)
Mode of admission; n (%)	
Direct admission	95 (69.34)
Refer admission	42 (30.66)
Time of admission; n (%)	
Antepartum	9 (6.57)
Postpartum	128 (93.43)

SD=standard deviation

during the five-year study period, with 137 obstetric patients admitted to the ICU. The prevalence of obstetric ICU admissions was 0.42% (0.74% of total ICU admissions, 7.42:1,000 ICU admission), equivalent to 420 ICU admissions per 100,000 deliveries.

Patient characteristics

Characteristics and obstetric histories are shown in Table 1 and 2. Mean maternal age was 31.01 years (SD 6.84), with average gestational age at admission at 30 weeks (SD 10, median 35). Sixteen (11.68%) patients did not receive antenatal care services. One hundred fourteen patients were multipara (83.21%). There were 128 (93.43%) admissions in the postpartum period. The most common mode of delivery was emergency cesarean section (n=86, 51.81%). Twenty-nine patients (21.17%) had comorbidities, including seven (5.11%) with hypertensive disorder and five (3.65%) with diabetes mellitus.

Diagnosis for intensive care unit admission

Indications for ICU admission were respiratory failure, hemodynamic instability, neurological impairment, and renal impairment.

Diagnoses at admission are shown in Table 3. The two most common reasons leading to ICU admission were obstetric for 119 patients (86.86%) and PPH for 78 patients (56.93%). The most common

Table 3. Diagnosis for intensive care unit

Diagnosis	Total (n=137); n (%)
Obstetric	119 (86.86)
Postpartum hemorrhage	78 (56.93)
Pregnancy-induced hypertension	20 (14.60)
Sepsis of pelvic origin	9 (6.57)
Acute fatty liver	5 (3.65)
Amniotic fluid embolism	3 (2.19)
Peripartum cardiomyopathy	3 (2.19)
DIC	1 (0.73)
Non-obstetric	18 (13.14)
Sepsis	11 (8.03)
• Pneumonia	7 (5.11)
• Small bowel ischemia	1 (0.73)
• Urinary tract infection	1 (0.73)
• Aspergillosis septemia	1 (0.73)
• Acute pancreatitis	1 (0.73)
Anesthetic complication	3 (2.19)
Trauma	2 (1.46)
Diabetic ketoacidosis	1 (0.73)
ABO incompatibility	1 (0.73)

DIC=disseminated intravascular coagulation

cause of PPH was uterine atony for 39 patients (50.00%), followed by twelve patients with retained placenta (15.41%), ten patients with placenta accrete (12.80%), five patients with placenta previa (6.41%), five patients with abruptio placenta (6.41%), three patients with uterine artery laceration (3.85%), two patients with uterine rupture (2.56%), one patient with cervical uteri tear (1.28%), and one patient with cervical myoma uteri (1.28%). Fifty-four (69.23%) patients with PPH required a hysterectomy after conservative treatment failed.

The second common obstetric cause of ICU admission was pregnancy-induced hypertension for 20 patients (14.60%) with eight patients admitted with eclampsia (40%), followed by seven patients with severe preeclampsia (35%) and five patients with HELLP syndrome (25%). All patients received magnesium sulfate and anti-hypertensive drugs for stabilization before the termination of pregnancy. Blood pressure was controlled after delivery. One patient admitted for HELLP syndrome because of hemolysis, elevated liver enzymes, and low platelets showed loss of consciousness and was sent for computed tomography (CT) brain. The most common non-obstetric causes of ICU admission were sepsis for eleven patients (8.03%), followed by anesthetic complications in three patients (2.19%). Two patients (1.46%) suffered trauma from a car accident and a

Table 4. Comparison of obstetric and non-obstetric patients (n=137)

	Obstetric (n=119)	Non-obstetric (n=18)	p-value
Age (years); mean±SD	31.13±6.68	29±9.17	0.39*
Gestational age (weeks); mean±SD	35.33±4.96	33.74±5.54	0.21*
Gravidity; mean±SD	3.14±1.83	2.61±1.46	0.19*
Parity; mean±SD	1.82±1.58	1.16±1.15	0.06*
Abortion; mean±SD	0.32±0.54	0.39±0.61	0.65*
Mode of delivery; n (%)			
Normal vaginal delivery	37 (25)	4 (22.22)	
Elective caesarean section	7 (4.73)	1 (5.56)	
Emergency caesarean section	74 (50)	12 (66.67)	
Instrument-assisted	1 (0.68)	1 (5.56)	
Mechanical ventilation; n (%)	102 (85.71)	16 (88.89)	0.45+
Length of stay (days); median			
ICU	1	2.5	0.04*
Hospital	6	8	0.08*

SD=standard deviation; ICU=intensive care unit

* Mann-Whitney U test, + Fisher's exact test

Table 5. Interventions undertaken in obstetric patients admitted to intensive care unit (n=137)

Intervention	n (%)
Mechanical ventilator	118 (86.13)
PRC transfusion	102 (74.45)
FFP transfusion	84 (61.31)
Platelet transfusion	53 (38.69)
Central line insertion	22 (16.06)
Magnesium sulphate infusion	29 (21.17)
Inotropic support	17 (12.41)
Arterial line insertion	20 (14.60)
Hemodialysis	3 (2.19)
CT brain	2 (1.46)
MRI brain	1 (0.73)

PRC=packed red cell; FFP=fresh frozen plasma; CT=computed tomography; MRI=magnetic resonance imaging

Number do not add up to 137 because some patients had more than one intervention

boat accident, respectively. The detailed results are shown in Table 3. Table 4 shows a comparison of obstetric and non-obstetric patients. Patients admitted to the ICU for obstetric causes had a significantly longer stay in the ICU. There were no statistically significant differences in age, parity, gestational age, or mechanical ventilator use.

Interventions during intensive care unit stay

Table 5 shows that the most common intervention during the ICU stay was mechanical ventilator with 118 patients (86.13%), followed by packed red cell

Table 6. Outcomes of obstetric patients admitted to intensive care unit (n=137)

	Length of stay (day)
Hospital; mean±SD [median]	7.88±7.25 [6]
ICU; mean±SD [median]	2.34±3.80 [1]
Survived; n (%)	130 (94.89)
Died; n (%)	5 (3.64)
Refer; n (%)	2 (1.46)

SD=standard deviation; ICU=intensive care unit

(PRC) transfusion for 102 patients (74.45%).

Patient outcomes

Table 6 shows that the median length of ICU stay was one day, while the median length of stay in the hospital was six days. Five-year maternal deaths were five (3.64%), with causes presented in Table 7. There were two amniotic fluid embolisms (AFE), one sepsis, and two PPHs. Two patients were referred to a super tertiary care level hospital.

Discussion

During the five-year study period, obstetric admission to the ICU represented 0.42% of all deliveries and 0.74% of those admitted to the ICU. This was comparable with other studies that recorded 0.24 to 3.97% of all deliveries⁽⁵⁻⁸⁾. The present study found that only a small proportion of obstetric patients were admitted to the ICU. Most were young and in good health. Changes in the physiology of pregnant patients require special care, and complications can lead to mortality. Studies showed that substandard care for obstetric patients led to a higher mortality rate^(3,9). Conditions such as severe preeclampsia and PPH require standard management for ICU admission⁽¹⁰⁾.

PPH was the most common obstetric cause for ICU admission, followed by pregnancy-induced hypertension. Other studies reported obstetric hemorrhage as the most common cause for admission to the ICU^(5,6,8,9,11). At the same time, the most common

cause of PPH was uterine atony in 50%. Treatment for PPH in the present study hospital after non-responsive conservative management such as uterine balloon tamponade, B-Lynch suture, internal iliac artery ligation, or uterine artery embolization, depended on obstetrician opinion, but was a hysterectomy.

With 20 patients having pregnancy-induced hypertension (14.60%), it was the second cause for ICU admission, compared to the average for Asian countries at 14 to 26.2%^(4-6,8,10,11). The present study admission rate for this indication was like other studies. Several patients had underlying hypertension that led to eclampsia. Eight patients with eclampsia were treated by intubation, anticonvulsant, magnesium sulfate infusion, and termination of pregnancy. All patients fully recovered and were discharged with no focal neurologic deficits.

Sepsis, with eleven cases (8.03%) was the most common non-obstetric cause for admission to the ICU. Other studies reported that 10 to 14% of patients were admitted due to sepsis^(6,13). The present study sepsis management was like non-obstetric patients, with close monitoring of fetal status prompted resuscitation. Care must be taken concerning medications that may affect the fetus.

Three obstetric patients (2.19%) were diagnosed with AFE, which was higher than the 1.5% reported in other studies⁽⁸⁾. AFE was associated with a high mortality rate, while two patients died from an AFE in the present study.

A mechanical ventilator was used in 118 patients (86.13%) and was the most common intervention during ICU admission. Another review of obstetric patients requiring a mechanical ventilator noted that 85% of the patients required this intervention⁽¹⁰⁾. The median duration of the mechanical ventilator was one day. No patients developed ventilator-associated pneumonia. The mortality rate in the present study was 3.64%. This is comparable with other studies with reported rates of 3.5 to 6%^(4,6).

The information obtained from the present study confirmed the previous knowledge that PPH

Table 7. Maternal mortality (n=137)

Number	Age (years)	Parity	Gestational age (weeks)	ICU admission diagnosis	Cause of death
1	33	G7P4A2	37	Postpartum hemorrhage	DIC, multiorgan failure
2	35	G5P3A1	31	Postpartum hemorrhage	DIC, multiorgan failure
3	35	G2P0A1	31	Sepsis due to pneumonia	Multiorgan failure
4	22	G3P2	38	Amniotic fluid embolism	Multiorgan failure
5	41	G4P2A1	39	Amniotic fluid embolism	Multiorgan failure

ICU=intensive care unit; DIC=disseminated intravascular coagulation

and pregnancy-induced hypertension are the most important complications in obstetrics. Mortality and morbidity rates can be reduced by health education, thus, training caregivers to identify high-risk cases. Training programs for an obstetrician in pregnancy critical care may reduce complications in resource-poor hospitals. However, early referral to tertiary care level centers where multidisciplinary teams are available is preferred. Medically experienced teams tend to detect the problems in the obstetric patient early. Obstetric complications and the need for ICU admission may be reduced.

The present study is the first study in Thailand concerning obstetric patients admitted to the ICU. The five years data collection is explained by the obstetric ICU admission in Thailand. Moreover, the study results confirmed that PPH and pregnancy-induced hypertension are still significant obstetric problems in this country. Further study about adequate reservation and distribution of obstetric ICU beds should be done.

Conclusion

The prevalence of deliveries requiring intensive care in Hatyai Hospital is 0.42%. PPH and pregnancy-related hypertension were the two most common indications for ICU admissions. The maternal mortality rate was low. A multidisciplinary team approach is mandatory to manage obstetrical emergencies.

What is already known on this topic?

Worldwide data demonstrated that obstetric ICU admission rates were 0.24% to 3.97%^(1,4-6). There is a lack of data in tertiary hospital in Thailand, especially in high maternal mortality region.

What this study adds?

Prevalence of obstetric ICU admission is 0.42% in Hatyai Hospital, a tertiary referral hospital of Regional Health Office 12. PPH and pregnancy-related hypertension were leading causes of ICU admission.

Conflicts of interest

The authors declare no conflict of interest.

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