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Acute Renal Failure; Causes and Outcome

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SUMMARY

Acute renal failure (ARF) is a common problem. The data about the etiology and outcome in our country is not available. Acute renal failure was diagnosed in 187 cases out of total 6752 admissions in Department of Nephrology Shaikh Zayed Hospital, Lahore from July 1994 to December 2001. Acute tubular necrosis (ATN) was found to be the commonest cause of ARF seen in 124 patients (66.3%). Among the patients with ATN gastroenteritis (43/124 patients, 34%) and complications of pregnancy (32/124 patients, 26%) were the leading causes and both were preventable. Toxins were responsible for ATN in 16 patients (13%). Common complications included severe metabolic acidosis in 80 patients (42.7%), uremic encephalopathy in 68 (36.4%), urinary tract infection in 60 (32.1%) and pulmonary edema in 57 patients (30.5%). Complete recovery was seen in 112 patients (60%) with ARF. Death occurred in 34 (18%). Twenty patients (10.7%) had incomplete recovery and developed chronic renal failure. Death was more frequently seen in elderly patients and those who had more than two complications. Incomplete recovery was observed in female patients usually associated with pregnancy related ARF.

KEY WORDS: Acute renal failure, Acute tubular necrosis.

INTRODUCTION

Acute renal failure (ARF) is a common nephrological problem of diverse etiology, complications, and outcome. It is broadly defined as a rapid deterioration of renal functions resulting in accumulation of waste products in the body such as urea and creatinine [1]. The incidence of ARF is quite variable in different countries. In the United Kingdom, 140 per million people per year developed ARF, of which 72% were above the age of 70 years[2]. In the United States 5% of all patients in general medical and surgical wards and 10-20% patients in ICUs have ARF.[3] According to Nerlich et al[4] ARF was estimated to occur in 5% of all the hospitalized patients. In Australia the incidence of ARF was 8 patients per 100,000 populations per year.[5] The exact incidence and etiology of ARF in our country is not known.

Aims and objectives

1. To find out the common causes of ARF due to intrinsic renal disease.
2. To find out the complications and out come of these patients

PATIENTS AND METHODS

Patients admitted to Nephrology Ward, Shaikh Zayed Hospital, Lahore from July 1994 to December 2001 with ARF due to renal causes were included in the study. Diagnosis of ARF was made on the basis of acute rise of serum creatinine more than 2.0 mg/dl with no pre-existing renal disease. The relevant clinical and laboratory data including radiological, ultrasonographic examination and renal biopsy (where indicated) were carried out to determine the cause of ARF and its complications. To see the impact of these complications on the outcome of ARF, the patients were divided into two groups on the basis of number of complications. Group-1 included patients having less than three complications and group-2 with three or more complications during the course of their illness. To see the effect of the age on the etiology and

outcome, all the patients were divided into two groups, elderly group (age $\geq$50 years) and a younger group (age < 50 years)

Mild to moderate degree of uremia and its complications were treated conservatively. Acute peritoneal dialysis (APD) or hemodialysis were carried out when the conservative treatment failed, moderately severe azotemia or complications like uremic encephalopathy, pericarditis, or bleeding diathesis were present.

Complete recovery was defined as complete normality of renal functions during admission or follow-up. Partial recovery was defined as persistently abnormal renal functions after three months of acute insult. Death was considered as a result of renal failure if it was due to severe uremia or one of its complications.

RESULS

Total of 187 patients with the diagnosis of acute renal failure secondary to intrinsic renal disease were admitted. 115 (61.5%) were males and 72 (38.5%) were females. 121 (64.7%) were oligouric and remaining 66 (35.3%) were non-oligouric. Their mean age was 40.4 years + 17, ranging from 11 years to 83 years. The etiology of their renal failure is shown in Table 1. ATN was the most common cause of ARF, which was present in 124 cases (66.3%) followed by Acute Glomerulonephritis (AGN) in 31 cases (16.6%). ATN was mainly due to renal ischemia that was present in 64 patients while in other 40 patients septicemia was responsible for ATN. Hypotension due to fluid losses secondary to gastroenteritis was the cause of ischemic ATN in 43 (67% of ischemic ATN), cardiogenic shock in 3 (5% of ischemic ATN) and antipartum (APH)/postpartum hemorrhage (PPH) in 18 patients (28% of ischemic ATN).

Out of 40 patients who developed ATN due to septicemia, 12 had due to pregnancy related complications, 5 due to chest infections, 6 postoperatively, 6 due to miscellaneous causes like UTI, dental infections and road traffic accidents, and in 11 patients the cause of septicemia could not be identified. Exogenous and endogenous toxins were responsible for ATN in 16 patients (12.9% of 124 ATN patients) Out of these 16 patients, 6 were due to hemoglobinuria (malaria in 5 patients and blood transfusion reaction in one patient), 7 due to myoglobinuria (3 due to strenuous exercise, 3 due to fits and 2 due to road traffic accidents) and 3 patients because of aminoglycosides.

Table 1: Etiology of acute renal failure.

	Total	*Male*	*Female*
ATN	124	73 (63.5%)	51 (70.8%)
Ishemic	64	38	26
Septic	40	20	20
Toxic	16	15	1
Misc	4	0	4
AIN	14	14 (12.2%)	0
AGN	31	19 (16.5%)	12 (16.7%)
Ac.Urate Nephropathy	6	5 (4.3%)	1 (1.4%)
Misc.	12	4 (3.5%)	8 (11.1%)
Total	187	155 (100%)	72 (100%)

Out of 31 patients who developed ARF due to AGN, 14 patients had proliferative GN with crescents formation in eight patients, two due to mesangioproliferative GN, and one each due to membranoproliferative GN and lupus nephritis. Biopsy was not done in 13 patients who were clinically diagnosed as suffering from AGN.

Drugs like antibiotics and analgesics were responsible for Acute Interstitial Nephritis (AIN) in 12 patients. In two patients cause of AIN could not be determined. All the patients suffering from AIN were male.

Distribution of various causes of ARF in elderly and younger age groups is shown in Table 2. Ischemic ATN was significantly more common in elderly age group (P=0.02). In younger age group, out of 36 patient of ischemic ATN, 18 were due to gastroenteritis and 18 due to APH/PPH, while in elderly age group the cause of ischemic ATN was gastroenteritis in 25 patients and myocardial infarction in 3 patients. Out of 30 septic young patients, 12 were related to the pregnancy, 7 due to unknown reasons and the rest of 11 due to different causes like chest infections, postoperative sepsis and road traffic accidents.

Total 43 patients (23% of the total number of patients) developed ARF due to dehydration due to gastroenteritis. Out of these 43 patients, 35 were

male (30.4% of all male patients) and 8 were female patients (11% of all female patients) and this difference was statistically significant (P< 0.001). Elderly patients more frequently suffered from gastroenteritis (25 patients out of the total 59 patients, 42.3%) as compared to younger patients (18 out of 128, 14%) (P< 0.001). Gastroenteritis was the most common cause of ARF, especially in male and elderly patients. Pregnancy related complication like puerperal sepsis in 12 patients, hypotension due to APH/PPH in 20 patients, and pregnancy induced hypertension in 2 patients were responsible for ARF in 34 patients (18%of the total patients) and this was the most common cause of ARF in females (47% of the total 72 female patients) and younger patients (26.5% of 128 young patients).

Table 2: Different causes of ARF in two age groups

		Older group (n=59)	*Younger group (n=128)*
ATN	Total	43 (73%)	81 (63.3%)
	Ischemic	28	36
	Septic	10	30
	Toxic	4	12
	Unknown	1	3
AIN		6 (10.2%)	8 (6.2%)
AGN		6 (10.2%)	25 (19.5%)
Misc		4(6.7%)	14 (11%)

The frequencies of different complications of ARF seen in this study are shown in the Table 3. The commonest complication was severe metabolic acidosis (42.7%) followed by uremic encephalopathy (36.4%), urinary tract infection (32.1%) and pulmonary edema (30.5%).

90 patients (48.1% of the total number of patients of ARF) required acute peritoneal dialysis (APD), 11 patients (5.9%) treated with hemodialysis, 9 patients (4.8%) initially treated with APD but later on required hemodialysis, in 4 patients (2.1%) continuous Veno-venous hemodialysis (CVVHD) was done and 73 patients (39%) were treated conservatively.

Table 3: Complications of acute renal failure

Complications	*No. Of patients*
Hyperkalemia (S.Potassium > 5.5meq/l)	51 (27.3%)
Hypokalemia (S.Potassium < 3.5meq/l)	33 (17.6%)
Pulmonary edema	57 (30.5%)
Uremic encephalopathy	68 (36.4%)
Sever metabolic acidosis (Ph. < 7.2)	80 (42.7%)
Hyponatremia (S.Sodium < 130meq/l)	12 (6.4%)
Hypocalcemia (S.Calcium < 8.5mg/dl)	53 (28.3%)
Hyperphosphatemia (S.Phosphorus > 5.0mg/dl)	42 (22.4%)
Hyperurcemia (S.Uric acid > 7.0mg/dl)	44 (23.5%)
Urinary tract infection	60 (32.1%)
Coagulopathy	39 (29.9%)

Outcome

112 patients (59.9%) of ARF completely recovered, 34 (18.2%) died, 20 (10.7%) developed CRF due to incomplete recovery, and 21 patients (11.2%) either refused treatment and left against the medical advice or were lost to follow up after discharge. CRF was more frequent in females as compared to males (P=0.05) and death was more frequent in elderly patients as compared to younger patients (P=0.01) as depicted by the Figures 1 and 2.

There were 97 patients who developed less than three complications (group-1) and 90 patients developed more than three complications (group-2). The effect of the number of complications on outcome is shown in Figure 3 and as evident that partial recovery and death rate was more frequent in group 2 (P= 0.02 and 0.03 respectively). This shows that patients who developed lesser number of complications have lesser chance of CRF and death.

DISCUSSION

Acute renal failure was found in 187 out of 6752 patients (2.7%) admitted in Nephrology Ward

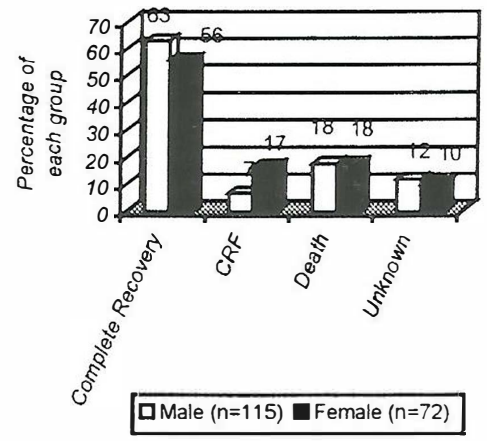

Fig. 1: Outcome in male and female patients

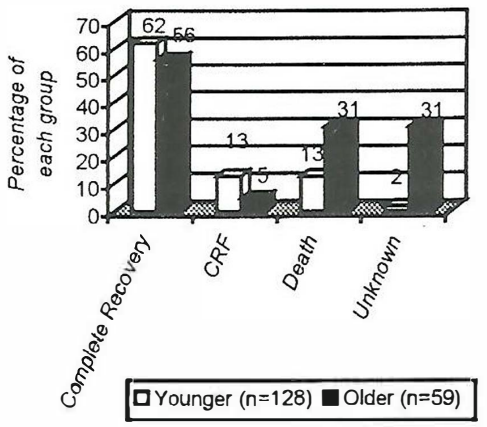

Fig. 2: Outcome in different age groups

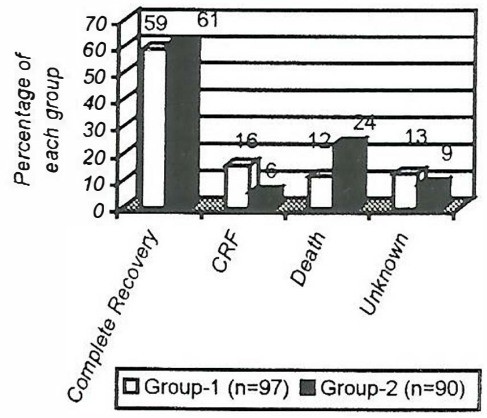

Fig. 3: Impact of complications on outcome

of Sheikh Zayed Hospital, Lahore from July 1994 to December 2001. ATN was found to be the most common cause of ARF. We found ischemic ATN as the most common cause seen in 64 (34.2%) followed by septic ATN in 40 (21.4%) patients. This was in contrast to the western studies where dehydration due to gastroenteritis is a rarity.[7] In another report from India gastroenteritis was responsible for ARF in 35% patients.[8] In our study gastroenteritis was the commonest cause of ARF (specially in older age group and in male patients). The high figure of ATN due to dehydration (43 out of 187 ARF patients, 23%) in our country like India might be due to higher prevalence of gastroenteritis and also inadequate initial management. The early initial management with fluid and electrolytes not only prevents ATN but also has effects upon the prognosis of the patients with ARF.[9]

In the present study, ARF due to obstetrical complications was seen in 34 patients (18% of 187 ARF patients) and it was the most common cause of ARF in females that is similar to other reports from the area.[8,10] Most of the cases were because of APH/PPH or puerperal sepsis. The incidence of ARF due to pregnancy related complications is decreasing in the developed countries.[11-17] Even the inner city areas of the developed world where the medical facilities are not so advance, the ARF due to pregnancy related complications is still higher as compared to rest of the developed areas.[18] The fall in incidence of ARF due to pregnancy related complications in developed countries are due to better antenatal care, decreased incidence of septic abortion due to more liberal laws and less number of home deliveries, from which we are far away. In our study all the pregnancy related ARF patients were brought from peripheral areas with inadequate antenatal care..

Septicemia unrelated with pregnancy was the cause of ATN in 28 patients (22.5% of ATN patient). Septicemia due to medical and surgical illness was seen in seven and ten cases respectively. This was in contrast to other reports where surgical complications were the most common cause of ARF.[6,19] The paucity of surgical related septicemia and ATN in present study may be due to the fact that most of the accident cases are being managed in other hospitals.

Toxic ATN was found to be the cause of ARF in 13% patients compared to the Firmat et al[19] series where toxins (mainly exogenous) were

responsible for 20% cases. Lower number in our study was probably due to exclusion of patients with pre-existing renal disease from the study.

ATN due to obstetrical complications was found to be a common cause of ARF in patients below 50 years of age and ATN due to hypovolemic shock due to gastroentritis was the commonest cause of ARF in males and patients of age more than 50 years. Other causes of ARF such as AIN, acute GN and ATN due to pigment induced nephropathy; septicemia (unrelated to pregnancy) and toxins were not significantly different in two age groups. This is different from report by Hojs.[20] This disparity may be due to the fact that pregnancy related complications and dehydration both are very rare in the developed countries.

The common complications were metabolic acidosis found to be present in 42.7% of patients followed by uremic encephalopathy in 36.4%, urinary tract infection in 32.1% and pulmonary edema in 30.5% of patients. The number of complications had direct impact on outcome. The patients having less than three complications had better prognosis as compared to those who had three or more complications as have been reported previously[21].

Despite advances in medical care, there seems to be little improvement in survival in patients with ARF, during the last 30 years[2,7,18]. In our study 59.9% of patients suffering from ARF completely recovered and 11.7% died. Apparently better survival in the present study would be because of significant numbers of obstetrical ARF and younger mean age of the patients both having better survival. Most of the studies favor the concept that prognosis and survival is not good in elderly patients[22,23] while others did not find any impact of age on survival[2,20]. We found deaths were more frequent in elderly patients.

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