

Original Article

Acute kidney injury is a common complication after acute stroke in Mymensingh Medical College Hospital

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Abstract

Stroke represents a continuously evolving medical and social problem, being the third leading cause of death after heart disease and cancer in developed countries. Acute kidney injury (AKI) may develop as a possible complication after acute stroke. Insufficient care of acute stroke patients is an important factor behind it. It may be associated with a significant burden of morbidity and mortality. This cross sectional observational study was conducted in Mymensingh Medical College & Hospital, Mymensingh from July 2012 to June 2014. A total of 240 patients with newly detected acute stroke confirmed by CT scan of brain were included in this study. According to this study, 15.42% of acute stroke patients developed AKI. Majority (54.05%) of the AKI patients were in >60 years age group. 17.93 % of male patients developed AKI and 11.58% of female patients developed AKI. So, AKI was a common complication after acute stroke. Early diagnosis and management of AKI may be an important part of management of these stroke patients.

Key words: Acute Kidney Injury, stroke

Introduction

Stroke is represents a medical and social problem, being the third leading cause of death after heart disease and cancer in developed countries.¹ Annually 16.3 million people suffer from stroke worldwide, among which 11.2 million events occur in developing countries including Bangladesh. About 5.8 million people die of stroke each year, the two third of which occurs in developing nations.² The prevalence rates of stroke among South Asians living in India vary from 52 to 842 per 100,000 for all ages.³⁻⁵ Bangladesh is a small country in South Asia with high density of population (an average of 964 inhabitants / square kilometer).⁶ The prevalence of stroke here is 3 per 1000 above the age of 40 years.⁷

In the immediate period following a stroke, acute kidney injury (AKI) may develop as a possible complication. However, this association is frequently overlooked and underestimated in clinical trials.⁸ The brain and kidney share a similar vascular structure with low-resistance exposure of the small vessels to highly pulsatile flow and pressure.⁹ As a result, microvascular damage to both organs can lead not only to renal impairment with reduced GFR but also to asymptomatic or symptomatic brain infarcts and white matter lesions.¹⁰⁻¹³

This cerebrorenal interaction is considered to be based on small vessel disease. Because small vessel disease is a systemic disorder, information about small vessel disease in one organ may provide information on damage in another organ. Although mild AKI in most cases is “clinically” reversible, but in the tissue level, endothelial damage, tubular inflammation, and activation of intrarenal fibrotic pathways during kidney repair may gradually damage kidney structure, leading to progressive decline in renal function.¹³⁻¹⁶

The occurrence of AKI, defined by the RIFLE criteria, is not a rare finding in stroke patients; more than one fourth of patients develop AKI in the first 2 days after the acute stroke. The prevalence of AKI in acute stroke is 14.5% and the incidence of AKI and stroke 240 pmp/year. As expected, AKI develops more frequently in older persons.⁸

The purpose of the study was to find out the proportion of acute kidney injury in patients with acute stroke in Bangladesh and to highlight the importance of serial

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measurement of serum creatinine among the patients with acute stroke, as a means to diagnosis of acute kidney injury and management of these patients.

Methods

This cross sectional observational study was conducted in Department of Nephrology, Department of Neuromedicine and Department of Medicine, Mymensingh Medical College & Hospital (MMCH), Mymensingh from July 2012 to June 2014. A total of 240 patients with acute stroke, admitted within 7 days of onset of symptoms and above 18 years of age, that fulfilled the inclusion and exclusion criteria were included in this study. A structured case record form was used which included detailed history, physical findings, results of serial measurement of serum creatinine on admission, on Day 2 & on Day 7, CT scan of brain and other relevant laboratory investigations.

The diagnosis of acute stroke was based on WHO definition of stroke, with the support of convincing history, compatible clinical examination finding and confirmed by CT scan of brain. AKI was diagnosed by either an increase in serum creatinin by ≥ 0.3 mg/dl (≥ 26.5 μ mol/l) within 48 hours; or increase in serum creatinin to ≥ 1.5 time's baseline, which was known to have occurred within the prior 7 days.¹⁷ As baseline serum creatinine (before the present illness) was not known in most of the cases, so serum creatinine level at admission was taken as baseline serum creatinine.

Patients were evaluated meticulously with history, clinical examination and necessary investigations at the time of

hospital visit. All investigations were done in clinical pathology laboratory, biochemistry laboratory and radiology department of Mymensingh Medical College Hospital. Patients were classified according to renal function using the serial serum creatinine levels. Data were analysed according to standard statistical method using computer based software.

Results

This study included 240 patients with acute stroke, confirmed by CT scan of brain. Mean \pm SD of age of AKI and non AKI patients were 65.59 ± 13.67 and 62.95 ± 13.89 years respectively. Among the AKI patients 26 (70.27%) were male and 11 (29.73%) were female. Among the non AKI patients 119 (58.62%) were male and 84 (41.38%) were female. Male: Female ratio among AKI and non AKI patients were 2.36:1 and 1.42:1 respectively. This sex ratio among the AKI and non AKI patients was not significant. (Table-I)

Among the AKI patients, Mean \pm SD of time interval from onset of symptoms of stroke to hospital admission was 20.41 ± 15.67 hours, GCS was 9.89 ± 2.49 , systolic blood pressure was 163.24 ± 19.41 mm of Hg, distolic blood pressure was 93.78 ± 12.33 mm of Hg and mean blood pressure was 116.94 ± 13.34 mm of Hg (Table -I). Among the non AKI patients Mean \pm SD of time interval from onset of symptoms of stroke to hospital admission was 23.50 ± 17.92 hours, GCS was 11.00 ± 1.92 , systolic blood pressure was 154.01 ± 26.19 mm of Hg, distolic blood pressure was 87.29 ± 12.55 mm of Hg and mean blood pressure was 109.53 ± 15.14 mm of Hg, respectively. (Table -I)

Table-I: Baseline characteristics of study patients according to AKI presence

Characteristics	Mean \pm SD		p value
	AKI (n=37)	Non AKI (n=203)	
Age (Years)	65.59 ± 13.67	62.95 ± 13.89	0.2812
Male (n %)	26 (70.27)	119 (58.62)	0.0634
Female (n %)	11 (29.73)	84 (41.38)	0.0634
Time interval (from onset of symptoms of stroke to hospital admission) hours.	20.41 ± 15.67	23.50 ± 17.92	0.2786
GCS	9.89 ± 2.49	11.00 ± 1.92	0.0100
Systolic BP (mm of Hg)	163.24 ± 19.41	154.01 ± 26.19	0.0122
Diastolic BP (mm of Hg)	93.78 ± 12.33	87.29 ± 12.55	0.0033
Mean BP (mm of Hg)	116.94 ± 13.34	109.53 ± 15.14	0.0024

Among the AKI patients majority (54.05%) were in >60 years age group. 40.54% were in 41-60 years age group and only 5.41% were in <40 years age group. Similarly,

among non-AKI patients majority (53.20%) were in >60 years age group. 41.25% were in 41-60 years age group and only 5.42% were in <40 years age group. (Table-II)

Table-II: Distribution of patients by age (n = 240)

Age (Years)	AKI	Non AKI	Frequency
<40	2 (5.41)	11 (5.42)	13 (5.42)
41- 60	15 (40.54)	84 (41.38)	99 (41.25)
>60	20 (54.05)	108 (53.20)	128 (53.33)
Total	37 (100.00)	203 (100.00)	240 (100.00)

$\chi^2=1.8269$
P = 0.4011

* Figures within parentheses indicate percentage.

Out of 145 male patients, 26 (17.93%) patients developed AKI, and out of 95 female patients 11 (11.58%) patients developed AKI. Male female ratio of AKI was 1.55:1. This observed difference was not significant.

Out of 240 acute stroke patients 37 patients developed acute kidney injury (AKI) according to “KDIGO Clinical Practice Guideline, 2012” definition of AKI and proportion of AKI was 15.42% among the acute stroke patients (Table III).

Table-III: Distribution of AKI in stroke according to sex (n=240)

Group	AKI	Non -AKI	Frequency
Male	26 (17.93)	119 (82.07)	145 (100.00)
Female	11 (11.58)	84 (88.42)	95 (100.00)
Total	37 (15.42)	203 (84.58)	240 (100.00)

$\chi^2=3.446$
OR= 1.66
P = 0.0634

* Figures within parentheses indicate percentage.

Discussion

The present study was carried out to find the proportion of acute kidney injury as a possible complication in the early period of acute stroke in Bangladesh and to highlight the importance of obtaining a base line serum creatinine value early after admission for acute stroke and need for close monitoring of renal function during the hospitalization or discharge.

14.5% 8. This higher proportion of AKI observed in our study was due to lower GCS level and higher systolic, diastolic and mean blood pressure on admission among the AKI patients in comparison to non AKI patients.

In this study, AKI developed in 15.42% of acute stroke patients which was higher than the findings of the study of Covic et al 2008 in which the prevalence of AKI was

In another study, Tsagalis et al, 2009 found that 26.7% of acute stroke patients developed AKI. High incidence of AKI in their study was due to the increased age (mean age 70.3 ± 11.9 yr), low baseline GFR, and the use of a high-sensitivity definition for the detection of AKI. Preexisting renal dysfunction was a major contributor to the occurrence of AKI. In their study, only 13.4% of

patients with an eGFR > 60 ml/min developed AKI, whereas the percentages for patients with an eGFR of 30 to 60 and < 30 ml/min were 41.2 and 81.0%, respectively.¹³

In this study, Mean \pm SD of age of AKI patients was 65.59 \pm 13.67 years and that of non AKI was 62.95 \pm 13.89 years (P=0.2812, >0.05). Majority of the study subjects, (128, 53.33%) and majority of the AKI patients (20, 54.05%) belonged to > 60 years age group. These findings were comparable to the study of Covic et al, 2008. They have showed in their study that the mean age of the study subjects was 66.1 \pm 11.5 years.⁸ Mean \pm SD of age of AKI patients was 65.2 \pm 11.5 years and that of non AKI was 71.5 \pm 9.7 years. This higher mean \pm SD of age of the study subjects and non-AKI group in their study were due to inclusion of more older patients as prevailing in their society.

In this study, among the male, 26 (17.93%) patients developed AKI, and among the female 11 (11.58%) patients developed AKI. Male to female ratio of AKI was 1.55:1 (P=0.0634, >0.05 & OR=1.66). This sex difference of AKI in stroke patients was not significant. This finding was comparable to the study of Covic et al 2008.⁸ They have showed that male & female patients were 49.3% & 50.7% respectively. AKI developed in 49.7% of male patients & 50.3% of female patients. This observed difference may be due to less hospital admission of the neglected female patients for better & earlier medical care which is still prevailing in our society.

Nonetheless, this study has several limitations. This study was carried out in a single tertiary care hospital and included a small sample size due to time & cost limitations. So, this study may not reflect the real scenario of the country. Moreover, very few patients had documentation of renal function before admission. So it is unclear that to what extent the first creatinine reflects "baseline" kidney function.

This study accurately described the proportion of a potential deleterious complication i.e. acute kidney injury in patients with acute stroke in our country. It may impose a significant burden of morbidity and mortality. AKI patients have a higher risk of later development of Chronic Kidney disease (CKD). So prevention, early diagnosis and proper management of AKI are of utmost importance to reduce the related morbidity, mortality and economic burden of stroke patients. Nationwide study with random sampling is needed for generalization of the findings and to identify the precise mechanism, risk factors and actual outcome of acute kidney injury (AKI) that develop in patients with acute stroke.

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