

Profile of women admitted at an obstetric ICU due to non-obstetric causes

MARTA DE ANDRADE LIMA COELHO¹, LEILA KATZ², ISABELA COUTINHO³, ALINE HOFMANN⁴, LARISSA MIRANDA⁵, MELANIA AMORIM⁶

¹MSc Student in Maternal-Child Health, Instituto Integral de Medicina Integral Prof. Fernando Figueira (IMIP); Pneumologist at IMIP and Hospital Geral Otávio de Freitas (HGOF), Recife, PE, Brazil

²PhD in Obstetrics and Gynecology, Universidade Estadual de Campinas (UNICAMP); Head of the Obstetric Intensive Care Unit, IMIP; Professor of the Postgraduate Program in Maternal-Child Health, IMIP, Recife, PE, Brazil

³PhD in Surgery at Universidade Federal de Pernambuco (UFPE); Professor of the Postgraduate Program in Maternal-Child Health, IMIP; Obstetrician and Gynecologist, IMIP, Recife, PE, Brazil

⁴Medical Resident in Internal Medicine, IMIP, Recife, PE, Brazil

⁵Medical Student at Faculdade Pernambucana de Saúde do Recife, Recife, PE, Brazil

⁶PhD in Obstetrics and Gynecology; Adjunct Professor, Universidade Federal de Campina Grande (UFCG) and the Postgraduate Program in Maternal-Child Health IMIP, Recife, PE, Brazil

SUMMARY

Objective: To characterize patients admitted during the pregnancy-puerperal cycle for non-obstetric causes in the obstetric intensive care unit (ICU) of a tertiary hospital in northeastern Brazil. **Methods:** A descriptive study, analyzing the participants from a bidirectional cohort study was conducted between January 2005 and October 2010. A total of 500 patients admitted during the pregnancy-puerperal cycle due to non-obstetric causes in an obstetric ICU in northeastern Brazil were included; cases of gestational trophoblastic disease (GTD), ectopic pregnancy, death or ICU stay lasting < 24 hours, and lack of signed informed consent form (ICF) were excluded. The biological, socio-demographic, obstetric, and clinical variables were analyzed. Statistical analysis was performed using Epi-Info 3.5.3. **Results:** Of 5,078 obstetric admissions in the service, 500 patients (9.8%) were due to non-obstetric causes. The mean age was 25.9 years, the predominant ethnicity was mixed-race (68.9%), and mean BMI was 27.5. In 79.9% of cases, women had a partner, and schooling over eight years was observed in 49.2%. The main clinical diagnoses seen at ICU admission were heart disease, deep vein thrombosis (DVT), urinary tract infection (UTI), asthma, acute pulmonary edema (APE), and community-acquired pneumonia (CAP). Central access was used in 10.2% of patients, 11% were on mechanical ventilation, 20.4% received blood transfusions, and 4.0% of the patients died. **Conclusion:** Women admitted at the obstetric ICU due to non-obstetric causes represent a significant number of patients in this sector. They are mostly young women, and the main admission diagnoses were cardiovascular, respiratory, and infectious diseases, with a fatality rate of 4%.

Keywords: Cohort studies; intensive care unit; maternal mortality; obstetrics.

Study conducted at the Obstetric ICU of Instituto de Medicina Integral Prof. Fernando Figueira, Recife, PE, Brazil

Submitted on: 06/12/2011
Approved on: 01/23/2012

Financial Support:
CNPq (Institutional Program of Scientific Initiation Grants)

Correspondence to:
Leila Katz
Rua Barão de Itamaracá, 160/1501
Espinheiro
CEP: 52020-070
Recife – PE, Brazil
Phone: +55 (81) 34269077
+55 (81) 8858-5977
katzleila@yahoo.com.br

Conflict of interest: None.

©2012 Elsevier Editora Ltda. All rights reserved.

INTRODUCTION

The main causes of maternal death are complications associated with the pregnancy-puerperal period, represented primarily by hypertensive and hemorrhagic complications, and puerperal infections¹. Over the past years, as a result of the efforts aimed at reducing maternal mortality (MM), a decrease in MM due to the above mentioned causes has been observed; this decrease has been more marked in developed countries, but it has also been significant in developing countries². Consequently, a relative increase in mortality due to secondary causes, such as heart and respiratory diseases, has been observed².

Most women admitted at the ICU have an obstetric diagnosis as cause of hospitalization (50-80%); however, these women tend to have a better prognosis when compared to women admitted to the ICU for clinical reasons. The frequency of hospital admissions of women in the ICU for clinical problems varies according to geographical location and type of ICU where the research was performed (obstetric or general), ranging from 16.9% to 69.1%²⁻⁷. Heart, respiratory and infectious diseases have emerged as important causes of hospitalization of women during the pregnancy-puerperal cycle in the ICU, and their contribution as causes of maternal deaths has been rising relatively³. However, there are few data on research carried out in ICUs of different countries.

In Brazil, a retrospective cohort study evaluated all patients admitted to an obstetric ICU with a diagnosis of severe maternal morbidity (SMM). 673 patients were studied, of which 18 (2.7%) died, nine due to obstetric causes and nine to non-obstetric causes (heart disease, non-hematological malignancies, gastrointestinal disorders, pneumonia, acute pyelonephritis, and other infections). Among the 655 survivors, the most frequently found clinical conditions were: heart disease (8.2%), severe asthma/pulmonary embolism (2.6%), chronic hypertension (2.6%), hematological diseases (2.1%), endocrine/collagen diseases (2.1%), and pneumonia (1.8%). Mechanical ventilation was used in 88.9% of patients who died and in 15% of the survivors⁸.

In a study published in 2006 analyzing the profile of obstetric admissions to the ICU of IMIP, in the city of Recife, state of Pernambuco, Brazil, the three leading causes of admission were hypertensive and hemorrhagic disorders of pregnancy, and puerperal infections, while non-obstetric diseases accounted for 5.7% of causes of hospitalization. In this cohort, only 3.6% of patients underwent mechanical ventilation and 2.4% died⁶. Most studies evaluate the patients admitted to the general and/or obstetric ICU due to obstetric and non-obstetric causes in a more generalized form. The aim of this study was to evaluate in more detail the non-obstetric causes of hospital admission at the obstetric ICU in a tertiary hospital in northeastern Brazil.

METHODS

This was a bidirectional cohort study of obstetric patients admitted to the Obstetric ICU of the Instituto de Medicina Integral Prof. Fernando Figueira (IMIP), between 2005 and 2010. The retrospective data collection covered the period of January 1, 2005 to August 17, 2010. The prospective data collection occurred from August 18 to October 31, 2010. The present study was initiated only after its approval in August 2010 by the Research Ethics Committee of IMIP, with protocol number in the National System of Research Ethics (SISNEP) 0116.0.099.000-10.

During the study period, 5,078 obstetric patients were admitted at the ICU. Of these, 833 patients were selected through review of medical records of admission according to the documented diagnosis, and those with a non-obstetric diagnosis at admission were included for evaluation. We included women in the pregnancy-puerperal cycle, with a non-obstetric hospitalization indication. Exclusion criteria were: 1) death within 24 hours of ICU stay, 2) duration of ICU stay less than 24 hours, 3) ectopic pregnancy, 4) gestational trophoblastic disease; and during the prospective phase, in addition to the abovementioned criteria, 5) lack of signed informed consent form (ICF) or legal tutor to do so.

During the retrospective phase, medical records from pre-selected patients were obtained from the Department of Medical Archives of the hospital, and the inclusion and exclusion criteria were then applied as described in the present study's checklist. In this phase, 482 patients were included. In the prospective phase of the study, patients were included when they had met the eligibility criteria and had signed the ICF, and they were monitored daily by the researcher. In this phase, 18 patients were included. In total, 500 patients were included and data were collected through a form developed by the researchers, including data from inclusion in the cohort (ICU admission), throughout hospital admission, to the final outcome.

The variables studied were the social (education, marital status), demographic (origin, referral institution), biological (body mass index – BMI – at admission, ethnicity, age) background (inadequate prenatal care, presence of comorbidities, gestational age at ICU admission - in patients admitted while pregnant -, phase of the pregnancy-puerperal cycle at ICU admission) and clinical (presence of associated obstetric disease, clinical examination, complications and medical interventions performed, length of ICU stay, outcome - discharge or death).

The comorbidities considered were diabetes mellitus (DM), systemic arterial hypertension (SAH), hematologic diseases, autoimmune diseases, and neoplasia. As for the phase of pregnancy-puerperal cycle, the period during gestation at the time of ICU admission was considered for analysis (whether or not the woman was pregnant at the

time of admission). Associated obstetric disease was considered as the presence of any obstetric disease at the time of ICU admission.

Regarding the clinical examination, the presence of abnormal cardiac auscultation, altered respiratory auscultation, peripheral oxygen saturation (SpO_2), near miss and SMM criteria at the time of ICU admission were analyzed. The criteria used to define near miss and SMM were those adopted by the World Health Organization (WHO)⁹.

Medical complications were defined as systemic inflammatory response syndrome (SIRS) and acute respiratory distress syndrome (ARDS). ARDS represents a clinical condition characterized by acute onset; $PaO_2/FiO_2 < 200$ despite positive-end expiratory pressure, bilateral pulmonary infiltrates, and pulmonary wedge pressure < 18 mmHg¹⁰. The systemic inflammatory response syndrome (SIRS) requires two or more of the following criteria for the diagnosis to be established: leukocytosis $> 12.000/mm^3$, or leukopenia $< 3.000/mm^3$, or 10% or more of immature forms; heart rate > 90 beats per minute (bpm); temperature > 38 °C or < 36 °C; respiratory rate > 20 breaths per minute (bpm), or pressure of CO_2 ($PaCO_2$) < 32 mmHg, or need for mechanical ventilation due to an acute process¹¹. Medical interventions were divided into drug (use of oxygen and antibiotics) and invasive therapy (blood transfusion, central venous puncture, hemodialysis, and mechanical ventilation).

Data analysis was performed using the public domain program Epi-Info, release 3.5.3 (CDC, 2010 – Atlanta). Frequency distribution tables were constructed for categorical variables, calculating measures of central trend and dispersion for quantitative variables.

RESULTS

During the period of January 2005 to October 2010, there were a total of 5,078 obstetric admissions in the obstetric ICU of IMIP. Of these, 554 met the eligibility criteria for

this study. For 52 cases, which were part of the retrospective phase, we could not locate the medical records, and two patients had very incomplete records, preventing the assessment. In the prospective phase, there were no refusals. In the end, 500 patients who had been admitted due to non-obstetric causes were included, representing 9.8% of obstetric ICU admissions.

The mean age of patients was 25.9 years, with a predominance of mixed-race (68.9%), and mean BMI of 27.5. Most patients (79.9%) had a partner (they were married or had a common-law partner). Schooling was stratified as more than eight years of study and equal to or less than eight years (49.2% and 50.8%, respectively). As for the origin, 51% were from the metropolitan area of Recife and 49.1% were from other cities or states. In relation to the referral institution, most patients came from our institution (61.5%).

The median of previous pregnancies was two and parity was one. The median gestational age at the time of ICU of those admitted while pregnant was 27.5 weeks, with an interquartile range of 20.4 to 33.2. Most patients (86.9%) received some type of prenatal care, with a median number of four consultations. Almost half of patients (45.7%) had an associated obstetric diagnosis at the time of ICU admission. Half the patients were admitted to the ICU in the pre-delivery phase, while 49.2% were admitted at the postpartum period and 0.8%, post-abortion. Caesarean section was performed in 65.3% of patients who had their deliveries during the ICU stay (Table 1).

Among the main clinical diagnoses responsible for the ICU admission were cardiovascular diseases (17.6%), thromboembolic disease (11%), urinary sepsis (7.8%), and severe asthma (7.8%). Acute pulmonary edema and community-acquired pneumonia were important causes of hospitalization, each occurring in 30 cases (6%) (Table 2).

Regarding the findings of physical examination at ICU admission, the median respiratory and heart rates were 20

Table 1 – Obstetric characteristics of women admitted at the Obstetric ICU of IMIP during the pregnancy-puerperal cycle due to non-obstetric causes from January 01, 2005 to October 31, 2010 (n = 500), Recife – PE, Brazil, 2010

Characteristics		
Gestations (median/ interquartile interval) (n = 480)	2	1-3
Parity (median/ interquartile interval) (n = 480)	1	1-2
Gestational age at ICU admission without date of last period (median/ interquartile interval) (n = 498)	27.5	20.4-33.2
Present prenatal care (n/%) (n =406)	353	86.9
Number of prenatal consultations (median/ interquartile interval) (n = 371)	4	2-6
Caesarean section (n/%) (n = 323)	211	65.3

ICU, intensive care unit; IMIP, Instituto de Medicina Integral Prof. Fernando Figueira.

Table 2 – Main clinical diagnoses that caused hospitalization of the women admitted during the pregnancy-puerperal cycle due to non-obstetric causes at the Obstetric ICU from January 01, 2005 to October 31, 2010 (n = 500), Recife – PE, Brazil, 2010

Main clinical diagnoses that caused ICU admission	n	%
Heart disease	88	17.6
DVT	55	11.0
Urinary sepsis	39	7.8
Severe asthma	39	7.8
APE	30	6.0
CAP	30	6.0
Epilepsy	20	4.0
Hospital pneumonia	18	3.6
Diabetic ketoacidosis	15	3.0
Others	166	33.2
Total	500	100

ICU, intensive care unit; IMIP, Instituto de Medicina Integral Prof. Fernando Figueira; APE, acute pulmonary edema; DVT, deep venous thrombosis; CAP, community-acquired pneumonia.

and 95, respectively. Less than 20% of patients had abnormal cardiac auscultation at ICU admission, while almost 32% had altered respiratory auscultation. The median SpO₂ was 97%. The frequency of patients admitted to the ICU already intubated was 2.6%. Regarding the severity criteria used, 22% had near miss criteria, while 80.4% had SMM criteria (Table 3).

The drug interventions evaluated were: use of oxygen, antimicrobials (including antibiotics, tuberculostatic, antifungal and antiviral drugs), and vasoactive drugs (VAD), which were used at a frequency of 36%, 50.6% and 3.4%, respectively. Considering the invasive interventions, 9.8% of patients were intubated, 1.0% underwent tracheostomy,

10.2% had a central venous puncture, 2.4% underwent hemodialysis, and 20.4% underwent a blood transfusion.

The average hospital stay of these patients in the ICU was 6.9 days, with a minimum of one and a maximum of 57 days of hospitalization. Fifty-five patients (11%) underwent mechanical ventilation, and four of these (7.3% of total) were subjected only to non-invasive mechanical ventilation (NIMV); one patient (1.8%) underwent NIMV and invasive mechanical ventilation (IMV), while the majority (90.9%) underwent only IMV.

Regarding outcome, 92.6% of patients were discharged from the ICU to the ward, 2.0% had to be transferred to a clinical ICU, 1.4% left the hospital, and 20 women (4.0%) died.

Considering only the patients who died, most were 30 years or younger, with a mean age of 25.9 years, of mixed-race ethnicity, from the countryside of Pernambuco, and had come from another hospital. Most had been admitted during the pre-partum period, and 35% had an obstetric morbidity at ICU admission. 40% of these women had some comorbidity, the most frequent being cancer and HIV infection. Regarding the causes for death, the most prevalent were: lower respiratory tract infections, including community-acquired pneumonia, nosocomial pneumonia and AH1N1 infection (seven cases); liver disease (five cases); neoplasms (three cases); complications of HIV infection (two cases); urinary tract infection (one case); dengue hemorrhagic fever (one case); and asthma (one case). Of the 20 patients who died, 75% underwent mechanical ventilation.

DISCUSSION

The 500 patients admitted due to non-obstetric causes accounted for 9.8% of all obstetric patients admitted to the ICU during the study period. This group of patients in this sector is represented by mostly young women, with a low number of pregnancies and parity.

Table 3 – Main findings at physical examination and signs of severity of female patients admitted during the pregnancy-puerperal cycle due to non-obstetric causes at the Obstetric ICU from January 01, 2005 to October 31, 2010 (n = 500), Recife – PE, Brazil, 2010

Variables		
Characteristics of physical examination at ICU admission		
Respiratory rate (median/ interquartile interval) (n = 479)	20	19-26
Heart rate (median/ interquartile interval) (n = 489)	95	80-111
Abnormal cardiac auscultation (n,%) (n = 499)	99	19,8%
Abnormal respiratory auscultation (n,%) (n = 499)	58	31,7%
Peripheral oxygen saturation (median/ interquartile interval) (n = 351)	97	96-98
Patients admitted intubated (n,%) (n = 500)	13	2,6%
Frequency of patients with near miss criteria (n,%) (n = 500)	110	22,0%
Frequency of patients with SMM criteria (n,%) (n = 500)	402	80,4%

ICU, intensive care unit; IMIP, Instituto de Medicina Integral Prof. Fernando Figueira; SMM, severe maternal morbidity.

In a study conducted at the Mayo Clinic in the United States, 60% of 106 women admitted in the prenatal period had medical/clinical causes¹². This high number of hospitalizations in a developed country is probably explained by the significant decrease in rates of MM and SMM of pregnant women due to obstetric causes.

In a study carried out in India, 30.9% of 453 women admitted during the pregnancy-puerperal cycle in a neurological ICU during the five years of the study had clinical diseases (*versus* 69.1% of admissions due to obstetric causes), perhaps reflecting the limited availability of ICU beds for obstetric patients².

The rate of almost 10% of clinical diseases as cause of admission at the obstetric ICU observed in our study is probably due to the proportional decrease in admissions because of obstetric diseases and lower rates of MM and SMM in Brazil. Moreover, the ICU of IMIP is one of the few ICUs specialized in obstetrics in the region, especially dedicated to patients during the pregnancy-puerperal cycle. This leads to an increased number of women with clinical diseases at the unit, many of which, during the time of delivery, need ICU admission.

It is also noteworthy that Brazil still has a high rate of maternal morbidity and mortality due to primary causes, but has begun to show considerable percentages of ICU admissions due to clinical causes. This may be due to the progressive decline in admissions due to obstetric causes, which promotes a relative increase in clinical diseases as complicating factors during the pregnancy-puerperal period¹³.

The mean age of patients was 25.9 years, similar to patients in an Indian ICU, which was 25.5 years². However, in a case-control study conducted in England, with cases represented by women who delivered after 24 weeks of gestation between March 1997 and February 1998 in South East Thames, who met the criteria for severe morbidity; and controls represented by women in the same region without morbidity criteria, the mean age was 29.6, and for controls, 28.7 years¹⁴. In a 12-year study conducted in the Netherlands, the mean age of patients admitted to the ICU was 30 years⁴.

In a previous retrospective study conducted in the Obstetric ICU of IMIP, including a sample of 933 of all obstetric patients admitted at the service, the age found was < 35 years in about 89% of cases⁶. In the present study, including only patients admitted due to non-obstetric causes, 87.6% of patients were younger than 35 years. In the case of a sample of patients hospitalized for non-obstetric causes, a higher percentage of older patients would be expected. However, this hypothesis was not supported by the findings. The hypothesis is that in Brazil women get pregnant at younger ages than in developed countries, hence they can present complications at a younger age.

Regarding schooling, 49.2% of women had more than eight years of study, similar to the results reported in another study at the institution, showing that 47.7% of patients had more than eight years of study⁶. That is, patient profile has remained the same over the years, with the profile of patients with non-obstetric causes of hospitalization similar to that of patients with obstetric causes.

When assessing the origin of the patients (50.9% from the Metropolitan Region of Recife and 49.1% from other cities or states) and the referral institution (38.5% from another institution), we confirmed that the service is a reference center, as it has an Obstetric ICU, not always available even in large centers. The ICU of IMIP is one of the few Obstetric ICUs in the Northeast region, which explains the large number of patients from other cities and even other states.

The low median of pregnancies per patient observed, only two per patient, as well as the consequent low parity, must be emphasized. In studies carried out in countries such as England, the United States, and China, parity was also low^{12,14,15}, whereas in underdeveloped or developing countries parity was higher, as found in Pakistan (3.2 ± 2.61)¹⁶, and in Turkey, where 88% of the studied patients were multiparous¹⁷. In the study carried out in 2006 in the obstetric ICU of IMIP, most patients (45.1%) had had two or more deliveries. In a study that evaluated patients with SMM in the same ICU, in 2008, the median parity was also one delivery⁷. These findings are similar to the mean number of children of Brazilian women, which has stabilized at 1.5 children per woman; this means that Brazilian birth rates are closer to that of developed countries regarding the decrease in birth rates¹⁸.

The mean gestational age at ICU admission was 26.6 weeks. Half of the patients admitted to the ICU were in the pre-delivery period, while 49.2% were admitted at the postpartum period, and 0.8% in the post-abortion period.

In a study performed in Turkey, the mean gestational age was 35 weeks, similar to that found in China, which was 34 weeks^{15,17}. In a study performed at the Mayo Clinic that evaluated fetal outcomes in patients admitted to the ICU for non-obstetric causes, the median gestational age was 25.2 weeks in patients admitted during the antepartum period, and 36 weeks in patients admitted in the postpartum period¹². These findings reinforce the idea that women with clinical diseases as cause of hospitalization or that meet any criteria for ICU admission tend to have complications at an early period of pregnancy. Therefore, it is justified to offer this group more intensive prenatal care, especially in the third trimester, including interconsultations with specialists.

Regarding prenatal care, 86.9% of patients in our sample received some type of prenatal assistance, with a median number of four consultations. In a Chinese study,

72% of patients received prenatal care¹⁵. In a retrospective cohort study carried out in Argentina, only 30% of women were treated at the prenatal clinic¹⁹. This high percentage of prenatal care in Brazil can be justified by the Family Health Program, through which pregnant women are entitled to home visits and consultations with doctors and nurses, as well as the consultations carried out in prenatal clinics and hospitals. It bears questioning whether the appropriate number of prenatal visits provides quality care, since this population, despite having had access to prenatal care, still needed to be admitted at the ICU due to non-obstetric complications at an early gestational age. A timely referral to specialized prenatal care for high-risk patients might have prevented some of these hospitalizations.

When we considered patients who had assisted deliveries after the ICU admission ($n = 323$), the most common type of delivery was Caesarean section (65.3% of cases), while vaginal delivery occurred in 34.6% of women. In the cohort study performed at the Mayo Clinic in the United States, with 93 pregnant women, vaginal delivery occurred in 47% of patients, a higher frequency than that observed in our study¹². In the cohort study carried out in China, the incidence of vaginal delivery was 24%, and of Caesarean section, 76%¹⁵.

In the cohort study carried out in Turkey, vaginal delivery occurred in 10% of patients, while Caesarean section was performed in 90% of patients¹⁷. The present study showed a lower percentage of Caesarean sections compared to those seen in the two latter studies, probably due to the great incentive given at the IMIP, as well as in some centers as the Mayo Clinic, to vaginal delivery. In fact, this is the safest and most appropriate way of delivery for the mother and fetus in most cases, with Caesarean sections being reserved for special situations, often with obstetric indications.

At the time of ICU admission, 45.7% of patients admitted due to non-obstetric causes also had an associated obstetric diagnosis. This fact is explained by the high prevalence of obstetric indications as causes of ICU admission (hypertensive, hemorrhage, and infectious syndromes). In the study performed in the same ICU in 2006, 94.3% of patients were hospitalized due to obstetric causes⁶. In a study carried out in India with 140 patients, 69.1% had obstetric causes as the reason for ICU admission². In a cohort study carried out in Argentina, 75% had obstetric indications for ICU hospitalization¹⁹. In a multi-center English study, with 214 patients, 27.1% of patients had non-obstetric causes of ICU admission⁵.

As for the clinical, non-obstetric diseases that were seen at admission, the most common, corresponding to 66.8% of cases were the following conditions: heart disease, deep vein thrombosis (DVT), urinary tract infection (UTI), asthma, acute pulmonary edema (APE),

community acquired pneumonia (CAP), epilepsy, nosocomial pneumonia, and diabetic ketoacidosis (DKA). It bears remembering that patients with superimposed preeclampsia were not included, as it is an obstetric disease, classified as part of the hypertensive disorders of pregnancy.

The Obstetric ICU of IMIP receives patients from the institution that could be referred to a semi-intensive unit, who present less severe cases, but as this type of unit is not available, sometimes patients are admitted to this ICU when they only needed a more careful medical observation. This may be one reason why the diagnoses found during admission at this ICU differ from those of other hospital units.

In the Chinese cohort with 50 patients, only 15 patients were hospitalized due to non-obstetric causes, and the most common reasons for ICU admission were: respiratory sepsis, urinary sepsis, and monitoring for thrombocytopenia in the postoperative period¹⁵. In a review performed in the Netherlands, with 142 patients, only two non-obstetric causes appeared in the list of medical illnesses that led to ICU admission: thromboembolism (3.5%), and miscellaneous (13.4%)⁴. In Buenos Aires, CAP accounted for 9% of the reasons for ICU admission during the pregnancy-puerperal cycle¹⁹. Among the medical conditions responsible for admission at the ICU in 30.9% of 140 patients in India, the most frequent were: malaria, viral hepatitis, cerebral venous thrombosis, cardiac arrest before ICU admission, APE due to valvular heart disease, and exogenous intoxication².

In a cohort study carried out in Pakistan with 30 patients, 10% had non-obstetric causes of ICU admission, represented by the following conditions: hepatic encephalopathy secondary to hepatitis C virus, cerebral malaria, and pulmonary embolism¹⁶. In our study, we observed an incidence of similar clinical diseases to those found in developing and/or developed countries. We did not have a significant number of admissions due to infectious diseases, as did Pakistan and India.

When analyzing the presence of near miss and SMM criteria, only those present at the time of admission of patients in the ICU were considered. "ICU admission" was not considered as a positive criterion, because in that case, all patients would have had it. 80.4% met the criteria for SMM and 22% met the criteria for near miss.

Among the evaluated interventions, the use of oxygen showed a frequency of 36%, the use of antimicrobials (including antibiotics, tuberculostatic, antifungal, and antiviral drugs) of 50.6%, and the use of vasoactive drugs (VAD) was 3.4%. None of the studies evaluated the variable "use of oxygen," thus a comparison of the present study's findings with those of other authors regarding this type of intervention was not possible.

In a Turkish ICU cohort, MV was needed by 85% of the 73 patients studied. Vasoactive drugs were needed by 56% of patients, and antibiotics by 97%. There were nine deaths (12.3%)¹⁷. In Buenos Aires, 41% of all patients underwent MV, 25% had shock, and mean ICU stay was six days (3-11). In the study carried out in Argentina, mortality was 13%¹⁹.

Considering the invasive interventions, 9.8% of patients were intubated, 1.0% underwent tracheostomy, 10.2% had central venous puncture, 2.4% underwent hemodialysis, and 20.4% had blood transfusions. The median length of ICU stay of these patients was six days.

With these data on non-invasive and invasive interventions, and on the time of ICU stay, we observed that women admitted to the ICU due to non-obstetric causes have a different severity profile than those admitted due to primary causes. When comparing the Chinese cohort patients admitted due to obstetric causes with those admitted due to non-obstetric causes, there was an MV rate of 67% *versus* 38% in the non-obstetric group, well above the rate shown in the present study¹⁵. Regarding the ICU stay, it was similar in the two groups in this study, with a mean stay of two days, considerably lower than in the current study¹⁵.

Regarding the longer ICU stay observed, this can be explained by the fact that IMIP's ICU is reserved for obstetric patients. There is no need to discharge as soon as the patient is stable, as it often occurs in units that treat general cases (clinical and surgical), requiring a higher turnover of hospital beds.

A U.S. cohort study analyzed 93 women admitted at the ICU for non-obstetric causes; 14% of whom required vasopressors, and 22% were submitted to MV¹². In Turkey, there were very high rates of intervention: MV in 85% of cases, blood transfusions in 66%, use of vasoactive drugs in 56%, use of antibiotics in 97%, and use of dialysis in 5% of cases. The length of ICU stay was not evaluated¹⁷.

In a study carried out in Pakistan, the length of ICU stay was also much lower than in the present study, with an average of 2.2 days. The medical interventions occurred at the following frequencies: MV (53%), blood transfusions (40%), use of vasoactive drugs (33%), and central venous puncture (13%)¹⁶. In China, there was an incidence of 58% of MV in 50 patients studied, 52% IMV and 6% NIMV. When comparing the patients admitted due to obstetric causes with those admitted for non-obstetric causes, the need for MV was 67% *versus* 38%, respectively, and the mean ICU stay was similar in both groups of patients². The mortality rate was 6%¹⁵.

These rates of MV, use of vasoactive drugs, blood transfusions, central venous puncture, and antibiotics, which are significantly higher than the present study's, can be explained by the fact that the patients admitted

in IMIP's ICU are less severely ill, such as some patients with heart disease admitted only for clinical observation. This is due to the fact that the obstetric ICU of IMIP often admits women with medical diseases that could be managed in intermediate units, without much risk of requiring mechanical ventilation. Due to the structure of the public health system of Pernambuco, these women are admitted at the ICU to ensure better monitoring, thus decreasing the rate of MV and other interventions in this group, when compared to other services.

In a cohort of patients admitted to an obstetric ICU in the city of Campinas, state of São Paulo, Brazil, 673 patients with SMM were studied, and 23.7% were submitted to MV, of which 28.7% used NIMV⁸. The rate of mortality in this ICU was low: 2.6%. The lower mortality rate in this case may be due to better prenatal care and better quality of life of patients in this city, located in a more economically developed region. Nevertheless, this study did not select women with medical diseases, and included women without previous morbidities, who have better prognosis. The Indian cohort study showed a higher mortality rate in patients with clinical conditions (28.6% *vs.* 18.5%). The overall mortality rate was 21.6%².

In a previous study carried out in this ICU, which analyzed a sample of 933 patients, only 3.6% were submitted to MV, and the mortality rate was similar to that found in Campinas (2.4%)^{6,8}. However, the sample consisted of patients admitted for obstetric and clinical causes, and perhaps that is why it showed a lower MV rate than that of the current study.

Compared to other Brazilian studies, this study's specific sample of patients with clinical diseases admitted in an obstetric ICU during the pregnancy-puerperal cycle had a very different rate of MV (higher than in one study and lower than the other), but had a higher mortality rate when compared with patients obstetric^{6,8}. The use of different admission criteria and the different profiles of intensive care units may explain such diverse findings.

After searching for similar items in the MEDLINE database, only studies that included obstetric patients admitted for SMM or due to associated obstetric and clinical causes were found. Only one article whose sample comprised only obstetric patients admitted to the obstetric ICU due to non-obstetric causes was retrieved¹². Thus, there is a lack of studies that have performed this assessment, which supports the importance of the current study and contributes to a better understanding of the characteristics of these patients.

The present bidirectional study has the disadvantages of a retrospective phase, such as inadequate data collection from medical records of patients selected for the survey. Ideally, for a more comprehensive collection of the desired data, a study should be prospective only. However, the

current study has the advantage of having included a substantial number of patients, an unusual series of women admitted to an obstetric ICU due to non-obstetric causes.

Therefore, prospective studies should be performed with the same population of women admitted in an obstetric ICU due to non-obstetric causes, in order to obtain more information about this type of patient, whose care increasingly challenges obstetricians, intensivists and specialists.

CONCLUSION

Women admitted at the obstetric ICU of IMIP due to non-obstetric causes over a period of nearly six years represented a significant proportion of patients admitted during the pregnancy-puerperal cycle, nearly 10%. These women were mostly young, with low number of pregnancies and parity.

The main diagnoses for ICU admission were cardiovascular diseases, respiratory and infectious diseases. Among the studied women, 11% required mechanical ventilation, and 4% died.

REFERENCES

- Sousa MH, Cecatti JG, Hardy EE, Amaral E, Souza JP, Serruya S. Sistemas de informação em saúde e monitoramento de morbidade materna grave e mortalidade materna. *Rev Bras Saúde Matern Infant.* 2006;6:161-8.
- Karnad DP, Lapsia V, Krishnan A, Salvi VS. Prognostic factors in obstetric patients admitted to an Indian intensive care unit. *Crit Care Med.* 2004;32:1294-9.
- Soubra SH, Guntupalli KK. Critical illness in pregnancy: an overview. *Crit Care Med.* 2005;33(10 Suppl):S248-55.
- Keizer JL, Zwart JJ, Meerman RH, Harinck BIJ, Feuth HDM, Roosmalen JV. Obstetric intensive care admissions: a 12-year review in a tertiary care centre. *Eur J Obstet Gynecol Reprod Biol.* 2006;128:152-6.
- Hazlegrove JF, Price C, Pappachan VJ, Smith GB. Multicenter study of obstetric admissions to 14 intensive care units in southern England. *Crit Care Med.* 2001;29:770-5.
- Amorim MMR, Katz L, Ávila MB, Araújo DE, Valença M, Albuquerque CJM, et al. Perfil das admissões em uma unidade de terapia intensiva obstétrica de uma maternidade brasileira. *Rev Bras Saúde Matern Infant.* 2006;6(Supl 1):S55-S62.
- Amorim MMR, Katz L, Valença M, Araújo DE. Morbidade materna grave em UTI obstétrica no Recife, região Nordeste do Brasil. *Rev Assoc Med Bras.* 2008;54:261-6.
- Neto AFO, Parpinelli MA, Cecatti JG, Souza JP, Sousa MH. Factors associated with maternal death in women admitted to an intensive care unit with severe maternal morbidity. *Int J Gynecol Obstet.* 2009;105:252-6.
- Say L, Souza JP, Pattinson RC. Maternal near miss - towards a standard tool for monitoring quality of maternal health care. *Best Pract Res Clin Obstet Gynaecol.* 2009;23:287-96.
- Cole DE, Taylor TL, McCullough DM, Shoft CT, Derdak S. Acute respiratory distress syndrome in pregnancy. *Crit Care Med.* 2005;33(10 Suppl):S269-78.
- Costa RT, Azevedo LCP. Choque séptico. In: Azevedo LCP, Oliveira AR, Ladeira JP, Martins MA, editors. *Medicina intensiva baseada em evidências.* São Paulo: Atheneu; 2009. p 135-43.
- Cartin-Ceba R, Gajic O, Iyer VN, Vlahakis NE. Fetal outcomes of critically ill pregnant woman admitted to the intensive care unit for non-obstetric causes. *Crit Care Med.* 2008;36:2746-51.
- Mc Caw-Binns A, Alexander SF, Lindo JL, Escoffery C, Spence K, Lewis-Bell K, et al. Epidemiologic transition in maternal mortality and morbidity: new challenge. *Int J Gynaecol Obstet.* 2007;96:226-32.
- Waterstone M, Bewley S, Wolfe C. Incidence and predictors of severe obstetric morbidity: case-control study. *BMJ.* 2001;322:1089-94.
- Leung NYW, Lau ACW, Chan KKC, Yan WW. Clinical characteristics and outcomes of obstetric patients admitted to the intensive care unit: a 10-year retrospective review. *Hong Kong Med J.* 2010;16:18-25.
- Bibi S, Memom A, Sheikh JM, Qureshi AH. Severe acute maternal morbidity and intensive care in a public sector university hospital of Pakistan. *J Ayub Med Coll Abbottabad.* 2008;20:109-12.
- Togal T, Yucel N, Gedik E, Gulhas N, Toprak HI, Resoy MO. Obstetric admissions to the intensive care unit in a tertiary referral hospital. *J Crit Care.* 2010;25(4):628-33.
- IBGE. Instituto Brasileiro de Geografia e Estatística. *Projeção da população do Brasil por sexo e idade - 1980-2050. Revisão 2008.* v.24. Available from: <http://www.ibge.gov.br/home/presidencia/noticias>.
- Vasquez DN, Estenssoro E, Canales HS, Reina R, Saenz MG, Das Neves AV, et al. Clinical characteristics and outcomes of obstetrics patients requiring ICU admission. *Chest.* 2007;131:718-24.
- Pérez A, Acevedo O, Tamayo FDC, Oviedo R. Characterization of obstetric patients with multiple organ failure in the intensive care unit of Havana Teaching Hospital, 1998 to 2006. *MEDDIC Rev.* 2010;12:27-32.