

Obstetric Admissions to the Intensive Therapy Unit of a Tertiary Care Institution

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Abstract

Introduction: Between 0.1% and 0.9% of women develop pregnancy complications which require admission to an intensive therapy unit. The aim of this study was to review all obstetric admissions to the intensive therapy unit at the KK Women's and Children's Hospital from 1998 to 1999 with respect to indications for admission, interventions employed and clinical outcome. **Method:** The medical records of all obstetric patients admitted to the intensive therapy unit during the 2-year period were analysed retrospectively. Subjects were included if they were admitted during pregnancy up to 42 days postpartum. **Results:** There were 31,725 deliveries in our hospital during the study period of which there were 239 admissions to the intensive therapy unit. Of these, 42% were Malays, 41% Chinese, 12% Indians and 5% other races. 65% stayed 1 day, 24% 2 days, 7% 3 days and 4% more than 3 days. The patients' ages ranged from 18 to 44 years. The indications for admission were hypertension (50%), haemorrhage (24%), respiratory insufficiency (10%), neurological problems (11%) and sepsis (3%). Intervention-wise, 43% of patients required vasoactive infusions, 35% had arterial line placement, 22% central venous pressure monitoring, 21% ventilatory support and 2% pulmonary artery catheter placement. The maternal mortality and stillbirth rates were 1.3% and 3.7% of intensive therapy unit admissions, respectively. **Conclusion:** The admission rate to the intensive therapy unit in our institution was 0.73% of all deliveries during the 2-year study period. Hypertensive disease and haemorrhage were the predominant admitting diagnoses.

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Introduction

Pregnancy is associated with physiological changes in various organ systems and complications arising from the interaction between these changes and disease processes may be severe enough to require admission to the intensive therapy unit (ITU) for management. The purpose of this study was to review all obstetric patients admitted to the ITU over a 2-year period. We analysed the demographic profile of these admissions, the causes for admission, the type of invasive monitoring and intervention instituted and the eventual outcomes.

Method

The casenotes of all obstetric patients admitted to the ITU during the 2-year study period from 1 January 1998 till 31 December 1999 were retrospectively reviewed and

analysed. Patients were included in the study if they were admitted during pregnancy and up to 42 days after delivery.

Diagnoses on admission to ITU were categorised as: (1) pre-eclampsia/hypertension, (2) diabetes mellitus, (3) sepsis, (4) respiratory complications, (5) cardiovascular complications, (6) neurologic complications, (7) haemorrhage and (8) others. The need for invasive monitoring, vasoactive drug infusions and ventilatory support were also documented.

Results

There were a total of 31,725 deliveries during the study period and the number of obstetric admissions to the ITU totalled 239, of which there were 232 different patients (0.73% of all deliveries).

Ninety-nine (41%) of the admissions were Chinese

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patients, of which 2 were re-admissions. Malays made up 100 (42%) of the admissions, with 3 re-admissions. Indians constituted another 29 (12%) admissions, of which 2 were re-admissions, and the other 11 (5%) admissions were of other races (Table I). The patients' ages ranged from 18 to 44 years (mean 32.5 years).

Sixty-five per cent of patients stayed for 1 day, 24% stayed for 2 days, 7% stayed for 3 days and 4% more than 3 days. The mean duration of ITU stay was 1.6 days. Post-caesarean delivery admissions accounted for 91% of the total number.

Fifty per cent of patients had pre-eclampsia or hypertension on admission. Eight per cent had diabetes mellitus, 3% had sepsis, 10% had respiratory complications, 12% had cardiovascular complications, 11% had neurologic complications, 24% were admitted for haemorrhage, and 5% were admitted for other reasons.

Three patients (1.3%) were admitted for anaesthetic reasons: vocal cord oedema, suxamethonium apnoea and suspected local anaesthetic toxicity, respectively.

Invasive blood pressure monitoring, central venous pressure monitoring, and pulmonary artery pressure monitoring were utilised in 35%, 22% and 2% of admissions, respectively. Twenty-one per cent required ventilatory support and 43% received vasoactive drug infusions.

TABLE I: COMPARISON OF SINGAPORE'S POPULATION PROFILE AND BIRTHRATE, AND KKH'S ITU ADMISSION RATE BY ETHNIC GROUP

	Population profile (1998)	Birth rate (1995-1998)	ITU admission (1998-1999)
Chinese	77%	50%	41%
Malays	14%	34.1%	42%
Indians	7.6%	15.9%*	12%
Others	1.4%		5%

* This figure is a combination of Indians and other races.

KKH: KK Women's and Children's Hospital; ITU: intensive therapy unit

TABLE II: ADMISSION DIAGNOSES OF PATIENTS THAT DID NOT REQUIRE INVASIVE MONITORING, VASOACTIVE DRUG INFUSION OR VENTILATORY SUPPORT

Admission diagnosis	Number of patients (n = 102)
Postpartum haemorrhage	33
Hypertension	21
Cardiovascular disease	19
Respiratory complications	11
Epilepsy and brain tumour	4
Thyrotoxicosis patient for monitoring	2
Sepsis	4
Obesity	2
Others	2
No medical history of note	4

One hundred and two (43%) patients did not receive invasive monitoring, vasoactive drug infusion or ventilatory support. Their admission diagnoses are shown in Table II. Three patients from the group with respiratory complications and 1 from the group with sepsis were among the 8 patients who were transferred to other hospitals. Among the 102 patients, 85% stayed for only one day in the ITU. Twenty of these patients had intraspinal opioids administered for postoperative analgesia after operative delivery and were admitted for monitoring of delayed respiratory depression. Included in this group were 4 patients with no medical history of note.

There were 3 maternal deaths, which constituted 1.3% of ITU admissions or 0.009% of all deliveries. The respective causes of maternal mortality were eclampsia with haemorrhage, valvular heart disease with cerebral embolism and amniotic fluid embolism. There were 9 stillbirths (0.028% of all deliveries).

Eight patients were transferred to other hospitals for further management—3 for suspected pulmonary embolism, 2 for sepsis and 3 for epilepsy and/or brain tumour.

Discussion

KK Women's and Children's Hospital (KKH) is a tertiary hospital for obstetric, gynaecologic and paediatric patients. The Women's ITU is a 5-bedded unit co-managed primarily by staff from the Departments of Anaesthesia, and Obstetrics and Gynaecology. Sometimes, medical or surgical consultations are sought from affiliated institutions. Patients who require sub-specialised care, e.g. cardiovascular surgery or renal dialysis, may be transferred to other multidisciplinary institutions. Being a tertiary referral institution for obstetric patients, KKH admits patients who have more complex medical problems and who are more likely to need ITU care. The hospital registered an ITU admission rate of 0.73% over the 2-year study period which is within the 0.1% to 0.9% range of previously published reports.¹⁻⁹ A study conducted about a decade ago at the National University Hospital (NUH), which has a shared surgical and obstetric ITU, reported an admission rate of 0.22%.³ However, despite a 5-year review period, only 16,264 deliveries (~50% of our 2-year total) were evaluated in this report.

Studies conducted in centres where the ITU was shared by multiple disciplines tend to reveal a lower admission rate compared to centres where the ITU was dedicated to obstetric patients only (Table III).^{1,3-8} It is likely that multidisciplinary ITUs enforce more stringent admission criteria. It is also noted that ~40% to 60% of admitted patients required ventilatory support in the "shared" ITU setting, in contrast to the 12% and 21% respectively reported by Mabie et al² and the authors in this study (Table III); this

TABLE III: COMPARISON OF ITU DATA AMONG VARIOUS STUDIES¹⁻⁸

	Stephens ⁸	Graham et al ¹	Kilpatrick et al ⁶	Ng et al ³	Mabie et al ²	Collop et al ⁴	Wheatley et al ⁷	Guerin et al ⁵	Quah et al (current study)
Year of study	1979-1988	1982-1986	1985-1990	1985-1990	1986-1989	1988-1991	1989-1993	1994-1998	1998-1999
ITU set up	Shared ITU	Shared ITU	Shared ITU	Shared ITU	Dedicated ITU	Shared ITU	Shared ITU	Shared ITU	Dedicated ITU
No. of deliveries	61,435	21,983	NA	16,264	22,651	NA	19,020	18,145	31,725
No. of ITU admissions	126 (118)*	23	32	37	200	20	144	88	239 (232)*
ITU admission rate	0.19%	0.1%	0.4%	0.22%	0.9%	0.29%	0.75%	0.48%	0.73%
Mean age	NA	NA	26 ± 6	31 ± 5	NA	24 ± 1	28.7	30	32.5
Mean length of ITU stay	NA	4.1 days	5.4 days	NA	2.5 days	8 ± 3 days	NA	NA	1.6 days
Requiring ventilatory support	NA	60.9%	59%	NA	12%	60%	40%	39%	20.9%

* Figures in parentheses indicate the number of different patients who were admitted
ITU: Intensive therapy unit; NA: Data not available

lends support to the observation that generally less ill patients tend to be admitted to dedicated obstetric compared to “shared” ITUs. In our series, 43% of the admitted patients did not require any invasive monitoring, vasoactive drug infusion or ventilatory support. Arguably, they could have been monitored in a high dependency unit (HDU) setting or in the wards (delivery suite or postnatal ward) in close proximity to the nurses’ station. This may be an economically more viable option with the advent of managed care and casemix, whereby high-acuity areas like the ITU have shifted from being profit centres to cost centres.¹⁰ The merits and demerits of ITU and HDU care have been succinctly addressed by Wheatley et al⁷ and essentially relate to the issue of quality-of-care versus cost. Cost-benefit rather than cost-containment strategies should be adopted lest a “penny-wise, pound-foolish” situation emerges.¹⁰

The shorter length of stay in our study population (mean of 1.6 days) as compared to other studies (range of means: 2.5 to 8 days) again reflects our cohort of generally less ill patients (Table III). With regard to the type of delivery associated with ITU admission, most had caesarean sections. Our figures are similar to those reported by Ng et al³ in 1992 (91% versus 95%).

It is noteworthy that in our study, anaesthetic causes accounted for only 1.3% of admissions; this is markedly different from the NUH experience of 22%³. This could be partly accounted for by our current practice of encouraging regional anaesthesia for caesarean delivery and procedures involving the high-risk parturient,¹¹ in contrast to NUH where general anaesthesia was routinely administered.³

Regional anaesthesia may reduce the risks of failed intubation, aspiration pneumonitis and hypoxaemia as airway instrumentation is avoided.

Of demographic interest, Malays accounted for the same proportion of ITU admissions as the Chinese, despite constituting only 14% of the country’s population¹² (Table I). This may be explained in part by the fact that Malays have a higher birth rate relative to their population profile (Table I). They tend to have bigger families and favour delivery in KKH for historical and socio-economical reasons (unreported data). One could also hypothesise that higher ITU admission rates could reflect a tendency to default antenatal follow-up, resulting in delays in treatment and a higher incidence of obstetric complications.

The mean age of our patient cohort was 32.5 years, which is comparable to that of the NUH study (31 years) but generally higher than those reported in other series (24 to 30 years) (Table III). This probably is indicative of our societal trend of late marriages and childbirth.

The pattern of ITU admission diagnoses revealed a similar trend among all studies.¹⁻⁹ Raised blood pressure was the main reason for admission, followed by haemorrhage. In 2 consecutive studies^{5,7} done at the same hospital in the UK (Table IV), the number of admissions due to hypertension showed a decreasing trend, reflecting better antenatal care, as well as improvements in hypertensive management.

The limitations of our study, especially with regard to comparisons among case series, relate to the following factors:

1) Non-uniform admission criteria among various

TABLE IV: COMPARATIVE ITU ADMISSION DIAGNOSES

	Quah et al (1998-9)	Wheatley et al (1993) ⁷	Guerin et al (1998) ⁵
Pre-eclampsia/Hypertension	50%	66%	40%
Sepsis	3%	0.8%	13%
Respiratory complications	10%	5%	10%
Neurologic complications	11%	4%	2%
Haemorrhage	24%	19%	27%

ITU: Intensive therapy unit

institutions; at KKH, the ITU and HDU are essentially “merged”, thus the admission criteria are more lax.

- 2) Admission rates inevitably depend on ITU bed availability, and attending anaesthetists may alter patient management accordingly, e.g., avoiding the administration of intraspinal morphine for postoperative analgesia and hence obviating ITU admission.
- 3) Causes of admission do not exhibit strict demarcation; e.g., an eclamptic patient with laryngeal oedema may constitute both an obstetric as well as an anaesthetic problem.

In conclusion, although the outcome of the majority of our obstetric patients in ITU was good, improvements should be made with respect to fine-tuning of admission criteria to facilitate future capacity planning.

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