

Aetiological Spectrum of Acute Renal Failure in Kumaon Region of Uttarakhand.

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ABSTRACT

Background: Acute renal failure (ARF) or acute kidney injury (AKI) is a clinical condition in which rapid decline in glomerular filtration rate over an hour to days. It is an important clinical condition and common cause of mortality in hospitalized patients. Aims: To analyze the aetiological spectrum and outcome of ARF in Kumaon region of Uttarakhand and to compare data with that of other parts of country. Settings and Design: Hospital based observational analytic study. **Methods:** This study was conducted on patients admitted to Government Medical College & associated Dr. Susheela Tiwari Memorial Hospital Haldwani from November 2011 to October 2012 with ARF irrespective of the cause. ARF was defined according to AKIN criteria. Statistical analysis used: Statistical analysis of data was performed using SPSS V.20.0 (Windows). All data was summarized and expressed as mean \pm SD or as percentages as appropriate. The chi square test was used to analyze categorical variables while the student T-test used to analyze normally distributed data. Statistical significance was accepted at $p < 0.05$. **Results:** Out of 100 patients, 77% had community acquired ARF and 23% had hospital acquired ARF. Medical causes were leading contributors (68%), while surgical causes in 20% and obstetrical causes in 12% of patients. 36% patients required hemodialysis. The overall mortality was 21%, and highest mortality was found in celphos poisoning group (100%). **Conclusion:** ARF is still common in the community and is associated with high mortality. Aetiologies like acute gastroenteritis, septicemia, snakebite and malaria were the leading cause of ARF in our study.

Keywords: acute renal failure, hospital, hemodialysis, septicemia, shock.

INTRODUCTION

Acute renal failure (ARF) is characterized by rapid (over hours to days) decline in glomerular filtration rate, retention of nitrogenous waste products and perturbation of the extracellular fluid volume, electrolytes and acid base homeostasis.^[1]

ARF constitutes approximately 5% of hospital admissions and up to 30% of admissions to intensive care units.^[1] Although reliable statistics on the prevalence of AKI are not available, statistics on referrals to dialysis units suggest that the condition is more common in India as compared to the West.^[2] ARF can result from decreased renal perfusion without cellular injury, an ischemic, toxic or obstructive insult to the renal tubule, a tubulointerstitial process with inflammation and edema or primary reduction in the filtering capacity of the glomerulus.^[2] The mortality rate among patients with ARF approaches 50% and has changed little over the past 15 years.^[1]

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This study was conducted in a tertiary care hospital providing nephrology services in kumaon region of Uttarakhand. The aetiology of clinical ARF is closely linked to socioeconomic condition, medical facilities, education level and environmental

condition of area. Therefore, etiological spectrum of ARF is different in different regions of India.^[3]

MATERIALS AND METHODS

This was a prospective study, done over a period of 1 year in a tertiary care hospital. All adult (>18 years) patients admitted to this hospital were included. All one hundred and two patients with clinical (uremic symptoms or oliguria or anuria of recent onset) and laboratory evidence of azotemia (urea and creatinine above 40mg/dl and 1.5 mg/dl, respectively) were eligible. Adult patients who developed kidney injury after at least 24 hours of admission were referred as hospital-acquired AKI. Patients who had AKI on admission were considered as community-acquired AKI. Patients with chronic renal failure, acute or chronic renal failure and those not willing to participate were excluded from this study. The patients included in the study were explained in detail about the purpose of the study and an informed consent was taken. Evaluation included a detailed history, physical examination and laboratory investigations.

Patients were followed up until discharge or death. Each patient was looked for the complications of ARF like fluid overload, hypertension, electrolyte abnormalities, metabolic acidosis, uremic complications, bleeding, neurological abnormalities and infections. Hemodialysis was instituted as and when required. Kidney injury was listed as a cause of death if patient exhibited evidence of severe

uremia, hyperkalemia or volume overload secondary to oliguria. Patients were classified as oliguric (urine output<500 ml/day) and non oliguric (urine output>500 ml/day) during the azotemic phase. The study has been approved by institutional ethics committee. Chi-square test and student T-test were used for statistical analysis.

RESULTS

One hundred patients who satisfied the inclusion criteria were included. The mean age of these patients was 38.75±15.2 (range 20 to 83) years. The number of males was 60% and 40% were females. (Table 1) The mean duration of hospital stay was 10.2±7.3 days with a range from 1 to 38 days. Out of the 100 patients, 68% were admitted with medical causes, 16% with surgical causes and 12% with obstetrical causes. In our study most common cause was septicemia followed by acute gastroenteritis. (Table 2) Multiorgan failure were present in 34% patients. Twelve percent patients with multiorgan failure were died. Active urinary sediment was noted in 47% patients and mortality rate in them was 8%. Kidney biopsy was done in four patients two were having acute tubular necrosis (ATN), one revealed diffuse proliferative glomerulonephritis (DPGN) and one revealed allergic interstitial nephritis (AIN).

Table 1: Distribution of patients according to age group

Age group	Number	Percentage
≤25	11	11.0
25-34	33	33.0
35-44	26	26.0
45-54	14	14.0
55-65	11	11.0
>65	5	5.0
Total	100	100

Table 2: Distribution of patients according to age group

Aetiology	No. of patients or (%)
Septicaemia and Obstetric cause	32
Acute gastroenteritis	26
Snake bite	10
Drug induced	8
Celphos poisoning	6
Malaria	4

Mismatch blood transfusion	2
Hornet sting	2
Hepato renal syndrome	2
Post renal	8

In the remaining majority of patients, either the consent for kidney biopsy was not available or the patients had improved. Fifty-three patients did not have active sediment in urine. Sixty-four percent patients were managed conservatively and 36% patients underwent hemodialysis. Among the patients managed conservatively, 23.43% patient died and among those who underwent hemodialysis 16.66% patients died. The difference in mortality was not statistically significant (P>0.05). The mortality in our study was 21%. When we compare the mortality in septicaemia and celphos poisoning with other groups of ARF, there was statistically significant higher mortality in septicaemia group and celphos poisoning group as compared to other groups (P<0.05).

When we compared the mortality in two groups with or without comorbid conditions there was statistically significant difference in mortality in patients who had comorbid condition with ARF (P<0.05). When we compare mean duration of symptoms before hospitalization and mortality, the patients who present late in our hospital (>3 days) the mortality was statistically significant (P<0.05). On comparing mortality in different geographical area, the patients who came from hilly area had statistically significant high mortality as compared to those who came from plain (P<0.05).

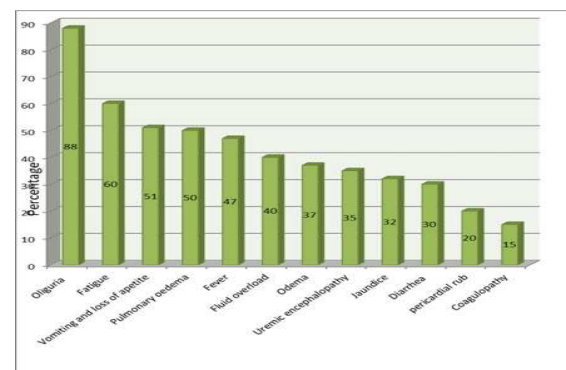


Figure 1: Bar diagram showing Presenting Clinical features of ARF patients

In the study, 40 patients required vasopressor support and 15 (37.5%) died whereas 6 (10%) out of 60 patients died who did not receive vasopressor support (P<0.05). In this study, 20 patients had nonoliguric AKI and mortality in nonoliguric AKI was 5% as compared to 40% in the oliguric patients (P<0.05). Severe metabolic acidosis was present in 12 patients. All of them died despite dialysis. Hyperkalemia was noted in 10 patients (10%) who also had metabolic acidosis. Intrinsic renal ARF was

seen in 52% patients. Forty percent patients had pre renal ARF and 8% had post renal ARF. The mortality was 18.75% in hospital acquired AKI and 22% in community acquired AKI ($P > 0.05$).

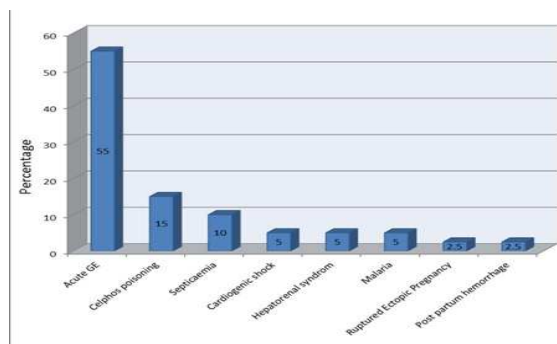


Figure 2: Bar diagram showing Aetiology of Pre Renal Failure

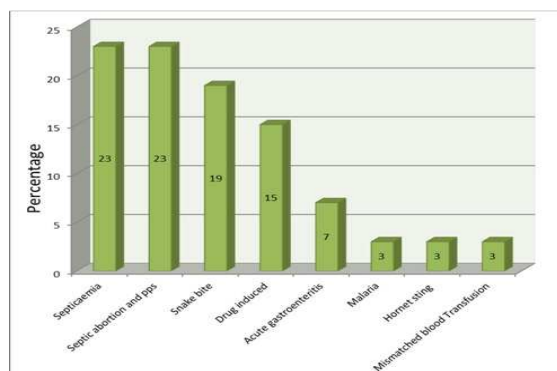


Figure 3: Bar diagram showing Aetiology of Renal ARF

DISCUSSION

In the current study, patients between 21 and 83 yrs of age were enrolled. The mean age was 38.75 years out of which (60%) were males and (40%) were females. Whereas study on acute renal failure done by Bernieh et al.^[5] the mean age was 56.2 years out of which 64% were males and 36% were females. However, in another study done by Ravindra L. Mehta et al.^[6] reported the mean age was 59.5 years with 59% females and 41% males. The mean age in present study was less in comparison to other study by Ravindra L. Mehta et al.^[6] and Bernieh B et al.^[7] The dominance of young age in the present study is in contrast to the fact that renal function decreases with increase in age. Like other societies, our society also showed more inclination and interest to promptly treat and brought young patients to hospital and neglect older people.

In other aetiologies majority of patients were males except for patients suffering from septicaemia in which female are common, it is due to higher incidence of postpartum sepsis and urinary tract infections.

We observed oliguria, fatigue and vomiting as most common symptoms, which encompasses of 88%, 60% and 51% respectively [Figure-1]. These findings corroborated to the study done by Singhal et al.^[8] which showed that oliguria was seen in 85.2% patients. In the present study, hypotension was seen in 51% of the patients, which is comparable with other studies done by Bernieh et al.^[7] where hypotension was reported in about 52% of patients. However, present findings did not corroborate the findings of Liano F. et al.^[9] and Singhal et al.^[8] where hypotension was seen in 32.8% and 20.6% of patients respectively. Higher incidence of shock in this study might be due to majority of patients of ARF were having septicaemia, celphos poisoning and acute gastroenteritis.

In the present study, out of 100 patients, 68% of patients had ARF due to a medical, 20% were due to a surgical and 12% due to obstetrical cause. Gurucharan Avathi et al.^[10] and Arora P. et al.^[11] attributed the highest incidence of ARF due to medical cause which was about 68% and 74% respectively followed by other causes. The advancement in critical care, surgeries and surgical intervention resulted more number of ARF patients due to surgical causes. In addition, the poor intraoperative and postoperative care precipitates the ARF. In present study, the low percentage of ARF in surgical patient could be attributed to non-performance of open heart and pancreatic surgery as well as better postoperative care.

In this present study of 100 cases, 40% patients had ARF due to pre-renal cause. Out of which 22(55%) patients had acute gastroenteritis, 6(15%) patients had history of celphos poisoning, 4 (10%) patient had septicaemia, 2 (5%) patient had cardiogenic shock, 2 (5%) patients had hepatorenal syndrome, 2 (5%) patients had malaria and 1 (2.5%) patients had rupture ectopic, and 1 (2.5%) had post-partum haemorrhage.[Figure 2] These results were contrary to the study by Liano F. et. al.^[9] which has shown prerenal ARF in 21% of patients. Study by Liano F. et al.^[9] was conducted in developed country where advanced health care facilities are readily available. In our study, this contrary finding can be explained by lack of primary health facilities in our country in comparison to developed countries. This fact is supported by the observation of Prakash J. et al.^[12] which showed that diarrhoea, malaria and sepsis are common causes of ARF in developing countries.

In this study, 52 patients had renal cause of acute renal failure Out of these, septicaemia was seen in 12 (23%) patients, 12 (23%) had septic abortion and postpartum septicaemia, 10 (19%) had snakebite, 8 (15%) had drug induced, 4 (7%) had acute gastroenteritis. Two (3%) patients had malaria, 2(3%) had hornet sting and 2(3%) patients had mismatched blood transfusion [Figure 3]

In the present study, septicaemia was the dominant cause of ARF. Twenty-nine patients had septicaemia, which was similar to study done by Bernieh B. et al.^[7] (44%), where septicaemia was the predominant cause of ARF.

In our study, post-partum sepsis was present in 13% of cases which is similar to study done by Prakash J. et al.^[12] where (10.5%) cases of postpartum sepsis was present. A study from Centre of Kidney Disease from Pakistan by Munib et al.^[13] showed that the third world countries are still having pregnancy related complications as a case of ARF. In his study 25% patients were having pregnancy related ARF. In contrast, a study done by Noronha et al.^[14] from Brazil showed only 0.3% cases of ARF due to obstetric complication. We concluded that obstetric care was better in Brazil in comparison to India. In our region most of the deliveries are conducted by unqualified person and their hygienic precaution are not proper. Even at peripheral centres, enough facilities are not available to cope up with obstetric emergencies. These cases develop complications before reaching any well-equipped tertiary centre. The hilly geographical conditions, unavailability of doctors in primary health centre, poor transportation and road all contribute to a high number of cases of post-partum sepsis. A higher number of cases were observed in present study in comparison to other studies done from North India.

Total 26% cases of acute gastroenteritis were seen in our study done by Chugh KS. et al.^[3] Study from developed world done by Liano F. et al.^[9] Beamen et al.^[15] had found very few numbers of cases of ARF due to acute gastroenteritis which is due to advance health care facilities.

Snake bite is also an important cause of ARF, which accounts for about 10% in the present study which is comparable to study done by Jaya kumar et al.^[16] The occurrence of considerable number of snake induced ARF can be attributed to socio-economic status and geographical condition of the region, where locals were largely dependent on agriculture and forest for their livelihood. The snakebites were more frequent in forest as well as agricultural areas in monsoon season when snakes were more active. Prolonged hypotension, DIC, intravascular haemolysis, nephrotoxicity of venom and myoglobinurea finally causing acute tubular necrosis was pathological reason for ARF.

In the present study, 8% of patients had ARF following drug nephrotoxicity. The common drugs used were NSAID'S, aminoglycosides, ACE inhibitors and ARB'S however, contrast induced ARF was seen in two patient. Six cases of celphos poisoning were found in this study and all cases presented with shock and oliguria. Consequently, they did not responded to vasopressor for hypotension, due to sustained hemodynamic instability only one patient became dialysed. The

acute condition due to shock and oliguria resulted in multiorgan failure consequently lead to death of all patients. There were 4% cases of malaria in our study. However study done by Singhal AS et al.^[8] found that 16% of patients with malaria had ARF. The lesser incidence of malaria cases in our study might be due to different ecological and geomorphological conditions of hilly region, which is unfavourable for mosquito breeding.

The mortality rate in this study was 21%, which was lower than study done by Prakash J. et al.^[12] which was done in Northern India. This is contrary to study done by Noronha et al.^[16] found that mortality in ARF was 50%. Sixty-four percent patients were managed conservatively while 36% were dialyzed. Mortality in patients who were not dialyzed was 23.43%, which was higher than those who were dialyzed 16.66%.

Fourteen patients died who were on conservative treatment, 5 (35.71%) had died due to Celphos poisoning, 4 (28.57%) septicaemia, 2 (14.26%) due to acute gastroenteritis, 1 (7.14%) due to cardiogenic shock, 1(7.14%) hepatorenal syndrome, 1(7.14%) PPH with septicaemia. The common factor in all the patients was hemodynamic instability because of which these patients were not offered dialyzed despite of presence of indications. Our study had one lacunae that peritoneal dialysis was not considered in these patients as this therapeutic intervention was not available at our centre. However, in study done by Ali A. et al.^[17] since peritoneal dialysis was available, hence the results could not be compared. In the present study, those patients who had dialyzed they have not statistically better survival rate as comparison to those who had not dialyzed. This discrepancy can be explained by the fact that most of our patients who were managed conservatively and died were in need of dialysis but because of unstable hemodynamic status, they were not dialyzed and therefore expired. We conclude that whenever indicated early dialysis definitely gives better survival rates.

Our study area had hilly as well as plain fields. It is evident that cases coming from hilly area needed more travelling time and had poor access to good medical facility have significant higher mortality in comparison to those coming from plain area. The major factors behind the mortality were poor roads and transport facility and they had deprived of initial primary health management.

CONCLUSION

In this study the main burden of diseases were due to infective aetiologies like acute gastroenteritis, septicaemia, snakebite and malaria. This is unlike to studied done in developed countries. This reflects inadequate healthcare facilities, poor sanitation and low socioeconomic status in our

patient population. Clinical features were comparable with the observations made elsewhere in developing countries. Cases came from hilly area reached late in a tertiary care centre due to poor roads, lack of transport facility and they have inadequate medical facility. In hilly area these factors had contributed to significantly high mortality in ARF patients. Therefore, this study emphasized the availability proper health care facilities in developing countries, especially in hilly areas.

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