Original Research Article

Clinical profile of pregnancy related acute renal failure: An experience at a tertiary level hospital in Mumbai

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Abstract

Background: Pregnancy-related acute renal failure (ARF) can be caused by any of the disorders leading to ARF in the general population. We aimed to study the clinical profile of pregnancy related acute renal failure, management and clinical outcomes.

Materials and methods: After obtaining ethical committee's approval, a prospective observational study was carried out on hospitalized patients in our hospital from 1st August 2007 till 30th September 2008, where all pregnant females referred to nephrology unit were enrolled.

Results: A total of 41 patients were included in the study in which oliguria was the commonest symptom (58.53%). Fluid overload was the most common complication encountered (33.33%). Respiratory system involvement was associated with increased mortality. No correlation between serum creatinine level and mortality was observed. Neonatal deaths were seen in 2.43% of patients while IUFD was seen in 19.51% of patients.

Conclusions: Incidence of PR-ARF is still high in our country as compared to western countries. Multigravidas were more commonly affected than primigravidas. More than two organ involvement was associated with higher mortality and majority of the patients were treated conservatively. Maternal and fetal mortality were high, 17.07% and 2.43% respectively.

Key words

Pregnancy, ARF, Acute renal failure, Oliguria, IUFD.

Introduction

Pregnancy-related acute renal failure (ARF) can be caused by any of the disorders leading to ARF in the general population. There are also, however, pregnancy complications characteristic of each trimester that can be associated with kidney injury. ARF is defined by the abrupt loss of kidney function. Several consensus definitions of ARF have been developed for use in the general population in order to provide a uniform, quantitative definition of ARF. These include the RIFLE (Risk, Injury, Failure, Loss of kidney function, and End-stage kidney disease) and Acute Kidney Injury Network (AKIN) definitions and the Kidney Disease: Improving Global Outcomes (KDIGO) modifications of the AKIN definition [1]. However, it is not clear that the consensus criteria for AKI are useful in pregnancy. This is because, during pregnancy, glomerular filtration rate (GFR) increases significantly (by approximately 50 percent), resulting in a lower baseline serum creatinine compared with similarly healthy, non-pregnant individuals [2].

Pregnancy-associated AKI is uncommon in the developed world. The true incidence is difficult to estimate because of varying diagnostic criteria. Most reviews estimate that, in countries with adequate antenatal care, only approximately 1 in 20,000 pregnancies are affected by ARF severe enough to require renal replacement therapy (RRT) [3]. The incidence may be considerably higher in countries where antenatal care is less available and where illegal abortions are performed. Although some single-center series from India and Africa report an incidence as high as 10 to 20 percent, a series from Egypt reported an incidence of ARF requiring dialysis of only 0.6 percent of 5600 deliveries. ARF in pregnancy follows a bimodal distribution with respect to gestational age [4].

Apart from non – obstetrical causes, the pregnant females are predisposed to various obstetrical causes of ARF like hyperemesis gravidarum, septic abortion in the first trimester, pre-eclampsia, eclampsia, antepartum haemorrhage in the 2nd half, postpartum haemorrhage, puerperal sepsis, Acute fatty liver of pregnancy and idiopathic post partum renal failure in the later part of the pregnancy [5].

In this study we aim to study the clinical profile of acute renal failure in pregnancy: incidence, etiologies and complications, to study the various clinical features of ARF in pregnancy, involvement of various organs and its impact on maternal mortality. We also studied the outcome in terms of cure, maternal mortality and various treatment modalities available for ARF in pregnancy and its outcome.

Materials and methods

Study design

After obtaining approval from the institutional ethics committee, this prospective observational study was conducted from 1st August 2007 till 30th September 2008 on hospitalized patients in our hospital. Pregnant females who were admitted or referred to nephrology unit were included in the study. All details including name, age, gravida, periods of gestation, ANC registration status, presenting complaints and other relevant details were taken from each patient. All patients were thoroughly examined with great attention on record of blood pressure, puffiness of face, bipedal edema, pallor, icterus and papilloedema.

Inclusion/ exclusion criteria

During the study period 11,079 pregnant patients were admitted, of which 51 patients were referred to nephrology division. Out of these 51 patients, 10 patients were excluded (3 were having shrunken kidneys, 4 patients were diabetic, 2 hypertensives and 1 patient had renal calculus disease) and 41 patients met the inclusion criteria and were included in the study. These forty one pregnant patients were previously healthy and had developed acute renal failure (ARF), were having oliguria (urine output < 400 ml/day) and increasing azotaemia (serum creatinine > 1.5 mg/dl). All pregnant females

who were not willing to participate in the study, hypertensive, diabetic, having renal calculi and shrunken/ scarred kidney on ultrasound were excluded.

Data collection and analysis

All patients underwent routine blood investigations like Complete blood count, Random blood sugar level, Liver function tests with enzymes, Renal function test (Blood urea nitrogen, serum creatinine), serum electrolytes (sodium, potassium, calcium, inorganic phosphate and uric acid), arterial blood gas (ABG) Blood coagulation profile (PT/INR, PTTK, Bleeding Time, Clotting Time , Serum Fibrinogen) and urine routine and microscopy. All patients were managed either conservatively or with dialysis. Those who recovered from ARF were discharged and those who do not were followed up in ward till discharge (partially recovered) or death. Serum creatinine was estimated by modified Jaffe's reaction.

The prognosis of the patients was evaluated as; complete recovery, partial recovery and irreversible renal failure or dead. The complete improvement in the renal functions was accepted as complete recovery. Those patients in whom serum creatinine had not reached the normal value but with normal urine output and lack of need for haemodialysis was evaluated as partial recovery. But the continuing need for dialysis was defined as irreversible renal failure. Chi square test was used in statistical analysis. $P < 0.05$ was accepted as the level of statistical significance.

Results

During the study period 11,079 pregnancies were recorded, of which 41 were diagnosed with acute renal failure. Most common clinical symptom of these subjects was oliguria, followed by edema and puffiness of face (**Table - 1**). Serum creatinine was decided as the severity index, majority of the patients (23) had serum creatinine level less than 3mg/dL, of which 2 died (**Table - 2**). More than two organ failure along with renal failure was seen in 21 patients, of which 5 died (**Table - 2**). Conservative management was done in 30 patients, rest received dialysis. 7 maternal deaths were recorded during the course of the study.

Table – 1: Clinical description of the study subjects.

Clinical Variable	***n***
Symptoms reported by patients	
Oliguria	24
Edema	22
Puffiness	18
Anuria	5
Severity of acute renal failure	
Serum creatinine less than 3 mg/dL	23
Serum creatinine 3 to 5 mg/dL	12
Serum creatinine more than 5 mg/dL	6
Treatment given to the subjects	
Conservative	30
Hemodialysis	11

Table – 2: Clinical outcomes of the study subjects

Variables	**Survival**	**Death**
Serum creatinine levels		
less than 3 mg/dL	21	2
3 to 5 mg/dL	8	4
more than 5 mg/dL	5	1
Organ failure complication		
Acute renal failure alone	8	0
Acute renal failure + 1 organ failure	10	2
Acute renal failure + ≥ 2 organ failure	16	5
Maternal mortality outcomes	7	34

Discussion

41 patients satisfied our study criteria and were included in the final analysis, which is a hospital based study carried out in a tertiary care teaching hospital over a period of 14 months from August 2007 to September 2008. There were 27 (65.85%) ANC registered and 14 (34.15%)

unregistered patients in our study. 3 (11.11%) patients out of 27 registered patients expired and 4 (28.57%) patients out of 14 unregistered patients expired. The mortality rate was high in unregistered patients. Also out of 14 unregistered patients, 4 patients had home delivery and 2 patients from that had expired. This suggests that lack of ANC care, immunization and aseptic home / hospital delivery has resulted in increased mortality. Similar observations were made by Goplani, et al. [6] in his study in which out of 70 patients 11 had home delivery (15.71%). Of these 11 patients, 4 died due to septicaemia and DIC while renal function did not improve in 1 patient who had patchy cortical necrosis.

The most common presenting symptom was oliguria seen in 58.53% (24) of patients followed by oedema feet in 53.65% (22) of patients. Puffiness of face was seen in 43.90% (18) of patients and anuria in 12.19% (5) of patients in our study consistent with the study from Pakistan in which oliguria was seen in 55% of patients. However this was in contrast with the studies by Goplani, et al. [6] and one study in which oedema feet was the common presenting symptom 72.85% and 55% respectively along with oliguria.

On comparing our study with other studies we have observed that sepsis, either due to puerperal or other causes, was the commonest cause of ARF in pregnancy. However there was an increase in the incidence of Toxaemia of pregnancy which is consistent with the study of Rani, et al. [3] in which there is a significant increase in the incidence of hypertensive disorders of pregnancy from 17.8 % to 43.9%, contributing to persistently high maternal mortality (23.2 %) and perinatal mortality (53.7 %) [2]. Septic abortion was seen in 7.31% of patients with PR-ARF which is less as compared with study done by Rani, et al. [3] and Siva Kilari, et al. [7] in which they have reported that the incidence of septic abortion as a cause of ARF has declined from 14.9% (1982-91) to 9.8% (1993-97) and 9.76% respectively. We correlated between various organ involvements other than renal with the outcome in our study. The most common organ involved was as follows: respiratory system in 53.65%, liver in 46.34%, coagulation system in 31.70%, Central nervous system (CNS) in 17.07% and fundus 4.87%. On chi square test analysis we found that respiratory system involvement was associated with increased mortality in pregnant females ($p < 0.05$) whereas there was no correlation between other system and outcome.

Majority of our patients had other organs involvement. Three organs were involved in 51.21% (21), two organs were involved in 29.26% (12) and single organ involved in 19.51% (8). Also three organs involvement was associated with increased mortality in 23.80%, two organs involvement in 16.60% and no mortality with single organ involvement. These observations were similar to those observed by Kilari, et al. 56.09% (23) of patients were having serum creatinine < 3 mg/dl followed by 29.26% (3 – 5 mg/dl) and 14.63% (> 5 mg/dl) with mortality being 28.57% (2), 57.14% (4) and 14.28% (1) respectively in each group [7]. On Chi Square test analysis there was no correlation with the level of serum creatinine and outcome ($P > 0.05$).

The respiratory involvement with poor outcome was mainly due to fluid overload seen as a complication in 33.33% (24) of patients and metabolic acidosis in 30.55% (22) of patients. Other complications were hyperkalemia in 18.05% (13) and uremic encephalopathy in 5.55% (4) of patients with PR – ARF. PR – ARF followed normal spontaneous vaginal delivery in 39.02% (16/41) and caesarean section in 34.14% (14/41) in our study which was consistent with the data reported by Kilari, et al, [7] hemodialysis was needed in 26.89% (11) of patients whereas conservative treatment was given in 73.17% (30) of patients. In our study, 73.17% (30) of patients recovered completely, 21.95% (9) did not recover, 17.07% (7) of patients expired and 4.87% (2) left against medical advice.

One of our patients developed bilateral renal cortical necrosis (BRCN) (2.43%) in the post partum period and was put on maintenance haemodialysis programme as compared to study by Goplani, et al. [6] where he reported the incidence of renal cortical necrosis was 28.57% in early pregnancy and 10.71% in late pregnancy. The higher incidence was attributed to late diagnosis and referral of complications related to dilatation and evacuation. In another study conducted in India, the incidence was nearly equal in the early (20.5%) and late (29%) pregnancies [8]. This is in contrast to the western countries where postabortal ARF leading to renal cortical necrosis is rare (1.5%) [9]. However, Chugh, et al. compared the incidence of renal cortical necrosis in 1983 and 1994. He reported that the incidence of BRCN has declined from 7.1% in 1983 to 3.8% in 1994 [10, 11]. This low incidence of BRCN in our study is probably because of early treatment of complications potentially leading to cortical necrosis.

Maternal mortality was 17.07% in our study which is less as compared to other studies where it is reported to be 24.39%, 18.57% and 23.2% by Kilari, et al. [7], Goplani, et al. [6] and Rani, et al. [3] respectively. This appears to be due to early management of ante and post partum haemorrhage, complications of toxaemia of pregnancy and early intervention in form of haemodialysis and medications to treat complications and further progression of renal failure. Neonatal deaths were seen only in 2.43 % of patients while IUFD was seen in 19.51% of patients with PR – ARF, 34.14% were delivered at term and 36.58% were continuing pregnancy. Sepsis with multi organ failure, pulmonary edema and hyperkalemia were the common causes of mortality.

Conclusions

Multi-organ involvement (three organs involvement) was associated with increased mortality as compared to single organ involvement. No correlation between serum creatinine level and mortality was observed. Sepsis, multi-organ failure, pulmonary edema and hyperkalemia were the common causes of mortality. Maternal mortality was 17.07% and it has declined as compared to other studies. Neonatal deaths were seen only in 2.43 % of patients while IUFD was seen in 19.51% of patients with PR – ARF.

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