

Clinical Characteristics and Outcomes of an Intensive Maternal Care Unit in a Tertiary Hospital in the Philippines

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ABSTRACT

Objectives. This is the first study that provides an overview of the characteristics of a specialized Intensive Maternal Care Unit (IMU) that caters to obstetric-related conditions in the Philippines. This study aims to describe the different kinds of cases admitted into this facility, the different medical and surgical interventions employed, length of hospital stay, and maternal and fetal outcomes of these patients.

Methods. This is a cross-sectional descriptive study based on a chart review of medical records and admission charts of patients admitted to the Intensive Maternal Unit of a tertiary hospital in Manila from January 2017 to December 2019.

Results. There were a total of 17,185 obstetric admissions from 2017-2019. There were a total of 841 admissions (4%) into the Intensive Maternal Unit, with an average of 280 admissions per year. The average length of Intensive Maternal Unit stay was 10.46 days and the average length of hospital stay was 12.98 days. Maternal outcomes were the following: 56.89% were discharged undelivered while 38.92% delivered on their initial admission. The maternal mortality rate was 2.39% among those admitted to the IMU. Among those discharged undelivered, 43% were re-admitted, 6% were admitted twice, and 4% were admitted three times. The most common reason for admission was pregnancy-related hypertensive diseases (34%). Blood transfusion (2.4%), the use of ventilator support (0.6%), and the use of inotropic drugs (0.6%) were the major medical interventions. Cesarean section was the most common surgical intervention, seen in 54.49% of patients. Most neonates were admitted to the neonatal ICU (23.95%), at an average pediatric age of 33 weeks, with an average length of stay in the Neonatal ICU of 12.33 days.

Conclusion. Pregnant women are a special group of patients with different needs compared to the general patient population. Pregnancy-associated hypertensive disease is the most common cause of admission to the IMU and hospitals should be able to cater to these patients who will present in their institutions, as this may lead to poor maternal and neonatal outcomes. An Intensive Care Unit dedicated to complicated obstetric care in institutions is recommended to cater to high-risk pregnancies.

Keywords: pregnancy, intensive care unit, maternal morbidity, critical care



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INTRODUCTION

The effort to lower maternal mortality rates is always in the top health agenda of each country. The United Nations have set the 17 Sustainable Development Goals, where goals related to Health ranked on the top three. Under Health, the first target aims to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030. Maternal mortality is widely acknowledged as a general indicator of the overall health of a population, of the status of women in society, and of the functioning of the health system.¹ The latest statistics show that as of 2015, the maternal mortality rate

in the Philippines is 114 per 100,000 live births.¹ Providing women with accessible health care during pregnancy should be a top priority in the health care system in each region of the country.

There is still a huge gap between the maternal care provided across public and private hospitals. Not all hospitals have a dedicated Intensive Maternal Care Unit that can cater to obstetric cases that need close monitoring and special or advanced care. A systematic literature review on Maternal Intensive Care was done by Van Parys et al. in 2010, where they reviewed fourteen papers, and two conclusions were drawn: 1) there is no standard definition of maternal intensive care and 2) that admission criteria to a maternal intensive care unit differ widely.² Each country has its own healthcare system and have adapted terminologies to refer to what each one understands as maternal intensive care.² One such admission criteria was presented in a study done by Panda et al. in 2017, where they delineated intensive care unit (ICU) admissions from their high-dependency unit (HDU) admissions by using a criteria based on derangements in different organ systems: respiratory arrest, cardiac arrest, CNS derangement, signs suggestive of diminished tissue perfusion, renal derangement, and liver derangement. In this study, women with single-organ system involvement were managed in the HDU³, which resulted in lower rates of ICU admissions. In other studies, the criteria for admission into the ICU were not distinctly mentioned. In the Philippines, some hospitals and rural health units are only capable of Basic Emergency Obstetric and Newborn Care (BEmONC), where the following obstetric functions are being done: (1) parenteral administration of oxytocin in the third stage of labor; (2) parenteral administration of loading dose of anti-convulsants; (3) parenteral administration of initial dose of antibiotics; (4) performance of assisted deliveries; (5) removal of retained products of conception; and (6) manual removal of retained placenta; as well as the following emergency newborn interventions, including: (1) newborn resuscitation; (2) treatment of neonatal sepsis/infection; and (3) oxygen support; as well as being capable of providing blood transfusion services. A tertiary center may be classified as a Comprehensive Emergency Obstetric and Newborn Care (CEmONC)-capable facility if it is able to perform the functions mentioned prior, with the addition of being able to perform cesarean section deliveries, blood banking and transfusion services, and other highly specialized obstetric interventions and contraceptive services such as IUD insertion, vasectomies, and tubal ligations; plus providing an itinerant team composed of one physician/surgeon, one nurse, and one midwife who will conduct out-reach services to remote communities. Smaller institutions with no attending obstetricians who receive such high-risk patients will not be able to provide the necessary interventions, and will eventually refer these cases to the few tertiary hospitals who also have very limited beds for such cases.

The institution in this study has an intensive maternal care unit, called the “Intensive Maternal Unit” or IMU, which is a specialized area under the Department of Obstetrics and Gynecology dedicated to the intensive surveillance of high-risk pregnancies; patients with a pregnancy at risk for perinatal and neonatal complications, as well as patients who need highly specialized post-partum care. It is an extra function under a CEmONC-capable facility, however, not all institutions have a dedicated IMU, rather, some have a High-Risk Unit bed which may function similarly. There is a need for this particular institution to have more beds catering to more patients as it is the primary referral center for such cases. This unit has a capacity for eight beds, where six beds are dedicated for undelivered patients and two are for critically-ill patients. Patients who are deemed less priority but may still need close monitoring by the IMU staff are assigned to special detail beds labeled as IMU beds in the regular obstetric ward. In the IMU, there is a resident physician on duty who monitors patients admitted in the facility. They are joined by a trained nurse in intensive care. Monitoring of vital signs is done every four hours, and may be more frequent depending on the case of the patient. Fetal heart tones are monitored hourly, and a tococardiogram is available to perform a non-stress test once or twice a day. Intrapartum monitoring is done every four hours or continuously if a patient is in labor. The admission criteria to the IMU are as follows:

- A. **Intensive maternal care patients** are patients, pregnant or post-partum, who need to be admitted into the Intensive Maternal Unit for closer monitoring, may be co-managed by a perinatologist during her pregnancy, or need specialized care post-partum.
- B. **High-risk patients** refer to patients who have comorbidities such as hypertensive diseases, diabetic conditions, cardiac diseases, thyroid diseases, epilepsy, malignancies, recurrent pregnancy loss, previous fetal death, previous pre-term deliveries, and other conditions that will need co-management with perinatology service and other specializations.

Criteria for direct admission to the Perinatology service

- Conditions that may require invasive procedures for fetal diagnosis and therapy (e.g., cordocentesis, chorionic villous sampling)
- Disorders of amniotic fluid volume that may require invasive procedures for therapy and or intensive fetal monitoring (e.g., amnioreduction, amnioinfusion)
- Severe fetal growth restriction documented by serial ultrasound examinations with abnormal Doppler findings
- Multiple gestations (with three or more fetuses)
- Twin pregnancy complicated by:
 - Discordant growth (>30% instead of the original >20%)
 - Selective intrauterine growth restriction
 - Twin to twin transfusion syndrome

- Death or impending death of one twin
- Conjoined twins
- Acardiac twins
- PPROM of one twin
- Pregnancies with congenital anomaly EXCEPT:
 - Anencephaly
 - Unregistered patients for delivery on admission and no further monitoring is required (example: Unregistered term patient in labor with fetal hydrocephalus)
- Patients with antiphospholipid antibody syndrome or other acquired or congenital thrombophilias who:
 - require additional therapy other than aspirin and heparin
 - had a history of thrombo-embolic disease prior to or during current pregnancy
- Medical conditions in pregnancy that would need intensive care of the mother and the fetus, like:
 - Diabetic ketoacidosis
 - Hyperosmotic nonketotic coma
 - SLE in activity
 - Hemolytic uremic syndrome
- Gynecologic and non-gynecologic neoplastic conditions requiring oncologic intervention in the form of chemotherapy and/or surgery during the pregnancy and/or those with complications related to the malignancy

C. Priority admissions to the IMU include:

- Placenta previa with minimal bleeding
- Complicated multiple gestation
- Pre-eclampsia with severe features
- Worsening or poor control of any of the following medical conditions:
 - Chronic hypertensive vascular disease
 - Heart disease
 - Bronchial asthma
 - Diabetes mellitus
 - Chronic renal disease
 - Hematologic disorder
 - Neurologic disorder
 - Maternal infections
- Preterm pre-labor rupture of membranes / uncontrolled preterm labor

There are currently no in-depth studies on specialized intensive maternal care units that cater to obstetric-related conditions in the Philippines. This study will help inform obstetricians about the kind of cases that should be admitted into an Intensive Maternal Unit. Assessing their demographics will also enable the healthcare staff to anticipate these cases and avoid untoward outcomes for patients who will be admitted to intensive maternal care units. Data from this study may help health institutions plan for and build intensive maternal care units by knowing which cases are

prevalent, and help determine which hospital equipment are needed, properly allocate health care workers, improve existing facilities, and identify which sub-specialties are available and what other specialties are needed to co-manage these patients.

OBJECTIVES

General Objective

To determine the different patient characteristics in the Intensive Maternal Care Unit in a tertiary hospital and its outcomes

Specific Objectives

1. To determine the primary obstetric causes of admission of obstetric patients to the Intensive Maternal Care Unit.
2. To determine the average hospital stay in the Intensive Maternal Care Unit.
3. To determine the medical and surgical interventions performed on patients at the Intensive Maternal Care Unit as they relate to their medical/surgical co-morbidities
4. To determine the maternal outcomes in terms of morbidities, mortalities, and condition on discharge.
5. To determine the fetal outcomes in terms of age of gestation at delivery, APGAR scores, NICU admissions, morbidities, and mortalities.

MATERIALS AND METHODS

Research Design

This is a cross-sectional descriptive study based on a review of existing medical records and admission charts of patients who were admitted into the Intensive Maternal Unit of the selected tertiary hospital from January 2017 to December 2019.

Study Population

The following criteria were used to determine eligibility for the study:

- Patient with high-risk pregnancies, patients with a pregnancy at high risk for neonatal intensive care, and patients who will need highly specialized post-partum care
- Undelivered pregnant patients who are admitted in the service ward deemed to need specialized care
- Post-partum patients needing close monitoring under the Intensive Maternal Unit
- The patients described above were admitted under the Intensive Maternal Unit for at least 24 hours

Exclusion criteria included those:

- Who delivered within 24 hours and did not need admission into the IMU post-partum
- Who were re-admitted into a non-IMU bed
- Undelivered patients in a non-IMU bed

Sample Size Calculation

All patients admitted into the Intensive Maternal Care who satisfied the inclusion and exclusion criteria provided were included in the study. Data from January 2017 - December 2019 was collected. The computed sample size is 167 patients. A 95% confidence interval was used in computing the sample size. A design effect of 1, 50% anticipated frequency to achieve highest minimum sample size, 95% absolute precision, and 95% confidence interval.

Description of Study Procedure

A sample of 167 pregnant Filipino women who were admitted in the tertiary hospital’s Intensive Maternal Unit from January 2017 to December 2019 were included in the study. Data was collected from patient charts and were placed in the Data Collection form and organized in an Excel file for analysis. Admissions were categorized in order to determine the causes of admissions and mean number of days admitted in the hospital was obtained per category. Patients who were re-admitted were counted as one subject. Interventions done were summarized per category. Categorical data were expressed as percentages and was compared using the chi-square test. Continuous data were expressed as the mean and standard deviation (SD) and was compared using the T-test. A univariate analysis was performed to examine the association with IMU mortality. The statistical significance was defined as a P value of less than .05.

The research protocol was approved by the University of the Philippines-Manila Research Ethics Board (UPMREB) PGH Review Panel prior to data collection. A waiver of informed consent was requested from the UPMREB panel since: the research presents no more than minimal risk, the waiver or alteration will not adversely affect the rights and welfare of the participants, the research cannot be practicably carried out without the waiver or alteration; and

the participants will be provided with additional pertinent information after their participation (whenever appropriate) in accordance to the National Ethical Guidelines of Health and Health-related Research 2017. Patient confidentiality was kept by assigning a control number for each patient included in the study. The participants of the study did not receive any form of financial compensation and they did not directly benefit from the research.

RESULTS

There were a total of 17,185 obstetric admissions from 2017-2019, where 841 patients (4%) were admitted into the Intensive Maternal Unit, with an average of 280 admissions per year.

Table 1 shows the patient characteristics of this sample. The average age of the patients was 30.37 years old. The median obstetric score for gravidity was 3 and parity 1. The average number of pre-natal consultations is five consultations per patient. The average height, weight, BMI were 153.32 cm, 64.57 kg, 27.25 kg/m², respectively.

The average length of Intensive Maternal Unit stay was 10.46 days and the average length of hospital stay was 12.98 days as shown in Table 2. Among those discharged undelivered, a total of 72 patients (43%) were re-admitted once, 11 patients (6%) were re-admitted a second time, and eight patients (4%) were re-admitted for a third time. The average stay is 2.48 days in the IMU and 7.49 days in the hospital.

Reasons for admission are shown in Table 3; 56 patients (33.53%) were admitted for elevated blood pressure, 44 patients (26.35%) for pre-term labor, 9 patients (5.39%) for dyspnea, 8 patients (4.79%) for complications of cardiac disease, 7 patients (4.19%) required intensive blood sugar control, and 6 patients (3.59%) for vaginal bleeding.

The following referrals were made to sub-specialties as shown in Table 4: 94.61% were referred to the perinatology service and 50.9% were referred to the Internal Medicine service. Referrals were also made to Ophthalmology (12.5%), Endocrinology (7.1%), Pulmonology (4%), OBGYN-Infectious Diseases (2%), Hematology (1.7%), Cardiology (1.1%), General Surgery (1.1%), and Neurology (1.1%).

Medical interventions are depicted in Table 5. For anti-hypertensive medications, 32.34% were given methyldopa, 20.96% were given magnesium sulfate, and 17.37% were given hydralazine. Nifedipine and nicardipine drip were also used as antihypertensives. For tocolysis, 41.32% were given

Table 1. Patient Characteristics (n=167)

	Continuous		Median
	Mean	SD	
Age	30.37	6.44	
OB Score (Gravidity)	2.92	1.73	3
OB Score (Parity)	1.68	1.67	1
Number of pre-natal consults	5.26	2.75	5
Height	153.32	5.46	
Weight	64.57	16.70	
BMI	27.25	6.32	

Table 2. Length of IMU and Hospital Stay (n=167)

	Initial admission		Readmission 1		Readmission 2		Readmission 3	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Length of IMU stay	10.46	8.21	2.48	4.98	2.38	2.97	1.40	2.19
Length of hospital stay	12.98	9.51	7.49	5.41	7.00	3.50	7.17	4.62

Table 3. Reasons for Admission (n=167)

	Frequency	%
<i>Elevated blood pressure</i>	56	33.53
<i>Preterm labor</i>	44	26.35
<i>Dyspnea</i>	9	5.39
<i>Cardiac disease</i>	8	4.79
<i>Elevated blood sugar</i>	7	4.19
<i>Vaginal bleeding</i>	6	3.59
<i>Abdominal pain</i>	5	2.99
<i>Thyroid disease</i>	4	2.40
<i>Ruptured membranes</i>	4	2.40
<i>Hypokalemia</i>	4	2.40

Table 4. Referrals to Other Services (n=167)

	n	%
<i>Perinatology</i>	158	94.61
<i>Internal Medicine</i>	85	50.9
<i>Ophthalmology</i>	21	12.5
<i>Endocrinology</i>	12	7.1
<i>Pulmonology</i>	7	4
<i>OBGYN-Infectious Diseases</i>	4	2
<i>Hematology</i>	3	1.7
<i>Cardiology</i>	2	1.1
<i>General Surgery</i>	2	1.1
<i>Neurology</i>	2	1.1

Table 5. Medical Interventions (n=167)

	n	%
Anti-hypertensive medications		
Methyldopa	54	32.34
Hydralazine	29	17.37
Terbutaline	1	0.6
Nicardipine	1	0.6
Nifedipine	7	4.19
MgSO ₄	35	20.96
Tocolysis		
Nifedipine	69	41.32
MgSO ₄	5	2.99
Terbutaline	2	1.2
Dydrogesterone	-	-
Isoxuprine	5	2.99
Proluton	1	0.6
Micronized progesterone	32	19.16
Glycemic Control		
Insulin	30	17.96
Metformin	2	1.2
Antibiotics		
No antibiotics	86	51.5
With antibiotics	81	48.5
Cefuroxime	23	13.77
Ampicillin	6	3.59
Ceftriaxone	6	3.59
Ceftriaxone, Azithromycin	6	3.59
Erythromycin, Ampicillin,	4	2.4
Amoxicillin		

Table 6. Major Medical Interventions (n=167)

	n	%
<i>Blood transfusion</i>	4	2.4
<i>Ventilator support</i>	1	0.6
<i>Inotropic support</i>	1	0.6

Table 7. Surgical Interventions (n=167)

	n	%
<i>Cesarean section</i>	91	54.49
<i>Vaginal delivery</i>	43	25.74
<i>Exploratory laparotomy</i>	3	1.8
<i>Biopsy</i>	1	0.6
<i>Others</i>	6	3.59

nifedipine, 19.16% were given micronized progesterone, 2.99% were given MgSO₄, 2.99% were given isoxuprine, 1.2% were given terbutaline, 0.6% were given 17-hydroxyprogesterone caproate. For glycemic control, 17.96% were given insulin and only 1.2% were given metformin. Antibiotics were given to 81 patients (48%), with cefuroxime being the most common antibiotic used.

Blood transfusion (2.4%), the use of ventilator support (0.6%), and the use of inotropic drugs (0.6%) were the major medical interventions as shown in Table 6. Table 7 shows the surgical interventions done, where a total of 91 patients (54.49%) underwent cesarean section, 43 (25.74%) underwent vaginal delivery, 6 (3.59%) other surgical interventions such as exploratory laparotomy and biopsy were done.

Table 8 shows the Maternal outcomes: 56.89% (95 patients) were discharged undelivered while 38.92% (65 patients) delivered while admitted. There was 1.8% maternal mortality rate among those admitted in this institution's IMU. Fetal outcomes are shown in Table 9; neonates were either admitted to the neonatal ICU (32.93%), directly roomed-in (10.18%), mortality (1.79%), or fetal death in utero (1.19%). Moreover, the average pediatric aging was 33.06 weeks during the initial admission, with an average APGAR score of 8.27 at 1 min, and 8.70 at 5 mins. In subsequent re-admissions, the pediatric aging was 36 weeks,

with similar APGAR scores. The average length of stay in the Neonatal ICU was 12.33 days.

DISCUSSION

The need for an Intensive Maternal Unit for specialized obstetric care in hospitals has been emphasized in previous literature, because pregnant women are a special population with different needs from that of the general population. Some institutions do not even have the capacity to admit women with high-risk pregnancies. Co-morbidities such as hypertension and cardiac diseases are unmasked and may worsen during pregnancy. These conditions will require advanced care from several specialties, as well as require a variety of diagnostic tests and medications for these patients.

The average length of Intensive Maternal Unit stay was 10.46 days and the average length of hospital stay were 12.98 days, which may mean that turnover of beds to newer patients may take more than two weeks for some cases. As mentioned, IMU beds in this institution are limited to eight beds, with special detail beds labeled as IMU beds in the regular obstetric ward depending on their availability. More resources may be needed for these patients in the IMU, including medications and healthcare workers. It was also noted that more than half of the patients included in

Table 8. Maternal Outcomes (n=167)

	Initial admission		Readmission 1		Readmission 2		Readmission 3	
	n	%	n	%	n	%	n	%
<i>Discharged undelivered</i>	95	56.89	17	10.18	4	2.4	2	1.2
<i>Discharged delivered</i>	65	38.92	55	32.93	8	4.79	8	4.79
Mode of Delivery								
Cesarean section	44	26.35	35	20.96	7	4.19	5	2.99
Vaginal delivery	21	12.5	18	12.5	1	0.6	3	1.8
Mortality	3	1.8	1	0.6	-	-	-	-

Table 9. Fetal Outcomes

Fetal Outcome	Initial admission		Readmission 1		Readmission 2		Readmission 3	
	n	%	n	%	n	%	n	%
<i>Room-in</i>	20	10.18	47	28.14	5	2.99	5	2.99
<i>Neonatal ICU</i>	40	32.93	9	5.39	3	1.8	3	1.8
<i>Mortality</i>	3	1.79	1	0.6	-	-	-	-
<i>Fetal death in utero</i>	2	1.19	1	0.6	-	-	-	-

	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Pediatric aging</i>	33.06	3.52	36.91	3.13	36.00	2.14	36.125	2.03
APGAR Score								
1 st minute	8.27	1.70	8.86	0.90	8.88	0.35	8.37	1.41
5 th minute	8.70	0.98	8.91	0.75	9.00	0.00	8.87	0.35
<i>Length of stay in NICU</i>	12.33	19.66	8.50	7.78	-	-	-	-

the study (56.89%) were initially discharged undelivered as their initial concern for being admitted (severe hypertension, uncontrolled diabetes, infection) were resolved and did not need immediate termination of pregnancy. 75% of these patients were re-admitted, however, data on the outcomes of the other patients were not gathered as these patients delivered in other institutions. The sample that was taken for this study were all antenatal admissions.

Several studies found that hypertensive disorders and hemorrhagic complications were the top reasons for admission into an intensive maternal care unit. In a study done by Jain et al., hypertensive disorders were found to be the most frequent clinical diagnosis leading to ICU admission (37.7%), followed by hemorrhage (28.8%).⁴ This is similar to another study done in Mexico, where 67.9% were admitted for hypertensive disorders, 28.3% were admitted due to obstetric hemorrhage, 3.9% patients were admitted with a diagnosis of sepsis, and another 3.8% patients were admitted for HELLP syndrome.⁵ Some data may also show differences in geographic locations, as a study done in Southern India showed that hypertensive disorders of pregnancy was the most common condition which necessitated HDU admission (52.2%), followed by obstetric hemorrhage (23.4%)⁶ while in another city in India, it was reported that obstetric hemorrhage (44.05 %) was the most common condition requiring ICU admission followed by hypertensive disorders of pregnancy (28.88 %)⁷. A study done in Saudi Arabia also

mentioned non-obstetric causes of admission to the ICU, where sepsis was the most common non-obstetric indication among pregnant patients, with community-acquired pneumonia and urinary tract infection as the most common underlying diseases causing the cases of sepsis.⁸ Consistent with the data from the literature reviewed,^{5,6} our data showed that pregnancy-associated hypertensive disease is still the most common cause of admission to the IMU. Other studies showed that obstetric hemorrhage was the most common cause of admission in their countries⁹, however, among our study population, this was not observed. Pregnancy-associated hypertensive disease account for 30.3% of all maternal deaths in the Philippines, which is higher than the worldwide rate. Guidelines for screening hypertensive-related diseases in the Philippines is still underway, but may help curb the number of patients developing complications if we are able to effectively screen these patients in the outpatient clinic. In this institution, preterm labor, dyspnea, complicated cardiac disease, were common causes of admission in the IMU, which were not reported in the literature review from other countries. Preterm labor, in particular, comes second as an indication of admission to the IMU in this institution. Preterm labor may be caused by prior preterm birth, smoking, malnutrition, infections, multifetal pregnancies, and low socio-economic status, to name a few. However, the particular causes of preterm labor were not specifically mentioned in the data collected and may be a

point of improvement in subsequent studies as it can improve antenatal care and decrease admissions. For institutions who are planning to create an Intensive Maternal Unit in their own obstetric wards, taking note of the most common causes of admission may help prepare their own institutions to cater to such specialized cases.

Referral to other sub-specialties were also very frequent, with almost all cases being referred to the Perinatology service. The diverse sub-specialties of this tertiary training institution benefited these patients since referrals for specialized care are readily available and easily accessible.

Data regarding the medications used for the various interventions that were commonly used for the most frequent reasons for admission were also presented. Availability of these medications in other institutions must be ensured if they are going to cater to patients with such co-morbidities. Blood transfusion and mechanical ventilation were also common medical interventions, which was also similar to that reported from other countries.

The most common interventions being performed in the ICU were reported by Rathod and Malini: blood and blood component transfusion, followed by inotropic support, and ventilator support.⁷ Another study reported that cesarean section was the most common surgical intervention, which was attributed to the higher number of complicated cases referred during the later stages of gestation.⁸ Meanwhile, in a study done in the Netherlands by Zwart et al., the following interventions were done: assisted ventilation, inotropic support, and renal dialysis, while surgical interventions included hysterectomy and arterial embolization because of obstetric hemorrhage.¹⁰ In this study, it was seen that cesarean section was the most common surgical intervention done among the patients admitted in the IMU. This was consistent with the literature reviewed. Emergency cesarean section while admitted in the IMU was indicated when deterioration of the maternal status or a non-reassuring fetal condition was noted, however, specific indications for the cesarean section were not included in this study and may be a point for review in subsequent studies.

Most studies reported the outcomes as they relate to the morbidity and mortality of the patients, however, most did not include neonatal outcomes. One study showed an 8% mortality rate for critically ill obstetric patients, consistent with the reports of maternal mortality in the area studied (9.4% in Eastern Saudi Arabia), which was comparable to the mortality rates in North America and Europe. Such low rates were attributed to better hospital facilities since the ICU was manned by board-certified critical care physicians and an obstetric team was available 24 hours a day, seven days a week.¹¹ In developed countries where a more complex ICU system exists, it was found that obstetric ICU admissions represented 0.24% of all deliveries, and the mortality rate of 3.4% was significantly lower than the rates presented in other studies done in developing countries.¹² The maternal mortality of patients admitted in the IMU was 2.39%, which

was significantly lower than the percentage reported in the literature reviewed. This may be attributable to the status of the patients when they were admitted into the facility, as majority were not critical with life-threatening conditions, however, due to the nature of the disease in these high-risk pregnancies where maternal or fetal condition can deteriorate at any time, admission to the Intensive Maternal Unit for closer monitoring was indicated. Baseline intensive care and monitoring, with additional monitoring of patients by resident physicians, nurses, and medical interns were also strictly implemented, which resulted into timely referrals and interventions which may have resulted in good outcomes.

Fetal outcomes showed that the average pediatric age was 33.06 weeks at delivery and the average length of stay in the neonatal ICU was 12.33 days. Further review of the data showed that most babies with poor APGAR scores were born to mothers with complications of uncontrolled hypertensive diseases. These are important findings as neonatal ICUs in different institutions have different capacities in handling preterm neonates.

This is the first local study that provides an overview of the characteristics of specialized intensive maternal care units that cater to obstetric-related conditions in the Philippines. Being able to characterize the patients being admitted to the IMU has given us knowledge regarding the demographics of the patients being admitted into the facility, identify the different medications and interventions that are most commonly performed on these patients, and more importantly, determine the maternal and fetal outcomes of these group of patients resulting from this specialized set up. In this time of the COVID-19 pandemic, it has been reported that pregnancy increases the risk for acquiring severe COVID-19 infection and admission to the intensive care unit¹³, which may even be associated with several co-morbidities such as pre-eclampsia, gestational diabetes mellitus, and preterm birth¹⁴. Hospitals should be prepared to at least stabilize these patients in the emergency room for such conditions prior to transfer to tertiary hospitals if they do not have the capacity to admit them into intensive maternal units. Coordination of the obstetricians with their respective pediatricians and neonatal ICUs will also help them prepare for the deliveries and management of the babies of such high-risk pregnancies.

CONCLUSIONS

Pregnancy-associated hypertensive disease is the most common cause of admission to the IMU and hospitals should be able to cater to these patients who will present in their institutions, as this may lead to poor maternal and neonatal outcomes. Maternal complications like eclampsia, nephropathy, and retinopathy may be avoided if timely interventions are performed. Neonatal complications such as stillbirth and poor delivery outcomes leading to NICU admission may also be prevented. Prenatal care for these

patients should also be strengthened to avoid further complications that may lead to their admission. Cesarean section was the most common surgical intervention seen among the patients admitted in the IMU, and hospitals catering to such cases should be ready to perform this intervention when indicated.

Data was gathered only from a single tertiary hospital and results may be not applicable to other hospitals with limited facilities, sub-specialties, and provisions for an intensive maternal care unit, however, results of this study may be used as a springboard to establish intensive maternal units in other institutions who want to cater to such cases. It is recommended that other institutions formulate their own defined criteria for admission into the intensive maternal care unit for future facilities that will be set up. Setting up a high-dependency unit, as described by Panda et al. where women with single-organ system involvement are being managed³, may also be built to supplement intensive maternal care units, which can cater to cases that are less life-threatening but still need close monitoring. A study done in China also supports this, as it was seen that creation of an obstetric high-dependency unit decreased admission to intensive care units by 20%.¹⁵ Considerations to allocate a dedicated intensivist or a critical care obstetrician in the Intensive Maternal Unit, aside from perinatologists, are also recommended to cater to special cases in the facility.

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Statement of Authorship

Both authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

Both authors declare that there is no conflict of interest.

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