

ACUTE RENAL FAILURE: A PROSPECTIVE FOUR MONTHS STUDY AT SHARIATI HOSPITAL

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Abstract - To delineate the incidence, epidemiology, etiology, and prognosis of acute renal failure (ARF) and to compare the findings with international data, we prospectively studied 2360 patients, admitted at Shariati hospital during a four months period ending on Jan, 6, 1996.

One hundred and twenty-four (5.1%) patients meeting ARF criteria were encountered. The most common cause of ARF was prerenal azotemia, nephrotoxins were the second common cause, and primary renal diseases were the third.

In-hospital mortality was 5.5% and 31% of this mortality was related to ARF. Poor prognostic factors were oliguria, maximum serum creatinine (Cr) level, rise of Cr during admission, multiorgan failure, and sepsis.

Acta Medica Iranica 39 (2): 103-105; 2001

Key Words: Acute renal failure (ARF), etiology, prognosis

INTRODUCTION

Acute renal failure (ARF) is a clinical syndrome characterized by a precipitous deterioration in renal function over a period of hours or days. It carries a high rate of morbidity and mortality, is caused by a variety of different disorders, and occurs in a wide range of clinical settings (1).

The potential reversibility of many specific entities in the differential diagnosis mandate that a rapid diagnosis is made and appropriate therapy started (1). ARF complicates approximately 5% of hospital admissions and up to 30% of admissions to intensive care units (2). It is usually asymptomatic and diagnosed when routine biochemical screening of hospitalized patients reveals a recent increase in blood urea nitrogen (BUN) and serum creatinine (Cr) level. Oliguria (urine output <400 ml/d) is frequent (50%) but not in clinical features (3-5).

To clarify the incidence, epidemiology, etiology and prognosis of ARF, and to compare them with international data, we undertook a prospective study of all patients admitted over a 4-month period at Shariati hospital, the aims of which were to:

Determine the incidence of ARF in a general

hospital in Tehran, etiology of ARF, the impact of age, sex, underlying disease, serum Cr level, urine sediment, and oliguria on prognosis of ARF, and assess its mortality in Iran.

MATERIALS AND METHODS

Terminology and definitions

ARF was defined as an acute reduction in renal function with a persistent rise of serum Cr level: > or = 0.5 mg/dl in patients with basal serum Cr levels of < 2.5 mg/dl and > or = 1 mg/dl in patients with basal serum Cr levels of > or = 2.5 mg/dl. Three thousand eight hundred and fifty two (3852) patients were admitted at Shariati hospital from Sep 7, 1995 to Jan 6, 1996. Patients of Catheterization Laboratory (Cath Lab) and Infertility ward were excluded, as they were discharged on the day of admission. The records of 2360 patients were reviewed daily to determine if they met criteria of inclusion (serum Cr > or = 1.2 mg/dl). All who entered the study were evaluated by one or more of research team personnel. Patients with inadequate data for definite diagnosis of ARF were regarded as suspected group and those with undetermined origin as unknown group. P-values were investigated by Chi-square and T-test, with significant level set at 0.05.

RESULTS

One hundred and twenty-one (5.1 %) patients met the criteria for 124 episodes of ARF (three patients developed two attacks of ARF).

In-hospital mortality was 5.5% while mortality of ARF was 31%. Mean age of patients was 51.3 ± 20.4 years, and 57% of them were males.

Out of 124 episodes of ARF, 89 (72%) were pure ARF, 27 (22%) were acute on chronic renal failure and 8 (6%) were suspected ARF.

Ninety (73%) episodes of ARF had a single cause, 19 (15%) had multiple causes and 15 (12%) were of

unknown causes. Frequency of underlying diseases was as follows: Diabetes mellitus (DM) 5.6%, hypertension (HTN) 12.9%, DM and HTN 13.7%.

Thirty-six (29%) patients were oliguric, and 75 (65%) were nonoliguric.

While 1641 (43%) patients were admitted in medical wards, 1235 (32%) in surgical wards and 956 (25%) in Gynecology - Obstetrics (GYN-OBS) ward, the distribution of ARF was 68%, 30%, 2%, and ARF mortality rates were 26%, 47.3%, and 0% respectively.

The most common cause of ARF was prerenal azotemia (36%) and other causes were as follows: Nephrotoxins (24%), primary renal diseases (14%), septicemia (11%), and obstruction (6%). Ten percent of cases were due to tubulointerstitial nephritis.

Table 1 shows distribution of ARF, and mortality of it in different wards.

Age, sex, underlying renal disease, HTN, DM, and active urinary sediment did not have any significant correlation with prognosis of ARF prognostic factors of ARF are shown in Table 2.

Table 1. Incidence of ARF on descending order and its mortality in different wards of Shariati hospital

WARD	Admission	Total mortality		ARF Mortality
		(%)	ARF (%)	(%)
Renal transplantation	28	3(10)	(53%)	3(20)
Hematology	59	8(13.5)	(17%)	4(40)
G-ICU	554	69(44)	(13%)	58(90)
Nephrology	234	3(12)	(13%)	(12%)
CCU	215	19(8)	(7%)	2(3)
OII-ICU	229	13(5)	(5%)	4(33)
Rheumatology	283	4(1.4)	(4%)	3(23)
Neurosurgery	83	1(1.2)	(2.5%)	0(0)
Pulmonology	129	2(1.5)	(1%)	0(0)
Surgery	275	2(0.7)	(0.7%)	1(50)
GYN-OBS	1235	0(0)	(0.1%)	0(0)
Orthopedics	205	0(0)	0	0(0)
Oromaxillofacial Surgery	140	0(0)	0	0(0)

Table 2. Prognostic factors of ARF in Shariati hospital

Factor	Relative risk	P-Value
MOF	14.54	0.000001
Delta Cr	6.3	0.0063
Cr > 6	5.75	0.0026
Septicemia	3.69	0.04
Oliguria	2.73	0.017

DISCUSSION

The incidence and mortality of ARF at Shariati hospital were 5.1% and 31% respectively which is

similar to studies of Hou and co-workers (2) and Anderson and co-workers (3).

Despite significant advances in supportive care, the lack of improvement in frequency and prognosis of ARF reflects a tendency for more aggressive surgical and medical interventions in an aging population, frequent major surgeries, nephrotoxic drugs used in ill patients, and iatrogenic injuries of the kidney due to angiography or intravenous pyelography.

High incidence of ARF in general intensive care unit (G-ICU) was due to multi-organ failure (MOF), sepsis, and shock, and in open-heart intensive care unit (OH-ICU) due to open heart surgeries, hypotension, prolonged mechanical ventilation, and cardiopulmonary diseases.

Incidence of ARF in renal transplantation ward was high because of acute rejection as a major cause of ARF in this ward. In hematology and oncology wards, high incidence of ARF was due to septicemia and nephrotoxic drugs including antibiotics and chemotherapeutic agents. Low frequency of ARF in orthopedics and GYN-OBS wards was due to the nature of operations, usually performed in these wards, and to the fact that, complicated patients of these wards were transferred to G-ICU as soon as possible.

The most common cause of ARF was prerenal azotemia (36%), including volume depletion, congestive heart failure, cirrhosis and nephrotic syndrome. The other common causes were endogenous (rhabdomyolysis, hemolysis...) and exogenous nephrotoxins (24%), including gentamicin (72.4%), cyclosporin (10.3%), angiotensin converting enzyme (ACEIs) inhibitors (6.8%), NSAIDs (6.8%), and dye (3.4%).

Other causes of ARF were primary renal disease (14%), sepsis (11%), postrenal azotemia (6%), while (9%) were due to unknown causes.

Thirteen cases of tubulointerstitial nephritis were diagnosed, 9 (69%) of them were in renal transplantation ward, 7 (53%) had acute rejection and 2 (15%) had acute cortical necrosis. Frequency of nonoliguric ARF in our study, in Hou's (2), and in Anderson's(3) studies was 33.2%, 81%, and 59% respectively.

Mortality in severe ARF who needed dialysis was 47.8% and in mild to moderate ARF who did not need dialysis was 1.3%. Mortality of septic patients, postrenal azotemia, prerenal azotemia, primary renal disease, and nephrotoxic ARF was 56%, 50%, 39.2%, 30%, and 20.5% respectively.

The most common cause of postrenal azotemia was malignancy, hence the high ratio of ARF mortality to total mortality in medical and surgical wards was 26% and 47.3%, respectively.

Higher mortality rate in surgical wards could be due to insufficient care of renal function and the nature of

the patients who underwent major operations in these wards.

Poor prognostic factors in our study were oliguria, maximum serum Cr, rise of Cr (delta Cr), MOF, and sepsis which increased mortality of ARF significantly, while in Hou's study (2), they were severity of ARF, underlying renal disease, oliguria and active urinary sediment.

In conclusion, our study shows that the incidence, etiology, and prognosis of hospital acquired ARF in a general hospital in Tehran are similar to international data (1-7). High mortality of these patients is due to their underlying disease; actually they die with ARF, not because of it, and the most important step in management is prevention of ARF instead of treatment.

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