CRITICALLY ILL OBSTETRIC AND GYNAECOLOGICAL PATIENTS IN THE INTENSIVE CARE UNIT

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Objectives. To document mortality among critically ill obstetric and gynaecological patients requiring intensive care unit (ICU) admission and to investigate whether any poor prognostic features could allow for earlier and more aggressive intervention.

Study design. A retrospective study of all obstetric and gynaecological patients admitted to the ICU of Johannesburg Hospital between 1985 and 1996. Sixty-one patients were analysed both as a group and as two subgroups — those with incomplete abortions and those with other pregnancy-related diagnoses.

Results. Derangements in platelet counts, serum creatinine levels and prothrombin international normalised ratio (INR) were present in all patients on the day of admission to hospital. In the group with incomplete abortions absolute levels of these parameters may be used to identify those patients with a worse outcome. The mortality rate was 38%.

Conclusion. Early ICU admission and aggressive surgical intervention are strongly recommended in patients with septic incomplete abortions presenting with more than a single organ dysfunction.

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World literature concerning the outcome of critically ill obstetric and gynaecological patients is scarce. Those studies that are available have included heterogeneous populations where the pregnancy is often incidental to the primary diagnosis.[1-3] As a consequence the documented mortality rate in most of these studies has been low, in the region of only 10%.

The Johannesburg Hospital intensive care unit (ICU) offers sophisticated care to patients admitted with primary obstetric or gynaecological complications. Despite this mortality among these patients has appeared to be excessive relative to published figures and also to be much higher than that of our other critically ill patients. We decided to analyse these patients in order to determine true mortality and its causes, and to

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identify poor prognostic features at the time of hospital admission that might enable us to initiate more aggressive intervention earlier on in those with a poor prognosis.

We believe that this study also has value because in countries where abortion is legal, the complications of gynaecological sepsis are rarely seen and management strategies for these patients are poorly documented.

MATERIALS AND METHODS

Patients

A retrospective study was undertaken of all obstetric and gynaecological patients admitted to the multidisciplinary ICU between January 1985 and December 1996 for whom there were sufficient retrievable demographic and laboratory data both at the time of hospital admission and on admission to the ICU. December 1996 was chosen as the endpoint for the study because abortion was legalised in South Africa in early 1997.

Demographic and laboratory data

Demographic data included age, Acute Physiology and Chronic Health Evaluation 2 (Apache 2) score and length of total hospital and ICU stay. Patients were categorised according to outcome and whether the admission was subsequent to an abortion or another complication of pregnancy. In those presenting with abortions, interference was considered to be confirmed if admitted to by the patient or if evidence of such was documented at the time of surgery. Laboratory data included white cell and platelet counts, serum creatinine values and the prothrombin international normalised ratio (INR). The normal creatinine value for pregnant patients was taken as 45 - 60 µmol/l.[4]

The overall mortality was calculated and the cause of death determined where possible from postmortem data or ICU charts. The presence of sepsis was defined either bacteriologically by positive cultures of blood, urine or pelvic tissue (taken at the time of hospital admission), or on histological examination of uterine or ovarian specimens submitted either at the time of hysterectomy or at postmortem.

Statistical methods

Statistical analysis of demographic and laboratory data was performed by means of the Mann-Whitney test. Intergroup comparisons were analysed by means of Fisher's exact *t*-test. A *P*-value of ≤ 0.05 was taken as statistically significant.

This study was approved by the Ethics Committee of the University of the Witwatersrand.

RESULTS

Eighty patients with a primary obstetric or gynaecological diagnosis were identified in the 12-year period. Table I shows the admitting diagnoses in these 80 patients. The overall mortality rate for all patients admitted during the study period was 36%.

Table I. Diagnoses in all patients admitted between 1985 and 1996 ($N = 80$)

Diagnosis	Number
Incomplete abortion	26
Incomplete abortion with malaria	1
Incomplete abortion post motor vehicle accident	1
Eclampsia	16
Pre-eclampsia	8
Pregnancy-induced hypertension	7
HELLP syndrome	1
Abruptio placentae	3
Placenta accreta	1
Placenta praevia	1
Retained placenta	1
Intra-uterine fetal death	1
Septicaemia	5
Retained products of conception (missed)	2
Ruptured uterus	2
Extra-uterine pregnancy	1
Chorio-amnionitis	1
Ruptured ectopic	1
Amniotic fluid embolism	1

HELLP = haemolysis, elevated liver enzymes, low platelets.

Patients with complete data ($N = 61$)

Sixty-one patients had sufficient data for complete analysis. Fifty-six patients were admitted from 1990 onwards when the admission policy of the Johannesburg Hospital changed. Seven women were of European origin, 1 of mixed race and the remaining 53 were black. Eighteen patients (30%) were referred from peripheral hospitals where inadequate or no intensive care facilities existed. The remaining cases were referred from our own obstetric unit where inadequate facilities exist for the intensive supportive therapy that these patients require. The diagnoses on admission to our ICU are shown in Table II, and the relevant demographic and laboratory data on the day of admission to hospital are given in Table III. It should be noted that derangements in serum creatinine levels, platelet counts and INR were present in the majority of patients on the day of admission to hospital.

Table IV compares data for patients who survived with data for those who did not. The actual mortality rate was 38%, almost three times that predicted by the Apache 2 score (the Apache 2 score of 14 predicts a mortality rate of 14%). There was no significant difference in Apache 2 score between survivors and non-survivors, indicating that it not only underestimates actual mortality, but is of no value in predicting outcome. There was no difference in time to ICU admission for survivors and non-survivors. Not shown in the table, but of relevance, is the fact that there was no difference in time to ICU

Table II. Diagnosis in patients with complete data (*N* = 61)

Diagnosis	Number
Incomplete abortion	21
Incomplete abortion with malaria	1
Incomplete abortion post motor vehicle accident	1
Eclampsia	13
Pre-eclampsia	5
Pregnancy-induced hypertension	6
HELLP syndrome	1
Abruptio placentae	2
Placenta accreta	1
Placenta praevia	1
Intra-uterine fetal death	1
Septicaemia	4
Retained products of conception (missed)	2
Ruptured uterus	1
Extra-uterine pregnancy	1

HELLP = haemolysis, elevated liver enzymes, low platelets.

Table III. Demographic and laboratory data* for all patients (*N* = 61)

	Median	Range
Age (yrs)	27	16 - 43
Apache 2 score	14	2 - 32
Total stay (d)	24	1 - 178
ICU stay (d)	12.5	1 - 132
Delay to ICU admission (h)	24	12 - 216
White cell count (x 10^9/l)	13.8	2.8 - 47.4
Platelet count (x 10^9/l)	100	11 - 447
Creatinine† (µmol/l)	132	43 - 1478
INR	1.2	0.7 - 5.9

* Day of hospital admission.
†Normal value in pregnancy 45 - 60 µmol/l.[4]
INR = international normalised ratio.

admission for patients referred from other hospitals compared with in-hospital referrals (both groups had a median delay of 24 hours (12 - 216 hours) to ICU admission). There was a significantly shorter hospital stay among non-survivors (6.5 v. 22 days), indicating their short time to death. In addition, significantly worse derangements of creatinine, platelets and INR were present in those who died. Sepsis was documented in 46% of all patients but was not significantly different in survivors and non-survivors.

Although there were no laboratory parameters that could be used to select those patients with a worse prognosis for the group as a whole, when patients were categorised into those presenting with incomplete abortions and those with peripartum complications, some interesting data emerged.

Incomplete abortions (*N* = 23)

The actual mortality rate in this group was 39%, with the Apache 2 score of 17 for non-survivors predicting a mortality

Table IV. Demographic and laboratory data* for all patients — survivors versus non-survivors†

	Survivors (*N* = 39)	Non-survivors (*N* = 22)	*P*-value
Age (yrs)	26 (16 - 41)	30.5 (17 - 43)	0.321
Apache 2 score	13 (2 - 25)	15 (7 - 32)	0.957
Total stay (d)	22 (4 - 178)	6.5 (1 - 51)	0.0003
ICU stay (d)	7 (1 - 132)	4.5 (1 - 46)	0.247
Delay to ICU admission (h)	24 (12 - 216)	24 (12 - 216)	0.425
White cell count (x 10^9/l)	14.45 (2.8 - 33.4)	13.1 (3.5 - 47.4)	0.580
Platelet count (x 10^9/l)	120.5 (25 - 447)	56 (11 - 330)	0.017
Creatinine (µmol/l)	108 (43 - 492)	152.5 (64 - 1 478)	0.068
INR	1.1 (0.79 - 5.7)	1.35 (0.7 - 5.9)	0.035
Sepsis	18	10	1.00

*Day of hospital admission.
†Values expressed as median (range)
INR = international normalised ratio.

rate of 23%. In those who died, significantly shorter hospital (3 v. 22 days) and ICU (2 v. 6.5 days) stays occurred despite no difference between them and survivors in time to ICU admission (Table V), emphasising the extremely short time to death among non-survivors. Significant differences also existed between survivors and non-survivors in terms of platelet counts, serum creatinine and INR at the time of admission to hospital (Table V). Sepsis was found in 82% of those presenting with incomplete abortions, but was not significantly different between survivors and non-survivors. Nineteen patients underwent hysterectomy, with uterine sepsis documented histologically in 11. In three cases histological results were unavailable.

Three poor prognostic features were identified in these patients. The presence (on the day of hospital admission) of any 2 of the 3 following parameters appeared to be strongly

Table V. Demographic and laboratory data* for incomplete abortions — survivors versus non-survivors†

	Survivors (*N* = 14)	Non-survivors (*N* = 9)	*P*-value
Age (yrs)	26.5 (17 - 41)	32 (17 - 43)	0.344
Apache 2 score	9.5 (2 - 17)	17 (13 - 23)	0.001
Total stay (d)	22 (5 - 72)	3 (1 - 46)	0.003
ICU stay (d)	6.5 (2 - 39)	2 (1 - 46)	0.054
Delay to ICU admission (h)	24 (12 - 216)	24 (12 - 24)	0.772
White cell count (x 10^9/l)	16.9 (2.8 - 33.4)	13.6 (3.5 - 47.4)	0.801
Platelet count (x 10^9/l)	239 (25 - 304)	35 (11 - 241)	0.007
Creatinine (µmol/l)	80 (43 - 240)	142 (69 - 1 478)	0.013
INR	1.1 (0.9 - 1.6)	1.5 (1.1 - 5.9)	0.017
Sepsis	11	7	1.00

*Day of hospital admission.
†Values expressed as median (range).
INR = international normalised ratio.

linked to mortality, with 5 of the 9 non-survivors presenting with 2 or all 3 derangements: (*i*) platelets ≤ 100 × 10^9/l; (*ii*) creatinine ≥ 200 µmol/l; and (*iii*) INR ≥ 1.5.

None of the 14 survivors presented with more than one abnormality when using these parameters (platelets, creatinine or INR).

Table VI. Demographic and laboratory data* for peripartum patients — survivors versus non-survivors†

	Survivors (*N* = 25)	Non-survivors (*N* = 13)	*P*-value
Age (yrs)	26 (16 - 38)	30 (17 - 39)	0.644
Apache 2 score	14 (3 - 25)	14 (7 - 32)	0.590
Total stay (d)	21 (4 - 178)	10 (1 - 51)	0.030
ICU stay (d)	7 (1 - 132)	9 (1 - 46)	0.889
Delay to ICU admission (h)	24 (12 - 120)	48 (12 - 216)	0.151
White cell count (x 10^9/l)	13.7 (7.5 - 28.2)	12.6 (6.6 - 30.3)	0.645
Platelet count (x 10^9/l)	93 (25 - 447)	61.5 (33 - 330)	0.394
Creatinine (µmol/l)	150 (44 - 1 022)	157 (64 - 419)	0.861
INR	1.1 (0.79 - 5.7)	1.2 (0.7 - 2.0)	0.541
Sepsis	7	3	1.00

*Day of hospital admission.
†Values expressed as median (range).
INR = international normalised ratio.

Peripartum patients (*N* = 38)

In this group (Table VI) derangements in laboratory parameters were once again obvious at the time of hospital admission, but were not significantly different in those who survived and those who did not. The incidence of sepsis in this group was 27%. Seven had undiagnosed retained products of conception following either normal vaginal delivery or caesarean section, and in 3 of these patients the products and uterus were septic. The mortality rate in this group was 34%. Table VII gives a more detailed analysis of those patients who died, with intracerebral pathology the leading cause of mortality.

Discussion

The admission diagnoses in this maternal population relate to the complications of illegal abortion and the failure to utilise antenatal care facilities, either due to their absence or to poor patient education. Patients presenting with the consequences of

Table VII. Mortality in peripartum patients

Diagnosis	Delivery	Clinical details	Cause of death
Eclampsia	C/S	D+C day 16 — septic RPOC TAH day 21 — septic uterus	Multi-organ failure: ARF, ARDS, DIC
HELLP syndrome, IUD	NVD	*Escherichia coli* septicaemia on day of hospital admission. TAH + BSO + 2 relook laparotomies	Necrotic bowel at relook laparotomy. Multi-organ failure
Eclampsia	C/S	Seizures at ANC booking visit; never regained consciousness	Intracerebral bleed
Eclampsia, IUD	C/S	Found unconscious at home	Intracerebral bleed
Eclampsia	C/S	Seizures at home	Intracerebral bleed
Hypertension	C/S	Sudden decrease in level of consciousness 4 days post C/S	Cerebral oedema
PIH with IUD	C/S	TAH 3 days post C/S. Couvelaire uterus	Intrapulmonary haemorrhage with refractory ARDS
Placenta praevia	C/S	Placenta accreta at elective C/S. Massive blood transfusion, ongoing DIC	Multi-organ failure: DIC, ARF
PPH	C/S	Elective C/S for placenta praevia. Emergency TAH with massive transfusion	Arrhythmia post op
Uterine rupture	C/S	Shoulder prolapse — C/S. TAH 3 days later for deteriorating condition. Septic, necrotic uterus	Multi-organ failure
Eclampsia	C/S	*Enterobacter cloacae* UTI on day of admission	Multi-organ failure
Eclampsia	C/S	Ongoing DIC. TAH and BSO. Ongoing sepsis and DIC	Intracerebral bleed secondary to DIC
Pre-eclamptic	NVD	RPOC. D+C day 4. Arrested under anaesthesia	Anoxic brain damage

ANC = antenatal clinic; ARDS = acute respiratory distress syndrome; ARF = acute renal failure; BSO = bilateral salpingo-oophorectomy; C/S = caesarean section; D + C = dilatation and curettage; DIC = disseminated intravascular coagulopathy; HELLP = haemolysis, elevated liver enzymes, low platelets; IUD = intra-uterine death; NVD = normal vaginal delivery; PIH = pregnancy-induced hypertension; PPH = postpartum haemorrhage; RPOC = retained products of conception; TAH = total abdominal hysterectomy; UTI = urinary tract infection.

illegal abortions and with pregnancy-related diseases such as eclampsia frequently require intensive care and supportive therapy.

Despite the availability of sophisticated intensive care facilities, the mortality rate among critically ill obstetric and gynaecological patients in this study is much higher than that documented in studies from the USA;[1-3] it is also far higher than the average mortality in this ICU. This observation, namely that mortality is out of keeping with American and European figures, is understandable considering that abortion was illegal in South Africa during the study period. It has been well documented that deaths from abortion have decreased dramatically wherever this procedure has become legally available.[5,6] It is also well documented that sepsis is still the leading cause of death in all abortion-related mortality.[7] However, sepsis is not the sole consideration in these patients. The fact that there was no difference in the incidence of sepsis between survivors and non-survivors in our study and no difference in time to ICU admission, points to the role that the accompanying organ dysfunction plays. American studies[1,8] have noted that although multiple organ dysfunction is uncommon in critically ill obstetric and gynaecological patients, its presence portends a much poorer outcome than in patients with no or only single-organ dysfunction. The majority of our patients presented to hospital with significant derangements in biochemical and haematological parameters. In the abortion group the severity of this organ dysfunction was related to mortality, as illustrated by the strong association between mortality and absolute values in creatinine, platelets and INR.

It is well known that an integral part of the management of any patient who becomes ill following abortion or delivery is the exclusion of infected or necrotic tissue.[5,7-9] This tissue is responsible for the initiation and amplification of the systemic inflammatory response syndrome, with subsequent organ dysfunction.

The presence of sepsis and multiple organ dysfunction has profound implications when considering management strategies in these patients. In a review article on the topic of septic abortion Stubblefield and Grimes[5] suggested that the management of these patients include resuscitation, antibiotics and uterine evacuation. Laparotomy should be undertaken in any patient not responding to the above and in any patient where uterine perforation or pelvic abscesses are present. Hysterectomy is the procedure of choice in the presence of clostridial myometritis.[5]

What is not well defined is at what point antibiotic therapy and uterine evacuation are considered to be inadequate. We would suggest that urgent admission to the ICU be sought for any patient presenting with illegal abortion and dysfunction of more than a single organ, for an initial period of resuscitation with fluids and inotropes. In the light of our findings regarding the prevalence of sepsis (82%) and the short time to death (72 hours), we would strongly advise that in those patients presenting with an abortion and two or more poor prognostic features, hysterectomy and bilateral salpingo-oophorectomy be performed as an initial procedure, as there appears to be no time for an expectant policy. To the best of our knowledge there are no non-invasive techniques other than hysterectomy and subsequent histological examination that accurately define the presence of uterine sepsis or necrosis. It is interesting to note that the gynaecologists in our study who attempted to predict the presence of sepsis based on macroscopic visualisation of the uterus were correct only 50% of the time.

In the peripartum patient retained products of conception should also be vigorously searched for. In this group, however, because of the longer time to death interval, it is not unreasonable to begin with uterine evacuation. However, if the response is unsatisfactory then there should be no hesitation in proceeding to hysterectomy in order definitively to exclude sepsis or retained products of conception.

In hypertensive pregnant patients who present with a depressed level of consciousness or with seizures and who do not improve promptly following blood pressure control and fetal delivery, intracerebral pathology should be excluded by means of a computed tomography (CT) scan before any further management decisions are taken.

It is hoped that with legalisation of abortion in this country the mortality figures presented here will drop, becoming comparable to those in countries where it has been legalised. It remains for us to improve antenatal facilities, making them available and affordable to the majority of the population, and to educate the pregnant population so that early presentation and therapy of common pregnancy-related diseases becomes possible.

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