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Original Research Article

A study of AKI in pregnancy and puerperium

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ABSTRACT

Pregnancy related acute kidney injury is a common occurrence and is associated with substantial maternal mortality and morbidity in developing countries. The incidence of pregnancy related acute kidney injury in developing countries from 4% to 36%; it varies widely across the world. Acute kidney injury in pregnancy bears a high risk of bilateral cortical necrosis and consequently chronic renal failure. Study aimed to evaluate the preventable causes, contributing factors responsible for pregnancy related acute kidney injury and to assess the outcome of patients with pregnancy related acute kidney injury during pregnancy and puerperium.

1. Introduction

Acute kidney injury is rare in women during pregnancy and puerperium; however, it is related to increased morbidity and mortality rates. The incidence of acute renal failure during pregnancy has declined in both developed and developing countries. The incidence of pregnancy related acute kidney injury in developing countries from 4% to 36%,[1] it varies widely across the world, with reported incidence of 1 in 20,000 pregnancies in developed countries.[2]

Although the etiology of PR-AKI varies based on the country of origin, in most regions, including low income countries, preeclampsia & eclampsia account for 5 to 20% of cases.[3] Other major causes in developing countries include sepsis, severe hemorrhage, whereas primary renal disease, thrombotic microangiopathy & acute fatty liver of pregnancy are more common in developed nations.[4] Pregnancy also unmasks underlying primary renal disease or modifies the course of preexisting renal disease.

Acute kidney injury in pregnancy bears a high risk of bilateral renal cortical necrosis and consequently chronic renal failure.

Study aimed to evaluate the contributing factors responsible for pregnancy related acute kidney injury and to assess the outcome of patients with pregnancy related acute kidney injury during pregnancy and puerperium.

2. Materials and Methods

The present study was a prospective observational study of patients with obstetric complications leading to acute kidney injury admitted in obstetrics and gynaecology department of government Rajaji Hospital for a period of one year from august 2018 to September 2019. Ethical approval was obtained from ethical committee. This study was done with the objective to assess the causes leading to acute kidney injury during pregnancy and puerperium and their outcome.

Pregnant women who were included in the study were those who were healthy previously and had developed acute kidney injury-1. Increase in serum creatinine $\geq$0.3mg/dl within 48 hrs. 2. Increase in serum creatinine $\geq$1.5 times from baseline 3. Oliguria (urine output<0.5 ml/kg/hr.) for 6 hrs. Due to pregnancy related complications.

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2.1. Exclusion criteria

1. Evidence of renal disease prior to pregnancy.
2. History of renal stone disease and end stage renal disease.
3. Previous urology surgery.
4. History of reflux nephropathy.
5. Renal scarring on ultrasonography.
6. Small size of the kidneys.
7. Elevated serum creatinine prior to gestation.

Patients were analyzed on the basis of demographic data, detailed history, clinical presentation and laboratory investigations included urine analysis, blood biochemistry, and hemogram with peripheral smear. Sepsis screening including bacterial culture sensitivity on blood, urine and vaginal swabs, workups for disseminated intravascular coagulation, serum complements, anti-nuclear and anti-cytoplasmic antibodies was done whenever required. The indications for renal biopsy were persistent renal failure more than three weeks and features suggestive of underlying renal disease. Each patient underwent complete obstetric examination. Specific inquiries were conducted regarding the mode of delivery, need for blood transfusion and surgical intervention.

2.2. Statistical analysis

Descriptive statistics like mean and percentages were used to interpret the data with the help of Microsoft office.

3. Results

A total of 9921 patients were admitted in the department of obstetrics and gynaecology for a period of one year. Of the 606 cases of AKI 18 patients were having acute kidney injury during pregnancy and puerperium. The incidence of acute kidney injury was 3% in our study. Mean age of the patient was 27 years (Figure 1).

Table 1: Distribution according to parity of patients

Parity	No of patients	Percentage (%)
Primigravida	5	28%
Multigravida	13	72%

Out of 18 patients 5 were Primigravida (28%) and 13 patients were Multigravida (72%).

Table 2: Distribution according to stages of pregnancy and puerperium

Stages of pregnancy	No of patients	Percentage (%)
First trimester	1	6%
Second trimester	2	11%
Third trimester	8	44%
Puerperium	7	39%

8 patients (44%) presented in third trimester, 2 patients (11%) presented in second trimester, 1 patient (6%) in first trimester and 7 patients (39%) presented in puerperium.

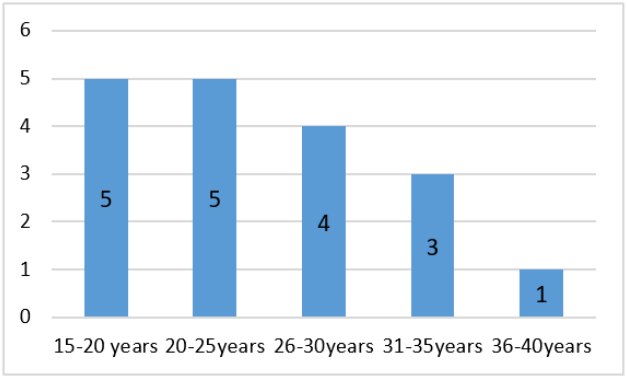

Fig. 1: Distribution according to the age of the patients

Table 3: Distribution according to clinical profile of the patients

Features	No of patients	Percentage (%)
Oliguria	13	72%
Edema	8	44%
Fever	7	39%
Jaundice	3	17%
Protienuria	8	44%
Anemia	12	67%
Thrombocytopenia	10	56%
Leucocytosis	7	39%
Disseminated intravascular coagulation	4	22%

13 Patients presented with symptoms of Oliguria (72%), 12 patients presented with anemia (67%),10 patients presented with thrombocytopenia (56%).

Table 4: Distribution according to the mode of the delivery of the patient

Mode of delivery	No of patients	Percentage (%)
Spontaneous expulsion	2	11%
Labour natural	4	22%
Hysterotomy	1	6%
LSCS	10	55%
Laparotomy	1	6%

4 patients (22%) delivered vaginally, 10patients (55%) had undergone lower segment cesarean section, 2 patients (11%) delivered by spontaneous expulsion, 1 patient (6%) had undergone Laparotomy for ruptured ectopic pregnancy

In terms of causes leading to acute kidney injury in pregnancy and puerperium was 7 patients(39%) had pre-eclampsia/eclampsia/HELLP syndrome, 4 patients (22%)

Table 5: Distribution according to causes leading to AKI

Causes of AKI	No of patients	Percentage (%)
Pre-eclampsia/eclampsia/HELLP syndrome	7	39%
Acute fatty liver of pregnancy	4	22%
Ante partum hemorrhage	4	22%
Hemorrhagic shock	2	11%
SEPSIS	1	6%

had acute fatty liver of pregnancy, 4 patients (22%) had ante partum hemorrhage, 2 patients (11%) had hemorrhagic shock and 1 patient had septicemia. Overall hypertensive complication disorders in pregnancy and puerperium accounted for 39%.

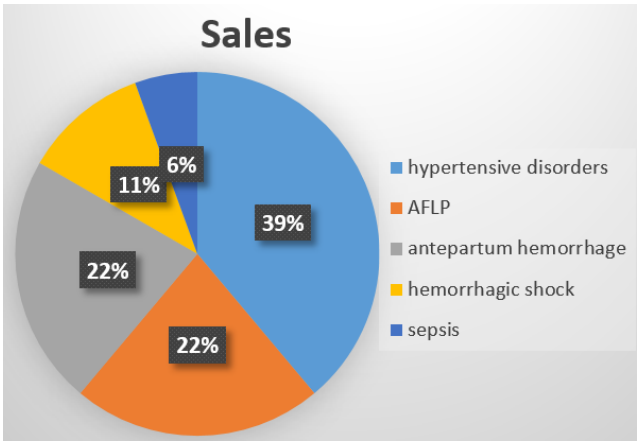

Fig. 2: According to the causes of AKI

Table 6: Distribution according to the outcome of the patients

Outcome of the patients	No of patients	Percentage (%)
Recovered	11	61%
Un recovered	1	6%
Death	6	33%
Loss of follow up	-	-

11 patients (61%) had recovered completely with kidney function tests coming back to normal limits.1 patient (6%) did not recover completely ending up into chronic renal failure. 6 patients (33%) were died.

Table 7: Distribution according to the patient's undergone dialysis

Patients undergone dialysis	No of patients	Percentage (%)
Hemodialysis	6	33%
Plasmapheresis	2	11%

Patients required Hemodialysis (33% 2 patients required Plasmapheresis (11%).

Table 8: Distribution according to causes of mortality

Causes of AKI	No of patients died	Percentage (%)
Pre-eclampsia/eclampsia/HELLP syndrome	1	16%
Acute fatty liver of pregnancy	2	33%
Ante partum hemorrhage	-	-
Hemorrhagic shock	2	33%
SEPSIS	1	16%

Out of 18 deaths 6 were died. Cause of death in 2 patients (33%) was acute fatty liver pregnancy, 2 patients (33%) was hemorrhagic shock, 1 patient (16%) was Hypertensive disorder, and 1 patient (16%) was due to sepsis.

Table 9: Distribution according to fetal outcome

Fetal outcome	Number	Percentage
Intrauterine death	4	22%
Live baby	12	67%
Intrauterine growth retardation	2	11%

Intrauterine death accounts for 4(22%).live baby accounts for 12(67%).

4. Discussion

AKI in pregnancy is a serious complication, involving the prognosis of mother and child. Incidence of obstetric AKI in the developed countries is 1 to 2.8%, and in the developing countries, it remains at 4% to 36%. Lower incidence in developed countries is due to adequate antenatal care, early diagnosis and management of complications. Inadequate antenatal care is a major factor leading to high incidence in developing countries.

Our study reported an incidence of 3%. This is lesser than studies done by Vineet et al,[5] Goplani et al[6] who reported an incidence of 9.12%, 9.06% respectively. Mean age of patients in this study was 27±4.2 years, while most of the study showed mean age of 26-30 years. The causes of AKI in pregnancy are usually due to Hyperemesis gravidarum, Septic abortion in early pregnancy and Pre-eclampsia, HELLP, Acute fatty liver of pregnancy, Antepartum hemorrhage and postpartum hemorrhage and sepsis in late pregnancy and puerperium.

Hypertensive disorders (39%) of pregnancy were the most common cause of AKI. This is contrast to study done by Goplani et al[6] in which the cause of acute kidney injury was obstetric hemorrhage. Pre-eclampsia related AKI was seen in 17% among which 11% presented with eclampsia.

Pre-eclampsia affects approximately 5% of pregnancies. This is the commonest cause of AKI in developed countries. Studies showed the incidence of HELLP syndrome varying from 3% to 40%, it was seen 22% in our study. HELLP syndrome was described by Weinstein in 1982, as a serious complication of severe pre-eclampsia. About 10-46% of pregnant women with AKI associated with HELLP syndrome need dialysis. Perinatal mortality rate ranges between 7% and 34% depending on gestational age and maternal disease severity.

Acute fatty liver pregnancy was seen in 22% of AKI cases. The incidence approximates 1 in 10000 pregnancies. Patient presents with symptoms of Persistent nausea, vomiting, epigastric pain and progressive jaundice. Perhaps half of affected women have hypertension, Proteinuria, hypoalbuminemia, hypercholesterolemia, and prolonged clotting times. Hypoglycemia is common, hepatic encephalopathy, coagulopathy; renal failure develops in half of the women. Mortality rate of 7% and perinatal mortality rate of 15% in acute fatty liver of pregnancy.

Ante partum hemorrhage related AKI accounts for 17% of cases. Commonest causes include placenta previa (6%) and abruption (11%), the risk of renal injury with abruption is magnified when pre-eclampsia coexists. Most cases of AKI are reversible. Irreversible acute cortical necrosis encountered in pregnancy associated with abruption.

We found more cases in late pregnancy and puerperium (83%) which is similar to study done by Goplani et al. 80%,[6] Ansari et al. 86%.[7] In India who reported 59.7% of patients of AKI in early pregnancy. This major change appears to be due to legalization of abortion. Multigravida (72%) is most commonly affected. In contrast to other studies where multigravida constituted 56.14%. We reported complete recovery in 61% of patients. This is similar to study done by Vineet et al,[5] Goplani et al[6] who reported complete recovery in 55%, 54/% of patients respectively.

We reported maternal mortality of 33%. This is similar to study done by Chaudhri et al,[8] this is contrast to study done by Khalil et al.[9] Fetal loss in our study was 22% which is contrast to Ansari et al[7] study where fetal loss is 58%. Requirement of hemodialysis was seen in 33% against 74% to Ansari et al[7] study. Prakash showed changing trends in pregnancy related acute renal failure over 20 years, where the incidence dropped to 10% from 15%, pre-eclampsia-eclampsiato 14.4% from 23% and maternal mortality to 6.4% from 20%.[10]

AKI in pregnancy is preventable and timely, aggressive management of obstetrical complications will reduce its incidence.

5. Conclusion

Obstetric AKI is still a critical situation in developing countries and rare entity in developed countries. Maternal mortality has decreased but hypertensive complication disorder (pre-eclampsia / eclampsia /HELLP) still accounts for causes of majority cases. There will be dramatic decrease in irreversible renal damage due to obstetric complications in developing countries like India. Early diagnosis and management of hypertensive disorders during pregnancy and puerperium prevents hypertensive disorders complication.

6. Source of Funding

None.

7. Conflict of Interest

None.

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