

Obstetric Admissions to the Intensive Care Unit in Malta over a six year period (2016-2021)

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Background

This is a retrospective evaluation of obstetric admissions to Mater Dei Hospital's (MDH) ICU between 2016 and 2021. MDH accounts for over 90% of Malta's deliveries. Comparison to data from a similar study covering 2012-2015 gives information over a 10-year period.

Methods

Patients were recruited using ICU admissions records. Obstetric patients in any trimester, and up to 30 days postpartum, were included. Data was collected from patient medical records, there was no patient contact. Collected data included demographics, diagnosis, parameters, duration of ICU stay, interventions, and hospital stay. Surgical interventions, maternal and foetal outcomes were noted. MSExcel was used for data analysis.

Results

55 obstetric patients were admitted to ICU over the six year period; 51 were included in the study. 0.19% of obstetric deliveries needed ICU admission and obstetric admissions accounted for 0.68% of all ICU admissions. The commonest admission diagnosis was haemorrhage followed by hypertensive disorders of pregnancy and sepsis. In patients admitted with haemorrhage, mean blood loss was 2.16L. The mean systolic blood pressure in pre-eclamptic patients was 179mmHg. All patients had an arterial line inserted. 54.9% required overnight stay. 45 patients required surgical intervention, the commonest being an emergency Caesarean section. No maternal deaths were reported. In one case, CPR was performed.

Conclusions

Malta's rate of obstetric ICU admissions falls within the lower range when compared to international reports. The most common obstetric ICU admission diagnosis is still haemorrhage, in contrast to other international studies where hypertensive disorders of pregnancy prevail.

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Malta is a Mediterranean island nation with a population of 421,000 and has one main general, tertiary and public hospital, Mater Dei Hospital (MDH), where one can find an Intensive Care Unit (ICU) which has a total of twenty beds. There is one formal separate High Dependency Unit (HDU), but this is mainly dedicated to surgical patients with no formal, allocated anaesthetic cover. All adult patients requiring intensive care (level three) and a large proportion of patients needing high dependency care (level two) are admitted to the ICU. Paediatric patients, aged three years and above are also admitted to the ICU. There is a separate Cardiac-Intensive Care Unit (CICU) where patients who undergo cardiac or thoracic surgery are admitted. In view of this set-up, one can understand why ICU beds in Malta are very much in demand and such a limited resource.

The aim of this study was to perform a retrospective review of obstetric admissions to Mater Dei Hospital's ICU over a six year period (2016 to 2021). This was done to compare and contrast with a previous benchmark study¹ performed locally, covering the period from 2012 to 2015; as well as to compare with international data.

The information gathered will be used to identify areas which require improvement, most especially those relating to staff training and resources available. The benchmark study recommendations will be reviewed to assess whether they have been implemented and if so, what were the outcomes.

MATERIALS AND METHODS

Permission to carry out the study was granted by the Chairperson of the Department of Anaesthesia and Intensive Care, the Chairperson of the Department of Obstetrics and Gynaecology, the Data Protection Officer, and the Chief Executive Officer, all at Mater Dei Hospital.

Patients were recruited by going through the ICU admissions database for the years 2016 to 2021 (six years in total) and recruiting the obstetric patients who were admitted to the ICU during any trimester of pregnancy and up to 30 days post-partum. Medical notes were reviewed retrospectively. Data collection sheets were an updated version of those used for the benchmark study. The data collected included

patient demographics, obstetric history, reason for admission to ICU with any related parameters, management including the need for surgery, length of ICU and hospital stays and maternal outcome. Data was inputted into Microsoft Excel and analysed using the same programme.

RESULTS

A total of 55 obstetric patients were admitted to ICU in the study period. 51 were included in the study, as missing records or information excluded the other four. 0.19% of obstetric deliveries needed admission to ICU and obstetric admissions accounted for 0.68% of all ICU admissions. The mean age of obstetric patients admitted to ICU was 30.4 years with 39.3% of them being primigravidae and 80% Caucasians. The majority were in their third trimester (84.3%), while five patients were in the first trimester and three in the second trimester. The mean gestation age was noted to be 31+5 weeks.

The commonest reason for requiring ICU admission was haemorrhage making up almost half of the admissions (49.0%) (Figure 1). The second commonest reason was hypertensive disorders of pregnancy (27.5%) followed by sepsis/infection (13.7%). Other reasons for admission included respiratory, neurological and cardiac problems. Eleven patients had more than one reason for ICU admission. The mean estimated blood loss (EBL) for patients admitted with haemorrhage was 2.16L. Out of the 25 patients admitted to ICU with haemorrhage, 20 required a blood transfusion. The mean systolic blood pressure in pre-eclamptic patients was 179mmHg.

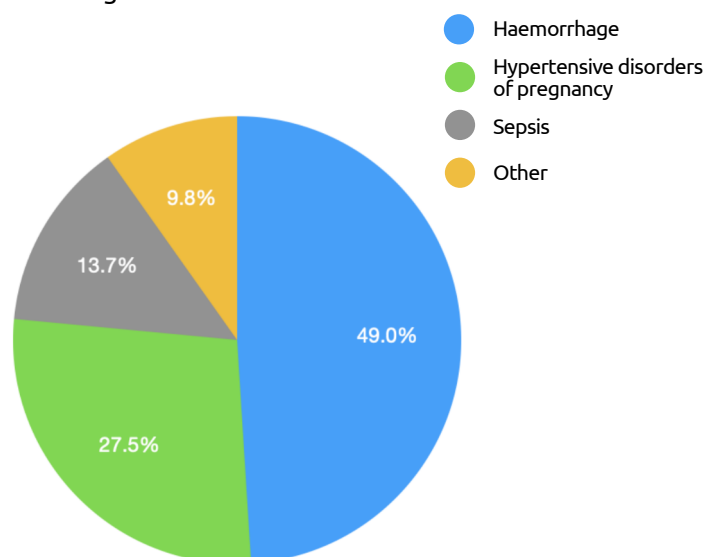


Figure 1 Reasons for Obstetric Admissions to ICU

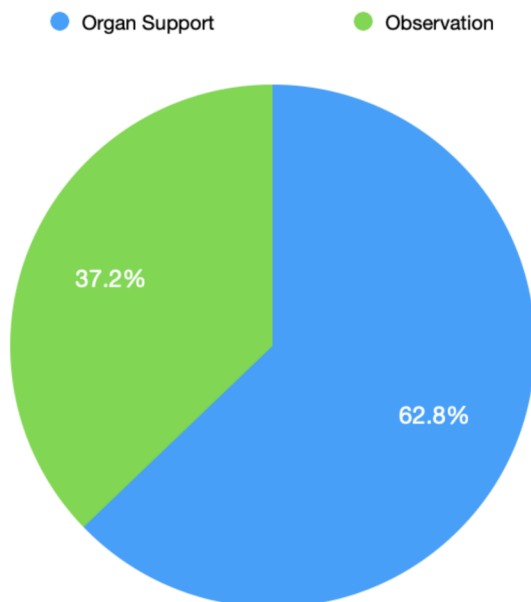


Figure 2 *Need for organ support*

Thirty-two patients (62.8%) required organ support (**Figure 2**): either ventilatory or vasoactive support or both. All patients had an arterial line in situ as part of the management in ICU (**Figure 3**). 24 patients (47%) required mechanical ventilation. In two cases non-invasive ventilation (NIV) was used, whilst the rest were intubated. Most of these patients were admitted intubated and mechanically ventilated after surgery and then were extubated after a few hours in the ICU. 12 patients (21.8%) had a central venous catheter (CVC). 11 (21.6%) patients required inotropic support and nine patients required anti-hypertensive treatment. Anti-epileptics were required in the management of one case.

We also looked at breastfeeding, breast milk expression, foetal heart monitoring as well as whether any of the mothers visited their babies in the NPICU. In five cases, breast milk expression was performed under the guidance of midwives in the ICU. In one case of foetal death, a bereavement midwife was involved. In another case the patient had daily foetal heart monitoring until delivery of the baby. One mother was taken for a few hours to NPICU to visit the baby. In one case the mother suffered a miscarriage and the products of conception were passed naturally.

We also reviewed any surgical intervention that was performed (**Figure 4**). Only six (11.8%) patients did not undergo any intervention. The most common intervention was a Caesarean section where this was performed in a total of 24 (62.7%) patients. Other emergency procedures included emergency laparotomy, Bakri balloon insertion, evacuation of retained products of conception, removal of ruptured

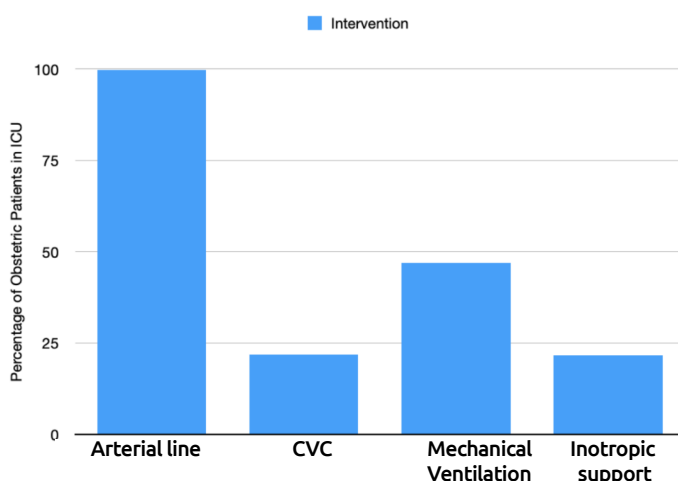


Figure 3 *Interventions Performed*

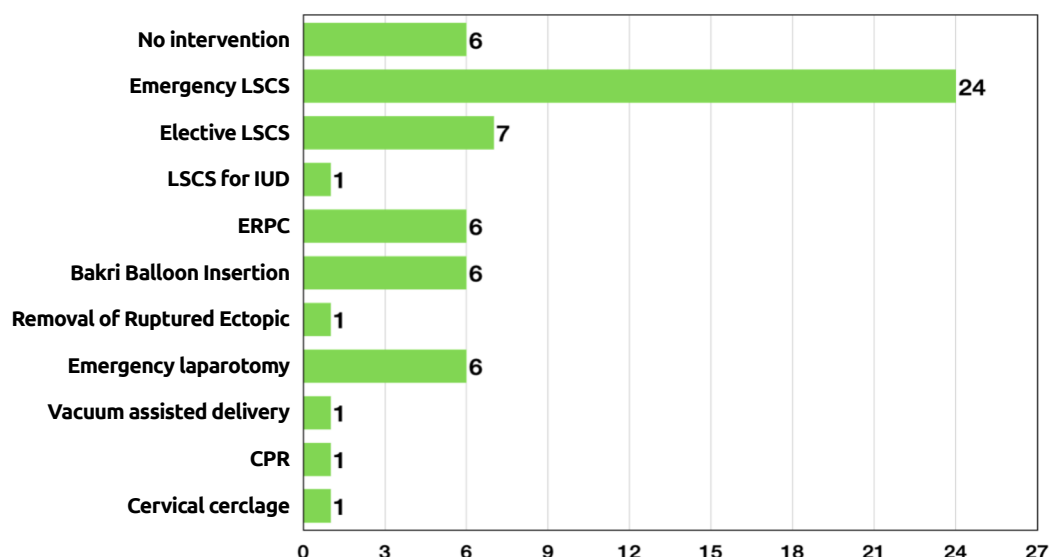


Figure 4 *Surgical Interventions Performed*

ectopic, vacuum assisted delivery under epidural anaesthesia and cervical cerclage. In one instance, cardiopulmonary resuscitation was required and return of spontaneous circulation was achieved.

Twenty-eight patients (54.9%) required overnight stay in the ICU. Fourteen patients were admitted for two nights and nine patients stayed for three nights or more before being transferred to a ward. With regards to total hospital stay, 25 patients (49.0%) were admitted for up to seven nights, while 13 patients were admitted for eight to 14 days. Thirteen patients required a longer duration of stay, with four staying for 15 to 28 days and nine requiring hospital care for 29 days or more (Figure 5).

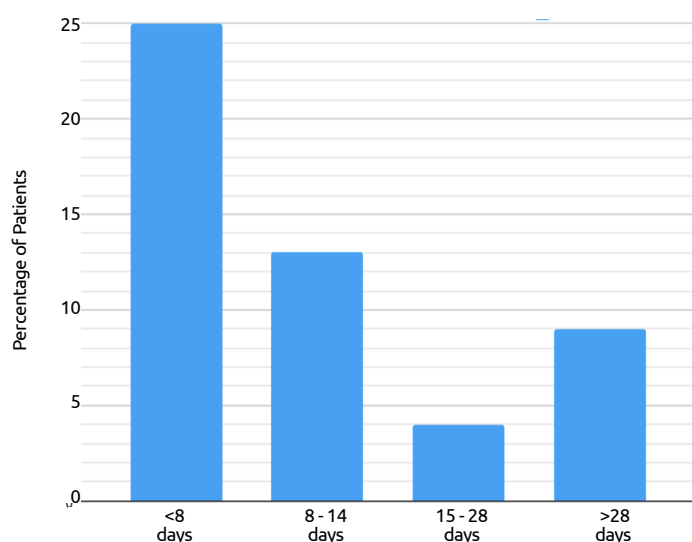


Figure 5 Hospital Length of Stay

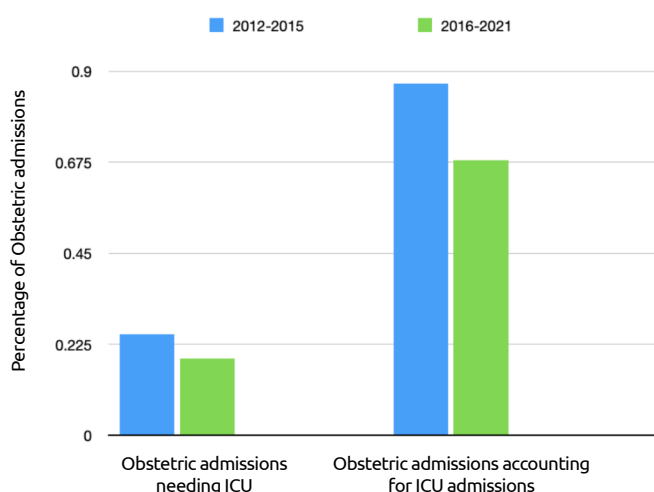


Figure 6 ICU admissions

DISCUSSION

A total of 0.19% of obstetric deliveries needed ICU admission over the 6 year period. This was noted to be 0.06% less (Figure 6), when compared to a previous study carried out locally between 2012 and 2015¹. However, this was not found to be a statistically significant difference (p-value of 0.7817 using unpaired T-test). International reports including from Australia², New Zealand³ and India^{4,5}, showed percentages of obstetric patients admitted to ICU ranging from 0.21% to 1.3%. There was one centre in Portugal⁶ which reported an admission rate of 0.07%.

Obstetric admissions accounted for 0.68% of all ICU admissions. This was noted to be 0.19% less when compared to the same previous national study. This was noted to be much less than international reports, where the percentage of ICU obstetric admission was between 0.8% to 0.84%^{3,4}.

Malta has one main public hospital, with one Intensive Care Unit (ICU) which has a total of 20 beds. There is no dedicated Obstetric ICU or Obstetric High Dependency Unit (Level 2). The ICU caters for all medical, surgical and obstetric patients, above 3 years of age, requiring Level 2 care or above.

Central Delivery Suite (CDS) is logistically equipped to care for level two patients as it has the possibility of invasive blood pressure monitoring and also the possibility of administering IV infusions including anti-hypertensives and vasopressors. Apart from this, on the labour ward, there is always one or two anaesthetists present 24/7, who have formal critical care training.

A number of admissions to ICU were indicated for overnight monitoring with the insertion of an arterial line being the only intervention. Organ support was not provided in 37.25% of cases making this group of patients ideal candidates for an HDU, if it were available. A total of 42 patients (82.4%) stayed between one and two nights. This short duration of ICU stay could mean that these patients had less complex pathology associated with a rapid recovery, possibly making them good candidates for management in an obstetric HDU setting. No re-admissions to ICU after step-down were noted.

One advantage for having an obstetric HDU, specifically to Malta, is to decrease burden on the only ICU that is present by offloading the obstetric cases to a specifically-designed obstetric HDU. Of

note, a regional obstetric hospital has shown a trend towards decreased admissions to ICU upon the establishment of an HDU⁷.

Another reason to further emphasise the importance of an Obstetric HDU is that it would allow for the provision of holistic care coordinated between anaesthetists, midwives, and obstetricians, allowing for newborns to stay with their mothers in the same unit, preventing emergency intra-hospital transfers and improving continuity of care from the antenatal to the postnatal periods⁸. Despite not having an obstetric HDU, Malta still had a lower number of obstetric admissions to ICU when compared to international rates.

With regards to overall hospital stay, 25 patients stayed for less than seven days and 13 patients stayed for seven to 14 days. The rest (25.5%) required more than two weeks of ward-based care with the longest duration of stay being 63 days.

Our study shows that the commonest reason for admission was haemorrhage, making up almost half of the admissions (49%). Hypertensive disorders of pregnancy were the second commonest cause for admission (27.5%) followed by sepsis and severe infections making up 13.7%.

This same trend was also seen in the previous similar local study¹. The reason for this discrepancy between local and international studies is probably thought to be due to a lower number of pregnancy-induced hypertension and pre-eclampsia patients being admitted to ICU and managed on CDS instead. Most of the hypertension cases brought to the ICU were noted to be the ones with eclampsia and other organ failures.

The fact that haemorrhage makes up the majority of ICU admissions has highlighted the importance to set up local postpartum haemorrhage guidelines for MDH. These guidelines have been published in December 2023. Over the six years there were no maternal deaths. This was also the case in the four previous years.

The study has a number of limitations. Due to its retrospective design, it relied on documentation available in patients' medical notes and this was often lacking, especially where it concerned mother-newborn contact and midwifery care in the ICU. The fact that obstetric admissions are not frequent in our ICU might be the reason why this is often overlooked. The importance of this aspect of care has been shown

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 0.07-1.3%
- Rate of obstetric admissions to ICU as a percentage of all ICU admissions in developed countries is reported as up to 0.87%
- The commonest ICU admission diagnosis in obstetric patients from the literature is hypertensive disorders of pregnancy.
- A previous similar study done locally showed that in Malta the commonest admission diagnosis in obstetric patients in ICU is haemorrhage.

What are the new findings?

- Rate of obstetric admissions to ICU as a percentage of all deliveries at MDH – 0.19%. Rate of obstetric admissions to ICU as a percentage of all ICU admissions at MDH – 0.68%.
- Rates are similar to those reported in the previous similar study done locally.
- Haemorrhage is still 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.

in several studies and should thus be taken as a point for improvement for future obstetric admissions.

Another limitation of this study was that we did not have available data on four obstetric patients being admitted to ICU over this six year period. Lastly, we noted that most blood loss documentation was based on visual estimates rather than quantifying blood loss. A local study comparing visual and measured blood loss during CS is currently in the data analysis stage.

In the previous study, one of the recommendations was the setting up of an obstetric HDU. As discussed, this has not yet been implemented but the need for it still stands, especially now with the rising population, but also to further improve mother-newborn care. Another recommendation was to

improve documentation, unfortunately we still had four missing files and there is still room for improvement of certain aspects of documentation relating to mother-newborn care. There was no difference in the maternal mortality rate between the two studies and this has remained at 0%.

CONCLUSION

The percentage of deliveries requiring ICU admission have remained stable over a 10-year period in Malta. Despite the fact that the percentage of obstetric patients among all intensive care unit admissions is lower than the reported averages in the literature, our data shows that implementing an Obstetric High Dependency Unit (HDU) could potentially further decrease the number of obstetric admissions to the ICU.

Haemorrhage emerged as the ongoing predominant cause for ICU admission, underscoring the necessity of implementing postpartum haemorrhage guidelines to establish standardised criteria for patient admissions. These local guidelines were published and are freely available on the hospital intranet. During the data collection phase of this study, it was observed that blood loss was usually assessed subjectively by a visual

estimate. Blood-soaked sheets and swabs were not routinely weighed.

Development of an Obstetric HDU would ensure that the multi-disciplinary teams caring for the obstetric patient receive formal critical care training. It would also be easier for the multi-disciplinary team to be effectively involved in patient care from a logistical perspective. A possible reason for having less cases of hypertensive disorders of pregnancy being admitted to the ICU could be that staff in the labour ward is well adapted and well equipped to the management of this cohort of patients, thus referring them less to the ICU. This has been further enhanced through the publication of the Management of Severe Pre-Eclampsia and Eclampsia Guideline in January 2024.

One of the limitations identified in this study pertains to the inadequate documentation concerning the mother's contact with the baby and the provision of post-natal midwifery care. This limitation raised the question of whether the lack of documentation implied that these practices were not conducted at all or simply went unrecorded.

Finally, our ultimate recommendation would be to conduct a follow-up study in the forthcoming years to assess any potential variations from the current findings.

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