



Acute Kidney Injury in Pregnancy—A Single Centre Retrospective Study

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ABSTRACT

Background: *Acute kidney injury continues to be common in developing countries. Its occurrence during pregnancy is a serious complication, involving the prognosis of both the mother and the child.*

Aims and Objectives: *To investigate the incidence, clinical characteristics, etiology and outcome of AKI during pregnancy in patients reported to the department of Nephrology.*

Materials and Methods: *Out of 650 AKI patients, 50 (7.69%) were associated with pregnancy. The results of a detailed medical history, physical examination, routine urine analysis, serum creatinine and renal ultrasonography were noted.*

Results: *The age of patients ranged from 20 to 50 years with a mean of 33.42 ± 5.63 years. 17 (34%) patients were primigravid and 33 (66%) were multigravid. Of the various causes, septic abortion was the commonest cause accounting for 25 (50%) cases, 20 (80) of which occurred in the first trimester and five (20%) in the second trimester.*

Conclusion: *PRAKI continues to be of significant occurrence accounting for 7.69 % of AKI in our study.*

Key Words: *Acute kidney injury, pregnancy, septic abortion, serum creatinine.*

Introduction

Acute kidney injury (AKI) is a rare but life threatening and challenging clinical condition that occurs sometimes during pregnancy. The incidence of acute renal failure during pregnancy has declined in both developed and developing

countries. But pregnancy-related acute kidney injury (PRAKI) is still responsible for 15–20% of AKI in developing countries.^{1,2}

Septic abortion is the most common cause of AKI in early pregnancy, whereas toxemia of pregnancy, hemorrhage, and ischemic, acute,

tubular necrosis occur in late pregnancy. Rare causes of PRAKI include acute fatty liver, HELLP Syndrome in the third trimester of pregnancy, puerperal sepsis and thrombotic microangiopathy in the postpartum period.³

We conducted this retrospective study to investigate the incidence, clinical characteristics, etiology and outcome of AKI during pregnancy in patients reported to the department of Nephrology.

Materials and Methods

Out of 650 AKI patients admitted to the Nephrology Department of Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana State, India, between June 2014 to May 2017, 50 (7.69%) were associated with pregnancy.

Inclusion Criteria

1. All pregnant and postpartum patients who developed a PRAKI.

Exclusion Criteria

1. Patients with pre-existing renal disease or renal insufficiency before pregnancy were excluded.

After obtaining institutional ethical committee approval and informed consent from study subjects, detailed case history and parameters like the causes of AKI, its clinical features, need for dialysis, and the outcome were examined. The obtained data about the age of patients, number of pregnancies, history of previous renal disease or hypertension and prior births were recorded. The results of routine urine analysis, levels of blood urea nitrogen, serum creatinine, fractional excretion of sodium, and renal ultrasonography were also noted. We followed the methodology used by Najjar *et al* (2008)

The diagnosis of PRAKI was given when there was sudden-onset oliguria (urine output < 400 mL in 24 hours) or anuria with serum creatinine elevated to > 1.5 mg%. Patients with underlying chronic kidney disease were excluded from the study.

The obtained data was analyzed using the Statistical Package for Social Science version 16 (SPSS Inc., Chicago, IL) for Windows and the

results were recorded as mean \pm standard deviation (SD). Chi square test and Fisher's exact tests were used. A p value of < 0.05 was considered as significant.

Results

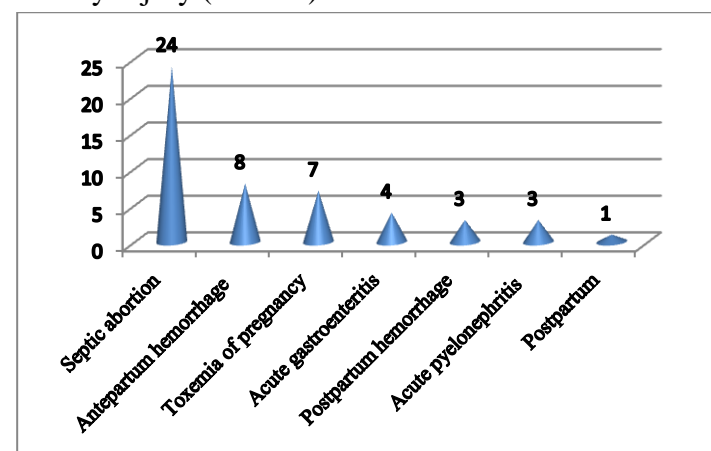
Of the 650 cases of acute kidney injury (AKI), 50 (7.69%) cases were related to gestational problems. The age of patients ranged from 20 to 50 years with a mean of 33.42 ± 5.63 years. 17 (34%) patients were primigravid and 33 (66%) were multigravid in our study.

Detailed history and clinical examination and investigation reports showed the various causes of PRAKI (Table 1, Graph 2). Of the various causes, septic abortion was the commonest cause accounting for 25 (50%) cases, 20 (80) of which occurred in the first trimester and five (20%) in the second trimester. 23 (92%) were from rural areas and their abortions had been conducted by untrained midwives.

Table 1: Causes of Pregnancy-Related, Acute Kidney Injury (PRAKI) (n=50)

Causes	Number of cases	Percentage of cases
Septic abortion	24	48
Antepartum hemorrhage	8	16
Toxemia of pregnancy	7	14
Acute gastroenteritis	4	8
Postpartum hemorrhage	3	6
Acute pyelonephritis	3	6
Postpartum	1	2

Graph 1: Causes of Pregnancy-Related, Acute Kidney Injury (PRAKI)

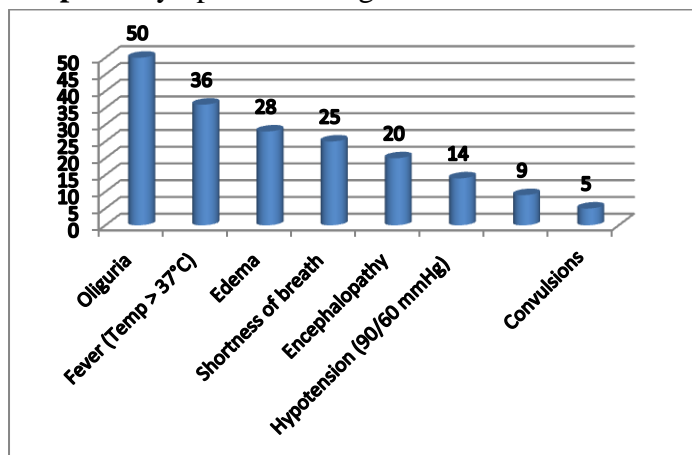


The symptoms and signs were also noted at the time of admission (Table 2, Graph 2). Oliguria was present in all patients and the average hospital stay was 1-22 days (1.23 ± 6.35).

Table 2: Symptoms and signs

Parameter	Number	Percentage
Oliguria	50	100
Fever (Temp > 37°C)	36	72
Edema	28	56
Shortness of breath	25	50
Encephalopathy	20	40
Hypotension (90/60 mmHg)	14	28
Hypertension (140/90 mmHg)	9	18
Convulsions	5	10

Graph 2: Symptoms and signs



Lab investigations revealed that anemia (Hb < 10 gm/dL) was most common feature and is seen in 39 (78%) patients, hyperkalemia in 15 (30%) cases, leucocytosis in 14 (28%), hyponatremia in nine (18%) and hypoalbuminemia in eight (16%) patients (Table 3).

Table 3: Laboratory Investigation Findings

Laboratory values	Mean ± SD
Hemoglobin (g/dL)	7.53±2.88
Serum urea (mg/dL)	212±91.12
Serum creatinine (mg/dL)	7.5±3.8
Serum albumin (g/dL)	2.46±0.81

In 15 cases (30%), pregnancies were terminated: 9 cases by cesarean section (18%) and by induction in six other (12%) cases. Hysterectomy was needed in 12 (24%) cases and repair of cervical tear was required in one (2%) case. ARDS developed in 13 (26%) cases, pneumonia in seven (14%) cases, disseminated intravascular coagulation in four (8%) cases, and suppurative cholangitis in one (2%) case.

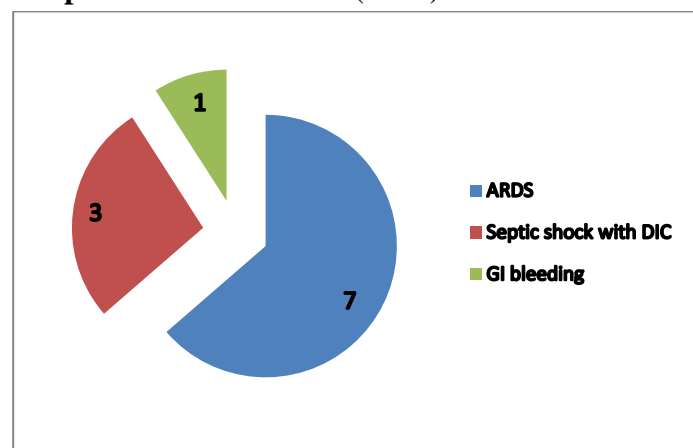
Hemodialysis was given to 17 (34%) cases, peritoneal dialysis to eight (16%) cases and both modalities to seven (14%) cases, whereas only medical treatment was given to 22 (44%) patients. Mortality was observed in 11 (22%) cases (Table 4, Graph 3). Thirty four (68%) patients recovered

completely, three (6%) showed partial recovery, and one (2%) patient remained dependent on dialysis.

Table 4: Causes of death (n=11)

Cause of death	Number	Percentage
ARDS	7	63.63
Septic shock with DIC	3	27.27
GI bleeding	1	9.09

Graph 3: Causes of death (n=11)



Discussion

AKI is defined as condition where serum creatinine increases about 1.5 times from the baseline or when the urine output decreases to less than 400 mL for more than 6 hours or both. AKI in pregnancy is a serious complication, involving the prognosis of the mother and the child. Oliguria is defined as condition where urine output is less than 400mL/24hours.⁴ The worldwide incidence of pregnancy-related acute kidney injury (PRAKI) has decreased markedly in the past 50 years from 20–40% in 1960 to less than 10% in current times through the legalization of abortion and improvement of antenatal and obstetric care (Table 5).

Table 5: Frequency of PRAKI reported in India

Author (year)	Number	PRAKI as % of total AKI
Chugh (1987) ⁵	1862	14.5
Prakash <i>et al.</i> (1995) ³	59	13.9
Rani <i>et al.</i> (2002) ⁶	82	12.2
Kilari <i>et al.</i> (2006) ⁷	41	4.3
Najar <i>et al</i> ¹	40	.07
Present Study	650	7.69

Caring for women diagnosed with acute kidney injury is a real challenge for nephrologists and all the medical team.⁸ AKI usually occurs in the third trimester of pregnancy. Puerperal sepsis and

thrombotic microangiopathy are seen in the postpartum period. In our series, PRAKI was more frequent in the 3rd trimester (61%) and 22% in the postpartum. Similar results have been reported by Ansari *et al*, where the majority of PRAKI occurred in the 3rd trimester (86%).⁹ Whereas in study by Arora *et al*, the PRAKI occurred during the postpartum in 75.6% of cases.¹⁰

The average age of onset for PRAKI is between 25 and 32 years according to various authors.⁸ In our study, the average age was 29.03±6.3 years, ranging from 18 to 40 years.

The mean serum creatinine was 34.8mg/L±25.4 with a maximum value of 105mg/L and a minimum value of 14mg/L. Our results are comparable to those of Randeree *et al*.¹¹

In most retrospective studies, preeclampsia-eclampsia was reported to be a major cause of AKI during pregnancy. In our study, the main cause of AKI associated with pregnancy is PE (62.4%), with eclampsia in five cases and HELLP syndrome in 21 cases. HELLP syndrome was described by Weinstein in 1982, as a serious complication of severe PE, accompanied by a significant morbidity and high maternal and perinatal mortality.

The obstetric hemorrhage was a significant cause of PRAKI. It was observed in 28% cases in study by Ansari *et al* and 5% of cases in study by Arora *et al*.^{9, 10}

Total recovery was obtained in 84% of the cases, whereas Arora *et al*, Goplani *et al*, and Erdemoglu *et al*. reported a total recovery of renal function in 42%, 54.3%, and 61%, respectively.^{10, 13, 14}

Hence, there is a need for education and improvement in ante- and postnatal care, especially in the rural areas, and the practice of illegal abortions by untrained personnel has to be stopped. The mortality related to PRAKI has declined to less than 10% in Europe and North America, while the reported mortality rate of PRAKI has decreased from 56% in 1987 to 24.39% in 2005 in India.^{5, 7}

The mortality rate was 22% in our study, which is in accordance to current trends in India but still significantly higher compared to the developed countries.

Conclusion

PRAKI continues to be of significant occurrence accounting for 7.69 % of AKI in our study. Prevention of PRAKI requires an improvement of the sanitary infrastructures with the implementation of an obligatory prenatal consultation. Prevention is the best and least expensive solution. Preventing abortions, assuring a good perinatal care and a better management of obstetrical complications, are the crucial tools to implement this purpose of reducing the incidence of AKI.

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