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COURSE AND OUTCOME OF OBSTETRIC PATIENTS ADMITTED TO A UNIVERSITY HOSPITAL INTENSIVE CARE UNIT

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ABSTRACT

Background: Obstetric Critical Care is an important service in the reduction of maternal morbidity and mortality, but few developing country data are available.

Objectives: To review all maternity patients admitted to the ICU over a seven year period to determine the causes and outcomes of these admissions and the frequency and causes of maternal morbidity and mortality.

Design: Retrospective patient file and ICU chart review.

Subjects: ICU Charts and medical files of obstetric patients admitted to the ICU at The Aga Khan University Hospital between (November 2003 – November 2010) were reviewed.

Setting: The ICU at The Aga Khan University Hospital, Nairobi, Kenya.

Results: Forty two obstetric patients were admitted to the intensive care unit for the period of November 2003 to November 2010. This constituted 0.24% of deliveries and 1.25% of ICU admissions. Seventeen patients (52%) were in the age group 30 to 40 years, 13 patients (45%) were on their second pregnancy, and 15 patients (51%) were at term. Twenty five patients (76%) did not have prior co-morbidities. Indications for ICU admission were haemorrhage 15 (44%), sepsis nine (26%), HELLP syndrome four (12%), thromboembolism two (6%), cardiomyopathy two (6%) and anaemia two (6%). The duration of stay ranged from two to 35 days with a mean of seven and median of two days. The outcome was 19 patients (58%) were discharged home, 11 patients (33%) deaths and three patients (9%) were transferred to the National referral hospital- their survival outcome unknown. Case fatality rates were three of four patients (75%) for HELLP syndrome, four of fifteen patients (26.7%) for haemorrhage and three of ten patients (30%) after sepsis.

Conclusion: Critical Care Obstetrics is vital to the reduction of maternal morbidity. The main indications for ICU admission may be unpredictable but are largely preventable by improved and timely antenatal and intrapartum care. For the few but very sick patients requiring ICU care, a team based approach, as is achieved using the 'closed' care model may be feasible. Support to peripheral obstetric facilities via public private partnership initiatives is necessary. Healthcare planners and financiers should factor in critical care obstetric needs. Provision of a planned level of obstetric intensive care with the associated triage and referral infrastructure is a priority for the Region. As part of the drive towards Millennium Development Goal 5, health care financing models should support this essential component of life saving care, through all available channels including public private partnership.

INTRODUCTION

Maternity patients are generally young and healthy. However, the potential for catastrophic complications is real, and despite the therapeutic advances of

the last few decades, maternal morbidity and mortality continue to occur. This may be related to the pregnancy itself, aggravation of a pre-existing illness, or complications of delivery which could be operative. The necessity for critical care support

and admission to an intensive care unit (ICU) is a relatively infrequent occurrence during pregnancy and postpartum. The exact incidence is unclear with various reports suggesting a range of 0.17 to 1.1% of pregnant patients (1-4). Obstetric complications account for most of the ICU admissions in pregnant patients which range from 47 to 93 % (1-4) (6-7). Haemorrhage and hypertensive disorders primarily pre-eclampsia and eclampsia constitute most of the obstetric ICU admissions during the puerperium stage.

Other common causes include sepsis and respiratory failure. There are data from retrospective studies in other parts of the world. There is work on Near Miss Cases (Severe Acute Maternal Morbidity) from Pretoria Academic Complex, the only published work from Africa (8-13). However, there are a few data on obstetric critical care from the developing world.

MATERIALS AND METHODS

The Aga Khan University Hospital, Nairobi is one of the teaching hospitals of the Aga Khan University in East Africa. It is a tertiary care referral hospital having 254 beds, located in the North-Western part of Nairobi.

The hospital serves residents of Nairobi and is a referral centre whose catchment includes other parts of the country and the entire East and Central Africa region. It is a teaching hospital offering courses in post graduate medical education and advanced nursing. Approximately 2,500 deliveries occur yearly.

The hospital has a multidisciplinary ICU of eight beds with facilities to manage critically ill medical, surgical and obstetric patients. The monthly ICU admission averages 40 patients; the range is from 35 to 45 patients with the majority suffering from medical illnesses. The ICU is staffed by critical care specialists, anaesthetists, critical care nurses and post graduate residents. The original referring unit consultant and residents are also involved in the comprehensive care of their patients.

We conducted a retrospective review of data on all obstetric patients admitted to the ICU at The Aga Khan University Hospital (November 2003 – November 2010). This included patients referred for ICU care from peripheral centres and those whose follow up was at our hospital. Approval to access patient data was sought and granted by the Aga Khan Hospital Medical Director's Office.

A list of patients admitted to the critical care unit was generated from the ICU admissions books. The list was submitted to the Medical Record department to aid in file retrieval. Retrieved files were reviewed and data on their demographics, significant antenatal, past medical and surgical history, delivery, indication for ICU transfer, complications, ICU interventions, ICU length of stay and outcomes were entered into a data collection form and analysed.

Patients are admitted to intensive care unit following actual failure or threat of failure of one or more organ systems.

A definition of organ dysfunction and failure was defined as follows.

Organ	Clinical syndrome	Common criteria
Cardiovascular	Shock	Vasopressor support. Systolic BP < 90 mmHg or mean arterial pressure < 70 mmHg for one hour despite adequate fluid resuscitation
Respiratory	Respiratory distress	Respiratory rate > 30 /minute. Use of accessory muscles of respiration.
	Respiratory failure	Apnoea, PaCO ₂ > 50 mmHg or PaO ₂ < 50 mmHg
	Acute lung injury Acute respiratory distress syndrome	PaO ₂ /FiO ₂ ratio < 300 Bilateral infiltrates on CXR, PaO ₂ /FiO ₂ ratio < 200
Central Nervous system	Altered consciousness	Reduced Glasgow Coma Scale
Renal	Acute renal failure	Doubling from baseline creatinine or 2X upper limit of normal. Urine output < 0.5 mls/kg/hour for 1 hour despite adequate fluid resuscitation.
Haematologic	Coagulopathy	Thrombocytopenia < 100,000 platelets/mm ³ . 50% decrease in platelets from highest value in last 3 days. INR > 1.2 PTT > upper normal limit
Metabolic		pH < 7.30 (or base deficit > 5 meq/L) Plasma lactate > upper normal limit
Hepatic		Serum bilirubin > 2mg/dl for 2 days. Glutamate dehydrogenase > 2X upper normal limit

HELLP syndrome is a life-threatening obstetric complication usually considered to be a variant of pre-eclampsia. Both conditions usually occur during the later stages of pregnancy, or sometimes after childbirth. HELLP is an abbreviation of the main findings: Hemolytic anemia, Elevated Liver enzymes and Low Platelet count.

RESULTS

About 17500 deliveries occurred during the seven year review period. A total of 42 obstetric patients were admitted to the Aga Khan University Hospital ICU for the period of November 2003 to November 2010. This constituted an incidence of 0.24% of all deliveries. Total ICU admissions for this period were 3360 patients. Obstetric patients constituted 1.25% of ICU admissions.

Complete data were available for 33 patients while data for 9 patients were missing from the medical records department owing to damage of files following a flooding accident in the records department stores. The data analysis below is for the 33 patients with complete records.

Twenty four (73%) patients were under Faculty team care while nine patients (27%) were under the care of Private Practitioners. The patients constituted 28 Africans (85%), four Asians (12%) and one Caucasian (3%).

About 17 patients (52%) were in the age group 30 to 40 years, 11 patients (33%) 20-30, four patients (12%) >40 years and one patient (3%) < 20 yrs. For parity, 13 patients (45%) were on their second pregnancy, six patients (21%) third pregnancy, five patients (17%) first Pregnancy and two patients (7%) > fourth Pregnancy.

For gestational age, 15 patients (51%) at >37 weeks, six patients (21%) at 24-37%, seven patients (24%) at < 24 weeks. Five patients (4%) unknown gestational age.

Twenty five patients (76%) did not have prior co-morbidities while 8 (24%) had concurrent illnesses. Seven patients had spontaneous vaginal delivery, 13 by Caesarean section and for 12 patients the mode of delivery was not indicated. Of those who delivered spontaneously, three were spontaneous and four had induction or augmentation of labour. None was after forceps or vacuum delivery.

The indications for Caesarean section included severe pre-eclampsia, multiple gestation, HELLP syndrome, previous scars, placenta praevia and malpositions (occipital transverse position and cephalopelvic disproportion).

The ICU admission for 15 patients (44%) was after haemorrhage, nine patients (26%) after sepsis, four patients (12%) after HELLP syndrome, two patients (6%) for thromboembolism, two patients (6%) for cardiomyopathy and two patients (6%) anaemia.

Of the ICU interventions, 22 patients (33%)

required intubation and ventilation, 16 patients (30%) required inotropic support, 16 patients (24%) were transfused, five patients (8%) required renal dialysis and three patients (5%) additional surgical interventions.

While in ICU, ten patients (37%) of patients had cardiovascular failure, six patients (22%) renal failure, four patients (15%) DIC, three patients (11%) haematopoietic failure, two patients (7%) sepsis and two patients (7%) respiratory failure.

The duration of ICU stay was a range of two to thirty five days, mean of seven days and a median of two days. The outcome was 58% discharged, 33% deaths and 9% were transferred to the National Referral Hospital. The case fatality rates were three out of four patients for HELLP syndrome (75%), four out of fifteen patients (26.7%) for Haemorrhage, three out of ten patients (30%) for Sepsis.

DISCUSSION

In a majority of instances pregnancy proceeds to a successful completion. However, a small fraction of patients develop complications, sometimes life-threatening, that require intensive care treatment by modern monitoring techniques and mechanical ventilation. Most of these complications are unpredictable although more likely when there are associated co-morbidities. The exact incidence is unclear because of the variety of reporting methods and definitions, with estimates that range from 0.17% to 1.1% of pregnant patients (6). This review showed an incidence of 0.24% of all deliveries and 1.25% of all ICU admissions. It is comparable to data from other units around the world (1-10)

The Critical Care team takes care of all patients irrespective of whether the primary obstetrician is privately admitting or belongs to the university (Faculty team). Both teams reviewed the patients and gave input into their management. This teamwork ensures sharing of knowledge and opinions amongst the team members on the management of the patient. Various specialists are readily available to review consults in case of system specific complications. The catchment area of our hospital is cosmopolitan and this is well reflected in the racial proportions of the patients reviewed. The review showed 85% were African, 12% Asian and 3% Caucasian. This is reflective of the proportions in the general population in Nairobi. The morbidity and mortality patterns are however similar and unpredictable.

In obstetrics, patients at the extremes of age are classified as high risk. This review shows that even those classified as low risk by age are potentially at risk. Majority of the patients were young and represented a significant proportion of the productive population. Eighty five per cent of patients reviewed were below 40 years of age, 12% were above 40 years

and 3% less than 20 years of age.

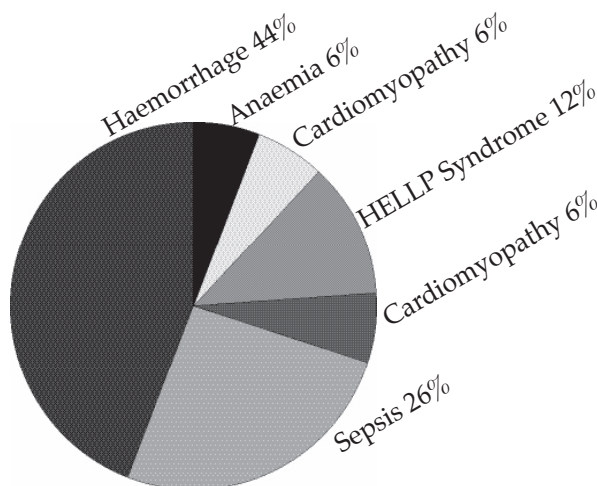
There was no direct correlation of risk with advancing parity. A majority of patients (45%) were in their second pregnancy having gone through their first pregnancies uneventfully.

The need for ICU care is most likely due to complications arising from after a term pregnancy (51% of patients). However, a few patients were in second trimester. Patients who required this care before term, commonly had co-morbidities. It is however important to note that 25 patients (76%) of patients had no co-morbidities and hence we stress the fact that even normal risk mothers are potentially at risk. Those identified in this review are pneumonia, acute myeloid leukaemia, complicated malaria, deep venous thrombosis, HIV, sickle cell trait and severe pre-eclampsia, hyperthyroidism, HIV with TB peritonitis and lastly HIV with pneumonia. These patients are best co-managed with a physician right from the antenatal period so as reduce the risk posed by the presence of the co-morbidity in pregnancy.

Although a greater number of patients delivered by Caesarean section than vaginal delivery, it is not thought that Caesarean section directly led to ICU admission. It is however prudent to conduct operative delivery only when absolutely indicated.

The indications for ICU admission showed haemorrhage as the leading cause. This is the leading cause of maternal morbidity and mortality in developing countries (1).

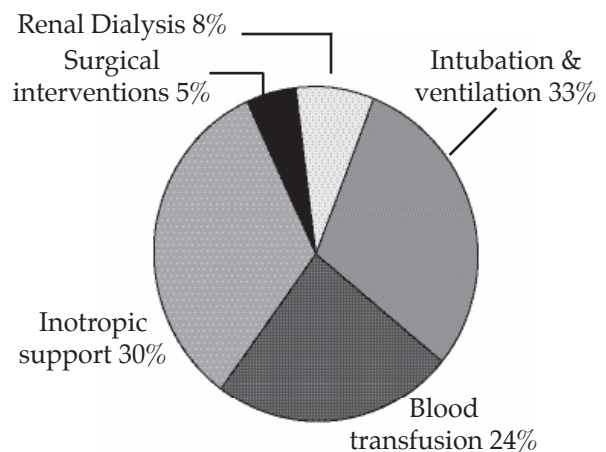
Indication for ICU Admission



All healthcare workers taking care of expectant mothers must be well versed with post-partum management protocols especially active management of third stage of labour.

While in the ICU, patients required a combination of intubation and mechanical ventilation (33%), inotropic support (30%) and blood transfusion (24%).

ICU Interventions



Six patients (5%) admitted suffered acute renal failure requiring dialysis mainly as a result of haemorrhage. It is important to note that a greater proportion (22%) had complications of acute renal failure despite the smaller proportion requiring dialysis. Re-laparotomy and incision and drainage of abscesses was necessary in 5% of patients. The above data shows that an Obstetric ICU needs to be multidisciplinary as training in obstetrics does not prepare the obstetrician to handle critical care complications. An alternative would be to develop an internal medicine subspeciality- Obstetric Medicine and Critical care.

While in the ICU, 37% of patients had cardiovascular failure, 22% renal failure, 15% DIC, 11% haematopetic failure, 7% sepsis and 7% respiratory failure. It is possible there may be long term effects after discharge from hospital but these have not been reviewed.

The duration of ICU stay was a range of two to thirty five days, mean of seven days and a median of two days. The outcome was 58% discharged home, 33% deaths and 9% were transferred to the National Referral Hospital. The case fatality rates were three out of four patients for HELLP syndrome (75%), four out of fifteen patients (26.7%) for haemorrhage, three out of ten patients (30%) for sepsis. The patients who died from HELLP syndrome suffered acute liver failure. The patients who died from haemorrhage died of disseminated intravascular coagulation while those of sepsis, one had acute myeloid leukaemia with sepsis and others had complications of HIV infection (severe pneumonia). While most patients had their whole care at our ICU, a few patients had been transferred from other peripheral facilities for ICU care after complications following normal labour and delivery. It is therefore important to form a network of care to ensure early referral and intervention.

This review demonstrates that the need for obstetric critical care arises even in low risk mothers. This need is commonly unavoidable and unpredictable. However, advance preparation, timing

of delivery and timely intervention may decrease the severity of maternal morbidity. This is especially so for obstetric haemorrhage. The information on ICU interventions may be useful in resource allocation. ICU stay may be short or as long as a month depending on the individual patient.

Based on that only 0.24% of deliveries required critical care intervention, a closed ICU care model may be appropriate over an open one especially for obstetrics where the average practitioner will only occasionally need this care. A closed model with care by intensivists may improve on outcomes, as the obstetrician typically has too few cases to generate enough experience of critical care compared to say a trauma surgeon who has critically ill patients on a daily basis.

It is unclear whether we should strengthen the capacity for general ICUs to handle obstetric cases or whether obstetric units should spare space and resources to establish critically ill patient care models. Existing programmes aimed at reduction of maternal morbidity and mortality should take into account the concept of risk sharing for health care financing. This is possible by recognising the percentage number of deliveries that may need ICU care, and spreading the cost over a programme for example, for the voucher schemes or 'free maternity care' where a certain amount is budgeted for a delivery, that certain amount could be slightly increased to cover the patients who may need complex care. Obstetric critical care may best be tackled via a public private partnership in sharing of knowledge and resources. This may prevent delays in intervention and hence reduce maternal morbidity and mortality.

It is necessary to include near miss (severe acute maternal morbidity) in the evaluation of maternity services not just maternal deaths as indicated in by the WHO in the 'Beyond the numbers' document. This has been proposed by Waterstone *et al* in their case control study of the incidence and predictors of severe maternal morbidity (14, 15).

It is important for a similar review to be carried out in the National Referral Hospitals where there is a greater number of patients and a higher capacity ICU. Information gained can then fill in the gap of the situation in the public sector.

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