



EVALUATION OF RENAL FUNCTION IN PATIENTS WITH STROKE AS A PARAMETER FOR PREDICTING THE SHORT-TERM OUTCOME AND DURATION OF HOSPITAL STAY

General Medicine

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ABSTRACT

Stroke is the leading cause of functional damage and death worldwide affecting both patients and their relatives in most regions. The main objective of the study is to check renal function in patient with stroke and to assess the link between the renal function and short-term outcome during their hospital stay. A perspective study was carried out for a period of one year with 137 consented stroke patient's age > 13 diagnosed within 48 hours. The statistical analysis was done using EPI INFO version. Qualitative and Quantitative data was analysed with statistical tests. We found that stroke was found more common in the male and mainly caused due to infarction and intracerebral hemorrhage. Reduced GFR was found in 50% of patients with stroke. Mean hospital stay was highest in patients with reduced GFR and increased PCR. Mortality was more in patients with reduced GFR and increased PCR.

KEYWORDS

Chronic kidney disease, Glomerular Filtration Rate, Renal Function, Stroke, Protein Creatinine Ratio

Introduction

Economic development and changing lifestyles are increasingly having a significant impact on the public health scenario of India. This epidemiological transition has demanded reconsideration of public health policies. Whilst, the focus previously was entirely on communicable diseases, mostly infectious, the increasing prevalence of non-communicable diseases and their risk factors is worrisome. Considering the monetary constraints to eradicate infectious diseases; increasing burden of lifestyle diseases is bound to cause resource crunching in the health sector of those economies. India at present facing a situation like that as the nation has the largest population of diabetics and obesity as an emerging epidemic.¹ One study suggested that every fifth person in India is hypertensive.² Considering the high prevalence of Chronic kidney disease (CKD) and its risk factors it has long been presumed that CKD represents a major public health problem in India and the true magnitude of the disease is controversial due to inadequate data of CKD.³ Besides, Stroke is the leading cause of functional impairment and death worldwide affecting both patients and their relatives in most regions. Annually 180-300 patients per 100,000 populations affected with stroke worldwide.

Chronic kidney disease (CKD) and cardiovascular disease are major public health problems worldwide and share many similar pathophysiological mechanisms.⁴ Renal dysfunction even to a subtle degree has been noted to be a prognostic factor for overall mortality in patients with diabetes mellitus and hypertension.⁵ A detailed review of observational studies available reveal that a reduced Glomerular Filtration Rate (GFR) is associated with increased risk of coronary artery disease (CAD).^{6,7} The effect of renal dysfunction on the incidence and outcome of patients with acute stroke, however, has not been well delineated in a qualitative and quantitative manner.⁸ As stroke is a leading cause of mortality and morbidity worldwide, several strategies such as blood pressure, diabetes control and dyslipidemia using statins and antiplatelet measures with aspirin may reduce subsequent cardiovascular diseases.⁹

Clinical presentation of stroke depends on which arterial territory is involved and size of the lesion. The widely used scales to measure the outcomes in acute stroke patients are NIHSS (National Institute of Health Stroke Scale) and Modified Rankin Scale. Ideally, all patients should be admitted in a specialized stroke units Pulse / BP should be monitored regularly and controlled with anti-hypertensive drugs. Blood sugar must be controlled ideally with insulin.¹⁰ Proper hydration and nutrition should be ensured if possible with nasogastric tube and intravenous fluids. Patients should be turned regularly and must be put on pressure relieving mattress like air bed or water bed. Some patients with large hematoma or infarct may need intravenous mannitol to

reduce brain oedema.

Patients with stroke usually admitted in hospital for proper evaluation and care. Normally they leave the hospital within 6 to 7 days. More than 12 days are considered as prolonged stay. The reasons for the prolonged stay are uncontrolled hypertension, loss of consciousness, uncontrolled diabetes mellitus, old age, renal dysfunction, intracerebral hemorrhage and subarachnoid hemorrhage.¹¹ The 28th-day case fatality is 24.5% of urban and 37.1% of rural population and mild disability occurs in 42.4%, moderate disability in 43% and severe disability occurs in 14.6 % cases. There is no significant difference in the outcome in males and females, and between urban and rural population.¹² Risk factors are fixed and modifiable. Fixed risk factors are age, gender (more in males), previous vascular event (Myocardial infarction, Stroke, Peripheral vascular disease), heredity, high fibrinogen, and homocystein. Modifiable risk factors are blood pressure, diabetes mellitus, cigarette smoking, hyperlipidemia, heart diseases (Atrial fibrillation, Valvular heart disease, Congestive cardiac failure, and Infective endocarditis), excessive alcohol intake, and estrogen containing drugs (oral contraceptive, hormone replacement therapy) and polycythemia.^{13,14}

The main objective of the study is to check the renal function in the patient with stroke and to assess the link between the renal function and short-term outcome during their hospital stay. This study was conducted as a hospital-based study to elucidate whether baseline biomarkers of renal dysfunction are independently associated with short-term clinical outcome and subsequent duration of hospital stay of patients admitted with acute stroke.

Materials and Methods

A prospective study was carried out for a period of one year with 137 consented stroke patients age > 13 diagnosed within 48 hours. The procedure was followed after getting ethical committee clearance from the IRB, at Department of Medicine, Thrissur Medical College during the period of 2014 February to January 2015. The patient getting hemodialysis for chronic renal failure and having paraparesis except for ACA (Anterior Cerebral Artery) stroke were not considered for the study. The statistical analysis was done using EPI INFO version.¹⁵ Qualitative and Quantitative data will be analysed with appropriate statistical tests.

Baseline clinical and demographic information for all patients including sex, age, weight, cardiovascular risk factors as hypertension, diabetes, alcohol misuse, cigarette smoking and history of recent stroke were taken and recorded. Past history of heart diseases, renal failure, any history of renal replacement therapy in the past and continuing, chronic liver disease and any chronic drug intake including

recreational drugs were taken and recorded.

A complete clinical examination including pulse rate, blood pressure (BP), respiratory rate, temperature and detailed general examination followed by complete and thorough neurological examination and necessary and relevant examination of cardiovascular, respiratory, gastrointestinal systems were done and recorded. The information gathered from these observations were systematically measured on NIHSS stroke Scale and Modified Rankin scale (MRS) on the same day.¹⁶

The biochemical assessment was done using various lab investigations which included complete blood count, urine routine, Random Blood Sugar, blood urea, serum creatinine, liver function test, serum sodium, potassium, 24 hr urine protein or urine Protein Creatinine Ratio (PCR) were recorded. Electrocardiogram (ECG), X-ray chest PA view and USG abdomen in selected cases were taken and recorded. Computerized Tomography (CT) Scan of the head was taken in all cases and categorized the patients into cerebral infarct, intracerebral hemorrhage (ICH) and sub arachnoid hemorrhage (SAH) and recorded. GFR is calculated using Cockcroft-Gault formula as $(140 - \text{Age}) \times \text{body weight in Kg} \times (s * *)$ divided by $72 * \text{serum vreatinine in } \frac{\text{mg}}{\text{dl}}$

$$\text{Cockcroft - Gault formula} = \frac{(140 - \text{Age in years})(\text{bodyweight in Kg}) \times (s * *)}{72 * \text{serum vreatinine in } \frac{\text{mg}}{\text{dl}}}$$

(**multiply with 1.23 for males, 0.85 for females)

Results

We collected data from 137 out of which 75 (55%) men and 62 (45%) female with hemorrhagic stroke. The age of study population was above 13 (the mean age was 66.0292 years) with std. deviation of 12.3 and median of 66 IQR (25-75%) of 66 to 75; of which >40 years were 3 (2.19%), 40-60 were 41(29.93%) highest with 60 to 80 years were 73 (53.28%). Among the 137 patients, 44 (32.12%) and 120 (87.59%) patients were diabetic and hypertensive respectively. There were 75 males (54.74%) and 62 females (45.26%) in our study were hypertensive with mean systolic BP 143.63 mmHg with std deviation 17.09 mmHg, and a mean diastolic BP 92.96 mmHg with std deviation of 11.32 mmHg.

CT scan brain of the 137 patients studied showed 125 (91.24%) were brain infarct and 11 (8.03%) were intracerebral hemorrhage with 1 (0.73%) case of subarachnoid hemorrhage. GFR was measured in all patients with a mean 59.68 and standard deviation of 15.62, median 59.58 and IQR (25-75%) 41.14 to 68.47. Glomerular Filtration Rate (GFR) calculated as per Cockcroft-Gault formula in our patients were 15 to 30ml/mt/1.73m², 2 (1.46%), 30 to 45-25 (18.25%), 45 to 60-38 (27.74%), 60 to 90, 66 (48.18%) and above 90 in 6 patients (4.38%). Patients with GFR<60ml /mt/1.73m² has 4.46 times more risk of death with p-value 0.00021 (Table I) (Figure I).

Among the 137 patients, 15 (10.95%) stayed more than 12 days with a mean 5.55 and std. deviation 12.31, median 66 with IQR (25-75%) 56-75. 15 patients stayed more than 12 days with the maximum duration of 28 days (Table III). Among the 137 patients studied 8 patients out of 69 with GFR <60ml/mt/1.73m² stayed more than 12 days and 61 patients out of 68 stayed less than 12 days. So, patients with lower GFR were 1.4 times more prone to stay longer. Of the 137 patients admitted 40 patients died (29.2%); 13 died on the day of admission, 6 died at day 7 and 21 died during the time of follow-up (Table IV).

Among the 137 patients studied 30 patients out of 69 died with GFR <60ml/mt/1.73m² and 58 out of 68 survived with GFR>60ml/mt/1.73m² (Table V). It showed that patients with GFR<60ml/mt/1.73m² had 4.46 times higher chance of death with a p-value of 0.00021. PCR was measured with a mean of 0.23 and standard deviation 0.05, median 0.22 and IQR (25-75%) 0.19 to 0.26. Among the 137 patients studied 8 out of 15 patients with PCR>0.3 died and 90 out of 122 patients with PCR<0.3 survived. It showed that patients with PCR>0.3 were 3.21 times higher risk of death with a p-value of 0.02 (Table VI, Table VIII).

Discussion

In this study, there were 137 patients of which 75 (54.74%) males and 62 (45.26) were females. The mean age was 66.02 and median age 66 with std deviation of 12.3 and IQR (25-75%) 56- 75. 120 (87.59%) patients were hypertensive with mean SBP/DBP 143.64/92.93 with std

deviation 17.09/11.32 and median 140/90mm of Hg with IQR (25-75%) 150/100 mm of Hg and 44(32.12%) were diabetic. NIHSS score on admission was a mean of 14.96, the median of 14 with std deviation of 6.27 and IQR (25-75%) 10 to 22. MRS Score on admission 10 (7.3%) were 2, 49 (35.77%) were 3, 40 (29.2%) were 4, 25 (18.25%) were 5 and 13 (9.49%) died. MRS Score at 30th day 24 (17.52%) were 2, 46 (33.58%) were 3/ 26 (18.98%) were 4 and 27 patients died.

Among the patients admitted 15 patients stayed>12 days and 122 patients stayed<12 days with the mean duration of stay 5.55, median 6.6 with a std. deviation of 12.31. 8 patients out of 69 with GFR<60ml/mt/1.73m² stayed>12 days and 61 out of 68 patients with GFR>60ml/mt/1.73m² stayed<12 days. So patients with lower GFR stayed 1.4 times longer than the patients with higher GFR. Among the 137 patients admitted 40 (29.2%) patients died and 97 (70.8%) survived with varying disabilities. 30 patients out of 69 with GFR<60ml/mt/1.73m² died and 58 out of 68 patients with GFR>60ml/mt/1.73m² survived. So, patients with lower GFR were found to be 4.46 times higher risk of death with a p-value 0.00021.

PCR measured with the mean of 0.23 and a std. deviation of 0.05, median of 0.22 and IQR (25-75%) 0.19 TO 0.26. 8 patients with PCR>0.3 died and 90 out of 122 patients with PCR<0.3 survived. So patients with higher PCR were 3.21 times higher risk of death with a p-value of 0.029. There were 44 diabetic patients and 14 died during the study and 4 stayed >12 days in the hospital. Among 120 hypertensive patients, 36 succumbed to the disease 11 patients stayed> 12 days in the hospital. There were 11 patients with intracerebral hemorrhage and 9 died including one subarachnoid hemorrhage and 125 cases of infarction of which only 30 died. So the hemorrhagic stroke carries the worst prognosis. There were only 31 smokers of which 11 died.

Conclusions

Stroke was more common in the age group of 60 to 80 and more than half were males. The Majority of stroke was due to infarction (90%) and only less than 10% due to intracerebral hemorrhage. Diabetes mellitus was found in 1/3rd and hypertension in 3/4th and reduced GFR in nearly 50% of the patients with stroke; Mean hospital stay was highest in patients with reduced GFR and increased PCR. Mortality was more in patients with reduced GFR and increased PCR.

Conflict of Interest

The authors declare that they have no competing interests.

Table 1 GFR value and its distribution in stroke patients

GFR	Frequency	Percent
90-120	6	4.38
60-90	66	48.18
45-60	38	27.74
30-45	25	18.25
15-30	2	1.46
Total	137	100

Table 2 Modified Rankin Score at admission and on the 30th day.

MRS 0	Frequency	Percent
2	10	7.30%
3	49	35.77%
4	40	29.20%
5	25	18.25%
6	13	9.49%
TOTAL	137	100.00%
MRS 30	Frequency	Percent
2	24	17.52%
3	46	33.58%
4	26	18.98%
5	1	0.73%
6	40	29.20%
Total	137	100.00%

Table 3 Showing duration of Hospital stay.

Stay	Frequency	Percent
<12	122	89.05%
>12	15	10.95%
Total	137	100.00%

Table 4 Correlation between GFR and duration of hospital stay.

GFR	Stay		Total
	<12	>12	
>60	61	7	68
<60	61	8	69
Total	122	15	137

Table 5 Correlation between GFR and death in patients with stroke

GFR	DEATH		Total
	YES	NO	
<60	30	39	69
>60	10	58	68
Total	40	97	137

Table 6 Correlation between urine PC ratio and death in stroke.

PCR	Death		Total
	Yes	No	
>0.3	8	7	15
<0.3	32	90	122
Total	40	97	137

Table 7 Correlation between smoking and death in patients with smoking

Smoking	Death		Total
	Yes	No	
No	29	77	106
Yes	11	20	31
Total	40	97	137

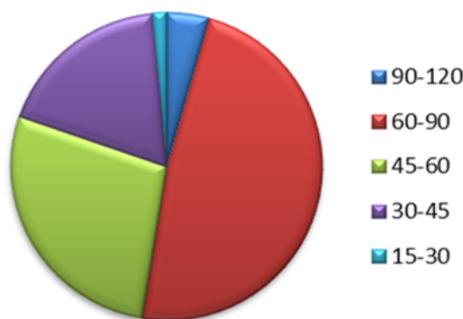


Figure I Distribution of GFR.

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