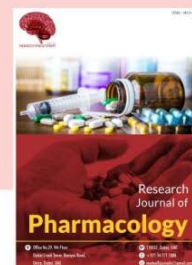


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Study of Acute Renal Failure Due to Gastroenteritis

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Abstract: This study was undertaken in a tertiary care centre from 1st October, 2015 to 30th March, 2016. A total of 87 patients fulfilling the inclusion and exclusion criteria were selected for the study who were admitted to the medical wards with acute renal failure following gastroenteritis. The purpose of the study is to study the prevalence of acute renal failure among gastroenteritis patients and prognostic factors. This is an hospital observational prospective time bound study of 18 months duration. The urea and creatinine level on admission were compared according to age groups by using Analysis of Variance (ANOVA). The Urea levels on admission were not significantly different in different age groups ($p = 0.065$). Mean urea level in males was highest 82.18 mg dL^{-1} as compared to 76.47 mg dL^{-1} of that in females. But this difference was not statistically significant. Similar trend was also observed with creatinine levels. Poor urine output, high urea creatinine levels on admission were poor prognostic factors.

INTRODUCTION

Acute Renal Failure (ARF) also known as Acute Kidney Injury (AKI) is characterized by sudden deterioration of the operation of the kidney resulting in accumulation of nitrogen and other waste materials usually removed by the kidney. AKI is not a specific disorder but rather a heterogeneous group of disorders that share similar diagnostic characteristics, especially increased concentration of Blood Urea Nitrogen (BUN) and/or increased concentration of plasma or serum creatinine, often associated with decreased volume of urine. Acute gastroenteritis is most common cause of renal failure in tropical countries. Wide spread poverty and lack of basic aliments like clean drinking water are leading factors for wide prevalence of diarrheal disease in tropics. There is limited data on the incidence of AKI

from India due to the absence of central registry for the same. The etiology, course and outcome of AKI differ in various parts of India. Among the medical causes of AKI acute diarrheal diseases is most common (Jayakumar *et al.*, 2006; Kumar *et al.*, 1990).

Aims and objectives: To study the prevalence of acute renal failure among gastroenteritis patients. To study the prognostic factors. To study the socio-demographic and laboratory parameters of acute renal failure in gastroenteritis. To study outcome of acute renal failure in gastroenteritis patients.

Literature review: In the century that followed Richard Bright's description of kidney disease in 1827 many case studies of acute Bright's disease associated with a variety of etiologies including infections, toxins and transfusion

reactions were published. AKI has primarily become a nosocomial disease in the developed world. AKI has an incidence of 5-7% in hospitalized patients (Chen *et al.*, 2001; Nath, 2006; Uchino *et al.*, 2005). This incidence appears to be rising over time (Hsu *et al.*, 2007; Waikar *et al.*, 2006) which may reflect greater clinical vigilance and/or differences in how AKI is precisely defined. The etiology of AKI differs somewhat depending on if the onset of AKI occurs in the hospital (hospital-acquired) or prior to hospitalization (community-acquired). Depending on the study, prerenal etiologies account for 25-60% (Brivet *et al.*, 1996; Hou *et al.*, 1983; Liano *et al.*, 1998; Liano and Pascual, 1996) and renal etiologies account for 35-70% of AKI cases (Chen *et al.*, 2001; Nath, 2006; Liano *et al.*, 1998; Liano and Pascual, 1996; Brivet *et al.*, 1996; Mehta and Chertow, 2003). Renal Parenchymal Disease is the medical term referring to the damage on the scarring on the outermost internal region of the kidney where filtration and urine formation occur. Bilateral Renal Parenchymal Disease can be divided into 3 grades or 3 stages (Hricak *et al.*, 1982).

MATERIALS AND METHODS

Hospital based observational prospective study includes patients who were diagnosed to have acute renal failure following diarrhoeal disease and fulfill inclusion and exclusion criteria, getting admitted in a tertiary health care centre, during an 18 months period from 1st October, 2015 to 31st March, 2016. Total of 87 patients who were admitted in the wards of the tertiary care centre, after consideration of both inclusion and exclusion criteria, were studied during a time period of 18 months. Data was collected using a proforma meeting the objectives of the study. All patients with increased serum creatinine levels on admission following gastroenteritis with no known history of previous renal insufficiency.

RESULTS AND DISCUSSION

The data was entered in MS Excel spread sheet and was analyzed using SPSS Version 20 and Epi info version 7.2. Levene's test for equality of variances was used and equal variances were assumed within the groups. Independent sample test (Unpaired t-test) was used to test equality of means. Analysis of Variance (ANOVA) was used to compare within the group and between the group variations. A 'p' value of <0.05 was considered as significant.

As seen in Table 1, the mean age of study participants was 53.71±17.34 years with maximum age 85 and minimum 16 years. The 25.3% patients were from 51-60 years of age, another 23% were from 61-70 years of age.

Table 1: Age wise distribution of study population

Age (Years)	No. of patients	Percentage
<30	10	11.5
31-40	10	11.5
41-50	13	14.9
51-60	22	25.3
61-70	20	23.0
>70	12	13.8
Total	87	100.0

Table 2: Urine output of study population on admission

Urine output on admission	No. of patients	Percentage
Good	83	95.4
Poor	3	3.4
Nil	1	1.1
Total	87	100.0

Table 3: Stool routine microscopy examination findings of study population

Stool R/M	No. of patients	Percentage
PC+	39	33.93
<i>Giardia intestinalis</i> trophozoites/cysts	1	0.87
<i>Cryptosporidium</i> and	1	0.87
<i>Isospora</i> trophozoites/cysts		
WNL	48	41.76
Total	87	100.00

Table 4: Stool culture and sensitivity findings of study population

Stool C/S Organism isolated	No. of patients	Percentage
<i>E. coli</i>	21	18.27
<i>Shigella</i>	7	6.09
<i>V. cholerae</i>	2	1.74
<i>Salmonella</i>	1	0.87
Sterile	56	48.72
Total	87	100.00

As shown in Table 2, total of (83)95.4% patients had a good urine output on admission while only (3)3.4% patients had poor urine output. The 1 patient was not having any output.

As seen in Table 3, of the total 87 patients in our study, 39(33.93%) patients had pus cells on stool routine microscopy and 1(0.87%) patient had *Giardia intestinalis* trophozoites/cysts and 1(0.87%) patient had *Cryptosporidium* and *Isospora* Trophozoites/cysts. Majority of the 48 (41.76%) patients stool reports were within normal limits.

As seen in Table 4, on stool culture and sensitivity, we found 56 (48.72%) patients with sterile stool cultures. Organisms isolated were *E. coli* spp. in 21(18.27%) patients, *Shigella* spp. in 7(6.09%) patients *Vibrio cholerae* in 2(1.74%) patients and *Salmonella* in 1(0.87%) patient.

As seen in Table 5, a total of 33(37.9%) patients showed normal USG studies. The most common abnormal USG finding was Enteritis in 27(30.8%) patients followed by Grade I MRD in 16(18.2%) patients. Few patients recorded >1 USG finding. The other USG findings recorded were Ca pancreas, renal calculi, fatty liver, Lt renal agenesis, splenomegaly and Rt small kidney.

Table 5: USG findings of study population

USG	No. of patients	Percentage
Enteritis	27	30.8
Grade I MRD	16	18.2
ARPD	12	13.7
Grade II MRD	10	11.4
Grade III MRD	2	2.3
Ca Pancreas	1	1.1
B/L Renal calculi	1	1.1
Grade I Fatty liver	1	1.1
Grade II Fatty liver	1	1.1
Lt Renal Calculus	1	1.1
Lt Renal agenesis	1	1.1
Rt Small kidney	1	1.1
Splenomegaly	1	1.1
NAD	33	37.9

This is an hospital based observational prospective time bound study carried out in a tertiary care centre to study cases of acute renal failure due to gastroenteritis. There was a clear preponderance of male subjects. The 51 were males and 36 were females with a total of 87 subjects with a mean age of a males being 50.5 (± 22.2) years, females with a mean age of 48.8 (± 23.37) years. The 54 patients with Acute Renal Failure (ARF) due to Acute Diarrhoeal Diseases (ADD) were treated between August, 1987 and May, 1988. The mean age was 46.25 years. Investigations revealed blood urea 129 (± 52.80) mg dL⁻¹ and serum creatinine 7.51 (± 4.3) mg L⁻¹. The 42 patients underwent peritoneal dialysis, 3 had haemodialysis and 29 patients died (mortality 53.7%). In our study out of the 87 patients 2 expired (mortality 2.3%), the condition of 4 patients did not change. Most of the patients recovered with conservative treatment (93%) and others required haemodialysis (7%). The mean blood urea was 114.5 (± 2.99) and mean creatinine 4.65 (± 2.99).

A total of 33(37.9%) patients showed normal USG studies. The most common abnormal USG finding was enteritis in 27(30.8%) patients followed by Grade I MRD in 16(18.2%) patients. Few patients recorded >1 USG finding. The other USG findings recorded were Ca pancreas, Renal calculi, fatty liver, Lt renal agenesis, splenomegaly and Rt small kidney.

More than half patients 46(52.9%) were not having any co-morbidity. Few patients reported >1 co-morbidity. The most common co-morbidity was hypertension 17(19.54%) followed by diabetes mellitus 11(12.64%), COPD 7(8%) and IHD 6(6.9%). The mean urea level on admission was 79.82 mg dL⁻¹ and on discharge it was 39.0 mg dL⁻¹. The mean difference was 40.82 (± 37.21) mg dL⁻¹. This difference was statistically significant. The mean creatinine level on admission was 3.32 mg dL⁻¹ and on discharge it was 1.55 mg dL⁻¹. The mean difference was 1.77 (± 1.4) mg dL⁻¹. This difference was statistically significant. The urea levels on admission were not significantly different in different age groups ($p = 0.065$). The creatinine levels on admission were

higher in 51-60 and 61-70 age groups as compared to younger patients. This difference was statistically significant in different age groups ($p < 0.05$). The difference in the mean urea levels and mean creatinine levels of diabetics and non diabetics was highly significant statistically; this is true with hypertension and also COPD. Various studies have postulated that prompt diagnosis and early initiation of the treatment for better final outcome and haemodialysis is done if required in some cases.

CONCLUSION

There is male preponderance, in a total of 87 cases. Majority of the patients belong to the 51-70 years age group. Majority of the patients improved with only conservative management. Only 8% of the study subjects required haemodialysis. Condition of 4.6% of patients remained same and mortality rate of 2.3% was established. *E coli* spp. were the most commonest organisms found on stool culture sensitivity while 48.72% reports were sterile did not show any pathogen. Hypokalemia and hyponatremia was common and should be corrected promptly. Poor urine output, high urea creatinine levels on admission were poor prognostic factors. Poor prognostic factors also include comorbidities like type 2 diabetes mellitus, hypertension, IHD, COPD. ARF secondary to acute gastroenteritis is a major health problem in tropical and sub tropical region, so, early diagnosis and initiation of treatment prevents mortality and morbidity.

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