

# MATERNAL AND RENAL OUTCOME OF PREGNANCY RELATED ACUTE KIDNEY INJURY REQUIRING DIALYSIS IN A TERTIARY CARE CENTRE

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## Abstract

**Introduction:** Acute kidney injury (AKI) is a rare complication of pregnancy, but may be associated with significant morbidity and mortality in young and often otherwise healthy women. In a developing countries like Bangladesh due to low resource settings intermittent hemodialysis is the usual mode of renal replacement therapy. It opens up a field of investigation to assess the maternal and renal outcome of pregnancy associated acute kidney injury after getting dialysis.

**Materials and method:** This analytic, descriptive, prospective study was performed over 46 patients with pregnancy associated AKI requiring dialysis during July 2015 to June 2016. Etiology and spectrum of pregnancy related acute kidney injury (PR - AKI) requiring dialysis were assessed and maternal and renal outcome were analyzed.

**Result :** Puerperal sepsis(25, 54.3%) was the most prevalent cause, followed by preeclampsia/eclampsia, (7,15.2%), septic abortion ( 5 ,10.9%), PPH/APH (5 ,10.9%), sepsis with PPH (2 ,4.3%), HELLP syndrome (1 ,2.2%) and sepsis with HELLP (1 ,2.2%)36 (73.3%) patients remained alive and 10 (22.8%) patients expired. HELLP syndrome and maternal mortality was more commonly observed in dialysis requiring group. Delivery at term was more commonly observed in dialysis requiring group and preterm delivery was more common in dialysis not requiring group. 26(56.5%) patients had delivery at term , 15(32.6%) had preterm delivery and abortion was found in 5(10.9%). Renal out come was better in dialysis not requiring group when compared with dialysis requiring group.Complete recovery was found in 19(52.8%) patient at 3 months follow up, 10(27.8%) had partial recovery seven patients remained dialysis dependent. According to the RIFLE criteria,19 patients were in the Injury category and 27 patients were in the Failure category.Relative risk of mortality in Injury is 0.94 and in Failure is 1.05. Multivariate logistic regression analysis showed that RIFLE classification did not discriminate the prognosis ( p value 0.788) in pregnancy associated AKI requiring dialysis.

**Conclusion :** PR- AKI requiring dialysis is associated with high maternal mortality and poor renal outcome.

**Keywords:** Pregnancy related AKI requiring dialysis, Renal outcome, Maternal outcome

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## Introduction

Acute kidney injury (AKI) is one of the most challenging and serious complications of pregnancy. The reported incidence of obstetric AKI in the developed countries is 1-2.8%, while in developing countries it is 9–25%.<sup>1</sup> Pregnancy associated AKI requiring dialysis occurs in approximately 1 in 20,000 pregnancies.<sup>2</sup> The incidence of pregnancy-related AKI in developing countries like Bangladesh is up to 11%<sup>3,4</sup> and this has not changed significantly and continues to remain an important medical problem. Incidence of pregnancy associated AKI requiring dialysis is 3.3% of total AKI cases.<sup>2</sup> 47% of pregnancy associated AKI cases required dialysis.<sup>5</sup> 25% of the referrals to dialysis centers is due to pregnancy related AKI in developing countries.<sup>6</sup> If optimum dialysis can be provided as much as 75% patient can achieve complete recovery of renal function.<sup>2</sup> The main causes of hospital admission are postpartum hemorrhage, preeclampsia and related diseases, and sepsis. The first peak of incidence, during the first trimester, is dominated by infection and illegal abortion in low-resource countries. The second peak occurs during the third trimester and is related to preeclampsia, the hemolysis, elevated liver enzyme, and low platelet count (HELLP) syndrome, acute fatty liver disease of pregnancy, or postpartum hemorrhage. The Endothelial cell injury is the starting point with subsequent vasospasm, platelet activation, unbalanced prostacyclin-thromboxane ratio, and decreased release of endothelium-derived relaxing factor, playing central role in the pathogenesis of several disorders such as preeclampsia, hemolysis, HELLP syndrome, thrombotic thrombocytopenic purpura, hemolytic uremic syndrome, acute fatty liver of pregnancy, and acute renal failure. AKI in pregnancy bears a high risk of development of bilateral renal cortical necrosis and, consequently, of chronic kidney disease. Abruptio placenta, septic abortion, eclamptic toxemia, post-partum hemorrhage (PPH) and puerperal sepsis are the pregnancy related situations responsible for causing renal cortical necrosis.<sup>7</sup> 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. Acute cortical necrosis, usually involves bilateral renal cortex, may occur as a consequence of irreversible or severe ATN. It has been found to be associated with poor renal outcome in longer term. Factors of possible importance for poor prognosis for renal recovery among patient with pregnancy related AKI are prolonged oliguria or anuria, anaemia, jaundice, thrombocytopenia and raised APTT.<sup>8</sup> According to the RIFLE criteria, 19 patients were in the Injury category and 27 patients were in the Failure category. Relative risk of mortality in Injury is 0.94 and in Failure is 1.05. Multivariate logistic regression analysis showed that RIFLE classification did not discriminate the prognosis (p value 0.788) in pregnancy associated AKI requiring dialysis.

## Materials and methods

This observational study was carried in the Department of Nephrology, Dhaka Medical College Hospital during July 2015 to June 2016. A total of 46 patients with pregnancy associated AKI requiring dialysis were admitted or consulted with nephrology department. AKI with requirement of at least one session of dialysis in otherwise healthy female following pregnancy, abortion, delivery of fetus, and related to its complication directly but not from any other cause were enrolled in this study. Twenty patients with pregnancy associated AKI who did not require dialysis were taken for comparison. All relevant information history, clinical examinations and investigations was collected in a pre-designed data collection sheet. The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. Data were analyzed by the chi-square test with SPSS-16 software. A P-value less than 0.05 were considered as being statistically significant.

## Result

46 patients were available for analysis. Majority of the patients aged between 19-35 years, were primi gravida, presented in 3<sup>rd</sup> trimester or during puerperium, within 6 days of renal injury

and 50% patients received irregular antenatal check-up .

Table I shows etiology of pregnancy associated AKI in the study subjects, puerperal sepsis(25, 54.3%) was the most prevalent cause, followed by preeclampsia/eclampsia, (7,15.2%), septic abortion (5 ,10.9%) , PPH/APH (5 ,10.9%) , sepsis with PPH (2 ,4.3%), HELLP syndrome (1 ,2.2%) and sepsis with HELLP (1 ,2.2%).

**Table I**  
*Distribution of the study patients by etiology of pregnancy associated AKI (n=46)*

Etiology of AKI	Number of patients	Percentage
Puerperal sepsis	25	54.3
Preeclampsia/eclampsia	7	15.2
Septic abortion	5	10.9
PPH/APH	5	10.9
Sepsis with PPH	2	4.3
HELLP syndrome	1	2.2
Sepsis with HELLP	1	2.2

Table II showing Comparison of maternal outcome of pregnancy associated AKI between dialysis requiring group and dialysis not requiring group. HELLP syndrome and maternal mortality was more commonly observed in dialysis requiring group.

**Table II**  
*Comparison of maternal outcome of pregnancy associated AKI between dialysis requiring group and dialysis not requiring group*

Maternal outcome	Dialysis requiring group (n=46)	Dialysis not requiring group(n=20)
Hypertension	8	0
Severe preeclampsia	6	13
Eclampsia	1	7
HELLP syndrome	2	0
Expire	10	0

Delivery at term was more commonly observed in dialysis requiring group and preterm delivery was more common in dialysis not requiring group [Table III].

**Table III**  
*Comparison of pregnancy outcome of pregnancy associated AKI between dialysis requiring group and dialysis not requiring group*

Pregnancy outcome	Dialysis requiring group (n=46)	Dialysis not requiring group (n=20)
Delivery at term	26	7
Preterm delivery	15	12
Abortion	5	1

Table IV showing Comparison of renal outcome of pregnancy associated AKI between dialysis requiring group and dialysis not requiring group. Renal outcome was better in dialysis not requiring group when compared with dialysis requiring group.

**Table IV**  
*Comparison of renal outcome of pregnancy associated AKI between dialysis requiring group and dialysis not requiring group*

Renal outcome	Dialysis requiring group(n=36)	Dialysis not requiring group(n=20)
Complete recovery	19	20
Partial recovery	10	0
No recovery	7	0

**Table V**  
*Association of RIFLE classification and mortality in pregnancy associated AKI requiring dialysis*

RIFLE class	Dead (n=10)	Alive (n=36)	Relative Risk	P value
Injury (19)	4	15	0.94	0.78ns
Failure(27)	6	21	1.05	

ns=not significant

P value reached from chi square test

Overall mortality was 21% , there were no significant difference in mortality according to RIFLE class.

### Discussion

Total 51 patient were admitted or consulted for pregnancy related AKI. Six patients lost in follow up. 46 patients were available for analysis. Concerning etiology of pregnancy associated AKI in the study subjects, puerperal sepsis(25, 54.3%) was the most prevalent cause, followed by preeclampsia/eclampsia, (7 ,15.2%), septic abortion (5 ,10.9%), PPH/APH (5 ,10.9%), sepsis with PPH (2 ,4.3%), HELLP syndrome (1 ,2.2%) and sepsis with HELLP (1, 2.2%).Recent study in India showed the most common cause was sepsis, where 25.51% developed sepsis after abortion by local village practitioners or traditional birth attendants, 7.14% after medical termination of pregnancy (MTP) at primary health centers, and 23.46% had puerperal sepsis. Twenty-three (23.46%) developed PAKI following upon antepartum and postpartum hemorrhage, 14.28% after preeclampsia/eclampsia, 4.08% after hemolysis, elevated liver enzymes and low platelet (HELLP) syndrome, and 2.02% had postpartum hemolytic uremic syndrome.<sup>2</sup> In most retrospective studies, preeclampsia eclampsia was reported to be a major cause of AKI during pregnancy. Similarly in Morocco the main cause of AKI associated with pregnancy is PE 66.7%, with eclampsia in 13.5%, and HELLP syndrome in 58.3%.<sup>9</sup> Another study in northern India showed septicemia was present in 41.7%, hypertensive disorders of pregnancy, in 33.3%, hemorrhage, in 13.3% patients, abortion, in 8.3% patients. HELLP syndrome one 1.67% and disseminated intravascular coagulation was reported in 1.67% patients.<sup>10</sup> Similar etiologic distribution was found in a previous study in Bangladesh. This study showed septicaemia 43.0% and eclampsia 19.0% were most common. others causes are PPH, APH, rupture ectopic pregnancy. In 3.0% patients despite all attempt aetiology could not be identified reported by the authors.<sup>11</sup> In this study most patients (73.9%) got up to 10 sessions of dialysis. 7 patients required more than 15 sessions of dialysis during hospital stay. They were dialysis dependent and continued to do

so in their follow up. The average number of dialysis sessions was 6.8, the reason for the relatively smaller number of dialysis sessions was financial, as most of the patients could not afford to keep paying the cost and discontinued after a couple of cycles. In this present study it was observed that 11 patients had prolong duration of oligoanuria for more than 3 weeks despite on dialysis. 3 patient or their attendant did not give consent for renal biopsy , these 3 patient were presumed to have renal cortical necrosis. Renal biopsy was done in 8 patient. at the end 3 month, of those biopsy proven AKI four patient with cortical necrosis remain dialysis dependent, one patient out of three patient with ATN had complete recovery and two had partial recovery. One patient of TIN had complete recovery. Prakash et al. (1995) study reported cortical necrosis in 14.28% of cases<sup>11</sup>. However, in India, Prakash et al. (2007) reported that renal cortical necrosis following obstetrical complication decreased significantly; 4.7% in the 1990s to 0.5% of the total AKI cases, in the 2000s<sup>12</sup>. Postabortal PAKI leading to renal cortical necrosis is rare 1.5% in western countries<sup>13</sup>. Current study showed 36 (78.2%) patients remained alive and 10 (21.8%) patients expired. These patient who died, did so within two weeks of renal insult. HELLP syndrome and maternal mortality was more commonly observed in dialysis requiring group. Previous study in Bangladesh found 31.0% died.<sup>14</sup> Due to improved education system, increased awareness, better transport facility, increased availability of medical services mortality rate has declined. Other studies in Pakistan showed maternal mortality rate was 15.0% and 33.3% respectively.<sup>15,16</sup> Recent study in India reported maternal mortality of 13%<sup>17</sup>. In this study 26(56.5%) patients had delivery at term, 15(32.6%) had preterm delivery and abortion was found in 5(10.9%) . Delivery at term was more commonly observed in dialysis requiring group and preterm delidery was more common in dialysis not requiring group. Krishna et al. observed 98 patients with PAKI, 46.94% had either medical or illegal abortion, 9.18% had preterm delivery and 43.8% had full-term delivery, which is comparable with the current study. In this present study renal out come was

better in dialysis not requiring group when compared with dialysis requiring group. At 6<sup>th</sup> week follow up no patient achieved complete recovery of renal function, 29(80.6%) patients had partial recovery. Seven patient remained dialysis dependent (no recovery). Complete recovery was found in 19(52.8%) patient at 3 months follow up, 10(27.8%) had partial recovery. The difference was statistically significant ( $p < 0.05$ ) between at 6<sup>th</sup> weeks and 3 months follow up. At the end of 3 months seven patients who were dialysis dependent at 6<sup>th</sup> week follow up remained dialysis dependent. Godara et al. (2014) found complete, partial and no renal recovery was observed in 52.64%, 21.05% and 26.31% of the patients, respectively. Rahman et al. (2012) found complete recovery in 63% of total pregnancy related AKI cases and 31.0% died while 6.0% patient has incomplete recovery and dialysis dependency. In India another study found 81.42% surviving patients who were discharged, 54.28% had complete recovery of renal function; 12.85%, partial recovery; and 14.28% required chronic dialysis<sup>18</sup>, which are consistent with the current study. According to the RIFLE criteria, 19 patients were in the Injury category and 27 patients were in the Failure category. Overall mortality was 21%, there were no significant difference in mortality according to RIFLE class. RIFLE classification did not discriminate the prognosis in pregnancy associated AKI requiring dialysis. Possible explanation is that these patients are already gravely ill. Such that RIFLE is no longer able to further discriminate between Risk and Failure class. Future studies with large sample sizes are needed to make more definitive conclusion.

### Conclusion

Pregnancy associated acute kidney injury requiring dialysis was associated with poor outcome. A strikingly large percentage of patients did not fully recover renal function. After surviving an episode of AKI, closer follow up is indicated for high-risk subjects—including those with residual kidney damage—for detection of CKD, and applying relevant measures to slow progression, avert development of cardiovascular disease, and reduce the chances of premature death.

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