ORIGINAL ARTICLE

AETIOLOGICAL PROFILE AND OUTCOME IN PATIENTS WITH ACUTE KIDNEY INJURY (AKI) ADMITTED TO VIMS, BELLARY

Ramamurthy P[1], Shivraj[2], Sunil Kumar N[3], Malappa[4], Vishwanatha Huggi[5]

ABSTRACT: BACKGROUND AND OBJECTIVES: This was a study about the various causes of ARF, in our hospital (VIMS, Bellary) during a specified period, and to find out the incidence of Pre-renal, Renal and Post-renal causes by using renal failure indices and to analyze outcome of ARF pertaining to the aetiology. **MATERIALS AND METHODS:** 70 cases admitted at VIMS, Bellary during the period January 2012 to june 2013, with clinical evidence of acute renal failure were included in the study. They were evaluated for various etiological, prognostic factors and its outcome. **RESULTS:** Among the various aetiologies in our study, snake bite (28.6%), ADD (27.1%), RPGN (7.1%) were the most common. Most common type of renal failure was prerenal (50%), among them ADD was the predominant cause followed by intrinsic failure (47%), among them snake bite was leading cause. Patients presenting with Anuria, late presentation to hospital, blood pressure <100(mmHg) and initial creatinine (>3mg) had poor outcome. **CONCLUSION:** Amongst the etiological factors snake bite and ADD ranked first. Prognosis was determined by age, aetiology of renal failure, initial creatinine value, blood pressure, time of presentation to. Even though both snake bite and ADD are equally common causes, morbidity is more in snake bite and cost of treatment also more in snake bite as many of them require dialysis.

KEYWORDS: Acute kidney injury, snakebite, hemodialysis, acute diarrheal disease.

INTRODUCTION: Acute kidney injury (AKI) is a common clinical syndrome with a broad a etiological profile. It is associated with major morbidity and significant mortality due to the severity of the causative illness. It complicates about 5 per cent of hospital admissions and 30 per cent of admissions to intensive care units (ICU).[1] The true incidence of AKI is not easily discerned from published reports because of variation in methods of case ascertainment, definitions of AKI, and catchment populations.[1] Most surveys of hospital populations cannot estimate true population incidence because there is a category called unselected hospital populations which include many patients never referred for nephrological opinion.

Hospital-based studies of AKI reflect selection bias as these populations are defined by the referral patterns to the site of care. While AKI secondary to diarrhoeal diseases, toxins, septic abortions, and other infections and environmental conditions are the common causes in the tropical countries, AKI following trauma due to high-speed traffic and industrial accidents, complex cardiovascular surgery, nephrotoxic drugs and chemicals, and cardiogenic shock are more prevalent in the industrialized world.[1,2]

Hence, we undertook this study to determine the various causes of AKI, in our hospital (VIMS, Bellary) during a specified period, and to find out the incidence of Pre-renal, Renal and Post-renal causes by using renal failure indices and to analyze outcome of AKI pertaining to the aetiology.

ORIGINAL ARTICLE

MATERIALS AND METHODS: This is a single Centre non-randomized prospective study conducted in VIMS (Vijayanagara Institute of Medical Sciences), Bellary over a period of one and half year from January 2012 to June 2013.All patients with symptoms of oliguria or uremia with raised serum urea and creatinine were included in the study. This includes those patients admitted in medicine and surgical wards for which nephrologist had been called for renal failure management. Patients with past history of hypertension, diabetes mellitus or previous history of renal diseases and patients with contracted kidneys (< 7 cm) were excluded from study.

AKI was diagnosed by AKIN criteria according to the following Criteria:
1. A rise of at least 0.3 mg/dl or more than 50% of baseline in serum creatinine within a period of 24-48 hours.
2. Decrease in urine output to 0.5 ml/kg/hour for longer than 6 hours.
3. Absence of pre-existing renal disease.
4. All patients were started on appropriate conservative therapy. Whenever possible, the aetiological factors were treated. Hemodialysis was begun (a) When biochemical or clinical deterioration occurred despite conservative measures or (b) When patients presented in severe uremia.

RESULTS: A total of 70 patients with AKI was studied in this period. The end point taken for this study was symptomatic improvements as well as improvement in biochemical results. In a few patients who died during study, death was taken as final end point. The data were analysed prospectively in these patients. Out of 70 patients 38 were males and 32 were females. Patients of age group between 31-40 years were most commonly involved constituting 32.9%, followed by 41-50 years constituting 25.7%.

Snake bite [Male 13 cases, Female 7 cases] was more common in male patients, which may be related to their place of working (agricultural fields). Otherwise other aetiologies were equal in both sexes. In our study, snakebite was the most common cause of AKI, followed by Acutediarrhoeal disease (ADD). Various causes in relation to initial admission in hospital are shown in table 1. Post-surgical causes included pre-renal AKI following any surgery. Poisoning included copper sulphate and paraquat poisoning.

Among 70 patients, 35 patients [50%] were managed conservatively, 35 patients [50%] underwent dialysis. Dialysis was given mostly to intrinsic renal failure patients. Among 33 cases of Intrinsic renal failure, 24 patients (72.7%) received dialysis. Prerenal type renal failure patients were totally 35. Among this, 9patients received dialysis. All these patients who received dialysis in this 'prerenal' group initially showed urinary indices value in the range of 'prerenal' pattern.

But later as the illness progressed and not responded to conservative line of management they were treated with dialysis and investigations taken at that time showed 'Intrinsic Renal' pattern. Two Post renal cases, both underwent hemodialysis once each. Among the 70 patients studied, 11 patients expired. Among this 6 were males (54.5%) and 5 were females (65.5%).

The mortality pattern and proportional mortality rate are shown in table 2. In our study, 6 patients presented in hypotension with proportional mortality rate of 66.6%, which was statistically significant. Another 48 patients presented to hospital with blood pressure between 100-140, in which proportional mortality rate was 10.4%. This was statistically significant with p<0.05.

This is shown in table 3. Also, Patients with heamoglobin equal to or more than 10 have better

ORIGINAL ARTICLE

prognosis (13.9) compared to Hb% less than 10% (18.5%), which was statistically not significant. There is no much difference in mortality of the patients in our study based on serum potassium levels. All deaths occurred in our study had hyponatremia (<136), which suggests patients with serum sodium less than 136 had bad prognosis and Proportional mortality was 17.1%, which was statistically insignificant (p=0.26). Also, no deaths were seen in patients with serum sodium in between 136 to 146.

Proportional mortality was high (40%) in Patients with Anuria (10 cases) compared to patients with oliguria (12.5%), which was statistically significant (p<0.04) as shown in table 4. Patients having initial creatinine value of <3 mg% (38 cases) [54.3%] have better prognosis and proportional mortality is less [7.9%] in them, which was statistically significant (p=0.05) as shown in table 5.

DISCUSSION: As already discussed, hospital based studies of AKI reflect selection bias as these population are defined by the referral patterns to the site of care. Here in our study those cases that are admitted in medical ward directly or taken over by other department were taken into account. On the other hand, those AKI cases in medical wards and surgical wards for whom nephrologist opinion not obtained either because they were treated by concerned unit physician or patients got discharged at their own request would not have come into account.

Especially surgical and trauma ward cases the incidence would have been more than what we have observed. But because either of the death of the patients or discharge at request or some other reasons would not have come to our notice. Incidence of prerenal, renal and post renal types of AKI in our study is 50%, 47.1%, 2.9% respectively. But according to various studies conducted in Western countries,[3] prerenal constitute 55-60%, renal 40-45% and post renal around 5%. But the slight change in incidence in our study may be due to increased incidence of 'intrinsic' AKI in this region.

And one important observation in our study is some prerenal cases, even though they initially showed urinary indices of 'prerenal' pattern latter progressed to 'intrinsic' pattern [Probably because of persistence of underlying pathology like ischemia, dehydration, etc.].[2,3,4,5] Aetiology of AKI is varying compared to temperate countries. Common aetiologies in our study are snake bite (28.6%), diarrhoeal disorder (27.1%), whereas in the developed world extensive trauma, abdominal and vascular catastrophes and complicated open heart surgery are the leading causes.[1,6]

But studies conducted in India show more or less similar aetiologies. In a study conducted by M. Ramprabakar et al[7] post diarrhoeal, RPGN and Leptospirosis were the leading causes of AKI.

Chugh et al[8] showed chemicals, drugs, RPGN, Post-diarrhoealas leading causes. Among the various aetiologies in our study, snake bite (28.6%), ADD (27.1%), Rapidly progressive glomerulonephritis [RPGN] (7.1%) are the common medical causes. The factors appear to be responsible for such a high incidence of snake bite induced AKI are most of the patients admitted in our hospital are from rural areas where snake bite is common and important occupational hazard.[9]

Another common medical cause in our study is AKI following ADD. The factors appear to be responsible for such a high incidence of ADD are poverty, poor socioeconomic status, poor hygiene in our setup and scarcity of primary health care and late referrals from peripheral centers. But the mortality in these 19 cases is only one. This is notable because previous studies conducted in many places showed more mortality. This indicates improvement in care, and effectiveness of dialysis.

Present study showed 50% of patients were managed conservatively 50% underwent dialysis. 'Intrinsic renal' failure patients received more dialysis than prerenal failure patients.

ORIGINAL ARTICLE

Of the total 11 cases died, 6 cases didn't undergo any form of dialysis. This indicates the better prognosis in patients who underwent dialysis. More institution of dialysis in our study, may be the reason for less mortality in our study compared to others.[10]

In our study, prognostic factors studied were symptoms (weather oliguric or non-oliguric), initial creatinine value, age, blood pressure, Hb%, serum electrolytes, and institution of dialysis and time of presentation to hospital. According to the present study most of the patients presented with oliguria and these patients had statistically significant mortality rate. Initial creatinine value, that is those having initial creatinine value of <3 mg%[11] (38 cases) [54.3%] have better prognosis and proportional mortality is less [7.9%] in them.

Likewise institution of dialysis reduces the mortality. In a study conducted by Liano F et al,[10] dialysis was given to 36% Patients and mortality was 45%. In our study, dialysis was given to 50% and mortality is 15.7%. Patients presenting with anuria, hyponatremia and late presentation to hospital and hypotension (systolic BP <100mmHg) also had poor outcome.

In conclusion, snakebite and ADD formed the major causes of AKI in our study. Even though both snake bite and acute diarrhoeal disorder are equally common causes, morbidity is more in snake bite and cost of treatment also more in snake bite as many of them require dialysis. Dialysis was required in 50% cases and was mostly for intrinsic renal failure patient. Also, hemodialysis plays an important role in improving the prognosis. Prognosis is determined by age, aetiology of renal failure, initial creatinine value, blood pressure and time of presentation to the hospital and comorbidity.

As morbidity and mortality due to snake bite induced renal failure is high, people must be made aware of this rural occupational hazard, and they should be taught about the preventive aspects. And as acute diarrhoeal disorder is another common cause of AKI, people should be given health education and to be taught the importance of fluid replacement therapy and early referral to hospital, which may reduce the incidence of AKI and its consequences.

REFERENCES:
1. Ciaran Doherty, JD Firth, Michael Beaufils, Kirpal S Chugh, VisithSitprija and VivekanandJha, Norbert HendrikLameirie. Oxford Textbook of clinical Nephrology, Third edition, Vol 2, 1998, London; 1435-1644.
2. Muthusethupathi MA, Shivakumar S. Acute renal failure due to leplospirosis. J Assoc Phys India 1987; 35:631-631
3. Hugh Redmond Brady, Michael R. Clarkson, Wilfred Liberthal. Brenner and Rector's The Kidney. 7 th edition, Vol 1.2004, Philadelphia: Elsevier; 1215-1292.
4. Muthusethupathi MA, Shivakurnar S, Jayakumar M, Rajendran S. Acute Renal failure in Madras city- Changing profile. Ind J Nephrol 1993; 3:66-70.
5. Ku, G., Lim, C.H., Pwee, H.S., Khoo, Q.T. (1975) Review of Acute Renal Failure in Singapore. Ann Acad. Med. Singapore Suppl. 4:2: 115-120.
6. KS Chugh, PC Singhal, VK Kher, VK Gupta, GH Malik, G Narayan, BN Datta. Spectrum of acute cortical necrosis in Indian patients. The American Journal of the Medical Sciences 01/1983; 286(1):10-20.
7. M Ram Prabakar, M Edwin Fernando, R Venkatraman, R Manorajan, S Sreedhar, M Jayakumar. Epidemiologic trend changes in acute renal failure in a tertiary centre. Indian J Nephrol 2004; 14: 99-156.

ORIGINAL ARTICLE

8. Chugh KS, Sakhuja V, Malhotra HS & Pereira BJG. Changing trend in acute renal failure in third world countries—Chandigarh Study. Q J Med 1989; 73: 1117–1123.
9. Alan F Almeida, Jatin P Kothari. API Textbook of Medicine 9th edition 2012, India: 1291-1295.
10. Liano F, Pascual J. Madrid Acute Renal Failure Study Group. Epidemiology of acute renal failure: a prospective, multicenter, community-based study. Kidney Int. 1996; 50:811–818.
11. Karatson A, Juhasz J, Hubler J et al. Factors influencing the prognosis of acute renal failure: Analysis of 228 cases. Int Ernal Nephrol 10: 321-333, 1978.

Medical		Surgical		Obstetric	
Causes	No. of cases	Causes	No. of cases	Causes	No. of cases
Snake Bite	20	Post-surgical	8	Toxemia	1
Post Diarrhoeal	19	Burns	4	PPH	1
RPGN	5	Post traumatic	3	Midtrimester Abortion	1
Poisoning	2	Post renal	2		
Leptospirosis	2	Sepsis	1		
Sepsis	1				
Total	**49**	**Total**	**18**	**Total**	**3**

Table 1: Showing various causes of AKI in our study

Sl. No	Acetiology	No. of Patients Expired	Percentage in Total Mortality
1	Snake Bite	2	18.2%
2	RPGN	2	18.2%
3	Burns	2	18.2%
4	Posttraumatic	2	18.2%
5	Paraquat poisoning	1	9.1%
6	Septicemia	1	9.1%
7	Post diarrhoeal	1	9.1%

Table 2: Showing various causes of death in patients with AKI

Systolic Blood pressure	Expired	Recovered	Total	Proportional mortality
< 100	4	2	6	66.6%
100 -139	5	43	48	10.4%
140 or >140	2	14	16	12.5%
Total	**11**	**59**	**70**	

Table 3: Showing relation of systolic blood pressure with mortality rate

ORIGINAL ARTICLE

Urine output	Expired	Recovered	Total	Proportional mortality
Normal	0	4	4	0%
Oliguria	7	49	56	12.5%
Anuria	4	6	10	40%
Total	**11**	**59**	**70**	
Table 4: Comparison of urine output with mortality rate				

Patients showing initial creatinine Value < 3mg/dl		Mortality	Proportional Mortality
No	**Percentage**		
38	54.3%	3	7.9%

Patients showing initial creatinine Value < 3mg/dl		Mortality	Proportional Mortality
No	**Percentage**		
32	45.7%	8	25%
Table 5: Comparison of serum creatinine with mortality rate			

AUTHORS:
1. Ramamurthy P.
2. Shivraj
3. Sunil Kumar N.
4. Malappa
5. Vishwanatha Huggi

PARTICULARS OF CONTRIBUTORS:
1. Associate Professor, Department of General Medicine, VIMS, Bellary.
2. Post Graduate Student, Department of General Medicine, VIMS, Bellary.
3. Post Graduate Student, Department of General Medicine, VIMS, Bellary.
4. Post Graduate Student, Department of General Medicine, VIMS, Bellary.
5. Assistant Professor, Department of General Medicine, VIMS, Bellary.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Sunil Kumar N,
Post Graduate Student,
Department of General Medicine,
VIMS, Cantonment,
Bellary-583104.
Email: sunil.kumar.n6@gmail.com