



IMPACT OF PREGNANCY RELATED ACUTE KIDNEY INJURY IN MATERNAL HEALTH IN CENTRAL INDIA- A CASE SERIES

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ABSTRACT

Many pregnancies associated diseases are adding to the development of Pregnancy Related Acute Kidney Injury (PR-AKI) like Pre-Eclampsia/Eclampsia (PE/E), HELLP Syndrome, Antepartum/Postpartum Hemorrhage (APH/PPH) and Pregnancy Associated Thrombotic Microangiopathy (P-TMA) are common. Puerperal sepsis, septic abortion, Pre-Eclampsia/Eclampsia, HELLP Syndrome, Antepartum and Postpartum Hemorrhage are common risk factors for PR-AKI development. PR-AKI patients have adverse impact on the maternal health and may leads to development of CKD even death.

KEYWORDS : Pr-aki, Pe/e, HELLp Syndrome, Aph/pph, P-tma, Ckd

INTRODUCTION

Pregnancy-related acute kidney injury (PR-AKI) is the commonest cause of maternal morbidity and mortality in developing countries. Encouraging news from the last three decades has demonstrated a significant reduction in its incidence in developing countries; the data from developed countries are more nuanced. For example, in India, PR-AKI requiring dialysis has reduced from 15% from 1982–1991 to 10% from 1992–2002, with a concurrent reduction in maternal mortality from 20% to 6.5%.^[1] Due to improvement in antenatal, postnatal care and better management of sepsis associated with abortion and childbirth, the incidence of PR-AKI in India has steadily decrease from 22% in 1960s to 9% in 1980s,^[2] and further decrease to 3–7% in 2000s,^[3,4] but still, the levels remain higher than the levels seen in developed countries (1 in 20,000 pregnancies).^[5] In developing countries, infection and hemorrhage contribute for more than 50% of cases of PR-AKI^[6,7] in comparison to developed countries where chronic hypertension, renal disease and preeclampsia and eclampsia are important causes.^[8,9] Acute cortical necrosis (ACN) is an important cause of death and dialysis dependency in this population.^[10] 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 disappearance of septic abortion and a better perinatal care.^[11] In the developed world, decrease in PR-AKI was noted by the end of the 20th century. Nevertheless, a recent report from Canada reported an increasing incidence of PR-AKI, from 1.66 per 10000 deliveries between 2003 – 2003 to 2.68 per 10000 deliveries between 2009–2010.^[12] The reasons behind this increment may be due to higher incidence of hypertensive disorders of pregnancy or may be several other factors. Newer standardized methods of classification of AKI using the RIFLE and AKIN criteria may have led to better “diagnosing” of this condition, and because this, a higher incidence. The absolute number of cases of PR-AKI is still significantly lesser in developing countries. PR-AKI has declined in incidence since last three decades, but it remains a valuable cause of maternal morbidity and mortality. Pregnancy-related causative factors of AKI such as preeclampsia, eclampsia, acute fatty liver of pregnancy, HELLP syndrome, and the thrombotic microangiopathies (thrombotic thrombocytopenic purpura, atypical hemolytic uremic syndrome) exhibit overlapping pictures and often seems like diagnostic conundrum. Differentiation among

these diseased states may be difficult or impossible based on clinical criteria only. In difficult situations and rare cases, a renal biopsy may need to be considered for the appropriate diagnosis and facilitate optimize treatment, but the risks and benefits will need to be calculated. The use of eculizumab for the management of atypical HUS has demonstrated efficacy in early case report studies. Non-pregnancy related causes such as volume depletion, urosepsis, septic abortion and pyelonephritis require early and aggressive resuscitative and antibiotic measures. The changing pattern of the causative factors of PR-AKI is worth highlighting. An evolution in the characteristics of kidney injury in pregnancy is apparent, with a decrease in PR-AKI in early pregnancy due to abortion and puerperal sepsis-related causes but an increase in frequency of hypertensive disorders, thrombotic micro-angiopathies, and postpartum—associated PR-AKI. These change show not only advances in obstetric care, but also modifications in underlying maternal risk factors such as advanced maternal age, increased use of reproductive technologies, and enhanced incidence of non-communicable diseases including hypertension, diabetes, obesity, and chronic kidney disease.

Definitions of pregnancy relate acute kidney injury (PR-AKI)- With inclusion of Risk, Injury, Failure, Loss of function, and End-stage renal disease (RIFLE) criteria. PR-AKI, defined as AKI diagnosed anytime during pregnancy as well as during postpartum phase (first 6 weeks after the delivery). RIFLE criteria were developed by the Acute Dialysis Quality Initiative (ADQI) in 2002 Risk, Injury, Failure, Loss of kidney function and End-stage kidney disease. RIFLE is stands for

1. Risk: 1.5-times increase in the serum creatinine, or glomerular filtration rate (GFR) decrease by 25 percent, or urine output <0.5 ml/kg per hour for six hours.
2. Injury: Two-times increase in the serum creatinine, or GFR decrease by 50 percent, or urine output <0.5 ml/kg per hour for 12 hours
3. Failure: Three-times increase in the serum creatinine, or GFR decrease by 75 percent, or urine output of <0.3 ml/kg per hour for 24 hours, or no urine output (anuria) for 12 hours.
4. Loss: Shut down of renal function completely (e.g., need for renal replacement therapy) for more than four weeks
5. End-stage kidney disease: Complete loss of kidney

function (e.g., need for renal replacement therapy) for more than three months.

AIMS & OBJECTIVES: -

- (1) To study the prevalence of acute kidney injury in antepartum and postpartum women.
- (2) To study the common risk factors (etiology) associated with PR-AKI and its impact on maternal health.

MATERIAL & METHODS

Method of collecting data

- Study design – Prospective study
- Study period - 1 year (15th February 2019 to 14th February 2020)
- Place of study – Department of medicine, MGM Medical College & M.Y. Hospital, Indore (M.P)
- Sample size – 100 persons

Source of patients

- Patients attending medicine OPD.
- Patients admitted in wards of M.Y. Hospital.

Inclusion Criteria

- All pregnant and postpartum patients who developed a PRAKI, with or without oliguria were included.
- PRAKI was defined as AKI diagnosed anytime during pregnancy or during postpartum phase (first 6 weeks after delivery).
- Consent given by patient and caretaker are included in the study.

Exclusion Criteria

- Patients with preexisting renal disease or renal insufficiency before pregnancy.
- Postpartum phase > 6 weeks.
- Patient who refused to participate in the study.

Procedural Planned: -

Informed consent will be taken from patients who visited in the department of medicine during the study period after getting approval by ethics committee. Minimum 100 patients. I take two follow up of PR-AKI diagnosed patients at the interval of 1 month 1st follow-up and at the interval of 3 months 2nd follow-up study.

Investigations

1. CBC
2. S. Urea
3. S. Creatinine
4. LFT
5. S.LDH
6. Urine output at 6 hours, 12 hours, and 24 hours

Data collection and methods: -

- A) Customized proforma was used for collecting data.
- B) Follow up after 1 month and 3 months interval.
- C) In this study Pearson chi-square test was applied to test the statistical significance for categorical data.

Statistical Analysis

It was observational follow-up study and data were analyzed by excel and spss 20 trial version.

Descriptive and univariate analyses have been conducted in collaboration with the epidemiology laboratory from medicine and pharmacy faculty qualitative variables were expressed as percentage and quantitative variables as median or mean. In this study Pearson chi-square test was applied to test the statistical significance for categorical data. The level of significance was set at less than 0.05.

Financial inputs and funding

Our study was performed in a government run tertiary care

hospital and all investigations and treatment used in our study was provided free of cost in our hospital.

OBSERVATIONS AND RESULTS

OBSERVATIONS AND RESULTS IN STUDY POPULATION AT THE TIME OF PRESENTATION TO THE HOSPITAL (n=100)

Table: 1: - Prevalence of PR-AKI in the study group

Age Group	Person (%)
11-20	11 (11.00%)
21-30	67 (67.00%)
31-40	22 (22.00%)
Total	100 (100.00%)
Mean± SD	25.11±3.86

Table: 2: - Age Distribution in Study Population

AKI	Numbers of opd Patients	% Of patients
PRESENT	20	2
ABSENT	980	98
TOTAL	1000	100

Table 3: - Association of PR-AKI and Risk factors

Topic	Yes	No
Puerperal Sepsis	30 (30.00%)	70 (70.00%)
Pre-Septic Abortion	24 (24.00%)	76 (76.00%)
APH	14 (14.00%)	86 (86.00%)
Acute diarrheal disease	11 (11.00%)	89 (89.00%)
HELLP	8 (08.00%)	92 (92.00%)
P-TMA	6 (06.00%)	94 (94.00%)
PPH	5 (05.00%)	95 (95.00%)
Pyelonephritis	5 (05.00%)	95 (95.00%)
acute cortical necrosis	2 (02.00%)	98 (98.00%)
AFLP	2 (02.00%)	98 (98.00%)
AFLP	1 (01.00%)	99 (99.00%)
P-VALUE	<0.0001	

Table 4: - Impact of PR-AKI on maternal health

Impact on maternal health	Cases (%)
CKD	6 (06.00%)
Death	6 (06.00%)
Recover	88 (88.00%)
Total	100 (100.00%)
P value	< 0.05

Table 5: - Foetal outcomes among PR-AKI cases

Foetal outcomes	PR-AKI Cases (%)
LBW	36 (36.00%)
Normal weight	27 (27.00%)
Abortion	15 (15.00%)
Preterm	13 (13.00%)
IUD	5 (05.00%)
Stillbirth	4 (04.00%)
Total	100 (100.00%)
P value	< 0.05

Table 18: - Percentage of case requiring dialysis during disease

Topic	Yes	No
Dialysis requirement	57	43
P value	0.0001	

Table: -19: - Impact of RIFLE stage on PR-AKI outcomes

	N (%) TOTAL	RECOVERED(%)	EXPIRED (%)	CKD(%)
RISK	25(25)	25(100)	0(0)	0(0)
INJURY	34(34)	33(97.05)	0(0)	1(2.94)
FAILURE	33(33)	30(90.90)	0(0)	3(9.09)
LOSS	6(6)	0(0)	4(66.66)	2(33.33)
ESRD	2(2)	0(0)	2(2)	0(0)
p value		0.001		

Table 20: - Association between PR-AKI and trimester

TRIMESTER	AKI
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	N	%
1st TRIMESTER	3	3
2nd TRIMESTER	7	7
3rd TRIMESTER	24	24
PND	66	66

Table 21: - Association of PR-AKI cases with gravida

Gravida	Frequency	Percent
primigravida	62	62.0
multigravida	38	38.0
Total	100	100.0

DISCUSSION

This study "A PROSPECTIVE STUDY OF ACUTE KIDNEY INJURY IN ANTEPARTUM AND POSTPARTUM PATIENT'S ATTENDING OPD/IPD OF M. Y. HOSPITAL" was conducted in Department of Medicine, MGM Medical College, Indore in 100 consecutive patients after taking their written valid consent. Our points of discussion are:

Age

In our study, mean age was 25.1 ± 13.8 years old among all PR-AKI cases. Among all patients' maximum patients are from age group 21-30 (n= 67, 67%) followed by 31-40 30 (n= 22, 22%). Least number of patients were in age group less than 20 years 30 (n= 11, 11%). Our study is comparable with study findings of **E. Mahesh et al**⁽¹³⁾ The study Conducted by department of nephrology M.S.Ramaiah Medical College , Bengaluru and patients means age was 25 years old. Also comparable with study findings of **S.M. Godara et al**⁽¹⁸⁾; in their study, the mean age of Indian PR-AKI patients in this study was 26.4 ± 5 years and the commonest age group affected was 20 to 25 years. Our study was also comparable with the study of **S. Shah et al**⁽¹⁷⁾, the mean age of patients was 28 years.

Prevalence Of Pr-aki

In our study prevalence of PR-AKI was found 2% among 1000 patients attending medicine opd / ipd. Our study was comparable with the study of **E. Mahesh et al**⁽¹³⁾ in this study the point prevalence was 1.56% in the context of all cases of PR-AKI during the time period. Our study was also comparable with the study of **J. Prakash et al**⁽¹⁴⁾ the association of PR-AKI to total cases of AKI reduced significantly from 15% in 1982–1991 to 10.4% in 1992–2002 and further decrease to 4.68% in the 2003–2014 periods. Post-abortual sepsis contribute for 9.4% of the total AKI cases in 1982–1991, the incidence reduced to 7.5% in 1992–2002; and falls further in 2003–2014 to 1.5%

Gravida Of Pregnancy

In our study, majority of patients were primigravida 62 out of 100 cases and rest 38 cases were multigravid. Our study was comparable with the study of **R. Aghwana et al**⁽¹⁶⁾ among all 57% of the women were primiparous while 29% cases were multiparous. Our study is also comparable with the study of **J. Prakash et al**⁽¹⁵⁾ Multi- gravida and primi-gravida comprised 62.6 and 37.6% of the cases, respectively. Our study is also comparable with the study of **S.M. Gadara et al**⁽¹⁸⁾ in this study patients, 32 (56.1%) were multi-gravida while 25 (43.9%) were primi-gravida.

Trimister Of Pregnancy

In our study most of the patients were diagnosed as PR-AKI at their puerperal period that was 66% followed by 3rd trimester 24%. Association of PR-AKI was found in 2nd and 1st trimester 7% and 3% respectively. This study was found comparable with the study of **E. Mahesh et al**⁽¹³⁾ PRAKI was studied mostly in the postpartum period (60%), followed by 3rd trimester (32%). Also found comparable with the study of **J. Prakash et al**⁽¹⁴⁾ the bulk of PR-AKI has raised in the 3rd trimester and puerperium while postabortal PR-AKI decreased significantly in 2003–2014.

Etiological Factors Of Pr-aki

In our study, the most common etiological factors associated with PR-AKI is sepsis, accounts 44% cases as combined. Among all 44% (n=44) of cases, 30% (n=30) cases were associated with puerperal sepsis followed by septic abortion 14 % (n=14) of all PR-AKI cases. In our study 2nd most common cause of PR-AKI was PE/E which account 24% (n=24) of all PR-AKI cases. Other causes were APH 11% (n=11), acute diarrheal disease 8% (n=08), HELLP 6% (n=06), P-TMA 5 % (n=05), Pyelonephritis 2% (n=02), AFLP 1 % (n = 1). Rest was associated with ACN and AFLP. Our study was comparable with the study of **E. Mahesh et al**⁽¹³⁾ Sepsis found as cause of PR-AKI in 36% and 4% of cases were associated with septic abortion. The cause of PR-AKI in 26% of patients was associated with pre-eclampsia and eclampsia. Also comparable with the study of **J. Prakash, P. Pant et al**⁽¹⁴⁾ the fraction of cases with post-abortal PR-AKI decreased from 61 % and 72% in 1982–1991 and 1992–2002, in respectively to thirty-two percentage in 2003–2014 ($P < 0.01$). Association of Preeclampsia/HELLP syndrome associated AKI has decreased significantly from 23% in 1982–1991 to 11 % in 2003–2014. Also comparable with the study of **S.M. Godara et al**⁽¹⁸⁾ the cause of PR-AKI in the study cases included post-abortion sepsis 15.7%, hemorrhage in early pregnancy 8.7%, PPH 8.7%, ante-partum hemorrhage (APH) 14%, pre-eclampsia/eclampsia 33.3%, puerperal sepsis 63%, disseminated intra-vascular coagulation (DIC) 8.7%. In some patients had multiple risk factor for AKI.

Renal Replacement Therapy

In our study we found that 57% cases were managed with renal replacement therapy during illness that was haemodialysis and peritoneal dialysis combined. Among all 57% cases only 6% of them became dependent for lifetime on maintenance dialysis. 46% patients were recovered completely from PR-AKI. Our study was statistically significant with p value 0.0001. this study was found comparable with the study of **A. Verma et al**⁽¹⁹⁾ according to this study 8/15(53.3%) patients received hemodialysis. Among them three patients left against medical advice (LAMA), while 2 out of 15(13.33%) patients were managed conservatively

Maternal Outcomes

In our study we studied impact of PR-AKI on maternal health among all one hundred cases. We found that among all cases 6% cases were land up into CKD during disease and on other hand 6 % cases died. Complete recovery was seen in 88 % of cases. In this study the maternal death was 6 %. Among all PR-AKI cases 57% were dialysis dependent during illness. This study was found comparable with the study of **A. Verma et al**⁽¹⁹⁾ Maternal mortality and morbidity is assessed according to severity of PR-AKI. While treating patients with obstetric PR-AKI, most of patients required dialysis as renal replacement therapy. In this study 8/15(53.3%) patients received dialysis. Among them three patients left against medical advice (LAMA), while 2 out of 15(13.33%) patients were managed conservatively and 2 out of 15(13.33%) patients were not able to survive. Recovery of PR-AKI found in 6 out of 10(60%), with complete recovery in 2 out of 10(20%) patients. Also comparable with the study of **E. Mahesh et al**⁽¹³⁾ renal replacement therapy was started in 30% patients in the form of intermittent hemodialysis or slow low-efficiency dialysis in 77% patients. Maternal mortality was nearly 20 % and about 2% of cases developed to ESRD.

Follow Up

Follow up was done at 1 month and 3 months. There was no loss of follow up found. All of 100 patients were followed up for 1st and 3rd months. In our study majority of patients did not hospitalize during follow up. For 1 month follow up, 36 % patients hospitalized once. For 3 month follow up, 9% patients hospitalized once, and 5% patients hospitalized twice.

Recurrent hospitalizations were more for 1 month follow up than 3 month follow up. Here hospitalization was for intermittent renal replacement therapy. During follow-up we noted that 6% of cases from study group became lifetime depend on renal replacement therapy. Among them most of the patient on maintenance hemodialysis. In each follow-up we investigated patient's renal function test and advised them for low salt diet and maintain proper hydration.

CONCLUSIONS

1. In this study most of the PR-AKI patients were from age group 21-30 years followed by 30-40 years age group. Mean age was 25.113.8 years old.
2. In our study we found prevalence of PR-AKI was 2% among all 1000 patients attending medicine ipd/opd.
3. In this study incidence of CKD was 6% among all 100 PR-AKI patients.
4. Primigravida patients were more affected than multigravida patients. Out of total 100 PR-AKI patients 62 cases were primigravida and 38 cases were multigravida.
5. Most of cases patients were developed into PR-AKI in their postpartum period about 66% followed by 3rd trimester period 24%.7% and 3% PR-AKI cases were associated with 2nd and 1st trimester patients.
6. Most common etiological factor associated with PR-AKI was sepsis 44% that was combination of puerperal sepsis 30% and septic abortion 14%.
7. In our study 2nd most common cause of PR-AKI was PE/E which account 24% (n=24) of all PR-AKI cases. Other causes were APH 11% (n=11), acute diarrheal disease 8% (n=08), HELLP 6% (n=06), P-TMA 5 % (n=05), Pyelonephritis 2% (n=02), AFLP 1 % (n = 1). Rest was associated with ACN 2%(n=2%).
8. In this study the association with etiological factors with PR-AKI cases were found statistically significant and p-value of 0.0001.
9. We found that among all cases 6% cases were land up into CKD during disease and on other hand 6 % cases died. Complete recovery was seen in 88 % of cases.
10. In our study we found relationship between PR-AKI cases and maternal outcomes were statistically significant. Associated p- Value was < 0.05.
11. Among all PR-AKI cases 57% were dialysis dependent during illness. While 6% cases were life-time dependent on renal replacement therapy.
12. Out of all 100 PR-AKI cases 42% patients recovered completely without RRT.
13. In our study p value was 0.0001 for the relation between need of RRT and PR-AKI cases.
- 14.. Based on RIFLE criteria most of the patients classified in Injury and Failure stage of AKI 34% and 33% of all PR-AKI cases respectively. This study was found statistically significant, and p-value was 0.0001.
15. There was 100% recovery among PR-AKI patients those were classified as Risk stage of RIFLE criteria.
16. There was 00% re-recovery among PR-AKI patients those were classified as Loss and ESRD stage of RIFLE criteria.
17. In our study 88% PR-AKI cases were recovered completely.
18. Majority of patients did not Hospitalized during follow up. For 1 month follow up, 36% patients hospitalized once. For 3 month follow up, 9% patients hospitalized once, and 5% patients hospitalized twice.

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