

# Acute Kidney Injury in Pregnancy at Jinnah Postgraduate Medical Centre Karachi

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## ABSTRACT

**Aim:** To determine the etiology and outcome of acute kidney injury in pregnant women.

**Study Design:** Descriptive, case series study.

**Place and Duration of Study:** Department of Nephrology, Jinnah Postgraduate Medical Centre, Karachi from 2<sup>nd</sup> August 2018 to 1<sup>st</sup> February 2019

**Methodology:** One hundred and thirty pregnant women with acute kidney injury of age 18-40 years were included. Patients with CKD, hypertension, diabetes mellitus, renal stones and small sized echogenic kidneys were excluded. After taking written consent from each patient, all patients were assessed for etiological factors (antepartum hemorrhage, postpartum hemorrhage, puerperal sepsis, disseminated intravascular coagulation and HELLP syndrome). All patients were given treatment as per the departmental protocol and patient prerequisite. All patients remained in ward till final outcome (complete recovery/progression to chronic kidney disease/maternal mortality) was evaluated.

**Results:** The etiology of ARF in pregnant females was found to be antepartum haemorrhage in 24 (18.46%), postpartum haemorrhage in 41 (31.54%), puerperal sepsis in 35 (26.92%), DIC in 13 (10.0%) and HELLP syndrome in 17 (13.08%) patients. Regarding outcome in these patients, maternal mortality was seen in 07 (5.38%) patients, 89 (68.46%) had complete recovery of renal function and 34 (26.15%) progressed to chronic kidney disease.

**Conclusion:** The postpartum hemorrhage is the most widely recognized reason of acute kidney injury in pregnancy followed by puerperal sepsis.

**Key Words:** Acute kidney injury, Pregnancy, Postpartum hemorrhage

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## INTRODUCTION

Acute kidney injury (AKI) can be characterized as the abrupt loss of renal capacity related with rise in creatinine levels above a known baseline and clearance of nitrogenous wastes, as well as extracellular volume and electrolyte regulation are impaired. AKI is related with expanded mortality, expanded length of hospital stay and monetary expenses.<sup>1,2</sup> In the pregnant populace the occurrence of all AKI cases, including dialysis dependence, is under 1% in the Western world, with diminished recurrence and improved mortality since the 1960s.<sup>3</sup> It is imperative to take note of that epidemiologic information on the rate and prevalence of AKI in pregnancy may fluctuate because of various diagnostic standards and variable cut-off qualities for serum creatinine levels that characterize kidney injury, the absence of creatinine information in this youthful, healthy population, and the inconstancy in identity and socioeconomic class. New instances of pregnancy-related AKI have declined from around 1/3000 to 1/15,000 – 20,000 since the 1960s.<sup>3</sup> Two principle variables might be liable for the general decrease in the frequency of pregnancy-related AKI: improvement in pre-natal care and a diminishing in the pace of illicit, septic fetus removals in developed countries. It is possible that the use of anti-progesterone drugs, such as mifepristone, might have contributed to the declining septic abortion rates, although there is a paucity of data regarding this association.<sup>4</sup>

During pregnancy, AKI can be due to any of the same disorders that affect the general population, such as pre-renal, intrinsic and post-renal causes. In the text that follows, we will review AKI in pregnancy in the context of pre-renal, intrinsic and post-renal etiologies, and will address its presentation and onset with respect to gestational age (i.e., trimester of pregnancy), as this may help to facilitate making a differential diagnosis. Finally, AKI may occur as a new condition, a pre-existing, albeit unrecognized condition, or as a pre-existing condition in cases with normal or impaired renal function. Among conditions that may lead to AKI, and which commonly occur during the 2<sup>nd</sup> and/or 3<sup>rd</sup> trimester, special attention will be given to those disease processes that are unique to the pregnancy state.<sup>5</sup>

Obstetric AKI is usually brought about by septic abortions in early pregnancy and by pregnancy toxemia, antepartum hemorrhage, postpartum hemorrhage and HELLP syndrome in late pregnancy.<sup>4</sup> Its incidence has declined in the developed era to only 1-2.8% due to proper antenatal support and rare cases of abortion with sepsis in these countries.<sup>5</sup> Be that as it may, in the developing nations it is as yet continuous and the rate is near 4.2–15%.<sup>6</sup> High rate in developing nations is for the most part because of restricted inaccessibility of antenatal care and emergency obstetric healthcare facilities.<sup>7</sup> In a study, etiology of ARF in pregnant females was found to be

antepartum haemorrhage in 18.6%, postpartum haemorrhage in 37.2%, puerperal sepsis in 27.90%, DIC in 9.3% and HELLP syndrome in 11.6% patients. Regarding outcome in these patients, maternal mortality was seen in 16.2% patients, 41.4% had full recovery of renal function and 13.9% progressed to chronic kidney disease.<sup>8</sup>

Acute kidney insult during pregnancy can be a risk factor for later kidney disease. As acute kidney injury in pregnant women is escalating in our populace due to quacks and dai handling of the cases. This study will provide the recent statics of the problem and thus help the clinicians to take proper steps in avoiding and proper management of the etiological factors which will improve the outcome of this particular population.

## MATERIALS AND METHODS

This Descriptive, Case series study was done in the Department of Nephrology, Jinnah Postgraduate Medical Centre, Karachi from 2nd August 2018 to 1st February 2019. One hundred and thirty were included. All women with acute kidney injury of any severity and duration  $\leq 48$  hours with age between 18-40 years of gestational age  $\geq 24$  weeks of gestation as assessed on last menstrual period and having parity 0-5 were included in the study. While women with already chronic kidney disease, history of hypertension, diabetes mellitus, renal stone (presence of acoustic shadow on ultrasonography), small size echogenic kidneys (on ultrasonography) and who lost follow up were excluded from the study.

After taking written consent from each patient, all patients were assessed for etiological factors; antepartum hemorrhage, postpartum hemorrhage, puerperal sepsis, disseminated intravascular coagulation and HELLP syndrome. All patients were given treatment as per the departmental protocol and patient prerequisite. All patients remained in ward till final outcome (complete recovery/progression to chronic kidney disease/maternal mortality) was noted. The data was entered and analyzed through SPSS-20.

## RESULTS

Age range in this study was from 18 to 40 years with mean age was  $30.51 \pm 4.29$  years, mean parity was  $3.19 \pm 0.98$  and mean duration was  $26.70 \pm 9.61$  hours. Distribution of patients with respect to stage of acute kidney injury is shown in Table 1. The etiology of ARF in pregnant females was found to be antepartum haemorrhage 24 (18.46%), postpartum haemorrhage 41 (31.54%), puerperal sepsis 35 (26.92%), DIC 13 (10.0%) and HELLP syndrome 17 (13.08%) patients (Table 2). Regarding outcome, maternal mortality was 7 (5.38%), 89 (68.46%) had complete recovery of renal function and 34 (26.15%) progressed to chronic kidney disease (Table 3). Stratification of outcome according to duration of AKI and stage of acute kidney injury are shown in Tables 4-5.

Table 1: Frequency of stage of acute kidney injury

Stage	No.	%
I	43	33.08
II	47	36.15
III	40	30.77

Table 2: Frequency of etiology of acute kidney injury

Etiology	No.	%
Antepartum hemorrhage	24	18.46
Postpartum hemorrhage	41	31.54
Puerperal sepsis	35	26.92
DIC	13	10.0
HELLP syndrome	17	13.08

Table 3: Frequency of outcome

Outcome	No.	%
Complete recovery	89	68.46
Progression to CKD	34	26.15
Mortality	7	5.38

Table 4: Comparison of outcome according to duration of acute kidney injury

Variable	0-24 hours (n=45)	25-48 hours (n=85)	P value
Complete recovery			
Yes	26	63	0.056
No	19	22	
Progression to chronic kidney disease			
Yes	16	18	0.076
No	29	67	
Mortality			
Yes	3	4	0.637
No	42	81	

Table 5: Comparison of outcome according to stage of acute kidney injury

Variable	Stage I (n=43)	Stage II (n=47)	Stage III (n=40)	P value
Complete recovery				
Yes	35	28	26	0.072
No	8	19	14	
Progression to chronic kidney disease				
Yes	6	19	9	0.014
No	37	28	31	
Mortality				
Yes	2	-	5	0.0001
No	41	47	35	

## DISCUSSION

The frequency of pregnancy related acute kidney injury (PR-AKI) has diminished extraordinarily overall during the previous 50 years, most likely because of progress of obstetric and prenatal care as well as decline in rate of illegal abortion.<sup>9</sup> Anyway as of late, the pace of PR-AKI seems, by all accounts, to be on the ascent even in some developed countries.<sup>10</sup> Even though the incidence of PR-AKI has been decreasing, it remains a serious issue due to its relation with significant adverse maternal and fetal outcomes.<sup>11,12</sup> The rates of maternal mortality and fetal misfortune in patients with PR-AKI have ascended to 30 and 60%.<sup>13,14</sup> Previously, AKI was viewed as a totally reversible syndrome<sup>13</sup>, nonetheless, lately, a few examinations have shown that AKI may build the danger of creating chronic kidney infection (CKD), bringing about permanent kidney harm.<sup>14</sup>

Age range was from 18 to 40 years with mean age of  $30.51 \pm 4.29$  years. Majority of the patients 73 (56.15%) were between 31 to 40 years of age. In this study, the etiology of ARF in pregnant females was found to be antepartum haemorrhage in 24 (18.46%), postpartum haemorrhage in 41 (31.54%), puerperal sepsis in 35

(26.92%), DIC in 13 (10.0%) and HELLP syndrome in 17 (13.08%) patients. Regarding outcome in these patients, maternal mortality was seen in 7 (5.38%) patients, 89 (68.46%) had complete recovery of renal function and 34 (26.15%) progressed to chronic kidney disease. In a study, etiology of ARF in pregnant females was found to be antepartum haemorrhage in 18.6%, postpartum haemorrhage in 37.2%, puerperal sepsis in 27.90%, DIC in 9.3% and HELLP syndrome in 11.6% patients. Regarding outcome in these patients, maternal mortality was seen in 16.2% patients, 41.4% had complete recovery of renal function and 13.9% progressed to chronic kidney disease.<sup>8</sup> In a study from India, 10 of 57 pregnant women enrolled in the study, developed ARF, 40 after delivery, and seven after abortion. Of all patients, 19.3% developed acute kidney failure in the first trimester, 10.5% in the second, and 70.2% during the peripartum period. Sepsis caused by abortion at the hands of non-specialists was reported as the most common reason of PR-ARF following abortions. Most of the patients received hemodialysis (HD) or peritoneal dialysis (85%). The death rate of PR-ARF was 28.1%. Forty-one patients survived of whom 24 recovered fully, five had partial recovery of kidney function, and five received kidney transplants, and there were no follow-ups for nine remaining patients. In the few patients who had renal biopsy patients, renal histopathology revealed acute tubular necrosis and renal cortical necrosis as well as acute interstitial nephritis.<sup>15</sup>

Sivakumar et al<sup>16</sup> reported that out of 1,353 cases with ARF seen between 1999 and 2009, 59 (4.36%) were pregnancy-related (with average age of 25 years). The prevalence rates of ARF during different trimesters pregnancy were as follows: 1.7% in the first trimester, 6.7% in the second trimester, 16.9% in the third trimester, and 74.6% in the postpartum period. 52.3% of all patients required dialysis treatment. Full recovery occurred in 54.2% of patients, 10.2% made a partial recovery, and 23.7% expired. In this study, the most common causes of ARF were septic abortion (47.4%) during the first half, and preeclampsia (30.5%) and placental abruption (18.6%) in the second half of pregnancy.

In another study from India, the prevalence rate of ARF was found to be 8% in the first trimester, 50% in the second, and 42% in the third trimester. Among the most common causes of PR-ARF were puerperal sepsis (40%), pregnancy-induced hypertension (28%), and retained products of conception (42%). Common laboratory findings were 24 h urinary protein (52%), metabolic acidosis (22%), anemia (78%) and leukocytosis (64%). Thirty three patients required HD.<sup>17</sup>

Godara et al<sup>18</sup> studied the clinical profiles and outcomes of pregnancy-related to ARF in 57 patients with average age of 26. Oliguria and high serum creatinine levels were the diagnostic markers for the disease. Patients were 56.1 % multigravida and 43.9 % primigravida. From the 57 patients, 59.6 % developed ARF during the puerperal period, and their primary clinical signs were fever, anuria, oliguria, peripheral edema, and vaginal bleeding. The most common causes of PR-ARF were puerperal sepsis (36.6%) and preeclampsia/eclampsia (33.3%). Renal biopsies revealed renal cortical necrosis.

Another study reported that out of 752 patients with ARF, 27 developed it during postpartum. In these cases, plasma creatinine levels had increased significantly during the 2nd and 3rd day after delivery. Sepsis was identified as the main cause. Antepartum and PPH also played an important role such that anemia was among the most significant clinical signs. During hospitalization, 29.6 % of patients needed HD. 18.5 % of patients expired; 80% of which died from sepsis and one patient died from postpartum hemorrhage.<sup>19</sup>

Krishna et al<sup>20</sup> studied 98 out of the 2890 patients with PR-ARF who visited the nephrology center from 2006 to 2011. The average age was 28 years and all of them required at least once dialysis session. 79.6% of patients were multiparous, and 56.1% developed PR-ARF during their third trimester. Sepsis was reported as the most common cause (56.1%). 18.4% of the subjects expired; sepsis was the cause of mortality in 13 patients, and risk of death was higher in patients with oliguria, sepsis, and involvement of the nervous system. Multiple dialyses were required in 75.5% of cases, and kidney biopsy was performed on 16 patients. Cortical necrosis was observed in eight cases, two cases had cortical necrosis alongside with thrombotic microangiopathy, and in six cases biopsy showed acute tubular necrosis.

Liu et al<sup>21</sup> reported 22 ARF pregnancy-related cases from 18,589 patients who had visited the nephrology centers from 2004 to 2013. Their average gestational age was 32 weeks, and 20 patients were primiparous; 72.4% experienced renal failure in the third trimester of pregnancy, and 77.3% of the patients were from rural areas and with no regular prenatal care. Hemorrhagic shock (31.8%) and preeclampsia (18.2%) were among the main causes of PR-ARF, and the most significant clinical signs were edema, hypertension, fever, anuria, oliguria, DIC, and increased blood uric acid levels.

From 2006 to 2007, Khanal et al<sup>22</sup> collected information on 50 patients with PR-ARF with an average age of 29 years. 17.5% of patients were multiparous. Most common causes of the disease were antepartum and PPH, preeclampsia/eclampsia. Overall, 50% of the patients became dialysis-dependent; of the remaining 50%, 7%, and 5.5% made a full or partial recovery, respectively. Rafiq et al<sup>23</sup> studied the hemostatic changes in 40 patients with PR-ARF during one year. The average age of patients was 33. Clinical manifestations included paleness, hemorrhage, fever, anuria, oliguria, petechiae and edema. Diarrhea, vomiting, and APH were identified as the causes of the disease.

In another study, Chaudhri et al<sup>24</sup> examined 345 patients with ARF who visited the nephrology centers during 2009-2010. Of these, 51 patients with average age of 28 had PR-ARF. Out of these patients, 88.2% were multiparous, and 90.2% developed PR-ARF in the third trimester. Sepsis was found to be the most common cause (64.7%). The highest serum creatinine level was 25.9 mg/dL. Metabolic acidosis, thrombocytopenia, sepsis, respiratory alkalosis, hyperkalemia, oliguria, hypotension, and paleness were observed. In this study, 3.9% of patients recovered partially, 7.8% did not recover at all, and 33.3% were lost to follow-up.

Srinil et al<sup>25</sup> reported on 44 patients with PR-ARF caused by septic abortion 52.2% of the patients were multiparous, and 54.5% had abortion in the first trimester. Most common findings were abdominal pain (36.4%) and vaginal bleeding (36.4%). Fever, anemia, oliguria/anuria, and azotemia were also seen in the patients of whom, 38.6% needed dialysis. The mortality rate among this group was 9%. Kadimova<sup>26</sup> studied 250 patients with PR-ARF during 2009-2011. 45.8% of the patients developed the disease in the first trimester, 33.3 % in the second, and 20.9% in the third trimester. Acute pyelonephritis, renal hydronephrosis, and eclampsia were the most common causes of PR-ARF.

Rashid et al<sup>27</sup> reported that from the 210 ARF patients who were admitted during 2010 to 2011, 40 had PR-ARF. Of these, 55% were multiparous, 15% developed renal failure in the first trimester, 15% in the second, and 70% in the third trimester or after delivery. In this study IUD, puerperal sepsis, septic abortion, PPH, and DIC were among most common causes of PR-ARF. 85% of the patients received HD; 20% made a full recovery and 32% did not recover at all. Mortality was reported to be 30%.

In a study in Hyderabad, in 56 patients with an average age of 21-30 who entered the study from 2011 to 2011; 27% were primiparous. Eleven percent of the patients developed the disease in the first trimester, 18% in the second, 33 % in the third trimester, and 38% in the puerperal period. Anuria and oliguria were seen. Antepartum and PPH (41%) and septicemia (21%) were the most common causes of PR-ARF. 43% of patients received HD, and 43% made full recovery. Mortality rate was at 43%.<sup>28</sup>

Erdemoglu et al<sup>29</sup> reported on 75 women with pregnancy associated AKI. The age range was 21-46 years, and 36% of the cases were seen in the post-partum period. Pregnancy-related AKI was caused by sepsis in 14.6%, toxemia of pregnancy in 75.2%, hemorrhage in 12% and post-abortion sepsis in 14.6% of the cases. Dialysis was needed in 33.3% of the patients, and the maternal mortality rate was 10.6%. Najjar et al<sup>30</sup> in their study on 569 cases of pregnancy-related AKI reported that septic abortion (50%), APH (15%), toxemia of pregnancy (15%), acute gastroenteritis (7.5%), PPH (5%), acute pyelonephritis (5%) and post-partum AKI (2.5%) were the common causes. Dialysis was needed in 60% of the cases, and the mortality rate was 20%.

## CONCLUSION

Postpartum hemorrhage is the most well-known reason for acute kidney injury in pregnancy followed by puerperal sepsis. Along these lines, we suggest that legitimate strides in maintaining a strategic distance from and appropriate administration of the etiological elements ought to be taken to improve the result of this specific populace.

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