IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 11 Ser.3 (November. 2019), PP 07-16
www.iosrjournals.org

Observational Study of Pregnancy Related Acute Kidney Injury in Obstetrics

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Aim and objectives*: to study acute kidney injury in pregnancy due to obstetric causes*
Methods: *It is prospective study done in 36 patients in the department of Obstetrics and Gynaecology from August 2016 to December 2018 who presented with acute kidney injury related pregnancy.*
Results: *The incidence of PRAKI in our study is 2/1000 deliveries. The main cause of AKI in pregnancy is preeclampsia and its complications (47.22%) followed by sepsis. The chief presenting symptoms is oliguria (86.11%). The Mean time of resolution of AKI is 16 days. The mean number of haemodialysis sessions required are 6. Most of them (82.85%) could recover partially whereas a complete recovery of renal injury is seen in 17.14% of patients. Maternal Mortality was 2.775 and perinatal mortality was 66.66%.*
Conclusion:
Eventhough the incidence of pregnancy related acute kidney injury is coming down in developing countries like India, but still it is one of the cause for maternal and fetal morbidity and mortality. The leading cause of PRAKI is preeclampsia and its complications followed by sepsis and postpartum haemorrhage. A majority of patients recovered partially whereas few patients could recover completely. A good antenatal care and timely detection and management of complications of pregnancy can reduce the morbidity and mortality to the mother and baby.

Date of Submission: 24-10-2019 Date of Acceptance: 09-11-2019

I. Introduction

The incidence of pregnancy related acute kidney injury has decreased in the developed world from 1 in 3000 to 1 in 15 – 20,000 due to legalization of abortion and a better access to prenatal care[1]. However, Pregnancy Related Acute Kidney Injury (PRAKI) is still frequent in developing countries; the incidence is around 4.2–15%. Pregnancy is still responsible for 15 - 20 % of referrals to dialysis centres in developing countries[2]. In less developed nations, though, rates of acute kidney injury related to septic abortion and other infectious and hemorrhagic complications continue to be high[3]. Pregnancy Related Acute Kidney Injury (PRAKI) is diagnosed, when there is sudden onset oliguria (Urine output <400 ml in 24 hrs) or anuria with serum creatinine elevated to > 1.5mg[4]. given that a normal baseline serum creatinine level in pregnant patients is approximately 0.5 mg/dl, a rise to a level greater than 1.0 mg/dL over 48 hours, or an increase of more than 0.5 mg/dL from baseline over that same length of time, should trigger evaluation for AKI[6]. Development of AKI during pregnancy usually follows a bi-modal distribution with two incidence peaks [5] .i. Early pregnancy-Hyperemesis gravidarum , Septic abortion . ii. Late pregnancy-PIH and its complications such as HELLP Syndrome, Hemolytic Uremic Syndrome (HUS), Acute fatty liver of pregnancy, Antepartum Hemorrhage (APH), Post partumhemorrhage(PPH) and Sepsis [6,7]. Early dialysis is necessary in pregnant women with renal failure diagnosed by RIFLE criteria and should be considered when the serum creatinine reaches 3.5 mg/dl or the glomerular filtration rate (GFR) is less than 20 ml/min or blood urea nitrogen is more than 100mg/dl. The long term effects of AKI in pregnancy include Chronic Kidney disease and end Stage Kidney Disease requiring Dialysis.

II. Aims & Objectives

- To Study the Clinical profile and outcome of Patients presenting with Pregnancy related Acute Kidney Injury.

III. Methodology

MATERIALS AND METHODS

The study was done in patients presenting with pregnancy related acute kidney injury to the Department of Obstetrics and Gynaecology in Gandhi Hospital, Secunderabad during the period of August 2016 to December 2018, in association with the Department of Nephrology, Gandhi Hospital.

INCLUSION CRITERIA:

1. Pregnant women presenting with PRAKI to the department of Obstetrics and Gynaecology, AKI was diagnosed based on AKIN/RIFLE criteria.
2. Postpartum women presenting with acute kidney injury**.**

EXCLUSION CRITERIA:

Women with known renal dysfunction

1. Chronic Kidney Disease due to HTN/DM
2. Renal stones
3. UTI
4. Connective tissue disorders like Lupus nephritis

PATIENT AND METHODS:

Study Design: This is an observational study.

TYPE OF STUDY: Observational study.

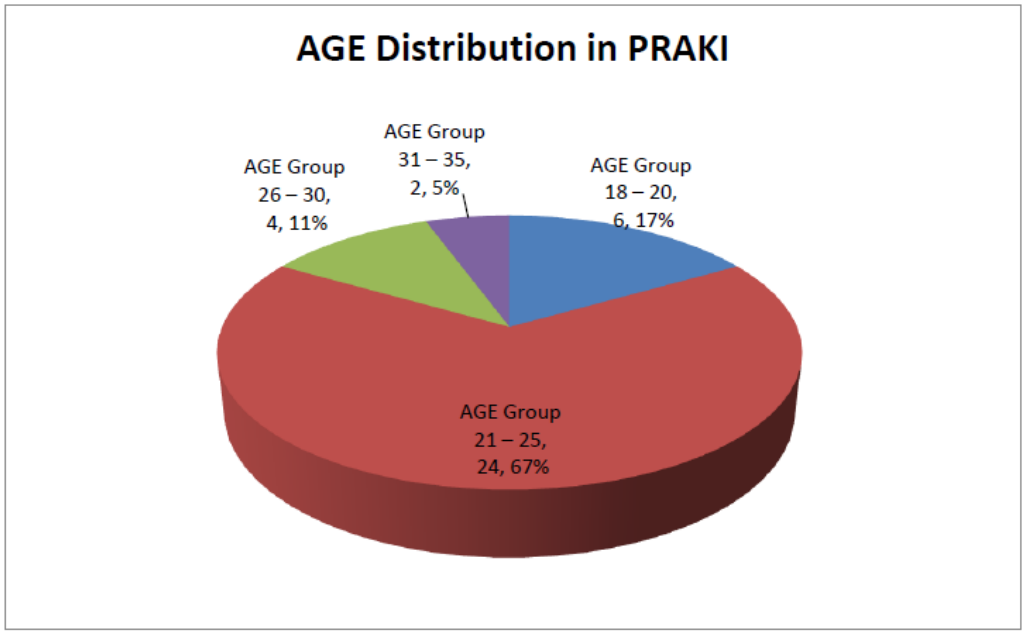
This observational study includes all the pregnant and postpartum patients with complaints of decreased urine output and increased serum creatinine. Patients with pre existing renal disease or renal insufficiency before pregnancy were excluded. Data was collected from Case sheets, clinical examination, lab investigations which includes parity, gestational age, presenting complaints, general examinations, obstetric examination. Past history of pre eclampsia and specific laboratory values along with epidemiological parameters like age, socio economical status, provision and utilization of antenatal care. The main clinical features like oliguria(< 400 ml/day), Anuria (< 100ml/day), Head ache, Vomitings, seizures, pedal edema were elicited. All patients were examined for important signs like state of consciousness, pallor, icterus, dehydration, temperature, pedal edema and its grading, BP recording. Respiratory system examination was done to note the presence of any additional sounds like crepitations or decreased breath sounds and abdominal examination to look for ascites. Obstetrical examination was done to assess the fetal growth, gestational age, presentation, amount of amniotic fluid, fetal heart beat recording. Intra Uterine Growth Restriction and oligohydramnios was noted in many cases of severe pre eclampsia, tense and tender uterus seen in cases of abruption. Fetal well being assessed by fetal heart rate monitoring and Non Stress Test Vaginal examination was done to know whether the patient was in labour or not. Laboratory investigations were done – Complete blood picture, Complete urine examination, Protenuria by dipstick method, Renal function test like blood urea, Serum creatinine, Serum electrolytes, Liver function test. Based on the changes in serum creatinine or urine output or both patients was diagnosed as having acute kidney injury and classified as according to RIFLE/AKIN criteria. Pregnancy was terminated either by vaginal delivery or by caesarean section by taking all the above data and co – morbid illnesses into consideration. Additional support was given in the form of blood and blood products like packed cells, whole blood, fresh frozen plasma, random donor platelets to the patients with abruption, HELLP, severe anemia and PPH. Input and output of fluids, the renal function in terms of urine output and daily serum creatinine levels are monitored. Perinatal outcome was also noted in terms of APGAR score and baby weight needed for NICU admission and outcome of the baby in NICU. A trial of fluid challenge is helpful to differentiate pre renal and intrinsic causes of AKI. Fluid challenge was given with 500 ml of isotonic saline administered over 20 minutes in cases with hypovolemia, serum creatinine levels of 1 – 1.36 mg/dl after ruling out (pulmonary edema) fluid overload conditions. Pueperal women with AKI are also evaluated. Nephrologist consultation was sought when there was Anuria, fluid overload, no response to fluid challenge or diuresis in the form of improvement in urine output, when there was derangements in the renal parameters including blood urea, serum creatinine, serum electrolytes and acidosis.

Renal replacement therapy in the form of haemodialysis was done as per the nephrologist advice. Indications for renal replacement therapy are

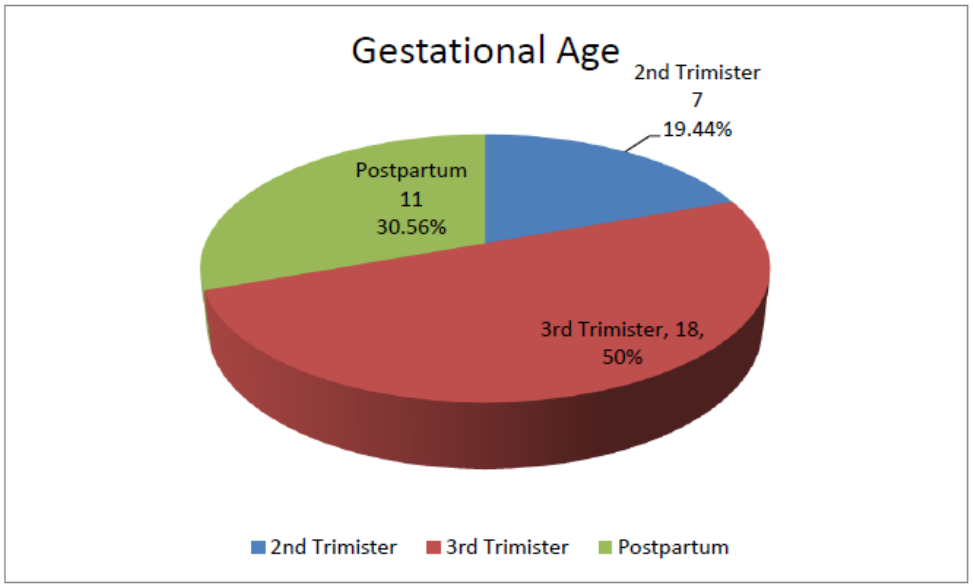
1. Anuria (the absence of urine or UO < 100ml/day
2. Hyperkaelemia (Serum K+ > 5.5meq/l)
3. Severe metabolic acidosis (PH <7.35 and HCO3)
4. Pulmonary edema
5. Uraemic encephalopathy
6. Uraemic peri carditis. Renal improvement is noted .The number of sessions of haemodialysis, duration of stay in hospital, renal recovery (complete or partial) was also noted. Serum creatinine of < 1mg/dl and creatinine of > 1mg/dl was taken as a criteria for complete or partial recovery respectively. Patients with complete and partial recovery with haemodialysis were discharged after improving their general condition and they were advised to report after one month for regular followup, to reclassify them as case of complete recovery or chronic renal failure.

IV. Results

TABLE – 1 – AGE



The mean age of patients our study was 23.08 ± 3.9 years of which the most common age group were 21 – 25 years.

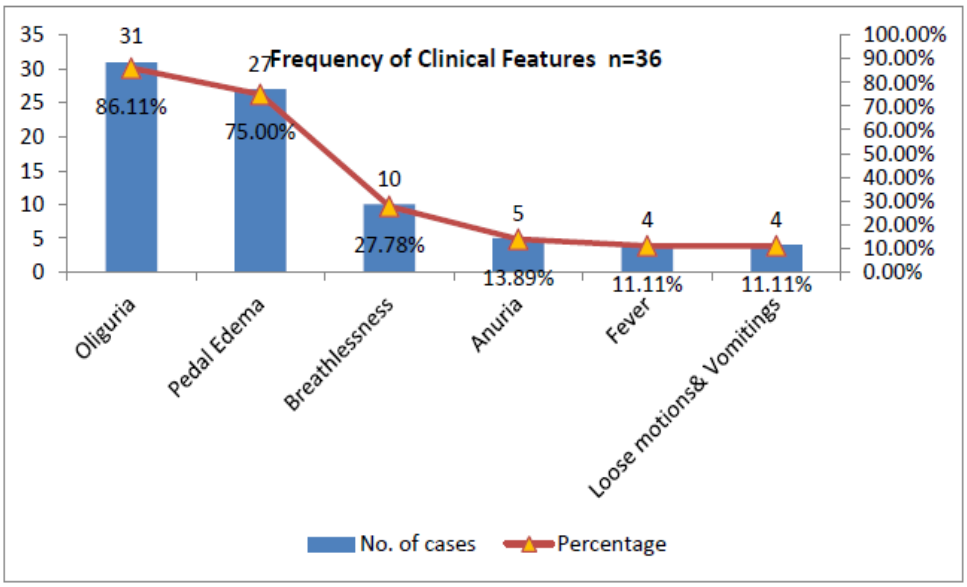


In Present study PRAKI was more common in the third trimester (n=18, 50%) , while 11(30.56%) presented in the postpartum, remaining cases in our study were in the second trimester 7 (19.44%).

TABLE – 5

CLINICAL FEATURES

Clinical Feature	No. of cases	Percentage
Oliguria	31	86.11%
Pedal Edema	27	75.0%
Breathlessness	10	27.78%
Anuria	5	13.89%
Fever	4	11.11%
Loose motions& Vomitings	4	11.11%

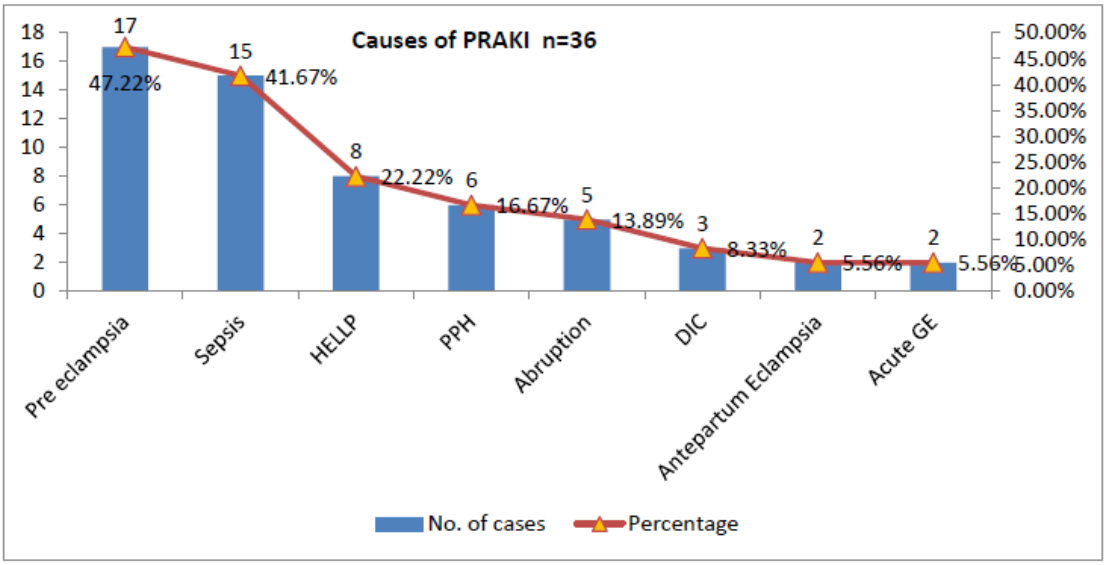


In my study the main clinical features at presentation included oliguria in 31 cases (86.11%), Breathlessness 10 cases (27.78%). Patients had > 1 presenting symptom in association with oliguria and anuria.

TABLE – 6

CAUSES OF PRAKI

Causes	No. of cases	Percentage
Pre eclampsia	17	47.22%
Sepsis	15	41.67%
HELLP	8	22.22%
PPH	6	16.67%
Abruption	5	13.89%
DIC	3	8.33%
Antepartum Eclampsia	2	5.56%
Acute GE	2	5.56%

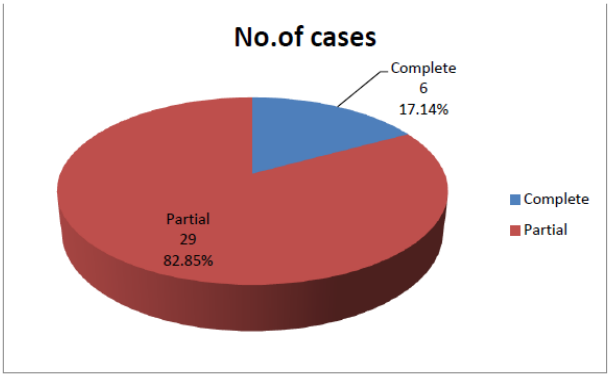


The main etiology of PRAKI in my study was pre eclampsia with 17 cases (47.22%) , followed by sepsis with 15 cases (41.67%) and 8 cases(22.22%) were with HELLP syndrome. Some patients had > 1 causative factor for AKI.

TABLE – 8

RECOVERY OF PRAKI

	Complete	Partial
No.of cases	6	29
Percentage	17.14%	82.85%

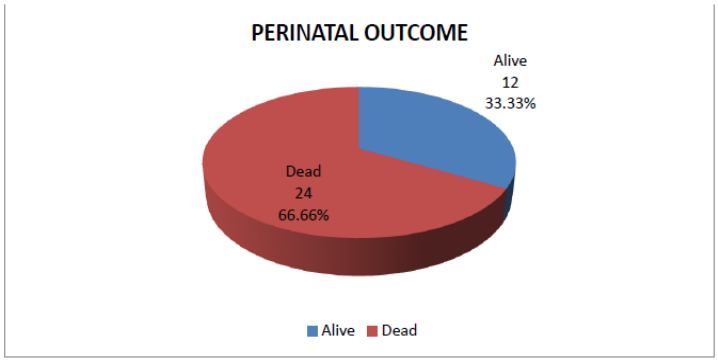


Out of the 36 cases in our study for PRAKI one case was died and recovery was noted among the other cases Complete renal recovery was seen in 6 cases (17.4%),and partial recovery in 29 cases (82.85%).

TABLE – 10

PERINATAL OUTCOME

	Alive	Dead
No. of cases	12	24
Percentage	33.33%	66.66%

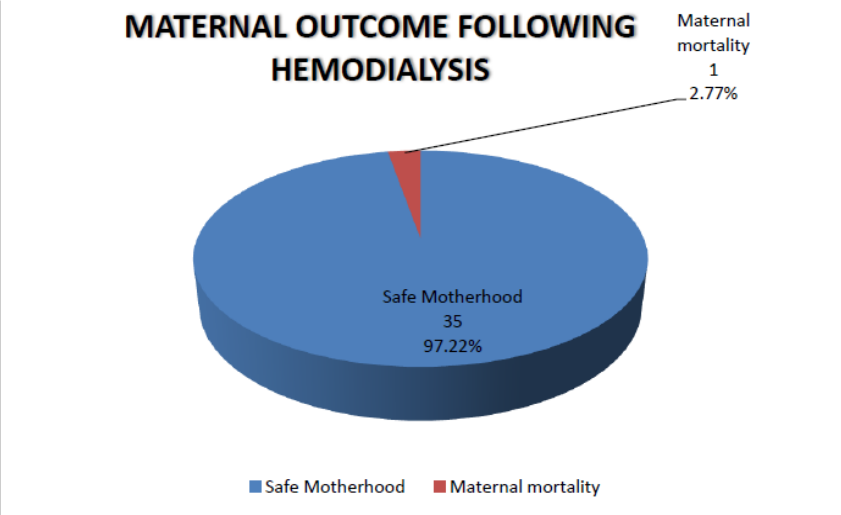


In my study the perinatal death was observed 66.66% and percentage of survival rate with 33.33%.

TABLE – 11

MATERNAL OUTCOME

Maternal Outcome	Safe Motherhood	Maternal Mortality
No. of cases	35	1
Percentage	97.22	2.77



In present study the maternal mortality was only 1 case (2.77%). The cause of death was with severe anemia complicated by PE and MODS.

V. Discussion

Age of onset of the PRAKI.

Studies	Age (years)	Extreme ages
Pakistan	29	18 – 40
India	25.8	15 – 35
Turkey	31.6	17 – 46
Morraco	29.03	18 – 40
Our study	23.08	18 – 35

In our study the mean age was 23.08 ± 3.9 years while in the studies done by Grunfeld et al.[8], and Chugh et al., the mean age was 28.4 and 29.5 years respectively. Our study patients had a slightly lower mean age, which may be due to the lower age at marriage. 56 In concordance with the studies from Pakistan and Morraco, PRAKI was more frequent in third trimester (86% and 61%). Whereas in the studies done by Suraj et al., Sivakumar et al., PRAKI was more frequent in the postpartum (59.64% , 75.61%).were noted in present study.

Clinical Feature	Suraj et.al (in India)	Our Study (in India)
Oliguria	64.9%	86.11%
Anuria	21%	13.89%
Pedal Edema	82.45%	75%
Breathlessness	73%	27.78%

. In the study of Suraj et.al, 64.9% of the patients were oliguric, 21% were anuric: Similar observations were found in our study.

Authors (Years) Country (Reference)	Number of cases	PRAKI of all AKI (%)	PE – E (%)	APH PPH (%)	Puerperal sepsis (%)	Septic Abortion (%)	AKI requiring dialysis (%)	Maternal Mortality (%)
Ansari et al (2004 – 2005) Pakistan (68)	42	36	12	38	31	-	71	26
Goplani et al (2004 – 2006) India (69)	70	9	28.5	38.5	61.4	20	97	18.5
Silva et al (2000 – 2006) Brazil (63)	55	-	41.8	-	14.5	-	100	30.9
Najar et al (2005 – 2007) India (70)	40	7	15	20	-	50	32.5	20
Khalil et al (2006 – 2007) Pakistan (65)	60	-	13.3	65	3.2	3.3	73.3	15
Prakash et al (2006 – 2008) India (60)	85	-	35.9	18.8	24.7	-	54.6	20
Miguil et al (2002 – 2008) Morocco (59)	58	19	67.2	25.9	8.6	0	100	13.8
Sivakumar et al (1999 – 2009) (71)	59	4.3	30.5	18.8	47.4	-	59.3	23.7
Erdemoglu et al (2006 – 2009) Turkey (62)	75	-	75.2	12	14.6	14.6	33.3	10.6
Arora et al (2007 – 2009) India (61)	57	6.5	26.3	28.1	21	12.3	85.9	28.1
Bentata et al (2008 – 2011) Morocco (51)	46	13	60.9	30	23	0	13	28.3
Our Study	36	0.08	52.78	30.56	41.67	0	100	2.7

Etiologies of obstetric AKI vary from one country to another. In Morocco, hypertensive disorders comprise the main etiology. Hachim et al[9] and Miguil et al[10], respectively, reported a 74.5% and 67.2% incidence of combined preeclampsia and eclampsia

More recent studies conducted in India reported a decrease in the incidence of AKI related to septic abortions, and an increase in the incidence of third trimester AKI, for which the dominant etiologies are hypertensive disorders and hemorrhages of the prepartum and postpartum periods. In Turkey, hypertensive disorders represent the main etiology of pregnancy-related AKI, with a 75.2% incidence of preeclampsia and eclampsia.In Brazil, hypertensive disorders also represent the main AKI etiology, with an incidence of 41.8%.

HELLP syndrome, considered a serious complication of severe preeclampsia, was associated with severe preeclampsia in 20% of cases 58 according to Silva et al, compared with 22.22% in our study. HELLP syndrome was responsible for AKI in 40%, 38% and 44.4% of cases according to Silva et al[11], Miguil et al[10] and Drakeley et al respectively**.** Abruptio placentae is also considered a grave complication of severe preeclampsia, being associated with AKI in 9.1%, 17.2%, 32% and 28.3% of cases according to Silva et al, Miguil et al[10], Drakeley et al and Mjahed et al[12], respectively. In our study, an abruptio placenta was associated with AKI in 23.9% of cases. DIC is a fatal complication of hemorrhage and severe sepsis that was observed in obstetric AKI in 18.3%, 16.5% and 37% of cases according to Khalil et al[13], Prakash et al and Mjahed et al. We found an incidence rate of 8.33% in our study.

The PE as a cause of AKI varies depending on the series from 12% in Pakistan 74 to 75.2% of cases in Turkey . abortions were the principal infectious cause of acute renal failure and a major public health problem in developing countries. However, there was no septic abortion in our study. The obstetric hemorrhage was a significant cause of PRAKI, in previous studies conducted at Pakistan and India with 28% and 5% of cases respectively where as in our study it was 30.56%.

Maternal mortality ranges from 7% to 30% depending on the study, and concerns the different types of obstetric AKI. In our study, maternal mortality was very low at 2.7%. This may be due to the lesser incidence of septic abortion and early institution of hemodialysis in my patients.

Perinatal mortality varies across studies from 36.2% to 66.6%**[13]**. In our study, perinatal mortality was high at 66.66%.

The mean admission serum creatinine was 6.24 mg/dl ± 2.3 in the present study which was less compared with 15.4 mg/dl in the study by Chugh et al. This could be due to early presentation and detection in the tertiary care hospital.

Comparision of serum creatinine in different series shown in the below table:
Comparision of Creatinine in different series

Author	Country	Period	Creatinine
Randeree et al.	South Africa	1990 – 1992	4.77 (mg/dl)
Khalil et al.	Pakistan	2006 – 2007	9.7 (mg/dl)
Altintepe et al.	Turkey	1997 – 2001	5.7 (mg/dl)
Mohamed Arrayhani	Moricci	2011 – 2012	3.48 (mg/dl)
Our study	India	2016 – 2018	6.24 (mg/dl)

The Mean number of sessions of dialysis is 6.35 (range 2 – 27). All patients received medical therapy for infection in addition to dialysis, if required. After haemodialysis the Mean serum creatinine was 2.42mg/dl ± 1.2. Complete recovery of renal function occurs earlier in AKI related to hypertensive disorders than in AKI related to severe states of hemorrhagic and septic shock where the risk of cortical necrosis is higher . In our study, complete recovery (Serum creatinine < 1mg/dl) of renal function in the surviving group was observed in 17.14% of cases. Khalil et al[13], Arora et al[14] and Prakash et al reported complete recovery rates of 46.6%, 58.5% and 69.4%, respectively, in a population of patients presenting obstetric AKI. In our study, partial recovery (Serum creatinine >1mg/dl) of renal function in the surviving group was observed in 82.85% of cases.

VI. Conclusions

Eventhough the incidence of pregnancy related acute kidney injury is coming down in developing countries like India, but still it is one of the cause for maternal and fetal morbidity and mortality. The leading cause of PRAKI is preeclampsia and its complications followed by sepsis and postpartum haemorrhage. A majority of patients recovered partially whereas few patients could recover completely. A good antenatal care and timely detection and management of complications of pregnancy can reduce the morbidity and mortality to the mother and baby.

AKIN-acute kidney injury network.
RIFLE-risk,injury,failure,loss of kidney function and end stage kidney disease
PRAKI-pregnancy related acute kidney injury

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Dr.B.Soujanya. "Observational Study of Pregnancy Related Acute Kidney Injury in Obstetrics." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 11, 2019, pp 07-16.