Clinical Profile and Management of Patients Having Acute Gastroenteritis Induced Acute Kidney Injury

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Introduction

The main factor that influences the high rates of mortality and morbidity within developing nations is diarrhoeal diseases. However, acute diarrhoeal diseases are also prevalent within nations that maintain high sanitary levels.[1]

Acute gastroenteritis i.e. acute inflammation of gastrointestinal tract involves both the stomach ("gastro") and the small intestine ("entero") resulting in different combinations of diarrhoea with vomiting, fever and abdominal pain.[2]

Acute kidney injury is rapid deterioration in renal function resulting in accumulation of metabolic waste, sufficient to cause uraemia, following variety of insults to previously normal kidneys.[3]

Several factors affect prognosis of acute kidney injury like oliguria, a rise in serum creatinine greater than 3 mg%, older debilitated patients, multi organ failure, associated co-morbid conditions, need for dialysis, suspected or proven sepsis.[4]

The auto regulatory response normally renders an individual relatively resistant to prerenal forms of acute renal failure; however, a marked decrease in renal perfusion pressure below the auto regulatory range can lead to an abrupt decrease in GFR and lead to acute kidney injury.[5]

Aggressive restoration of intravascular volume has been shown to reduce the incidence of acute renal failure dramatically in volume depleted states. Volume depletion due to diarrhoeal diseases is the commonest cause of acute kidney injury in India, which develops earlier and more severe in younger patients than adults. The use of oral rehydration therapy, better sanitation, and availability of better health care services has led to decline in incidence of post-diarrhoeal acute kidney injury from 23% to less than 10 % in last two decades.[6]

Materials and Method

This was a retrospective, cross sectional study carried out at tertiary care hospital at Ahmedabad, Gujarat, India. Indoor case file records of patients admitted in medicine ward with acute gastroenteritis induced acute kidney injury were collected over a period of one month. Data were collected for the age, gender, symptom onset, daily vitals, treatment given before presentation to tertiary care hospital, treatment in emergency

ward, investigations and physical examinations on daily basis. Outcomes were recorded. The study was carried out with aim of finding risk factors leading to acute kidney injury, and to study the clinical profile and management of patients developing acute kidney injury.

Inclusion criteria

- Age 12 to 80 years.
- Patients with acute gastroenteritis and acute kidney injury.

Exclusion criteria:

- Known case of chronic kidney disease.

Observations and Result

Total 200 cases of acute gastroenteritis were admitted in the duration of our study, of which 40 (20%) patients developed or presented with acute kidney injury. 25 (62.5%) were male and 15 (37.5%) were female. Mean age of patient was 40.3 years (CI 35-46). Minimum age was 17 years and Maximum age was 77 years.

All patient took average 1.7 days (CI 1.4-2.1) before presentation to civil hospital from their symptoms onset. 29 (72.5%) patients presented with acute kidney injury with average creatinine levels of 3.38 mg/dl (CI 2.67-4.10). 11 (27.5%) patients presented to civil hospital with normal creatinine levels and further during their hospital stay, developed acute kidney injury.

5 out of 40 patients (12.5%) took treatment before presenting to tertiary care hospital for an average of 3.2 days (CI 2.16-4.23). Of these 5 patients presenting to civil hospital, the average creatinine level was of 4.25 mg/dl. Hospital stay for these patient was 4.6 days (CI 3.49-5.71). All 5 patients had complaints of decreased urine output. Of these 5 patient, 3 (60%) patient underwent dialysis. Of these 5 patients, 4 patients were discharged and 1 patient died who had co morbid conditions.

Decreased urine output was complained by 10 patient with average of 1.2 days before presenting to hospital. 19 (47.5%) patients presented with raised haematocrit level of average 53.54% (CI 51.10-55.98) and haemoglobin of 16.27 gm/dl (CI

15.43-17.10). Abdominal pain was complained by 4 patients. 11 (27.5%) patients presented with hyponatremia of average 130.38 mEq/L (CI 128.31-132.46). 4 patients were with hypokalaemia of average 2.84 mEq/L (CI 2.51-3.17). 6 patients were with co morbid conditions like COPD (2 patients), chronic liver disease (1 patient), hypo thyroid (1 patient), diabetes (2 patients).

Stool R/M was done in 10 (25%) patients, occult blood test was positive in 3 patients and pus cells were found in 2 patients.

Ciprofloxacin was given in 32 (80%) patients, metronidazole was given in 38 (95%) patients, doxycyclline was given in 34 (85%) patients and racecadotril was given in 34 (84%) patients. Ceftriaxone in 5 patients, piperacillin+tazobactum in 3 patients having co morbid conditions.

32 (80%) patients recovered by conservative management. 8 (20%) Patients required dialysis. 4 on the first day and 4 on the second day of admission. 4 (50%) patients recovered from 1 dialysis, while 2 (25%) patients recovered after 2 dialysis. 2 patient required ICU admission and expired.

Table 1: Various clinical features of Patients with their mean and CI.

Criteria (no of patient)	Mean	CI Min	CI Max
Hospital Stay (40)	3.9 days	3.54 days	4.32 days
Diarrhoea (40)	9.98/day	8.01/day	11.94/day
Vomiting (29)	4.08/day	2.57/day	5.58/day
Mean BP (40)	80.67 mmHg	77.44 mm Hg	83.90 mm Hg
Creatinine Day 1 (33)	3.12 mg/dl	2.45 mg/dl	3.80 mg/dl
Creatinine Day 2 (36)	2.45 mg/dl	1.80 mg/dl	3.10 mg/dl
Creatinine Day 3 (26)	1.34 mg/dl	0.94 mg/dl	1.74 mg/dl
Urea Day 1 (32)	48.60 mg/dl	37.64 mg/dl	59.57 mg/dl
Urea Day 2 (36)	52.07 mg/dl	42.87 mg/dl	6.27 mg/dl
Urea Day 3 (26)	31.73 mg/dl	24.92 mg/dl	38.56 mg/dl
HCT Day 1 (36)	45.89 %	42.68 %	49.11 %
HCT Day 2 (29)	39.36 %	36.68 %	42.04 %
HCT Day 3 (14)	34.32 %	31.61 %	37.03 %
pH Day1/Day2/Day3	7.318/7.335/7.37	-	-
Hco3 Day1/Day2/Day3	10.125/12.16/13.44		-
Fluids Day 1 (40)	3,300 ml	2,806 ml	3,494 ml
Fluids Day 2 (38)	2842 ml	2525 ml	3160 ml
Fluids Day 3 (35)	2629 ml	2305 ml	2953 ml
U/O Day 1	570 ml/12 hr	380 ml/12hr	760 ml/12hr
U/O Day 2	970 ml/12 hr	790 ml/12hr	1140 ml/12hr
U/O Day 3	1360 ml /12 hr	1090 ml/12hr	1620 ml/12hr

Discussion

In contrast to developed countries where most cases of acute renal failure are related to surgery and trauma in intensive care units, acute renal failure in developing countries are related to medical causes.[7] The present study was carried out to find the presentation, complications and management of acute kidney injury due to one of the preventable causes like acute gastroenteritis.

In 200 cases of acute gastroenteritis studied, 40 (20%) patients developed acute kidney injury, which was comparable to other studies having acute gastroenteritis as the dominant cause of acute kidney injury. Mamun et.al, found (23.8%) cases with acute kidney injury due to acute gastroenteritis and Khakhurel et.al, found (22%) cases with acute renal failure due to acute gastroenteritis. Nagamani et.al, found 14 (28%) cases with acute renal failure due to acute gastroenteritis. Volume depletion due to diarrhoeal disease is the commonest cause of acute kidney injury in India, which develops earlier and more severe in younger patient than adults.[6] Shahzad F Haque et.al, reported decline in cases of acute kidney injury developing after acute gastroenteritis to around 10%.

In the present study, mean age of patients was 40.3 years (CI 34.78-45.814) which was comparable to Nagamani et.al, with mean age of 40.72 years. In the present study, minimum Age was 17 years and maximum age was 77 year. 25 patients (62.5%) were male and 15 patients (37.5%) were female.

5 patients who took treatment outside hospital for an average of 3.2 days and were treated with fluids and antibiotics. These patients presented to civil hospital with increased levels of creatinine (4.25 mg/dl) and oliguria which might be due to inadequate resuscitation. Shazad et.al, found early renal blood flow normalisation predicts better prognosis for recovery of renal function. Mamun et.al, also found improved recovery of renal functions by early management. There was an increase in the hospital stay for the patient who took treatment before presenting to civil hospital of (4.6 days) as compared to those who presented directly to civil hospital (3.5 days). Of these 5 patients, 3 (60%) patient underwent dialysis as compared to 35 patients who presented directly to civil hospital, only 5(14.28%) patient underwent dialysis. Of these 5 patients who took treatment before presenting to civil hospital, 4 patients were discharged and 1 patient died having co morbid conditions.

All patient took average 1.73 days before presentation to civil hospital from their symptoms onset. 11(27.5%) patients presented to civil hospital with normal creatinine and developed acute kidney injury during their hospital stay. 29 (72.5%) patients presented with acute kidney injury with average creatinine of 3.38 mg/dl (CI 2.67-4.10).

Diarrhoea was present in all cases with average frequency of 9-10 stools/day, watery in nature. Vomiting was seen in 29 cases with average frequency of 4 times/day. Decreased urine output was complained by 10 (25%) patient with average 1.2 days before presentation. Haematocrit in 40 patient was on average 45.89% (CI 42.68- 49.11) and 19 (47.5%) patients presented with raised HCT level of average 53.54% (CI 51.10-55.98) and Haemoglobin of 16.27 gm/dl (CI 15.43-17.10) which was suggestive of haemo concentration and dehydration commonly seen during acute gastroenteritis. Mamun et.al, found 23.8% cases with dehydration in their study.

With treatment patients improved symptomatically and their creatinine levels showed decreasing trend with increase in urine output. Haematocrit level also decreased during their stay with proper resuscitation and thus acidosis also gradually improved.

Investigations to find the cause of diarrhoea were not found in many cases. Stool R/M was done in 10 (25%) patients, occult blood test was positive in 3 patients and pus cells in 2 patients were seen.

According to Zollner-Schwetz et.al, initial treatment of acute diarrhoeal illness must include rehydration, which can be achieved with oral electrolyte solutions or intravenous fluids. Antibiotics therapy is not required in most patients, because the illness is self limiting.

Empirical antimicrobial therapy is recommended in selected patients groups: six or more stools/day, with fever and bloody diarrhoea or fever only.

In our study antibiotics were prescribed in all cases of acute gastroenteritis. Combination of Ciprofloxacin, Metronidazole and Doxycyclline were prescribed in 27 (67.5%) cases and combination of Ciprofloxacin, Metronidazole and Racecadotril were prescribed in 27 (67.5%) cases. Ciprofloxacin was given in 32 (80%) patients, metronidazole was given in 38 (95%) patients, doxycyclline was given in 34 (85%) patients, and racecadotril was given in 34 (84%) patients. These were the most common antibiotics combination empirically prescribed in acute gastroenteritis. Higher antibiotics like piperacillin + Tazobactum combination were given in patients having co-morbidities.

32 (80%) patients recovered by conservative management. 8 (20%) patients who required dialysis presented with more severity with average 5.33 creatinine and 88.214 urea. Of these 8 patients, 4 patient underwent dialysis on the first day and 4 patient on the second day of admission. Of these 8 patients, 4 (50%) patients recovered with single cycle of dialysis, while 2 (25%) patients recovered after 2 cycles of dialysis and 2 (25%) patient required ICU admission and expired. Nagamani et.al, found in his study that most of the patients were treated conservatively (n=29/30) and 1 required haemodialysis.

Limitations

The limitation of this study were its small sample size and the fact that it was conducted in a single centre. Study being retrospective, detailed and specified history was not available.

Conclusion

Effects caused by poorly treated acute gastroenteritis can lead to complete failure of renal system. Diarrhoea (n=40), Vomiting (n=29) and oliguria (n=10) were the most common symptoms in acute gastroenteritis developing acute kidney injury. As with most disease conditions, the earlier the treatment of acute gastroenteritis (adequate hydration and maintenance of mean arterial pressure) is initiated, and early intervention instituted in acute kidney injury provides more favourable outcomes. 95% patients survived, 80% patients were treated conservatively and 20 % underwent haemodialysis.

Acute kidney injury can be prevented by proper resuscitation and care.

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