

# Obstetric Admissions to the Intensive Care Unit in Malta (2012-2015): a nationwide, population-based, cohort study

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## Abstract

**Introduction:** A retrospective review of obstetric admissions to Malta's ICU during a four-year period was planned. Comparison to similar studies was used to benchmark the local situation.

**Method:** Patients were recruited using the ICU admissions database between 2012 and 2015. Patients admitted for obstetric pathology at any stage of pregnancy and up to 30 days postpartum were included and medical notes reviewed retrospectively. Data collected included demographics, ICU admission diagnosis, management including surgery, length of ICU and hospital stays, and maternal and neonatal outcomes. Data was analysed using MS Excel®.

**Results:** 42 patients were admitted to ICU for an obstetric pathology over the four-year period; 39 were included in the study. 0.25% of obstetric deliveries needed admission to ICU and obstetric admissions accounted for 0.87% of all ICU admissions. The commonest admission diagnosis was haemorrhage (62%), followed by hypertensive diseases of pregnancy (HDoP; 26%) and sepsis (23%). All patients had an arterial line inserted and this represented the only intensive management for one third of patients. 26 patients (67%) required surgery - the commonest procedure was an emergency Lower Segment Caesarian Section. There were no maternal deaths; however, four patients miscarried and there were three perinatal deaths.

**Conclusions:** The percentage of deliveries requiring ICU admission in Malta is in line with internationally-reported rates. Obstetric admissions as a percentage of all ICU admissions were lower than the reported averages in the literature. The most common admission diagnosis was haemorrhage, in contrast to most other studies where admission was due to HDoP.

## Introduction

Malta is an independent European island nation with a population of just over 400,000.<sup>1</sup> There is one main acute public hospital, Mater Dei Hospital (MDH), which houses a twenty-bed intensive care unit (ICU). There are no formal, separate high dependency units. The ICU caters for all medical and surgical patients above three years of age requiring high dependency (Level 2) or intensive care (Level 3). Children younger than three years go to the Neonatal and Paediatric Intensive Care Unit. The only other category of patients excluded is those post cardiac surgery, who are admitted directly to a Cardiac Intensive Care Unit post operatively. Due to this, ICU beds are a limited and sought-after resource in Malta.

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The aim of this study was to perform a retrospective review of obstetric admissions to our ICU during a four year period (2012 – 2015). This was done to benchmark our current admission rate and utilization of Intensive Care services by the obstetric patient population. The data will be used to plan resource allocation, education and training, as well as to identify potential improvements in workflow, treatment and management. Comparison to similar studies performed in other countries will be done to review similarities and differences with the situation in Malta.

### Materials and Methods

Permission to carry out the study was granted by the Chairperson of the Department of Anaesthesia and Intensive Care, the Director of the Department of Obstetrics and Gynaecology and the Data Protection Officer, all at Mater Dei Hospital. The audit was also approved by the University of Malta Research Ethics Committee (protocol code MD30/2016).

Patients were recruited by going through the ICU admissions database for the years 2012 to 2015 (four years in total) and listing those who were admitted to the ICU for an obstetric pathology at any stage of their pregnancy and up to 30 days postpartum. Medical notes were requested and reviewed retrospectively. Data collection sheets were designed by performing a literature review and noting what data was collected in similar, published studies. These were used for standardized data collection. The data collected included patient demographics, obstetric history, reason for admission to ICU, management including the need for surgery, length of ICU and hospital stays and maternal and neonatal outcome. Data was inputted into a MS Excel<sup>®</sup> spreadsheet and analysed using the same programme.

### Results

There were 42 patients who were admitted to ICU at MDH for an obstetric pathology over the four year period; 39 of these were included in the study. The remaining three patients could not be included as the medical records of one could not be found, of one were found but were empty, and the third had the wrong reference number listed in the ICU database. Over the four year period, 0.25% of obstetric deliveries needed admission to ICU. Obstetric admissions accounted for 0.87% of all

ICU admissions.

Average maternal age was 28.95 years and 62% of patients were in the 21 to 30 year age group when the admission to ICU occurred. Regarding ethnicity, the absolute majority were Caucasian ( $n=31$ ; 79%). 15 women were in their first pregnancy (38%); 11 in their second (28%); and 13% of patients ( $n=5$ ) were in their third or higher pregnancy. The commonest gestational age at which the obstetric event occurred was from the “thirty-third to the thirty-seventh week of pregnancy” ( $n=13$ ; 33%), closely followed by “at more than thirty-seven weeks gestation” ( $n=12$ ; 31%). There were five patients who were admitted to ICU postpartum and one patient required admission after embryo transfer as part of an assisted-fertility procedure. This intervention did result in a pregnancy that was unfortunately miscarried a few days after discharge from ICU.

The commonest admission diagnosis by far that warranted an ICU admission was haemorrhage ( $n=24$ ; 62%), followed by hypertensive diseases of pregnancy ( $n=10$ ; 26%) and sepsis ( $n=9$ ; 23%). Some patients had more than one diagnosis at the time of admission. All patients had an arterial line inserted on admission to ICU and this represented the only intensive management for a considerable proportion of this cohort ( $n=13$ ; 33%). 18 patients (46%) required ventilatory support. This number includes patients who were admitted intubated and mechanically ventilated and were transferred to ICU for weaning and extubation. 8 patients (21%) required infusions of vasoactive drugs, two (5%) required renal replacement therapy by CVVHDF (Continuous Veno-Venous HaemoDiaFiltration) and one patient (2.5%) needed pituitary hormone supplementation.

26 patients (67%) required surgery as part of their treatment and the commonest procedure carried out was an emergency LSCS (Lower Segment Caesarian Section). The absolute majority of patients ( $n=19$ ; 73%) received a general anaesthetic for their surgeries. Four of these had their procedure started under neuro-axial block and were then converted to a general anaesthetic (15%).

In terms of length of ICU stay, 12.8% of patients stayed less than 24 hours. 24 patients (61.5%) stayed between one and two days. 6 patients stayed 3-5 days, 3 patients for 6-10 days and 1 patient stayed for longer than 10 days. Regarding total hospital stay, 8 patients stayed 5

days or less (20.5%), 12 patients stayed between 6 and 10 days (30.8%) and 19 patients stayed more than 10 days (48.7%).

We also looked at records of contact with the neonate, breast milk expression, ice pack application to breasts and prescriptions of dopamine antagonists. In 10 patients (25.6%), these observations were not applicable (e.g. early pregnancy miscarriage). In 25 patients (64.1%), no documentation of the above was found. No patient was prescribed or given dopamine antagonists at any point.

Where documentation was present and applicable, breast milk expression was recorded for 2 patients (5.1%), breast milk expression and contact with neonate was recorded for 1 patient (2.6%) and contact with neonate and ice packs to breasts were recorded for 1 patient (2.6%).

There were no maternal deaths over this period. However, four patients miscarried their pregnancy and there were three perinatal deaths.

## Discussion

In Malta, 0.25% of all deliveries required ICU admission and obstetric patients represented 0.87% of all intensive care unit admissions. In developed countries, 0.07-0.9% of pregnant women require ICU admission, accounting for up to 3% of ICU admissions overall.<sup>2-3</sup> Therefore, our average for percentage of the obstetric population requiring ICU admission falls into the described range, but compared to the reported 3% of ICU admissions overall, our obstetric population accounted for only 0.87% of ICU admissions.

This is quite an unexpected finding considering that no formal HDU (level 2) facilities exist at MDH and our ICU admits patients requiring Level 2 and Level 3 care. In spite of this, our obstetric admission rate when compared to total ICU admissions is about a third lower than reported in previous studies. Although ICU beds are a limited resource, it is very unlikely that obstetric patients requiring Level 2 or Level 3 care were refused admission due to lack of bed space. This is the only ICU on the island and so patients could not be transported to another location. Similarly low rates of obstetric admissions as a percentage of total ICU admissions have been previously reported by a study from The Netherlands published in 2006<sup>4</sup> from a tertiary care centre, where the rate was found to be 0.7%.

Regarding the admission diagnoses, the commonest in our cohort were: 62% haemorrhage, 26% hypertensive disorders of pregnancy and 23% sepsis. A literature review for similar studies identified eleven studies (Table 1). From these, the most frequent ICU admission diagnosis in obstetric patients is hypertensive disorders of pregnancy (HDoP) as outlined in Table 1. We believe the relatively low percentage of ICU admissions for HDoP in Malta is due to the fact that most patients with pregnancy induced hypertension and mild-moderate pre-eclampsia are managed on the labour ward by the obstetricians. Patients with moderate-severe pre-eclampsia or eclampsia are referred to ICU for management of intractable hypertension despite IV agents; seizure control; or to manage complications such as HELLP syndrome, DIC and intracranial haemorrhage.

All patients admitted to ICU had an arterial line inserted for invasive blood pressure monitoring and regular blood-letting. In 33% of our patients, this was the only intensive care intervention. It could be argued that these patients could be managed in an Obstetric High Dependency Unit (HDU), thus reducing the workload, cost and psychological sequelae associated with ICU admission. A paper by Zeeman GG et al<sup>14</sup> proposes general recommendations for the organization of obstetric critical care including the Obstetric Intermediate Care Unit and medical/ surgical intensive care units. This could be relevant and helpful to the Maltese scenario due to the limited number of intensive and high dependency care beds. The findings regarding length of ICU admission, i.e. 29 patients (74.3%) stayed two days or less, may also be indicative of less severe, or quickly resolving, pathology that could be successfully and safely managed in an HDU setting.

We noted poor documentation regarding additional specific obstetric issues, for example, contact with the neonate, breast milk expression and ice-pack application to breasts. We feel this is an opportunity for improvement in our ICU care, or at least, an opportunity to enhance documentation. These care points may be overlooked in a busy ICU setting that does not frequently admit obstetric patients and so increased input from obstetricians and midwives may be relevant in these situations. We are very pleased to note the 0% maternal mortality rate in Malta for the years 2012 to 2015.<sup>15</sup>

*Table 1: Commonest ICU admission diagnoses for obstetric patients*

| Year of Publication | Authors                             | Country              | Most common admission diagnosis | Second most common admission diagnosis | Third most common admission diagnosis |
|---------------------|-------------------------------------|----------------------|---------------------------------|--|---------------------------------------|
| 1996                | Bouvier-Colle MH et al <sup>5</sup> | France               | HDoP 26.2%                      | Haemorrhage 20%                        | Embolisms 12.4%                       |
| 2001                | Quah TCC et al <sup>6</sup>         | Singapore            | HDoP 50%                        | Haemorrhage 24%                        | Neurological 11%                      |
| 2003                | Demirkiran O et al <sup>7</sup>     | Turkey               | HDoP 73.6%                      | Haemorrhage 11.2%                      | Infection 2.4%                        |
| 2004                | Mirghani HM et al <sup>8</sup>      | United Arab Emirates | Haemorrhage 28.4%               | HDoP 25%                               | Cardiac problems 21.6%                |
| 2004                | Okafor UV et al <sup>9</sup>        | Nigeria              | HDoP 56%                        | Haemorrhage 22.2%                      | N/A                                   |
| 2006                | Keizer JL et al <sup>4</sup>        | The Netherlands      | HDoP 21-76%                     | Haemorrhage 15-33%                     | Miscellaneous 13.4%                   |
| 2010                | Zwart JJ et al <sup>10</sup>        | The Netherlands      | Haemorrhage 48.6%               | HDoP 29.3%                             | Sepsis 8.1%                           |
| 2011                | Crozier TM et al <sup>3</sup>       | Australia            | Haemorrhage 33%                 | HDoP 15%                               | Cardiac disease 13%                   |
| 2011                | Gupta S et al <sup>11</sup>         | India                | Haemodynamic instability 83%    | Respiratory insufficiency 12.54%       | Neurological dysfunction 4.16%        |
| 2015                | Ruimy A et al <sup>12</sup>         | France               | HDoP 64%                        | Haemorrhage 16.7%                      | Miscellaneous disorders 5.4%          |
| 2016                | Seppanen P et al <sup>13</sup>      | Finland              | HDoP 57%                        | Haemorrhage 25.4%                      | N/A                                   |

HDoP – Hypertensive Disorders of Pregnancy

Our study has some limitations. Only 93% of obstetric admissions to ICU during this four year period were analyzed (39/42). The rest could not be included due to lack of proper documentation or misplacement of patient notes. Patients may also have been missed due to erroneous entries into the ICU admission database. This source of error was minimized by looking at both admission diagnosis and the specialty of the caring consultant (all admissions by obstetric consultants were reviewed for inclusion). It is however possible a very small number of patients were missed.

In conclusion, the percentage of all deliveries requiring ICU admission in Malta is similar to rates previously reported from other countries. The percentage of obstetric patients as part of all intensive care unit admissions is lower than the reported averages in the literature. Despite this, due to the limited number of ICU beds available, an HDU set up may help to reduce the number of

obstetric admissions to ICU even further. We feel there is a need for improved documentation, and possibly in points of care, with respect to specific obstetric issues e.g. neonatal contact and breast care. The mortality rate of 0% over these four years is an achievement.

### Summary Box

What is already known about this subject?

- Rate of obstetric admissions to ICU as a percentage of all deliveries in developed countries is reported at 0.07-0.9%<sup>2-3</sup>
- Rate of obstetric admissions to ICU as a percentage of all ICU admissions in developed countries is reported as up to 3%<sup>2-3</sup>
- The commonest ICU admission diagnosis in obstetric patients from the literature is hypertensive disorders of pregnancy (Table 1)

## What are the new findings?

- Rate of obstetric admissions to ICU as a percentage of all deliveries at MDH – 0.25%
- Rate of obstetric admissions to ICU as a percentage of all ICU admissions at MDH – 0.87%
- Identification of haemorrhage as the most common admission diagnosis in obstetric patients in ICU at MDH
- Level and frequency of intensive care interventions in obstetric patients admitted to ICU at MDH

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