

Frequency of Pregnancy Related Acute Kidney Injury

RAHMAT ALI KHAN¹, AYSHA BIBI², ZEESHAN MURTAZA³, IFTIKHAR MUHAMMAD⁴, MUHAMMAD AYUB KHAN⁵

¹Assistant Professor, ⁴District Physician, Department of Nephrology, Nawaz Sharif Kidney Hospital, Swat

²Medical Officer, Department of Obstetrics and Gynecology, ⁵Assistant Professor, Department of Medicine, Saidu Teaching Hospital, Swat

³Specialist Registrar Medical Teaching Institute, Lady Reading Hospital Peshawar

Correspondence to: Dr. Iftikhar Muhammad, Email: imgmc@yahoo.com, Cell +923339335622

ABSTRACT

Background: Pregnancy-related acute kidney injury (PR-AKI) is a rare yet serious problem during pregnancy. In the recent years, the incidence of PR-AKI has decreased in developed countries to only 1% to 2.8%. However, PR-AKI is still frequent in developing countries. The true incidence of obstetrics related AKI in developing countries like Pakistan and the change in incidence is not much known. The aim of this study is to explore the magnitude of acute kidney injury in pregnancy in our setup.

Objective: To determine the frequency of pregnancy related acute kidney injury.

Study Design: Cross sectional study

Place and Duration of Study: Department of Obstetrics and Gynecology, Saidu Group of Teaching Hospitals Swat from 1st April 2019 to 31st March 2020.

Methodology: One hundred and seventy four patients were enrolled in the study through non probability consecutive sampling from wards and OPD. The diagnosis of acute kidney injury in pregnancy was made on the serum creatinine levels.

Results: Mean age of the patients was 29±3.81 years. Mean duration of pregnancy was 4±5.31 months. Twelve (7%) patients had acute kidney injury while 162 (93%) patients didn't have acute kidney injury.

Conclusion: The frequency of pregnancy related acute kidney injury was found to be 7% in our setup.

Key Words: Acute kidney injury (AKI), Pregnancy, Serum creatinine

INTRODUCTION

Pregnancy-related acute kidney injury (PR-AKI) is a rare yet serious problem during pregnancy. Pregnancy per se can cause acute renal failure even if the mother had a previously healthy kidney.¹ It is a heterogeneous disease entity that occurs due to a multitude of underlying etiologies. Regardless of the cause, it is an important obstetric complication associated with significant maternal and fetal morbidity and mortality.²

The worldwide incidence of pregnancy-related acute kidney injury 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.³ In the recent years, the incidence of PR-AKI has decreased in developed countries to only 1% to 2.8%. It is a rare complication of pregnancy following the disappearance of septic abortion and a better perinatal care.^{4,5} However, PR-AKI is still frequent in developing countries; the incidence is around 4.2–15%.^{4,6} The true incidence of obstetrics related AKI in developing countries like Pakistan and the change in incidence is not much known and there is no such local data available in the past to compare with. Only few scanty available articles from Pakistan showed the prevalence of pregnancy related ARF to be 7–10%.⁷

The definition of PR-AKI used in literature is variable, ranging from an increase in serum creatinine to AKI needing dialysis. Hemodynamic and vascular changes in normal pregnancy result in a 40% to 50% increase in glomerular filtration rate. Thus, serum creatinine that is within the normal range for the general population could reflect significant compromise in renal function in a pregnant woman.⁸ In the first trimester of pregnancy, there is increased production of nitric oxide and relaxin leading to peripheral vasodilatation that results in decreased systemic

vascular resistance.⁹ Increase in cardiac output by 40 to 50% and vasodilatation leads to decrease in blood pressure. Blood pressures then increases slightly due to fluid retention and reach at a level of 10% less than the normal pre pregnancy level and then almost reach at the normal pre pregnancy level but it is never higher than the normal BP at any stage of the pregnancy.¹⁰ Multiple other mechanisms like thirst stimulation and vasopressin release affects the osmotic changes. This increase in volume also leads to decrease in osmolality and sodium concentration. Progesterone also acts on respiratory center and lead to hyperventilation. This hyperventilation can result in respiratory alkalosis and to compensate that body loses bicarbonate. Other complications of pregnancy like pre eclampsia, eclampsia, HELLP syndrome can also add to these.¹¹

PR-AKI is usually caused by septic abortion in early pregnancy, by pregnancy toxemia, hemorrhages during pregnancy (antepartum and postpartum), and acute tubular necrosis in late pregnancy.¹² Acute fatty liver is an uncommon cause of PR-AKI. 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 where the glomerular involvement is preminent.^{13,14}

The aim of this study is to explore the magnitude acute kidney injury in pregnancy in our setup as it is a common cause of hospitalization, associated with high morbidity and mortality especially in developing countries. In spite of renal replacement therapies, the in-hospital mortality rates remain high even in the developed countries, so early diagnosis and timely intervention will decrease these complications.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Saidu Group of Teaching Hospitals Swat from 1st April 2019 to 31st March 2020. A total of 174 women enrolled. All pregnant patients more than 18 years and less than 40 years of age and were diagnosed to have acute renal failure and willing to participate included. Patients diagnosed to have septic abortion, hyperemesis gravidarum, antepartum hemorrhage pre eclampsia, eclampsia, a, pre-existing renal disease and unwilling patients were excluded. The enrolled patients were assessed by consultant fellow gynecologist and detailed history taken, relevant clinical examination performed and obstetrical per abdomen ultrasound scans were performed. Three ml of venous blood was drawn by trained phlebotomist and stored in EDTA tube. From this blood urea and serum creatinine were measured through MicrolabElitech 300. Socio-demographic particulars of participants like age and clinical information like gravidity, parity, blood pressure, urine frequency and quantity were recorded. The diagnosis of acute kidney injury in pregnancy was made on the serum creatinine levels. An increase of serum creatinine greater than 88 $\mu\text{mol/l}$ (>1 mg/dl) or an increase within 48 hours of 44 $\mu\text{mol/l}$ (0.5 mg/dl) above baseline. Data was analyzed using SPSS-20.

RESULTS

Mean age was 29 \pm 3.81 years. Sixty one (35%) patients were in age range 18-25 years, 57 (33%) patients were in age range 26-30 years, 56 (32%) patients were in age range 31-40 years.

Table 1: Demographic and clinical variables of the patients (n=174)

Variable	No.	%
Age (years)		
18-25	61	35.0
26-30	57	33.0
31-40	56	32.0
Duration of pregnancy (months)		
≤ 4	96	55.0
>4	78	45.0
Acute kidney injury		
Yes	12	7.0
No	162	93.0

Table 2: Stratification of acute kidney injury according to age and duration of pregnancy (n=174)

Variable	Acute kidney injury		P value
	Yes	No	
Age (years)			
18-25	5	56	0.8316
26-30	4	53	
31-40	3	53	
Duration of pregnancy (months)			
≤ 3	7	89	0.8195
> 4	5	73	

Mean duration of pregnancy was 4 \pm 5.31 months. Duration of pregnancy among 174 patients was analyzed as 96 (55%) patients had pregnancy for ≤ 4 month while 78 (45%) patients had pregnancy for >4 month. Twelve (7%) patients

had acute kidney injury while 162(93%) patients didn't have acute kidney injury (Table 1). Stratification of acute kidney injury with respect to age and duration of pregnancy showed that AKI in pregnancy is more common in age group 18 to 25 years and is more common in pregnancies of ≤ 4 month's duration hence warranting the prevalence of causes of AKI in early pregnancy in our setup (Table 2).

DISCUSSION

Acute kidney injury (AKI) is a clinical syndrome denoted by an abrupt decline in glomerular filtration rate (GFR) sufficient to decrease the elimination of nitrogenous waste products (urea and creatinine) and other uremic toxin. Acute renal failure, in pregnancy, is a challenging problem. Acute kidney injury (AKI) in adults is a common cause of hospitalization, associated with high morbidity and mortality especially in developing countries. Acute kidney injury (AKI) is a life threatening complications of pregnancy. It is about 24%. In Pakistan it is 13% reported by Rizwan.¹⁵ The development of AKI in pregnancy follows a bimodal distribution with two incidence peaks: the first and third trimesters.

Our study shows that that mean age was 29 \pm 3.81 years and mean duration of pregnancy was 4 \pm 5.31 months. Seven percent patients had acute kidney injury while 93% patients didn't have acute kidney injury.

Najar¹⁶ had reported that of 569 cases of acute kidney injury (AKI), 40 (7.02%) cases were related to gestational problems; the age of the patients ranged from 15 to 45 years. Septic abortion was the most common cause of PRAKI, accounting for 20 (50%) cases of which 15 (75%) cases occurred in the first and five (25%) in the second trimester. Other causes were antepartum hemorrhage: six cases (15%), toxemia of pregnancy: six cases (15%), acute gastroenteritis: three cases (7.5%), postpartum hemorrhage: two cases (5%), acute pyelonephritis: two cases (5%), and postpartum, acute kidney injury: one case (2.5%). Dialysis was needed in 60% of the cases and mortality was observed in 20% of the cases. PR-AKI continues to be a major concern in our society, causing a high maternal mortality. Septic abortion which has virtually disappeared from developed countries continues to be a major cause of PRAKI in our society. Hence, there is a need to halt the practice of illegal abortions and improve antenatal care.

The worldwide incidence of PR-AKI has decreased markedly in the past 50 years from 20 to 40% in the 1960s to <10% in more recent series, largely due to the legalization of abortion and improved antenatal and obstetric care. No case of PRAKI was observed in 12000 and 20000 live births.¹⁷

Recent epidemiological studies have also confirmed the decreasing incidence of PRAKI in India, with a decrease from 14.5% in 1987 to 4.3% in 2005.^{18,19} This too is due to the legalization of abortion and better antenatal care.

There are a few studies from the Kashmir Valley that address the issue of PR-AKI. Pandith *et al*²⁰ reported the incidence of PR-AKI as 6% in the Kashmir Valley (unpublished data), whereas the incidence of PR-AKI was 7% in our study. Septic abortion was the main cause of

PRAKI in our series accounting for 20 (50%) cases, mostly conducted by untrained personnel (midwives and *dais*), eight hemorrhage (20%) cases and six toxemia (15%) cases were other common causes of PR-AKI.

Although there has been a significant decline in PRAKI at the international and national levels, it continues to be static in the Kashmir Valley, largely due to an insignificant decline in septic abortion. 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 < 10% in Europe and North America²¹, while the reported mortality rate of PRAKI has decreased from 56% in 1987 to 24.39% in 2005 in India.²²

CONCLUSION

The frequency of pregnancy related acute kidney injury was found to be 7% in our setup.

REFERENCES

1. Naresh P, Rajesh B, Ravindra K. Post-partum acute kidney injury. *Saudi J Kidney Dis Transpl* 2014;25:1244-7.
2. Liu Y, Ma X, Zheng J, Liu X, et al. Pregnancy outcomes in patients with acute kidney injury during pregnancy: a systematic review and meta-analysis. *BMC Pregnancy Childbirth* 2017;17:235.
3. Kumar KS, Krishna CR, Kuma VS. Pregnancy related acute renal failure. *J Obstet Gynaecol India* 2006;56(4):308-10.
4. Goplan KR, Gero DN et al. Pregnancy related acute renal failure: a single center experience. *Indian J Nephrol* 2008; 18(1):17-21.
5. Rani PU, Narayen G, Anuradha. Changing trends in pregnancy related acute renal failure. *J Obstet Gynecol India* 2002;52:36-8.
6. Chaudhri N, But GU, Masroor I. Spectrum and short term outcome of pregnancy related acute renal failure among women. *Ann Pak Inst Med Sci* 2011;7(2):57-61
7. Ali A, Zafar S, Mehmood A, Nisar A. Obstetrical acute renal failure from Frontier Province: A 3 years prospective study. *J Postgrad Med Inst* 2004;18:109-17.
8. Jim B, Garovic VD. Acute kidney injury in pregnancy. *Semin Nephrol* 2017;37:378-85.
9. Khanal N, Ahmed E, Akhtar F. Epidemiology, causes and outcome of obstetric acute kidney injury. Vijayakumar S (Ed.), *Novel insights on chronic kidney disease, acute kidney injury and polycystic kidney disease*. InTech Rijeka 2012;1:67-81
10. Arora N, Mahajan K, Jana N, Taraphder A. Pregnancy related acute renal failure in eastern India. *Intl J Gynaecol Obstet* 2010; 111(3):213-6
11. Machado S, Figueiredo N, Borges A, São M, Freitas L, Moura P, et al. Acute kidney injury in pregnancy: a clinical challenge. *J Nephrol* 2012;25(1):19-30.
12. Sahay M. Acute kidney injury in pregnancy. *Basic nephrology and acute kidney injury*. InTech Rijeka 2012.151-72.
13. Prakash J, Tripathi K, Pandey LK, S. Gadela SR, Usha. Renal cortical necrosis in pregnancy-related acute renal failure. *J Indian Med Ass* 1996;94(6):227-9.
14. Pertuiset N, Grünfeld JP. Acute renal failure in pregnancy. *Clin Obstet Gynaecol* 1994;8(2):333-51.
15. Rizwan N, Farhan Uddin S. Obstetrical acute renal failure: a challenging medical complication. *J Ayub Med Coll Abbottabad* 2011;23(4):66-8.
16. Najjar MS, A. Shah R, Wani LA, A. Reshi R, Banday KA, M. Ashraf BM. Pregnancy related acute kidney injury: A single center experience from the Kashmir Valley. *Indian J Nephrol* 2008; 18(4): 159-61.
17. Chugh KS. Etiopathogenesis of acute renal failure in the tropics. *Ann Natl Acad Med Sci* 1987;23:88-99.
18. Kilari SK, Chinta RK, Vishnubhotla SK. Pregnancy related acute renal failure. *J Obstet Gynecol India* 2006;56:308-10.
19. Maikranz P, Katz AI. Acute renal failure in pregnancy. *Obstet Gynecol Clin North Am* 1991;18:333-43.
20. Pandith et al. Incidence of PRAKI as 6% in Kashmir Valley.
21. Pertuiset N, ad Grunfeld JP. Acute renal failure in pregnancy. *Clin ObstetGynecol (Bailliere)* 1994;8:333.
22. Arrayhani M, Youbi RE, Sqalli T. Pregnancy-Related Acute Kidney Injury: Experience of the Nephrology Unit at the University Hospital of Fez, Morocco. *ISRN Nephrol* 2013;12-25.