

Clinical Spectrum of Pregnancy Related Acute Kidney Injury

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Abstract

Original Research Article

Introduction: Acute kidney injury (PRAKI) continues to be common in developing countries. The aim of this paper is to study AKI characteristics in pregnancy and identify the factors related to the unfavourable outcomes. **Methods:** This prospective study will be conducted in the Department of Nephrology, Sri Aurobindo Medical College & Postgraduate Institute, Indore (M.P.), from January, 2018 to June, 2019. All pregnant patients presented with acute kidney injury were included in the study. **Result:** post partum sepsis was leading cause of AKI (31.66%) and hypertensive disorders of pregnancy were second most common cause (23.33%). Significant number of patients (15%) had history of UTI including pyelonephritis. 11.6% of patients had history of GI loss (hyperemesis gravidarum /acute gastroenteritis). out of 60 patients most of the patients (80%) had complete renal recovery in follow up period of 3 months where as 4 patients turned in to CKD and no patient was dialysis dependent. Mortality occurred in 13.3 percent patients, all had stage 3 AKI.

Keywords: Acute Kidney Injury-Pregnancy related acute kidney injury, Atypical hemolytic uremic syndrome, Thrombotic microangiopathy, Preeclampsia, Hypertensive disorders of pregnancy.

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INTRODUCTION

Acute kidney injury represents a challenging clinical when it occurs during pregnancy. 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 the current series through the legalization of abortion and improvement of antenatal and obstetric care [1].

In the recent years, the incidence of PRAKI has decreased in developed countries to only 1% to 2.8%. It is a rare complication of pregnancy following the decreased incidence of septic abortion and a better perinatal care [2, 3]. However, PRAKI is still frequent in developing countries; the incidence is around 4.2–15% [2]. Caring for women diagnosed with acute kidney injury is a real challenge for nephrologists and all the medical team.

PRAKI is usually caused by septic abortion and hyperemesis gravidarum in early pregnancy, by hypertensive disorders of pregnancy, pregnancy toxemia, hemorrhages during pregnancy (antepartum and postpartum), and acute tubular necrosis in late pregnancy [4, 5]. Acute fatty liver is an uncommon cause of PRAKI. It occurs in the third trimester of

pregnancy. Puerperal sepsis and thrombotic microangiopathy are seen in the postpartum period.

Acute tubular necrosis (ATN) is the most common condition with a good prognosis compared to other pathology like severe eclampsia, HELLP syndrome, and disseminated intravascular coagulation (DIC) where the glomerular involvement is preeminent [6, 7].

The aim of this study is to investigate the characteristics of PRAKI and determine the factors associated to unfavourable evolution of kidney injury.

METHODS

This is an observational prospective study, conducted in the Department of Nephrology, Sri Aurobindo Medical College & Postgraduate Institute, Indore (M.P.), from January, 2018 to June, 2019. All patients with pregnancy related acute kidney injury (according to KDIGO criteria) admitted during study period were included. Pre-structured Proforma was used for data collection. Statistical analysis was done by standard methods and percentage was calculated for qualitative variables i.e. cause of PRAKI, morbidity, mortality and outcomes at three months in the form of complete recovery, partial recovery, ESRD and death.

Inclusion Criteria

- All pregnant and postpartum patients with AKI, with or without oliguria.

Exclusion Criteria

- Patients with pre-existing renal disease, diabetes or hypertension before pregnancy

AIM OF THE STUDY

To study the risk factors, etiology, and maternal outcomes in patients with pregnancy related acute kidney injury.

Definitions

- Pre-eclampsia: is defined by a set of three signs: hypertension (SBP \geq 140 mmHg and/or DBP \geq 90 mmHg), edema, and proteinuria after 20 weeks of gestation.
- Eclampsia: is defined by the existence of generalized convulsions and/or loss of consciousness occurring during pregnancy or Postpartum, in patient with preeclampsia.

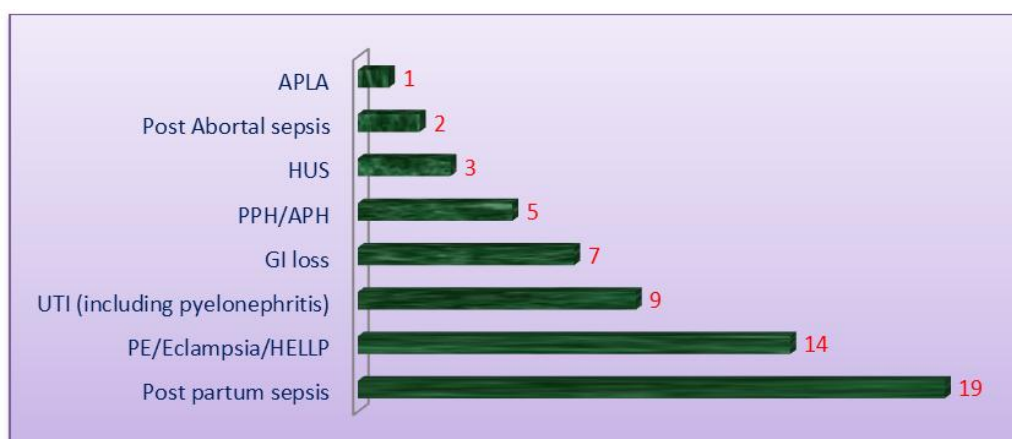
- HELLP: syndrome is defined by the existence of three main features: haemolysis, elevated liver enzymes, and low platelets count.
- Puerperium: Postpartum is the period beginning immediately after delivery and extending approximately 6 to 8 weeks.
- Acute kidney injury (AKI) is defined and classed according to KDIGO criteria based on changes in serum creatinine or changes in urine output, or both. (KDIGO criteria for acute kidney injury - increase in Scr \geq 0.3 mg/dl within 48 hours or increase in Scr to \geq 1.5 times baseline, within prior 7 days , or urine volume < 0.5 ml/ kg/hour for atleast 6 hours).
- Sepsis-Suspected or documented infection with SOFA score \geq 2 (vii) Evolution: unfavourable evolution means incomplete renal recovery.

RESULTS

Etiology of Acute kidney injury in pregnancy.

S. No	Etiology	Number of patients (Total =60)	Percentage (%)
1	Post partum sepsis	19	31.66
2	PE/Eclampsia/HELLP	14	23.33
3	UTI (including pyelonephritis)	09	15
4	GI loss	07	11.60
5	PPH/APH	05	8.30
6	HUS	03	05
7	Post Abortal sepsis	02	3.3
8	APLA	01	1.6

(PE: Pre-eclampsia, HELLP: hemolysis, elevated liver enzymes and low platelets, PPH: Post partum hemorrhage, APH: Anti-partum hemorrhage, HUS: Hemolytic uremic syndrome, APLA: Anti phospholipid antibody syndrome)

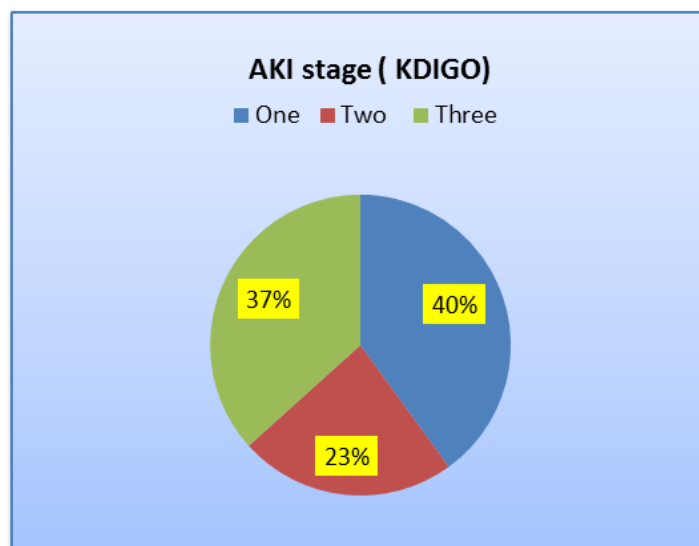


In our study post partum sepsis was leading cause of AKI (31.66%) and hypertensive disorders of pregnancy were second most common cause (23.33%). Significant number of patients (15%) had history of UTI including pyelonephritis. 11.6% of patients had

history of GI loss (hyperemesis gravidarum /acute gastroenteritis). Other uncommon causes were PPH/APH, HUS, Post abortal sepsis and APLA syndrome.

Stage of AKI

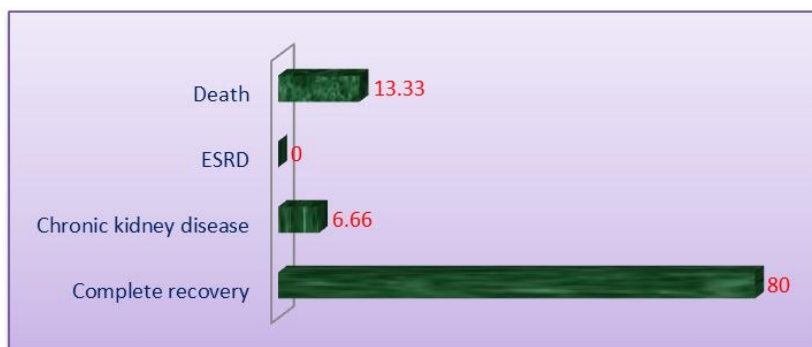
S. No	AKI stage (KDIGO)	Number of patients	Percentage (%)
1	One	24	40
2	Two	14	23.33
3	Three	22	36.66



In our study most of the patients had AKI stage 2 and 3 where hemodialysis was done in 8 patients (13.33%).

Maternal outcome: after three months follow up

S. No	Outcome	Number of patient	Percentage (%)
1	Complete recovery	48	80
2	Chronic kidney disease	04	6.66
3	ESRD	00	00
4	Death	08	13.33



In our study, out of 60 patients most of the patients (80%) had complete renal recovery in follow up period of 3 months where as 4 patients turned in to CKD and no patient was dialysis dependent. Mortality occurred in 13.3 percent patients, all had stage 3 AKI.

60 cases of PRAKI were listed. Their ages varied from 18 to 40 years old, with an average of 29.03 ± 6.3 years and an average parity of 1.83. Thirty-nine percent were oliguric. PRAKI occurred during the 3rd trimester in 66.6%. Hemodialysis was necessary in 13.33 % (8 patients) of cases. The outcome was favorable, with a complete renal function recovery for

48 patients. Poor prognosis was related to two factors: age over 38 years and advanced stage of AKI according to KDIGO classification.

The current study shows a rise in the rate of AKI in pregnancy due to hypertensive disorders but incidence of septic abortion was lower than previous studies. There is wide variation in the rates in other countries. In India, for instance, AKI in pregnancy severe enough to require dialysis occurs at 10%, and accounts for 5% to 20% of all AKI in developing countries, while in the developed world, overall, it has come down to less than 1%.

DISCUSSION

Pregnancy-related acute kidney injury (PRAKI) is a major cause of maternal and fetal morbidity and mortality in developing countries. With improvement in antenatal and postnatal care, the incidence of PRAKI in India has steadily declined from 22% in 1960s to 9% in 1980s [8] and further down to 3–7% in 2000s [9, 10], however, the levels continue to remain higher than the levels seen in developed countries (1 in 20,000 pregnancies) [11]. In developing countries, sepsis and hemorrhage account for >50% of cases of PRAKI [12, 13], in contrast to developed countries where chronic hypertension, renal disease and preeclampsia and eclampsia are important causes [14, 15]. Cortical necrosis (CN) is an important cause of death and dialysis dependency in this population.[16] Similar to our cohort, sepsis contributed 30–60% cases of PRAKI in other series from Indian subcontinent, in contrast to 11% in Western literature [14]. The mortality rate observed in our series (13.33%) is similar to those found in contemporary series from India and other developing countries [10, 14, 17]; however, it is higher than those noted in Western series [14]. It is evident that sepsis, severe hemorrhage, oliguria as well as AKI-RRT imply poor prognosis, findings which are consistent with reported determinants of maternal morbidity and mortality [18]. The obstetric hemorrhage was a significant cause of PRAKI. It was observed in 28% in Pakistan and 5% of cases in India [19]. In Pakistan, Khalil *et al.*, reported a maternal mortality rate of 15% in 2011 [20]. The PE as a cause of AKI varies depending on the series from 12% in Pakistan [21] to 75.2% of cases in Turkey [22] The obstetric hemorrhage was a significant cause of PRAKI. It was observed in 28% in Pakistan and 5% of cases in India [21]. Arora *et al.*, [17], Goplani *et al.*, [12], and Erdemoğlu *et al.*, [22] reported a total recovery of renal function in 42%, 54.3%, and 61%, respectively. In our study complete recovery of renal function at 3 month followup was highest (80%).

CONCLUSION

PRAKI is still an important cause of maternal morbidity and mortality in our country where sepsis and hypertensive disorders are the leading cause. For prevention of PRAKI, Promotion of institutional delivery, early detection / management of infections (including asymptomatic bacteriuria) and hypertensive disorders of pregnancy is crucial. Prevention of PRAKI requires an improvement of the sanitary infrastructures with the implementation of an obligatory prenatal consultation.

REFERENCES

1. Kumar KS, Krishna CR, Kumar VS. Pregnancy related acute renal failure. *Journal of Obstetrics and Gynecology of India*. 2006 Jul 1;56(4):308-10.
2. Goplani KR, Shah PR, Gera DN, Gumber M, Dabhi M, Feroz A, Kanodia K, Suresh S, Vanikar AV, Trivedi HL. Pregnancy-related acute renal failure: A single-center experience. *Indian journal of nephrology*. 2008 Jan;18(1):17.
3. Rani PU, Narayen G, Anuradha G. Changing trends in pregnancy related acute renal failure. *J Obstet Gynecol India*. 2002;52(1):36-8.
4. Beaufile MB. *Pregnancy in Clinical Nephrology*, Davidson AM, Cameron JS, Grunfeld JP. Eds., Oxford University Press, New York, NY, USA, 3rd edition, 2005; 1704-1728.
5. Prakash J, Tripathi K, Pandey LK, Gadela SR. Renal cortical necrosis in pregnancy-related acute renal failure. *Journal of the Indian Medical Association*. 1996 Jun;94(6):227-9.
6. Pertuiset N, Grünfeld JP. Acute renal failure in pregnancy, *Bailliere's Clinical Obstetrics and Gynaecology*, 1994;8(2):333-351.
7. Schrier RW. *Diseases of Kidney & Urinary Tract*, Lippincott Williams & Wilkins, Philadelphia, Pa, USA, 2001.
8. Chugh KS, Sakhuja V, Malhotra HS, Pereira BJ. Changing trends in acute renal failure in third-world countries—Chandigarh study. *QJM: An International Journal of Medicine*. 1989 Dec 1;73(3):1117-23.
9. Kumar KS, Krishna CR, Siva Kumar V. Pregnancy related acute renal failure. *Journal Obstet Gynecol India*, 2006; 56:308-10.
10. Najjar MS, Shah AR, Wani IA, Reshi AR, Banday KA, Bhat MA, Saldanha CL. Pregnancy related acute kidney injury: A single center experience from the Kashmir Valley. *Indian journal of nephrology*. 2008 Oct;18(4):159-161.
11. Gammill HS, Jeyabalan A. Acute renal failure in pregnancy. *Critical care medicine*. 2005 Oct 1;33(10):S372-84.
12. Goplani KR, Shah PR, Gera DN, Gumber M, Dabhi M, Feroz A, Kanodia K, Suresh S, Vanikar AV, Trivedi HL. Pregnancy-related acute renal failure: A single-center experience. *Indian journal of nephrology*. 2008 Jan;18(1):17-21.
13. Pahwa N, Bharani R, Kumar R. Post-partum acute kidney injury. *Saudi Journal Kidney Dis Transpl*, 2014; 25:1244-7.
14. Mehrabadi A, Liu S, Bartholomew S, Hutcheon JA, Magee LA, Kramer MS, Liston RM, Joseph KS. Hypertensive disorders of pregnancy and the recent increase in obstetric acute renal failure in Canada: population based retrospective cohort study. *bmj*. 2014 Jul 30;349:g4731.
15. Gurrieri C, Garovic VD, Gullo A, Bojanić K, Sprung J, Narr BJ, Weingarten TN. Kidney injury during pregnancy: associated comorbid conditions and outcomes. *Archives of gynecology and obstetrics*. 2012 Sep 1;286(3):567-73.
16. Prakash J, Vohra R, Wani IA, Murthy AS, Srivastva PK, Tripathi K, Pandey LK, Raja R. Decreasing incidence of renal cortical necrosis in

- patients with acute renal failure in developing countries: a single-centre experience of 22 years from Eastern India. *Nephrology Dialysis Transplantation*. 2007 Apr 1;22(4):1213-7.
17. Arora N, Mahajan K, Jana N, Taraphder A. Pregnancy-related acute renal failure in eastern India. *International Journal of Gynecology & Obstetrics*. 2010 Dec;111(3):213-6.
 18. Bentata Y, Housni B, Mimouni A, Azzouzi A, Abouqal R. Acute kidney injury related to pregnancy in developing countries: Etiology and risk factors in an intensive care unit. *Journal Nephrol*, 2012;25:764-75.
 19. Ansari MR, Laghari MS, Solangi KB. Acute renal failure in pregnancy: one year observational study at Liaquat University Hospital, Hyderabad. *The Journal of the Pakistan Medical Association*. 2008 Feb 1;58(2):61.
 20. Khalil MA, Azhar A, Anwar N, Wali R. Aetiology, maternal and foetal outcome in 60 cases of obstetrical acute renal failure. *Journal of Ayub Medical College Abbottabad*. 2009 Dec 1;21(4):46-9.
 21. Ansari MR, Laghari MS, Solangi KB. Acute renal failure in pregnancy: one year observational study at Liaquat University Hospital, Hyderabad. *The Journal of the Pakistan Medical Association*. 2008 Feb 1; 58(2):61.
 22. Erdemoglu M, Kuyumcuoglu U, Kale A, Akdeniz N. Pregnancy-related acute renal failure in the southeast region of Turkey: analysis of 75 cases. *Clinical & Experimental Obstetrics & Gynecology*. 2010 Jan 1; 37(2):148.