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Evaluation of Renal Function in Patients of Acute Stroke and its Relationship with-in Hospital Mortality

Sant Das[1], Kumar Lal[2] , Naresh Kumar[3], Kelash Jesrani[4] , Tariq Farhad[5] , Maesh Kumar[6], Niaz Hussain keerio[7*]

[1]General practitioner Family Medicine, Zyed Military Hospital al Batayah Sharjah, United Arab Emirates

[2]Specialist Internal Medicine, NMC Royal Hospital, Khalifa City Abu Dhabi United Arab Emirates

[3]General Practitioner Internal Medicine, AL Daid Hospital Sharjah United Arab Emirates

[4]Senior General Practitioner Internal Medicine, Dr Sulaiman Al Habib Hospital Dubai Healthcare City Dubai United Arab Emirates

[5]Resident Family medicine, Ambulatory Health Services SEHA Abu Dhabi United Arab Emirates

[6]General Practitioner Family Medicine, Aster Health Care Dubai, United Arab Emirates

[7]Assistant Professor of Orthopaedic, Muhammad Medical College and Hospital Mirpurkhas, Pakistan

ABSTRACT

Objective: The aim of this study was to find out renal function in patients with acute stroke and to provide early interventions to prevent morbidity as well as mortality.

Place of study and its duration: Department of Family Medicine, Zyed Military Hospital al Batayah Sharjah, United Arab Emirates from June 2019 to July 2020

Methodology: The study was observational and was performed on 50 patients with acute stroke. The lab tests including biochemical testing was done on every patient. GFR (glomerular filtration rate) was observed. The creatinine level was considered as baseline testing in the study. Therefore, acute kidney failure was defined as 0.3mg/dl elevation in creatinine level in hospitalized patients. All participants who participated in the research had a thorough medical history and clinical assessment. The data that was collected was changed into variables and were coded into IBM SPSS statistics 26.

Results: In this research, most of the subjects were male n=29, with mostly age group falling within 55 to 65 years n= 27. About 21 patients were with haemorrhagic stroke and 29 patients were with ischemic stroke. Out of 50 patients, 7 patients died which showed 14% mortality rate in stroke patients. 5 patients out of 7 was with AKI showing strong correlation of acute renal failure with mortality. AKI was found to be more in haemorrhagic stroke participants 20% (n=10) in contrast to ischemic stroke participants 4% (n=2). The statistical difference was found to be about p=<0.05. AKI was observed to be predicted with haemorrhagic stroke, old age, diabetes mellitus, as well as a higher baseline creatinine levels. The period of hospitalization was substantially longer in patients with stroke having AKI. Not much significant difference was noted in Mortality rate associated with haemorrhagic as well as ischemic stroke. Almost all AKI patients were found to have diabetes. There was strong correlation between diabetes and AKI which was quite significant. (P=0.001)

Conclusion: In our investigation, haemorrhagic stroke, old age, higher baseline levels of creatinine, as well as diabetes mellitus were revealed for being predictors of AKI. AKI was also discovered to be an important factor of longer hospitalization and higher death in patients with stroke.

Key words: AKI, Cerebrovascular disease, Stroke

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Corresponding author: Niaz Hussain Keerio
e-mail ✉ : niaz_h@hotmail.com
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INTRODUCTION

Stroke is interrupted or decreased blood flow towards brain leading to localized as well as global cerebral dysfunction. Symptoms may last for >24 hours and death may occur without any apparent reason except for the vessel origin. Given the commonalities between the

arterial beds of the renal, heart, as well as brain, there is rising indication in the research records of the significance of cardiovascular and cerebrovascular disorders in kidney failure. Renal failure is associated mainly with atherosclerotic condition (a significant risk factor of stroke).

Acute renal failure is a frequent co-morbid state in the population with a variety of medical conditions such as cardiovascular disorders, DM, HT, cerebrovascular disease, and in-patient treatment in an ICU. Acute renal failure occurs after stroke as its complication. Older patients (>60 years) with cardiovascular comorbid are managed through multiple drugs mostly for underlying acute renal failure [1].

Patients with stroke and AKI have many similar risk factors that cause morbidity as well as mortality. It is found that most of the vascular origin diseases like stroke are associated with AKI. The severity of AKI or damaged renal vessels are strongly associated with stroke severity [2].

According to many studies, haemorrhagic stroke tends to cause more AKI in contrast to ischemic stroke. Though after controlling for other factors, serum creatinine was proved to be an independently associated indicator of death and prolonged hospitalization in stroke survivors. Even though AKI is widespread and has a high morbidity and death rate, it is preventable, promptly detectable, as well as treatable [3].

The data that reveals association between AKI and stroke is short as well as controversial. Many researchers showed acute renal failure in stroke patients as mortality and morbidity predictor. Therefore, this study was done to evaluate renal function in patients with acute stroke and to provide early interventions to prevent morbidity as well as mortality.

METHODOLOGY

This observational research was carried out on 50 participants with acute stroke. The inclusion criteria involve age group of 18 to 75 who came within a week after having acute stroke. The exclusion criteria involve chronic renal dysfunction, cardiac disease or patients that will going to have cardiothoracic surgical intervention, glomerulonephritis as well as urinary tract obstruction. Stroke was described as a neurological disease of cerebrovascular nature that was verified by computed tomography (CT) and imaging (MRI) and lasted more than 24 hours and interrupted via mortality around 24 hours. There were two types of strokes according to the CT results: hemorrhagic or ischemic. acute kidney failure was defined as 0.3mg/dl elevation in creatinine level in hospitalized patients within 2 days [4]. Elevation in serum creatinine up to 1.5 times baseline, generally assumed to have happened during the previous 7 days: and 6-hour reduction in urine volume to less than 0.5 ml/kg/h [5]. After receiving approval from the Institutional Ethics Committee and carefully considering the including and excluding criteria, the patient as well as caretaker provided signed permission for research. During their hospitalization, all examinations were performed.

All participants who participated in the research had a thorough medical history and clinical assessment. On the admission day, the patients had normal lab tests, involving baseline biochemical studies, and then on days 3, 7, as well as 14 for result.

Statistical analysis

The data that was collected was changed into variables and were coded into IBM SPSS statistics 26. The qualitative data was analyzed and frequency tables, cross tabulation, group statistics were obtained. Independent sample T-test was performed to check the significance level. P value <0.05 was taken as statistically significant.

RESULTS

In this study, most of the subject were males about (n=29) with mean age group of 18 to 75. However, majority participants were falling in 55 to 65 years (n=27). The patients with ischemic stroke were about 58% (n=29) while the others were with haemorrhagic stroke 42% (n=21).

About (n=12) 24% were with acute renal failure from which 12% (n=6) were in stage I of AKI, 8% (n=4) were in stage II of AKI and 4% (n=2) were in stage III AKI.

AKI was found to be more in haemorrhagic stroke participants 20% (n=10) in contrast to ischemic stroke participants 4% (n=2). The statistical difference was found to be about p=<0.05.

The following Table 1 shows haemorrhagic and ischemic frequency among stroke patients.

Table 1: Haemorrhagic and ischemic frequency among stroke patients.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	HR	21	42	42	42
	IS	29	58	58	100
	Total	50	100	100	

The following Table 2A ad 2B shows AKI presence and absence in stroke patients along with AKI stages.

Table 2A: AKI.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	present	12	24	24	24
	absent	38	76	76	100
	Total	50	100	100	

Table 2B: Stage.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	stage I	6	12	12	12
	stage II	4	8	8	20
	stage III	2	4	4	24
	None	38	76	76	100
	Total	50	100	100	

Blood urea levels as well as serum creatinine were considerably increased in haemorrhagic patients with stroke (Blood urea= 68.22 ± 47.81) (Creatinine= 1.69 ± 1.17) than in ischemic stroke patients (Blood urea= 45.03 ± 18.39) (Creatinine=1.05 ± 0.60) at baseline. In contrast to ischemic stroke patients (86.60 ± 26.73),haemorrhagic stroke patients (56.09 ± 28.41) had considerably reduced e-GFR. Almost all AKI patients were found to have diabetes. The following Table 3 showed strong correlation between diabetes and AKI which was quite significant (P=0.001).

Table 3: Group statistics.

	Diabetes	N	Mean	Std. Deviation	Std. Error Mean
AKI	Present	31	1.6129	0.49514	0.08893
	Absent	19	2	0	0

Other indicators such as creatinine and urea, levels, fasting glucose levels, systolic blood pressure, diastolic blood pressure, and MAP were greater in AKI patients than in patients, with no AKI, although the variation wasn't significant statistically. The mean values are given in the following Table 4.

Table 4: Mean values.

	Creatinine	Urea	Fasting glucose level	SBP	DBP	MAP
AKI	1.95 ± 2.10	59.89 ± 38.55	110 ± 22	160 ± 17	96 ± 13	117.21 ± 14.26
Non-AKI	1.77 ± 1.85	52.85 ± 34.45	107 ± 20	158 ± 18	97 ± 13	118.52 ± 14.54

The period of hospitalization was substantially longer in patients with stroke having AKI. Subgroup analyses of ischemic and haemorrhagic stroke patients yielded comparable results.

However, the hospitalization period was found to be more in haemorrhagic stroke patients (12 ± 5 days) in contrast to ischemic stroke patients (9 ± 2 days). GCS score less than 10, AKI, stroke type, as well as need for kidney replacement treatment for AKI were related with a prolonged hospitalization. AKI was observed to be predicted with haemorrhagic stroke, old age, diabetes mellitus, as well as a higher baseline creatinine levels. Out of 50 patients, 7 patients died which showed 14% mortality rate in stroke patients. 5 patients out of 7 was with AKI showing strong correlation of acute renal failure with mortality. The following table V showed AKI relation with mortality rate (Table 5).

Table 5: AKI *death crosstabulation count.

		Death		Total
		Yes	No	
	Present	5	7	12
	Absent	2	36	38
Total		7	43	50

Not much significant difference was noted in Mortality rate associated with hemorrhagic as well as ischemic stroke as shown in the following Table 6.

Table 6: Stroke *death crosstabulation count.

		Death		Total
		yes	No	
Stroke	HR	4	17	21
	IS	3	26	29
Total		7	43	50

DISCUSSION

AKI, which seems commonly ignored as well as undervalued in therapeutic studies, can be linked to short term progression after stroke. In this research, we established that AKI is not an uncommon sign in stroke patients. AKI seems to be a prevalent co-morbid state in the community with various medical conditions such as cardiovascular disease, diabetes, hypertension, cerebrovascular stroke, as well as ICU admission. The renal function in the origin of CVD like stroke is becoming clearer in medical research [6]. Many patients with stroke experienced mild AKI which was reversible in most situations, this should not be forgotten that it is not necessarily true at the tissue level [7]. During renal healing, endothelial dysfunction, tubular inflammation, as well as stimulation of intrarenal fibrotic pathways might gradually alter renal structure, resulting in protein in urine, hypertension, as well as progressive decrease in kidney function. Renal impairment, particularly in risk factors like atherosclerosis or other illnesses, may suggest a greater comorbidity load [8]. It appears that perhaps the extent of renal impairment existing in patients with stroke is certainly an indicator of end organ impairment from long-standing small as well as large arteries' stiffness because of atherosclerosis as well as its vascular risk factors (for example, aging population, smoking, hypertension, diabetes, and cardiovascular disorders) or is not linked with other arteriosclerosis risk factors. Hence, many shared risk factors among stroke as well as renal dysfunction increase morbidity as well as death in patients with stroke [9].

In this study, most of the subject were males about (n=29) with mean age group of 18 to 75. However, majority participants were falling in 55 to 65 years (n=27). The patients with ischemic stroke were about 58% (n=29) while the others were with haemorrhagic stroke 42% (n=21). About (n=12) 24% were with acute renal failure from which 12% (n=6) were in stage I of AKI, 8% (n=4) were in stage II of AKI and 4% (n=2) were in stage III AKI. AKI was found to be more in haemorrhagic stroke participants 20% (n=10) in contrast to ischemic stroke participants 4% (n=2). The statistical difference was found to be about p= <0.05. Out of 50 patients, 7 patients died which showed 14% mortality rate in stroke patients. 5 patients out of 7 was with AKI showing strong correlation of acute renal failure with mortality. AKI was observed to be predicted with haemorrhagic stroke, old age, diabetes mellitus, as well as a higher baseline creatinine levels. Even though AKI is widespread and has a high morbidity and death rate, it is preventable, promptly detectable, as well as treatable.

The degree of decreased renal functioning in patients hospitalized with acute stroke is related with higher all-cause mortality, regardless of age, gender, or significant comorbidities [10]. Our findings emphasize the significance of evaluating patients having stroke who are more likely to develop AKI based on characteristics such as haemorrhagic stroke, older age, higher baseline levels of creatinine, as well as diabetes mellitus, which were identified in this study to predict its occurrence. Moreover, there had been a comparable risk of longer hospitalization and higher death in patients with stroke [11].

More study is needed to find whether the evolution of AKI following stroke is a causal connection or an indicator of end-organ destruction caused by long-standing stiffness of small as well large arteries caused by atherosclerosis and its affiliated vascular risk factors such as aging process, smoking, hypertension, and diabetes mellitus [12]. More research should be conducted to establish whether treatments aimed at proactively preventing the onset of AKI or treating early symptoms of AKI might lead to lower stroke mortality [13-15].

CONCLUSION

Stroke is a cerebrovascular disease in which blood flow towards brain got reduced leading to cerebrovascular dysfunction. Symptoms may last for >24 hours and death may occur without any apparent reason except for the vessel origin. AKI or acute renal failure occurs as complication of stroke. The severity of AKI or damaged renal vessels are strongly associated with stroke severity

According to many studies, haemorrhagic stroke tends to cause more AKI in contrast to ischemic stroke.

Many researchers showed acute renal failure in stroke patients as mortality and morbidity predictor. Therefore, this study was done to evaluate renal function in patients

with acute stroke and to provide early interventions to prevent morbidity as well as mortality. In this research, we established that AKI is not an uncommon sign in stroke patients.

In this study, 50 patients with stroke were taken out of which 21 were with haemorrhagic stroke and 29 patients were with ischemic stroke. AKI was most associated with haemorrhagic stroke patients. Out of 50 patients, 7 patients died which showed 14% mortality rate in stroke patients. 5 patients out of 7 was with AKI showing strong correlation of acute renal failure with mortality. AKI was observed to be predicted with haemorrhagic stroke, old age, diabetes mellitus, as well as a higher baseline creatinine levels. AKI was additionally discovered to be an independent prognostic factor of hospitalization and higher death in patients with stroke.

However, more research should be conducted to establish whether treatments aimed at proactively preventing the onset of AKI or treating early symptoms of AKI might lead to lower stroke mortality.

CONSENT

Consent was taken after explaining whole research procedure from all patients with stroke included in the study.

ETHICAL APPROVAL

According to the guidelines of university, ethical approval was taken and kept by the authors.

COMPETING INTERESTS

No competing interest is present as stated by the authors.

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