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## RESEARCH ARTICLE

# PROSPECTIVE OBSERVATIONAL STUDY ON EPIDEMIOLOGY AND OUTCOME OF ACUTE RENAL FAILURE IN OBSTETRICS

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**ABSTRACT**

**Aims and Objectives:** To evaluate the incidence and causes of ARF in obstetrics as well as to see the management and outcome of ARF in obstetrics.

**Methodology:** Prospective observational study. We included women with ARF during pregnancy due to obstetric complications such as severe pre-eclampsia, eclampsia, antepartum hemorrhage, IUFD, sepsis etc. women developing ARF during postpartum period due to post-partum hemorrhage, puerperal sepsis, anaesthetic complications during caesarean section as well as those developing ARF after septic abortion. In all women thorough history taking and physical examination were done. A detail analysis of all investigations and management were recorded. Patients were followed thoroughly till discharge or death. Parameters Studied included **c**linical parameters (history taking), general survey, abdominal examination, pelvic examination, speculum examination and per vaginal examination

**Results:** Out of 9270 deliveries (May 2012-April 2013) 79 women developed, Pregnancy related ARF (PRARF) showing an incidence of 0.87%. The age of the patients ranged between 17 to 40years with a mean of 23.23±5.05 years. 40.5% from cases were below 20 years of age. Majority of them (92.44%) were poor socio-economic status. 68 out of 79 patients were illiterate. Most of the patients were presenting ARF in their first pregnancy. PRARF was mostly found in (84.81%) referred cases. The most common causative factor for PRARF in the present study was sepsis 32 (40.51%) mainly due to puerperal sepsis, followed by PIH 20(25.32%) and postpartum hemorrhage17 (21.53%). 41 patients did not require haemodialysis, they were treated conservatively. On the other hand 2(2.53%) required dialysis more than 10 times. Most patients recovered completely. 59(74.68%), 13 (16.46%) patients died and 7(8.86%) patients left against medical advice. The case fatality rate was 16.46%.

**Conclusion:** Pregnancy related acute renal failure is a rare but serious complication occurring during pregnancy. It was most commonly found in illiterate, poor, young, and primi-mothers. It was mostly seen in referred cases. Sepsis was the leading cause of pregnancy related acute renal failure followed by pregnancy induced hypertension and postpartum hemorrhage. Almost half of the patients needed hemodialysis. Case fatality rate is high.



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## INTRODUCTION

Pregnancy Related Acute Renal Failure (PRARF), a rare but life threatening complication of pregnancy. Defined as a rapid decrease in the glomerular filtration rate over minutes to days, acute renal failure is termed acute kidney injury by the American Society of Nephrology (2005) (Cunningam *et al*., 2009). In developing countries it is associated with substantial maternal mortality (9-55%) (Pertuiset and Grunfeld, 1994; Goplani *et al*., 2008). It is largely a preventable problem usually resulting from obstetrics complications and not intrinsic renal diseases. In recent years, there has been a marked decline in the incidence of acute renal failure (ARF) associated with pregnancy. Currently, cases that are severe enough to require dialysis occur in less than 1 in 15,000 to 1 in 20,000 pregnancies. The legalization of abortion contributed to this decline in most developed countries, leading to a reduction in the number of septic abortions - the main cause of ARF in the recent decades (Gammill and Jeyabalan, 2005). A set of systemic and renal physiological adaptive mechanisms occur during gestation that will constrain several changes in laboratory parameters of renal function, electrolytes, fluid and acid-base balances. The diagnosis of acute kidney injury in pregnancy is based on the serum creatinine increase. The usual formulas for estimating glomerular filtration rate are not validated in this population. In general there is no consensus on a definition for renal failure during pregnancy. Acute renal failure in pregnancy can be induced by any of the disorders leading to renal failure in the general population such as acute

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tubular necrosis. There are however pregnancy complications, for example the most common problems are pre renal diseases. It may be associated with septic shock (endotoxaemia or septic abortion), pre-eclampsia, eclampsia, severe hemorrhage, dehydration related to hyperemesis gravidarum, amniotic fluid embolism. The Acute Dialysis Quality Initiative developed the RIFLE diagnostic scheme for renal insufficiency. This scheme was designed for non-pregnant patient and has been shown to have prognostic utility in this population (Abosaif *et al*., 2005). This initial management of renal failure in pregnancy commences with the treatment of underlying causes. Following measures, judicious fluid management is the foundation of successful treatment. Prompt initiation of dialysis seems to be safe and beneficial when indicated. Further evaluation of the prognostic factors in acute renal failure is needed. This study was planned to evaluate the incidence, etiologies, management and outcome of acute renal failure in pregnancy.

**Aims and objectives**

To evaluate the incidence and causes ARF in obstetrics as well as to see the management and outcome of ARF in obstetrics.

**Specific objectives of this study**

1. To find out the total annual deliveries in this hospital.
2. To record the number of pregnant women having ARF.
3. To note down the incidence of ARF.
4. To find the causes of ARF during pregnancy or during puerperium.
5. To know the management of ARF.
6. To note the outcome of these patients.

## MATERIALS AND METHODS

**Study area:** The study was carried out in the Department of Obstetrics and Gynecology in NRS Medical College and Hospital, Kolkata which is a tertiary care centre.

**Study population:** Pregnant and postpartum women attending OPD and emergency as booked or un-booked cases from different districts of West Bengal and adjacent states and admitted in the hospital.

**Study period:** May 2012- April 2013

**Study size:** During the study total annual deliveries from March 2012 to April 2013 in NRS Medical College and Hospital, Kolkata was 9270 and there were 79 cases of ARF in Obstetrics. Acute renal failure in Obstetrics is a clinical syndrome characterized by sudden decrease in urine output to<400 ml/24hrs, rising blood urea and creatinine level as a result of sudden marked decrease in glomerular filtration rate (GFR) due to some obstetric complications (Knapp and Hellman, 1957). Hence, diagnostic criteria of ARF includes: Sudden oliguria (24 hours urine output <400 ml) or anuria and Serum creatinine level >1.5 mg/dl.

**Study design:** Prospective observational study. The study was conducted after approval of Institutional Ethics Committee. After fulfilling selection criteria, women were selected and included in the study group. In all women thorough history taking and physical examination were done. A detail analysis of all investigations and management were recorded. Patients were followed thoroughly till discharge or death. Parameters Studied included **c**linical parameters (history taking), general survey, abdominal examination, pelvic examination, speculum examination and per vaginal examination Management : Prompt and vigorous replacement of blood in cases of massive hemorrhage, use of proper antibiotics in sepsis, use of diuretics to treat oliguria after fluid replacement, specific management of pre-eclampsia and eclampsia and hemodialysis.

**Final outcome of the disease**

**Inclusion Criteria:** Women with ARF during pregnancy due to obstetric complications such as severe pre-eclampsia, eclampsia, antepartum hemorrhage, IUFD, sepsis etc. Women developing ARF during postpartum period due to post-partum hemorrhage, puerperal sepsis, anaesthetic complications during caesarean section as well as those developing ARF after septic abortion.

**Exclusion Criteria:** Pre-existing chronic renal diseases, those with chronic renal failure prior to pregnancy (serum creatinine level >1.5 mg/dl.

**Results and Analysis:** During one year study, a total of 79 women having acute renal failure related to pregnancy were admitted in the Obstetrics and Gynecology Department of NilratanSircar Medical College and Hospital. All the cases were studied, descriptive statistics were used and percentage was calculated for quantitative variables. Mean ±SD were calculated for age.

## RESULTS

The present prospective study was aimed at evaluating the incidence, cause and outcome of acute renal failure in obstetrics. Out of 9270 deliveries (May 2012-April 2013) 79 women developed PRARF showing an incidence of 0.87%. The age of the patients ranged between 17 to 40years with a mean of 23.23±5.05 years. 40.506% cases were below 20 years of age. Majority of them 92.44% were of poor socio-economic status. 68 out of 79 patients were illiterate. Most of the patients were presenting ARF in their first pregnancy. PRARF was mostly found in (84.81%) referred cases. The most common causative factor for PRARF in the present study was sepsis 32 (40.51%) mainly due to puerperal sepsis, followed by PIH 20(25.32%) and postpartum hemorrhage 17 (21.53%). 41 patients did not require haemodialysis, they were treated conservatively. On the other hand 2(2.53%) required dialysis more than 10 times. Most patients recovered completely .59(74.68%) patients were discharged, 13 (16.46%) patients died and 7(8.86%) patients left against medical advice. The case fatality rate was 16.46%.

**Table 1. Age distribution of ARF cases**

| Age(years) | No. of cases (n=79) | Cases in percentage (%) |
|---|---|---|
| 15-20 | 32 | 40.506 |
| 21-25 | 22 | 27.848 |
| 26-30 | 17 | 21.519 |
| 31-35 | 7 | 08.861 |
| 36-40 | 1 | 01.266 |

The age of the patients ranged between 15 to 40 years with the average mean of 23.23 years and SD of ±5.03years. Most of the patients that is 32 (40.506%) out of 79 patients were in the age group of 15 to 20years.

**Table 2. Distribution of cases according to socioeconomic status**

| Socio-economic status | No. of cases (n=79) | Percentage (%) |
|---|---|---|
| Middle class | 6 | 7.56 |
| Poor | 73 | 92.44 |

Majority of the patients belonged to the low socio-economic status. 73 (92.44%) out of 79 patients come from poor families.

**Table 3. Distribution of cases according to literacy**

| Literacy | No. of cases (n=79) | Percentage (%) |
|---|---|---|
| Illiterate | 68 | 86.1 |
| Literate | 11 | 13.9 |

86.1% of women were illiterate showing that PRARF is more prevalent in uneducated women.

**Table 4. Co-relation of ARF according to Gravida (Antepartum) /parity(postpartum)**

| Gravida/Parity | Primi | Multi | Total |
|---|---|---|---|
| Gravida | 8 | 10 | 18 |
| Parity | 37 | 24 | 61 |
| Total | 45 | 34 | 79 |

Pregnancy related ARF is more common in primipara patients. It is mostly seen postpartum period.

**Table 5. Percentage of cases referred or not referred**

| Referred/Not referred | No. of cases | Percentage |
|---|---|---|
| Referred | 67 | 84.81 |
| Not referred | 12 | 15.19 |
| Total | 79 | 100 |

ARF is found mostly in referred cases (84.81%).As because NRSMCH is a tertiary referral centre so patients with PRARF are referred to our centre. It was observed in the study that ARF is mostly seen in patients having LSCS.

**Table 6. Period when ARF developed**

| Period when ARF developed | No. of cases (n=79) | Percentage (%) |
|---|---|---|
| Antepartum | 17 | 21.518 |
| Postpartum | 56 | 70.89 |
| Post-Abortal | 5 | 6.327 |
| Post Ectopic pregnancy | 1 | 1.265 |
| Total | 79 | 100 |

From this table it was evident that acute renal failure was common (70.89%) in the postpartum period.

**Table 7. Case distribution according to the cause**

| Causes | No. of cases (n=79) | Percentage (%) |
|---|---|---|
| Sepsis | 32 | 40.51 |
| PPH | 17 | 21.53 |
| APH | 2 | 2.53 |
| Eclampsia | 10 | 12.66 |
| Pre-eclampsia | 10 | 12.66 |
| IUFD | 3 | 3.80 |
| DIC | 2 | 2.53 |
| HUS | 1 | 1.26 |
| Acute fatty liver | 1 | 1.26 |
| Ectopic pregnancy | 1 | 1.26 |
| Total | 79 | 100 |

The above table depicted that sepsis (40.51%) was also the leading cause of PRAF

**Table 8. Distribution of cases according to creatinine level at the time of admission and or at the time of diagnosis**

| Creatinine level (mg/dl) | No. of cases (n=79) | Percentage (%) |
|---|---|---|
| 1.5 - 3.9 | 41 | 51.90 |
| >4 | 38 | 48.10 |
| Total | 79 | 100 |

The creatinine values the time of admission or at the time of diagnosis ranged from 1.5 to 18.2 mg/dl with an average value of 4.53±3.237mg/dl. Majority 41(51.90%) of the patients have values less than 4mg/dl. Some patients were referred as a case of ARF. Some patients referred due to other reasons developed ARF later on.

**Table 9. No. of Hemodialysis required**

| No. of haemodialysis | No. of cases(n=79) | Percentage (%) |
|---|---|---|
| 0 | 41 | 51.90 |
| 1-5 | 30 | 37.97 |
| 6-10 | 6 | 7.60 |
| >10 | 2 | 2.53 |

Hemodialysis was given to patients having creatinine level 4mg/dl or more.

**Table 10. Requirement of hemodialysis according to causes**

| Causes | No. of cases required HD (n=38) | Percentage |
|---|---|---|
| Sepsis | 17 | 44.737 |
| PPH | 8 | 21.053 |
| APH | 2 | 5.263 |
| Eclampsia | 4 | 10.526 |
| Pre-eclampsia | 2 | 5.263 |
| IUFD | 1 | 2.632 |
| DIC | 1 | 2.632 |
| HUS | 1 | 2.632 |
| Acute fatty liver | 1 | 2.632 |
| Ectopic pregnancy | 1 | 2.632 |

Most of the septic patients (17 of 32) required hemodialysis.

**Table 11. Number of haemodialysis required in different cases**

| Causes | No. of HD | | | Total |
|---|---|---|---|---|
| | 1-5 | 6-10 | >10 | |
| Sepsis | 14 | 3 | 0 | 17 |
| PPH | 6 | 2 | 0 | 8 |
| APH | 2 | 0 | 0 | 2 |
| Eclampsia | 3 | 0 | 0 | 3 |
| Pre-eclampsia | 1 | 1 | 0 | 2 |
| IUFD | 1 | 0 | 0 | 1 |
| DIC | 1 | 0 | 0 | 1 |
| HUS | 1 | 0 | 0 | 1 |
| Acute fatty liver | 1 | 0 | 0 | 1 |
| Ectopic pregnancy | 0 | 0 | 1 | 1 |

Thirteen of septic patients underwent hemodialysis 1 to 5 times while having creatinine level of 18.2mg/dl at the time of admission had undergone 21hemodialysis; she was later discharged in recovery stage.

**Table 12. Outcome of the cases**

| Outcome | No. of cases (n=79) | Percentage (%) |
|---|---|---|
| Discharge | 59 | 74.68 |
| LAMA | 7 | 8.86 |
| Death | 13 | 16.46 |

The case fatality rate due to ARF was 16.46%.

**Table 13. Patient outcome according to causes**

| Causes | Discharge | LAMA | Death | Total |
|---|---|---|---|---|
| Sepsis | 23 | 4 | 5 | 32 |
| PPH | 13 | 1 | 3 | 17 |
| APH | 1 | 0 | 1 | 2 |
| Eclampsia | 8 | 1 | 1 | 10 |
| Pre-eclampsia | 9 | 0 | 1 | 10 |
| IUFD | 3 | 0 | 0 | 3 |
| DIC | 0 | 1 | 1 | 2 |
| HUS | 1 | 0 | 0 | 1 |
| Acute fatty liver | 1 | 0 | 0 | 1 |
| Ectopic pregnancy | 0 | 0 | 1 | 1 |

Maternal death was more in patients having sepsis (5 of 32).

**Table 14. Distribution of cases according to creatinine level at the time of discharge / lama / death**

| Creatinine level | At the time of discharge | LAMA | Death |
|---|---|---|---|
| <1.5 | 37 | 1 | 2 |
| 1.5-3.9 | 22 | 6 | 4 |
| ≥4 | 0 | 0 | 7 |

Patients were discharged when creatinine level came down to less than 4 mg/dl.

## DISCUSSION

Pregnancy related acute renal failure (PRARF) is still a critical complication in obstetrics. In the present study 79 cases out of 9270 deliveries were diagnosed as acute renal failure related to gestational problems showing an incidence of 0.87%. Since the 1960s, the overall incidence of PR-ARF has decreased from 1/3000 to 1/15,000 –1/20,000 births (Gammill and Jeyabalan, 2005). According to Silva *et al* and Prakash *et al* incidence were 0.08% and 1.78%, respectively[42,36]. In our study most of the patients (92.44%) were coming from poor families. The age of the patients ranged from 17 to 40 years with a mean of 23.23± 5.03 years. It was seen that more than 70% patients were less than 30 years of age 32 (40.50%) patients were below 20 years of age. In the study conducted by Sivakumar *et al* the mean age was 25.6 yrswith range of 15 -45 yrs (Sivakumar *et al*., 2011). Patel *et al* reported the age range between 20 to 41 years with a median of 28 years (Patel *et al*., 2013), while N. Arora *et al* found more than 90% of their participants to be younger than 30 years of age (mean 25±4.5 years) (Arora *et al*., 2010). A total of 45 (56.96%) patients had developed acute renal failure in their first pregnancy either in the antepartum or postpartum period. This was in contrast to the study of Rizwan *et al*, where most of the (62.85%) patients were multipara (NaushabaRizwan and Syed FarhanUddin, 2011). Patel *et al* however found that 28 (46.7%) women were multipara and 32 (53.4%) women were primigravida in their study (Patel *et al*., 2013). As the study was conducted in a tertiary care centre majority of the cases (84.81%) were referred cases from the peripheral centres. According to the 2005-2006 National Family Health Survey, only 50% of the pregnant women in India had at least three prenatal check-ups. Incomplete coverage of prenatal care could be an important underlying factor in these complications which is being missed in their initial stages (International Institute for Population Sciences (IIPS) and ORC Marco, 2007). In our study most of the cases had institutional deliveries. PRARF was found more common after cesarean section (51.89%). Sivakumar *et al* found 33.89% of cesarean deliveries suffering from PRARF in their 10 years study in southern India (Sivakumar *et al*., 2011). In the present study sepsis caused 40.51% of PRARF. Only 5 (6.33%) women had developed sepsis in the post abortal period while most of the women developed sepsis during puerperium. Similar findings were seen in the study by Sivakumar *et al*, where puerperal sepsis was the most important cause (47.41%) (Sivakumar *et al*., 2011). However M.S. Najar *et al* found that septic abortion was the leading cause in their study (50%) (Najar *et al*., 2008). PIH accounted 20 (25.32%) cases of PRARF in present study. Worldwide PIH remains a major cause of PRARF (Lindheimer *et al*., 1993). Study done by Peng DZ showed pregnancy induced hypertension as the main cause of ARF in the late stage of pregnancy (Peng, 1993). In southern India, the most common cause of PRARF has changed from hemorrhage to hypertensive disorders over the past 20 years (Sivakumar *et al*., 2011). While in eastern India PIH is still the third important cause as depicted in the study done earlier by Arora *et al*. (2010). The present study showed that uterine hemorrhage was the third most common cause of PRARF (PPH 21.52% and APH 3.80%). Turney *et al* reported uterine hemorrhage in 48 out of 142 patients (33.80%) with acute renal failure (Turney *et al*., 1989). It was observed that 40 (51.9%) patients in the present study did not require haemodialysis. Haemodialysis support was needed in 38 (48.15%) cases. Of these, 15 (18%) cases had sepsis, 8(10.13%) had PPH and the rest 12 (15.19%) cases had other etiologies. In our study 59 (74.68%) patients were discharged after proper treatment and7 (8.86%) patients left against medical advice. There was 13 (16.46%) maternal deaths .Hachim *et al*, Ventura *et al* and Randree *et al* reported maternal deaths in 9.1%, 2% and 5% of PRARF cases respectively (Hachim *et al*., 2001; Ventura *et al*., 1997; Randeree *et al*., 1995). But maternal deaths were high in the studies of Ansari *et al* (24%) and Arora *et al* (28.1%) (Ansari *et al*., 2008; Arora *et al*., 2010).

### Conclusion

Pregnancy related acute renal failure is a rare but serious complication occurring during pregnancy. It was most commonly found in illerate, poor, young, and primi mothers. It was mostly seen in referred cases. Sepsis was the leading cause of pregnancy related acute renal failure followed by pregnancy induced hypertension and postpartum hemorrhage. Almost half of the patients needed haemodialysis. Case fatality rate is high.

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