

Maternal and Perinatal Outcomes in Cases of Acute Renal Failure in Pregnancy and Puerperium in Tertiary Care Centre

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Abstract

Introduction: This was a prospective observational study to determine to maternal and perinatal outcome in cases of acute renal failure (ARF) in pregnancy.

Materials and Methods: It was the prospective observational study carried out in Department of Obstetrics and Gynaecology, at Government Medical College, Nagpur, Maharashtra, India during the period of September 2012 to October 2014. Permission from the Ethical Committee was taken. The data were retrieved, tabulated, and analyzed. Patients were followed until they were discharged from the hospital. Data were analyzed using the appropriate software.

Results: Total number of cases were 83 in 2-year study period out of 25,391 deliveries. Thus, the proportion of ARF cases in pregnancy and puerperium was 0.37%. The average age of our patients was 25.60 ± 4.01 . Maximum number of patients were postpartum (68.67%). Cesarean section required in a maximum number of patients, i.e. 55.42%. Most common causes of ARF in our study were sepsis (26.05%) cases and severe pre-eclampsia in 18.07%. Maximum deaths (15) occurred in 0-5 days of admission. Mean duration of hospital stay was 10.71 ± 8.51 days. In dialysis group, 6 (31.57%) patients died and 13 (68.42%) patients survived. The improvement was more in dialysis as compared to a conservative group in reducing blood urea and serum creatinine. Leukocytosis, deranged liver function test, and international normalized ratio were seen in 60.24%, 45.78%, and 31.32% cases, respectively. Anuria found in 27.71% and oliguria in 39.75% while 32.53% had a non-oliguric renal failure. 24 (28.91%) patients expired, and 64 (77.10%) patients survived.

Conclusion: Proportion of ARF in pregnancy and puerperium was 0.37%. The majority of cases belonged to a rural area and that too lower socio-economic class. A significant number (86.74%) were booked cases; still the risk factors were not detected in the early stage may be due to lack of expertise and the patients referred late. Puerperal sepsis, pre-eclampsia, eclampsia, and obstetric hemorrhage were leading causes of ARF in the present study.

Key words: Acute renal failure, Acute tubular necrosis, Maternal and perinatal morbidity

INTRODUCTION

Pregnancy-related acute renal failure (ARF) is one of the most common causes of ARF. The important causes of pregnancy-related ARF are divided into (1) causes during

early pregnancy, which may include septic abortion leading to septic shock and acute tubular necrosis (ATN) and (2) causes in late pregnancy, i.e. after 34 weeks of gestation and immediate puerperium are antepartum hemorrhage (APH), abruptio placentae, postpartum hemorrhage (PPH), hemolytic uremic syndrome (HUS), HELLP syndrome, pre-eclampsia, puerperal sepsis, and hemolysis. Among these causes, ATN is most common pathological lesion, but it has excellent prognosis as compared to other pathological lesions associated with eclampsia, HELLP syndrome, disseminated intravascular coagulation (DIC), and HUS, in which glomerular involvement is predominant^{1,2} However, in rare case of septic abortion leading to acute tubular

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necrosis (ATN), the mortality is high if the causative agent was clostridium.² It is postulated that all these diseases are manifestations of thrombotic microangiopathy caused by endothelial injury, due to deficiency of nitric oxide-dependent endothelial relaxing factors.³ The bad prognostic lesion seen in pregnancy induced ARF is acute bilateral renal cortical necrosis. The incidence of cortical necrosis is still high in developing countries, in Pakistan, it is about 13% as reported by Ramzan,⁴ and about 24% in India as reported by Prakash *et al.*⁵ It is frequently seen after APH and prolonged retention of a dead fetus.^{2,6,7} Mortality in pregnancy-related renal failure depends on the underlying renal lesion and associated complications. It is high when associated with severe pre-eclampsia, HELLP syndrome, and acute fatty liver of pregnancy, sepsis, DIC, HUS, and cortical necrosis. Obstetrical renal failure is a challenging health problem of population, especially of rural areas of developing the country. Ours being tertiary care center situated in central India with referrals not only from districts around but also from adjoining states of Madhya Pradesh and Andhra Pradesh. Hence, the study of pregnancy-related ARF was undertaken. The aim of the study was to know the magnitude of pregnancy-related ARF, factors responsible for it and maternal and neonatal morbidity and mortality associated with it.

Aims and Objectives

1. To study proportion and underlying conditions associated with ARF in pregnancies and puerperium.
2. To study maternal and perinatal outcome in ARF.

MATERIALS AND METHODS

The present study was carried out in the Department of Obstetrics and Gynaecology, at Government Medical College, Nagpur, Maharashtra, India during the period of September 2012 to October 2014. Permission from the ethical committee was taken. It was the prospective observational study.

Inclusion Criteria

All patients having urine output <400 ml/24 h and or serum creatinine >2 mg% during pregnancy and puerperium during the study period.

Exclusion Criteria

Patients with chronic renal disease, chronic hypertension, diabetes mellitus, and renal stones.

Sample Size

Sample size calculated with reference to study by Agrawal *et al.* (2014) assuming expected the incidence of sepsis was 40%, with precision = 10% and confidence interval = 95% and hence sample size = 80.

Methodology

The data retrieved for analysis contained demographic parameters, routine obstetric, menstrual, past, personal, family history and general, systemic and obstetric examination of patients included in the study. Baseline investigations including investigations supporting renal functions such as complete blood count, renal function test, urine analysis, serum electrolytes, renal scan, and abdominal ultrasound were carried out. Patients were followed until they were discharged from the hospital. Partial recovery due to patchy cortical necrosis is suspected when renal function shows improvement but does not return to normal even after 12 weeks. Patients were managed in collaboration with the nephrology department when required dialysis.

Statistical Analysis

A continuous variable was presented as mean \pm standard deviation. A categorical variable was expressed in actual number and percentage. Student's *t*-test was applied to compare pre-dialysis and post-dialysis level of serum creatinine and blood urea among dialysis and conservative group. The difference between two means is calculated by applying Student's *t*-test. $P < 0.05$ was considered as significant.

OBSERVATION AND RESULTS

The present study was carried out in the Government Medical College and Tertiary Care Institute, Nagpur, Maharashtra, India during the period of September 2012 to October 2014. All patients with ARF in pregnancy and puerperium who met the inclusion criteria were studied. A total number of cases in the Department of Obstetrics and Gynaecology, medicine and nephrology fulfilling the inclusion criteria were 83 in 2-year study period out of 25,391 deliveries. Thus, the proportion of ARF cases in pregnancy and puerperium was 0.37%.

Table 1 depicts that average age of our patients was 25.60 ± 4.01 . 37.34% of cases were primiparous, and 61.44% cases were multiparous. 86.74% patients were booked. Maximum patients belonged to a rural area (62.65%). According to Prasad classification, 61.43% patients were from lower class while rest belonged to the middle class. Maximum number of patients included in the study were PP (68.67%) followed by 14.45% cases with gestational age above 36 weeks.

Table 2 shows that cesarean section was required in a maximum number of patients, i.e. 55.42% followed by vaginal delivery (38.55%). 3 patients aborted spontaneously while 2 patients remained undelivered.

Table 3 depicts that most common causes of ARF in our study were sepsis (26.05%) cases, followed by severe pre-eclampsia in 18.07%. APH encountered in 12.04% of cases as eclampsia, and acute febrile illness leads to 8 (9.63%) cases each. HELLP syndrome was associated with 6 (7.22%) of cases.

Table 4 shows that maximum patients, i.e. 36 (43.37%) had duration of 5-10 days in hospital followed by 19 (22.89%) patients had stay of 0-5 days. In a total of 19 patients with duration of hospital stay >20 days, 9 required dialysis. Maximum deaths (15) occurred in 0-5 days of admission as the patients were referred in critical condition and with

Table 1: Demographic parameters

Demographic parameters	Observations (%)
Mean age in years	25.60±4.01
Primipara	37.34
Multipara	61.44
Rural	62.65
Urban	37.34
Booked	86.74
Unbooked	13.25
Lower class	61.43
Middle class	38.55
Duration of pregnancy (%)	
<28 weeks	6 (7.22)
28-36 weeks	8 (9.63)
>36 weeks	12 (14.45)
Postpartum	57 (68.67)

Table 2: Distribution according to mode of delivery

Mode of delivery	Number of cases (%)
Vaginal delivery	32 (38.55)
Cesarean delivery	46 (55.42)
Undelivered	2 (2.40)
Abortions	3 (3.61)
Total	83 (100)

Table 3: Distribution according to underlying conditions in cases of ARF

Underlying condition	Number of cases (%)
Sepsis	22 (26.50)
Severe pre-eclampsia	15 (18.07)
Antepartum hemorrhage	10 (12.04)
Eclampsia	8 (9.63)
Acute febrile illness	8 (9.63)
Postpartum hemorrhage	5 (6.02)
HELLP syndrome	6 (7.22)
DIC	3 (3.61)
ARDS	2 (2.40)
Septic abortion	2 (2.40)
Acute fatty liver	1 (1.20)
Blood transfusion reaction	1 (1.20)

ARF: Acute renal failure, DIC: Disseminated intravascular coagulation, ARDS: Adult respiratory distress syndrome

early onset ARF. The mean duration of hospital stay was 10.71 ± 8.51 days.

Table 5 shows that cases, with output <400 ml/24 h and serum creatinine >2 mg/dl, 21 patients expired of which 6 underwent dialysis, 35 (62.5%) patients survived, out of which 9 required dialysis and rest were managed conservatively. In cases with urine output >400 mg/24 h and serum creatinine >2 mg/dl, 3 (11.11%) patients expired and 24 (88.88%) patients survived of which 4 required dialysis and rest were managed conservatively.

Table 6 depicts the outcome of patients receiving only conservative treatment and dialysis treatment. In dialysis group, 6 (31.57%) patients died and 13 (68.42%) patients survived. Similarly, in conservative group, 18 (28.12%) patients died and 46 (77.87%) patients survived.

Table 7 shows improvement in blood urea and serum creatinine after either conservative and dialysis group. Both groups show significant (*P* < 0.05) improvement in blood urea and serum creatinine level at post-treatment as compared to pre-treatment. The improvement was, however, more in dialysis as compared to the conservative group.

Table 8 depicts that anemia, thrombocytopenia, and leukocytosis seen in 30.12%, 33.73%, and 60.24%,

Table 4: Distribution of cases according to duration of hospital stay

Duration of stay (days)	Number of cases (%)
0-5	19 (22.89)
5-10	36 (43.37)
10-20	16 (19.27)
>20	12 (14.45)
Total	83 (100)

Table 5: Distribution of cases according to outcome of two groups

Groups	Groups	Number of cases (%)
U/O<400 ml/24 h	Deaths	21 (37.5)
Serum creatinine>2 mg/dl	Survival	35 (62.5)
U/O>400 ml/24 h	Deaths	3 (11.11)
Serum creatinine>2 mg/dl	Survival	24 (88.88)
	Total	83 (100)

Table 6: Distribution of cases according to treatment and outcome

Treatment	Deaths (%)	Survived (%)	Number of cases (%)
Conservative	18 (28.12)	46 (71.87)	64 (77.10)
Dialysis	6 (31.57)	13 (68.42)	19 (22.89)
Total	24 (28.91)	59 (71.08)	83 (100)

Table 7: Comparison of biochemical parameters between conservative group and dialysis group after treatment

Variable	Groups	Pre-T/T	Post-T/T	P value
Blood urea	Dialysis	177.42±39.30	106.05±41.33	0.0001
	Conservative	131.17±74.76	96.29±85.50	0.015
P value		0.001	0.63	
Serum creatinine	Dialysis	8.73±2.52	4.65±1.47	0.0001
	Conservative	5.33±3.22	3.91±3.65	0.021
P value		0.001	0.40	

Table 8: According to laboratory finding in cases of pregnancy-related acute renal failure

Laboratory finding	Number of cases (%)
Anemia (Hb<8 g)	25 (30.12)
Thrombocytopenia (platelet<1,00,000)	28 (33.73)
Leukocytosis (TLC>11,000)	50 (60.24)
Deranged liver function test	38 (45.78)
SGOT>80 U	
SGPT>80 U	
ALP>300 U	
D-dimer (>200 ng/dl)	1 (1.20)
INR>1.4	26 (31.32)
Hyponatremia (Na<135 meq/l)	26 (31.32)
Hypernatremia (Na>145 meq/l)	7 (8.43)
Hypokalemia (K<3.5 meq/l)	18 (21.68)
Hyperkalemia (K>4.5 meq/l)	26 (31.32)
Anuria (U/O<100 ml/24 h)	23 (27.71)
Oliguria (U/O<400 ml/24 h)	33 (39.75)
Non-oliguria (U/O>400 ml/24 h)	27 (32.53)

Hb: Hemoglobin, TLC: Total leukocytic count, SGOT: Serum glutamic oxaloacetic transaminase, SGPT: Serum glutamate pyruvate transaminase, ALP: Alkaline phosphatase, INR: International normalized ratio

respectively. Liver function test and international normalized ratio were deranged in 45.78% and 31.32% cases, respectively. Hyponatremia was seen in 26 cases and hypernatremia was seen in 7 cases. Hypokalemia and hyperkalemia were seen in 18 and 26 cases, respectively. Anuria found in 27.71% and oliguria in 39.75% while 32.53% had the non-oliguric renal failure.

Table 9 shows that 24 (28.91%) patients expired and 64 (77.10%) patients survived. Out of those who survived, 50 (84.74%) cases showed complete recovery while 8 (13.55%) cases had a partial recovery. Puerperal sepsis accounts for maximum number of mortality, i.e. 8 (33.33%), followed by APH (3 = 12.5%), and HELLP syndrome (3 = 12.5%). DIC, PPH, and adult respiratory distress syndrome (ARDS) accounted for 2 (8.33%) deaths each. Acute fatty liver of pregnancy, acute febrile illness (Dengue fever), septic abortion, and acute gastroenteritis accounted for 1 (4.66%) deaths each.

Table 10 shows a total number of live birth were 49 (62.82%) and 29 (37.17%) were stillbirth. Out of 20

Table 9: Distribution of cases according to maternal outcome

Maternal outcome	Number of cases (%)
Death	24 (28.91)
Survival	59 (71.08)
Complete recovery	50 (84.74)
Partial recovery	8 (13.55)
Left against medical advice	1 (1.69)

Table 10: Distribution of cases according to perinatal outcome

Outcome	Number of cases (%)
Live birth	49 (62.82)
Stillbirth	29 (37.17)
Perinatal deaths	06 out of 20 NICU admission (30)

NICU: Neonatal intensive care unit

neonatal intensive care unit (NICU) admissions, 6 perinatal deaths occurred. Most neonates died due to prematurity, i.e. 3 (50%), followed by sepsis, hyperbilirubinemia, and birth asphyxia with one case each.

DISCUSSION

A total number of cases in the Department of Obstetrics and Gynaecology, Medicine and Nephrology fulfilling the inclusion criteria were 83 in 2-year study period out of 25,391 deliveries. Thus, the proportion of ARF cases in pregnancy and puerperium was 0.37%. Mean age in the present study was 25.6 ± 4.01 which is comparable to study by Goplani *et al.*,⁸ which was 25.6. In the present study, 37.34% of cases were primiparous, and 61.44% cases were multiparous which is comparable to study by Goplani *et al.*⁸ (primipara = 31.4% and multipara = 68.57%). In present study, 68.67%, 7.22%, and 24.08% cases were from PP cases, 1st and 2nd trimester combined cases, and 3rd trimester cases, respectively, which is comparable to study carried out by Kumar *et al.*⁹ (PP = 75.61%, 1st two trimester = 7.32% and third trimester = 17.07%). We have 37.37% cases from urban and 62.65% cases from a rural area similar to results found in a study carried out by Rashid *et al.*,¹⁰ who observed 30% cases from rural and 70% cases from the urban population. We had more booked cases (86.74%) than unbooked cases (13.25%) which show disparity with a study by Rashid *et al.*¹⁰. However, most of the patients were booked at referring health care centers. In present study, we had maximum number of cases with cesarean delivery (55.42%) followed by vaginal delivery (38.55%) and abortions (3.61%) similar to study conducted by Arrayhani *et al.*¹¹ (cesarean = 40.5%, vaginal = 40.5%, and abortion = 18.9%). Most common causes of ARF in our study were sepsis (26.05%) cases, followed by severe pre-eclampsia in 18.07%. Patel *et al.*¹² found that 38.33%

cases required dialysis, 75% had a complete recovery, 17% had a partial recovery while 8.4% cases had no recovery and deaths occurred in 15% cases. In the present study, 22.89% cases required dialysis, 84.74% cases recovered completely, 13.55% recovered partially, and 28.91% cases died. In a study by Aggarwal *et al.*, (2014)¹³ 78% cases had anemia, 12% cases had thrombocytopenia, and 64% cases had leukocytosis. In our study, anemia was in 30.12%, thrombocytopenia in 33.73%, and leukocytosis was in 60.24% cases. The incidence of oliguria and anuria was comparable to study carried out by Patel *et al.*¹² (oliguria = 37% and anuria = 23%). In a study by Goplani *et al.*⁸ reported total mortality of 18.57%, most common cause was sepsis (39.02%) followed by HELLP syndrome (15.38%), pulmonary edema (15.38%), and hepatic encephalopathy (7.69%). In present study, puerperal sepsis accounts for maximum number of mortality, i.e. 8 (33.33%), followed by APH (3 = 12.5%) and HELLP syndrome (3 = 12.5%). DIC, PPH, and ARDS accounted for 2 (8.33%) deaths each. Patel *et al.*¹² in their study reported perinatal mortality of 41.3%, whereas in the present study, the total number of live births were 62.82%, 37.17% were stillbirths, and 18.60% were NICU admissions.

RECOMMENDATIONS

Rural women have poor access to MCH services. There is a need to provide better and expert antenatal care up to the grass root level. Development of standard protocols for detection of pre-eclampsia and timely referral to higher centers will definitely prevent eclampsia and associated life-threatening complications such as ARF.

Conducting mock drill for prompt management of hemorrhagic shock in obstetrics will definitely help in the training of both medical and paramedical staff and will contribute to reducing the mortality and morbidity associated with it, which is still higher.

CONCLUSION

During recent years, ARF in obstetrics has decreased significantly. The probable factors:

1. Diminished number of criminal abortion with liberalization of abortion law
2. Early detection of pre-eclampsia and judicious and early termination of pregnancy
3. Availability of blood transfusion and prompt treatment of hemorrhage and shock.

In the present study, the proportion of ARF in pregnancy and puerperium was 0.37%. The majority of cases belonged to a rural area and that too lower socioeconomic class. A significant number (86.74%) were booked cases; still the risk factors were not detected in the early stage may be due to lack of expertise and the patients referred late. Puerperal sepsis, pre-eclampsia, eclampsia and obstetric hemorrhage were leading causes of ARF in the present study.

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