# Acute Renal Failure in Pregnancy: A Review of Clinical Outcomes at an Inner-City Hospital From 1986-1996

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Acute renal failure is a serious complication of pregnancy. Over the past few decades, the overall incidence of acute renal failure in pregnancy has decreased in Western societies. In less developed countries, the incidence of acute renal failure in pregnancy has remained high. This retrospective study examined the incidence, morbidity, fetomaternal mortality, and renal prognosis among pregnant inner-city patients.

Serum creatinine levels of all pregnant patients seen at an inner-city hospital from January 1986 to December 1996 were reviewed. Twenty-one consecutive cases of acute renal failure were identified for an incidence of 2 in 10,000 pregnancies. Maternal mortality was high (15.7%) as was morbidity, with a tendency toward a high rate of intrauterine fetal growth retardation. These results suggest that the outlook for acute renal failure in inner-city patients is dismal in sharp contrast to the prognosis for other patient groups with acute renal failure in pregnancy in Western societies. Preventive strategies should be aimed at this subpopulation with a view to improving early prenatal care as well as enhancing overall access to the health-care system. (*J Natl Med Assoc.* 1998;90:486-490.)

**Key words:** renal failure ◆ pregnancy ◆ inner city

Disorders causing acute renal failure in pregnancy fall into three groups. The first group includes disorders in which acute renal failure is coincidental with pregnancy and could well have occurred in absence of pregnancy. The second group consists of those cases in which acute renal failure results from derangements in normal physiologic changes in pregnancy (eg, severe emesis gravidarum), while the third group encompasses diseases that cause acute renal failure and are unique to pregnancy.

Advances in modern obstetric care have reduced acute renal failure to an infrequent event, occurring in about 1 in 10,000 birth in Western societies.[1-3] This is a significant change from the 1950s and 1960s, when approximately 22% of all cases of acute renal failure were of obstetric origin.[4] Clinical studies in the 1970s and 1980s confirmed this decreasing incidence, but also highlighted the improved survival in patients who develop acute renal failure during pregnancy. This improved survival and decreased incidence was attributed to improved access to abortions (with decreased incidence of septic abortions), and early and more successful intervention in "high-risk" pregnancies.[5,6]

This study assessed the epidemiology and clinical outcomes of acute renal failure in pregnant patients at an inner-city hospital.

## MATERIALS AND METHODS

Between January 1986 and December 1996, the records of patients with acute renal failure in preg-

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**Table 1. Demographic and Clinical Characteristics of Patients With Acute Renal Failure in Pregnancy***

| Patient No./ Age (years)/ Race | Gestation (Weeks) | Urine Output | Serum Uric Acid | Proteinuria (Dipstick) | Peak BUN | Creatinine Level | |
|---|---|---|---|---|---|---|---|
| | | | | | | Peak | Follow-Up (1-6 Months) |
| 1/33/AA | 28 | 3180 | 5.0 | + | 22 | 2.8 | NA |
| 2/37/AA* | 24 | 3720 | 8.8 | 4+ | 24 | 1.7 | 0.8 |
| 3/26/AA | 32 | 1170 | 12 | 2+ | 17 | 1.9 | NA |
| 4/22/AA | 16 | 720 | 12 | 2+ | 83 | 8.8 | 1.2 |
| 5/19/AA | 31 | <300 | 62 | 4+ | 21 | 2.4 | 1.9 |
| 6/33/AA | 28 | 1730 | 8 | 3+ | 14 | 1.9 | 0.9 |
| 7/25/AA | 33 | 600 | 9 | + | 19 | 1.3 | 0.4 |
| 8/26/AA | 32 | 450 | 11 | 4+ | 10 | 1.5 | 1.0 |
| 9/26/AA | 30 | 1200 | 8 | 3+ | 23 | 1.8 | 1.2 |
| 10/16/AA | 38 | Anuric | 6 | + | 60 | 8.1 | 1.3 |
| 11/25/VA | 25 | 360 | 7.7 | 3+ | 22 | 1.4 | 0.7 |
| 12/24/AA | 32 | 9880 | 7.3 | 3+ | 10 | 2.8 | 8.6 |
| 13/20/AA | 30 | 720 | 5.6 | 3+ | 42 | 2.6 | 1.2 |
| 14/26/AA | 18 | 2250 | 4.2 | 4+ | 38 | 3.6 | 1.6 |
| 15/18/AA | 39 | 1200 | 5.7 | + | 9 | 1.3 | 0.8 |
| 16/15/AA | 31 | Anuric | 6.2 | 4+ | 19 | 2.1 | 1.5 |
| 17/17/AA | 19 | 760 | 7.9 | 2+ | 29 | 1.5 | NA |
| 18/25/AA† | 30 | <100 | 9.5 | 2+ | 109 | 15.2 | 13 |
| 19/27/A | 30 | 2720 | 11.2 | 2+ | 21 | 1.7 | 1.1 |
| 20/46/AA | 8 | <100 | 15.5 | + | 226 | 20.4 | 10.1 |
| 21/20/AA | 30 | <400 | 10.3 | + | 42 | 2.6 | NA |

Abbreviations: BUN=blood urea nitrogen, AA=African American, VA=Vietnamese American, and NA=unavailable.
*This patient had focal glomerulosclerosis diagnosed by biopsy prior to her pregnancy.
†This patient had Class III lupus nephritis (focal proliferative glomerulonephritis) prior to pregnancy, and underwent a second kidney biopsy to evaluate persisten renal failure 10 days postpartum.

nancy treated at Grady Memorial Hospital, Atlanta, Georgia, were reviewed. The hospital has 907 beds and serves the greater Atlanta metropolitan area. Renal consultation for these patients was provided by the renal units at Emory and Morehouse Schools of Medicine.

Patients were identified using software that coupled the *International Classification of Diseases* code for acute renal failure to pregnancy, hence identifying all patients with both conditions over the study period. The records of 21 patients with acute renal failure in pregnancy were reviewd and the following data were obtained: urine output; renal sonogram results; serum electrolyte, blood urea nitrogen, and creatinine levels; liver function tests; serum uric acid level; peripheral blood smears; and coagulation studies. Baseline and follow-up blood pressures were documented.

Acute renal failure in pregnancy was defined as a serum creatinine level >0.8 mg/dL (71 μmol/L) or >25% decrement in glomerular filteration rate over the level documented prior to onset of pregnancy.[5] One patient had a renal biopsy done 10 days postpartum for persistent renal failure; a kidney biopsy done in this same patient 3 years prior to her pregnancy was available for comparison.

Hypertension and associated disorders in pregnancy were defined according to the criteria of the International Society for the Study of Hypertension in Pregnancy.[7] Proteinuria was assessed by both quantitative (24-hour urine collections) and semiquantitative (dipstick) methods. Fetal outcomes were evaluated using Apgar scores, birthweight, or definite events such as fetal death. Maternal outcomes were assessed by documenting complications as well as maternal deaths. Renal outcomes were assessed

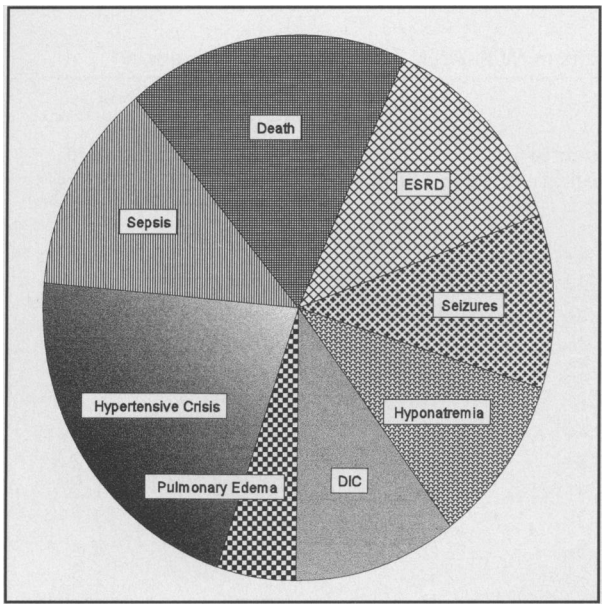


**Figure 1.**
Maternal outcome of acute renal failure in pregnancy. (Abbreviations: DIC=disseminated intravascular coagulation and ESRD=progression to end stage renal disease.)

**Table 2. Diseases/Conditions Associated With Acute Renal Failure in Pregnancy**

| Disease/Condition | No. (%) Patients |
|---|---|
| Preeclampsia/eclampsia | 8 (38) |
| Systemic lupus erythematosus | 3 (14) |
| Diabetes mellitus | 1 (4) |
| Abortions | 3 (14) |
| Sickle cell disease | 2 (9.5) |
| Obstructive uropathy | 1 (4) |
| Nephrotic syndrome | 3 (14) |
| Sepsis | 2 (9.5) |
| Postpartum hemorrhage | 2 (9.5) |
| Placental abruption | 1 (4) |
| Human immunodeficiency syndrome disease | 3 (14) |
| Drug abuse | 6 (29) |
| Lack of prenatal care | 6 (29) |

by dialysis requirement as well as follow-up serum creatinines 1 to 6 months postpartum depending on the availability of data.

## RESULTS

### Demographics

Over the study period, a total of 70,559 pregnant

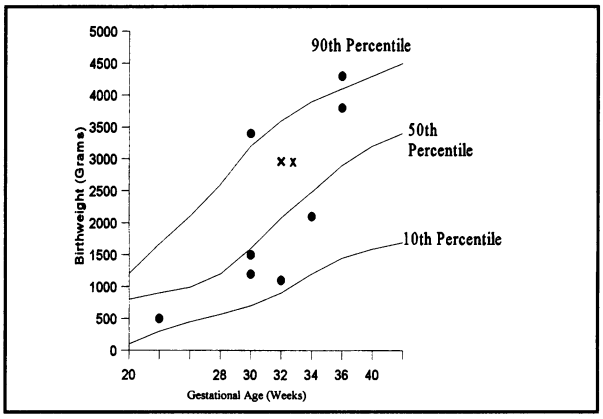


**Figure 2.**
Birthweight percentiles of neonates born to women with acute renal failure in pregnancy compared to normal percentiles (o =single birth and x=twin birth). Normal curves for birth percentiles taken from reference 12.

patients were seen by the obstetric unit at Grady Memorial Hospital. Twenty-one patients with acute renal failure were identified, yielding an incidence of 1 in 10,000. Patient characteristics are shown in Table 1.

Twenty patients were African American, and 1 patient was Vietnamese American. Mean patient age was 25 years (range: 15-46 years). One patient had a twin pregnancy, while the others were singleton pregnancies.

Acute renal failure occurred during the third trimester in 66% of cases. Nine percent and 25% of cases occurred in the first and second trimesters, respectively.

### Etiology

Two patients (patients 12 and 18) had preexisting renal insufficiency. Baseline data on the other 19 patients were unavailable. Table 2 shows the diseases associated with occurrence of acute renal failure in these patients. The most commonly associated disorder was preeclampsia (40% of patients). Fifty percent of affected patients had the syndrome of hemolysis, elevated liver enzymes, and low platelets (HELLP).

### Outcomes

***Maternal Outcomes.*** The maternal mortality rate was 16% in these patients. This is significantly higher than expected when compared with recent data from other patient populations in Western societies and

**Table 3. Fetal Outcomes in Acute Renal Failure Associated With Pregnancy**

| Patient No. | Delivery Method | Gestational Age (Weeks) | Birthweight (g) | Apgar Scores | Remarks |
|---|---|---|---|---|---|
| 1 | Cesarean section | 28 | 2500 | 0 | Intrauterine fetal death |
| 2 | Pitocin induction | 24 | 990 | 0 | Intrauterine fetal death |
| 3 | Cesarean section | 32 | 1270 | $6^{1}8^{5}$ (7) | Live birth |
| 4 | Dilation and curettage | >16 | – | – | Abortion |
| 5 | Prostaglandin induction | 25 | 570 | 0 | Intrauterine fetal death |
| 6 | Spontaneous vaginal delivery | 28 | 1119 | 0 | Intrauterine fetal death |
| 7 | Cesarean section | 33 | 2260 | $7^{1}9^{5}$ (8) | Live birth |
| | | | 2250 | $6^{1}8^{5}$ (7) | Twin gestation |
| 8 | Vacuum extraction | 38 | 3200 | $8^{1}8^{5}$ | Live birth |
| 9 | Cesarean section | 30 | 1210 | $9^{1}9^{5}$ | Live birth |
| 10 | Vacuum extraction | 38 | 2800 | $8^{1}9^{1}$ | Live birth |
| 11 | Cesarean section | 25 | 650 | $9^{1}8^{5}$ | Live birth |
| 12 | Cesarean section | 32 | 2840 | $8^{1}8^{5}$ (8) | Live birth |
| 13 | Pitocin induction | 30 | 1260 | – | Intrauterine fetal death |
| 14 | Suction evacuation | 18 | – | – | Abortion |
| 15 | Cesarean section | 39 | 3210 | 7,9 | Live birth |
| 16 | Pitocin induction | 31 | NA | – | Intrauterine fetal death |
| 17 | Dilation and evacuation | 19 | – | – | Intrauterine fetal death |
| 18 | Vaginal delivery | 30 | 1320 | – | Intrauterine fetal death |
| 19 | Cesarean section | 30 | 1210 | 9 | Live birth |
| 20 | NA | 8 | – | – | Spontaneous abortion |
| 21 | Cesarean section | 31 | 1280 | $6^{1}2^{5}$ | Live birth |

resembles mortality data reported in a study from 1957-1965.[8] Maternal complications included end-stage renal disease, seizures, hyponatremia, disseminated intravascular coagulation, pulmonary edema, hypertensive crisis, sepsis, and death (Figure 1).

***Fetal Outcomes.*** The patients in this study had a high stillbirth rate (38%), and 14% of the pregnancies ended in abortions. Nineteen percent of the pregnancies ended in the birth of a neonate with a low birthweight. Fetal outcomes are summarized in Table 3, and birthweights are compared with normal birth percentiles in Figure 2.

***Renal Outcomes.*** Data on renal function after pregnancy were available for 17 patients. Eleven (52%) patients had complete recovery of renal function to normal. Three patients had preexisting renal insufficiency, and in two of these patients pregnancy was associated with worsening renal function. In one of these patients (patient 18), the serum creatinine level rose from 2.8 mg/dL prior to pregnancy to 15 mg/dL at 30 weeks' gestation. This patient required dialysis. A second patient also required dialysis. The peculiarities of patient 10 have been reported elsewhere.[9]

## DISCUSSION

This study examined the immediate and short-term fetal and maternal morbidity and mortality associated with acute renal failure in pregnant patients seen at an inner-city facility. It is crucial to recognize that this facility is also a tertiary care institution; this introduces some bias into the results of this study. Similarly, the peculiar health needs of inner-city residents have been well-described elsewhere.[10,11] Moreover, young maternal age has been suggested by some to be a risk factor for preeclampsia.[12]

The findings of this study indicate that acute renal failure in pregnancy is associated with poor maternal and perinatal outcome in this subpopulation. These results contrast sharply with recent data suggesting that the outcome of renal disease in pregnancy has improved dramatically in Western societies.[1-3,13]

The maternal mortality rate of 14% is high, although it is similar to the mortality rate reported by Sibai in patients who had eclamptic pregnancies complicated by HELLP syndrome.[14] Maternal morbidity was equally high. It was surprising that the two patients who required dialysis survived, suggesting that mortality in this setting may be related to the underlying disease, rather than acute renal failure per se. Twenty-nine percent of patients had an active drug abuse history, as well as absent or poor antenatal care and essentially were first seen in late pregnancy or in labor.

The poor health status of these patients emphasizes the fact that urban health problems arise from the complex interaction of socioeconomic, behavioral, and environmental factors that also may relate to ethnicity.[15] While some studies have shown a relationship between socioeconomic status and mortality with renal disease,[16] other studies have shown that the survival of inner-city residents with renal failure can be significantly better than the national average with the provision of adequate support services, dialysis, and nutrition.[17]

In the case of acute renal failure in pregnant patients, better access to primary care obstetrics will allow early diagnosis and probably improve the outcome in these patients, which currently mirrors the situation in third-world countries.[6,17,18]

The perinatal mortality rate (43%) was high in this study, and there was a tendency toward low birthweight, but it was not possible to analyze the data further with regard to the role of acute renal failure because of the small sample size and retrospective design of this study. However, the birthweights were low even when compared with percentiles for African-American children. It is not surprising that renal function deteriorated in the patients with preexisting renal insufficiency as this gestational loss of renal function has been documented by earlier studies.[13,19,20,21]

## CONCLUSION

This study demonstrates that the outcome of acute renal failure in pregnant patients at this inner-city facility was dismal. Plans to improve this outcome should be part of a comprehensive urban health strategy to improve the access and delivery of health care to inner-city residents. These improvements must address the perennial problems of unemployment, poor housing, teenage pregnancy, violence, and urban poverty that affect the health of the inner-city residents.

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