

Prevalence of Renal Dysfunction in Acute Stroke Patients at Abakaliki Nigeria

Chukwuemeka Eze

ABSTRACT

Background: Renal dysfunction is commonly seen in hospitalized stroke patients. It serves both as a risk factor for stroke and as a complication of stroke. Renal dysfunction is a poor prognostic factor for stroke and increases the risk of recurrence. Despite the above poor indices, there is paucity of data on the prevalence of renal dysfunction in acute stroke patients in Nigeria. It is against this backdrop that we embarked on this study of the prevalence and pattern of renal dysfunction in acute stroke patients in Abakaliki Nigeria. **Method:** This is a cross-sectional observational hospital-based study undertaken at the Emergency unit of the Alex Ekwueme Federal University Teaching Hospital Abakaliki, Nigeria from October 2021 to April 2022 (7 months period). **Results:** Amongst the 210 acute stroke patients enrolled in the study, 51 (24%) had renal dysfunction with no age and sex predilection. Hemorrhagic stroke, alteration in consciousness, and anemia were significantly associated with renal dysfunction. **Conclusion:** The prevalence of renal dysfunction following acute stroke is high and there is a need for assessment of renal functions in every acute stroke patient and institute prompt multi-disciplinary treatment.

Keywords: Acute stroke, Renal dysfunction, Medical emergency, Abakaliki, Nigeria

INTRODUCTION

Renal dysfunction is commonly seen in hospitalized stroke patients. [1] Although the exact prevalence of renal dysfunction in stroke patients is not known, a few studies reported a prevalence rate of 28% to 38%. [2,3] Renal dysfunction serves both as a risk factor and as a complication of stroke. [4,5] Renal dysfunction also worsens the prognosis of stroke and increases the risk of recurrence. [6] The mechanisms of stroke in renal dysfunction are multi-factorial and include endothelial dysfunction, accelerated arteriosclerosis, and impaired cerebral autoregulation. [7,8] The mechanisms of renal dysfunction following acute stroke is also multi-factorial and include impairment of central autonomic network, neuroendocrine system, cerebral autoregulation, and inflammatory mediators, and dehydration. [9-12]

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Assessment of renal function is important in management of stroke as it helps in early detection and prompt treatment of renal dysfunction.

There is paucity of data on renal dysfunction in Acute stroke patients in Nigeria despite its high morbidity and mortality. It is against this backdrop that we embarked on this study of the prevalence and pattern of renal dysfunction in acute stroke patients. The findings from the study will highlight the burden of this condition and provide the background data for development of management protocols and reference purposes.

METHODOLOGY

This was a cross-sectional observational hospital-based study undertaken at the Medical Emergency unit of the Alex Ekwueme Federal University Teaching Hospital Abakaliki, a tertiary hospital in Abakaliki Nigeria from October 2021 to April 2022 (7 months period). The hospital is a referral hub for Ebonyi state, and the surrounding states such as Enugu, Abia, Imo, Benue, and Cross-River states. Acute stroke (1- 7 days post stroke) patients usually present to the medical emergency unit, from where they are admitted to either the intensive care unit or medical wards depending on the severity. All consecutive acute stroke patients that were 18 years and above, of both gender who had sample collected for serum creatinine assay within 24 hours of presentation were included in the study. The case notes of the patients were used to retrieve information on the biodata, clinical characteristics, type of stroke based on neuroimaging (brain computed axial tomography scan- CT scan), serum creatinine level, packed cell volume, and admitting random blood glucose value.

Stroke was classified as either ischemic or hemorrhagic type based on the findings of neuroimaging. Renal dysfunction was defined as estimated glomerular filtration rate (eGFR) of $< 60\text{ml/minutes}/1.73\text{m}^2$ using Modification of Diet in Renal Disease Study (MDRD) online calculator and then classified as mild ($30\text{-}59\text{ml/minutes}/1.73\text{m}^2$), moderate ($15\text{-}29\text{ml/minutes}/1.73\text{m}^2$) and severe ($<15\text{ml/minutes}/1.73\text{m}^2$). [1] MDRD calculator takes

into consideration serum creatinine, age, sex and race in calculation of eGFR. [13] Altered consciousness was defined as Glasgow coma score (GCS) of $< 15/15$. Hyperglycemia was defined as admitting Random blood glucose (RBG) level of $\geq 140\text{mg/dl}$. [14] Hypertension was defined as Systolic blood pressure (SBP) of $\geq 140\text{mmHg}$ and/or Diastolic blood pressure (BDP) of $\geq 90\text{mmHg}$. [15] Anemia was defined as packed cell volume (PCV) of $< 36\%$. [16]

The data were analyzed with Statistical Package for the Social Sciences (SPSS) version [25]. The categorical variables were presented as proportions and percentages while numerical variables were presented as means and standard deviations. Chi-square with Yates correction was used for test of statistical significance with p-value of < 0.5 as significant.

RESULTS

Two hundred and ten (male 120, female 90) patients who had acute stroke that met the study criteria were recruited for the study with mean age of 56.4 ± 12.3 years. Out of the 210 patients recruited for the study, 51 (24%) had renal dysfunction with mean age of 59.7 ± 11.5 years and male to female sex ratio of 2: 1. Thirty-three (64.7%) had mild renal dysfunction, while 13 (25.4%) and 5 (9.8%) had moderate and severe renal dysfunctions respectively. Hemorrhagic stroke, altered consciousness and anemia were statistically associated with renal dysfunction. The details are presented in table 1 and figure 1.

Table 1: Clinical characteristics of the patients

Variable		Normal renal function- n (%)	Renal dysfunction- n	Total- N	P-value
Age range (years)	18- 64	89 (42.4)	30(14.3)	119(56.7)	0.659
	≥ 65	70(33.3)	21(10.0)	91(43.3)	
Gender	Male	85(40.5)	35(16.7)	120(57.1)	0.082
	Female	74(35.2)	16(7.6)	90(42.9)	
Type of stroke	Ischemic	132(62.9)	34(16.2)	166(79.1)	0.044
	Hemorrhagic	27(12.9)	17(8.1)	44(20.9)	
Mental status	Conscious	117(55.7)	23(10.9)	140(66.7)	0.000
	Altered consciousness	42(20.0)	28(13.3)	70(33.3)	
Random blood glucose (mg/dl)	< 140	109(51.9)	35(16.7)	144(68.6)	0.870
	≥ 140	50(23.8)	16(7.6)	66(31.4)	
Blood pressure (mmHg)	< 140/90	43(20.5)	7(3.3)	50(23.8)	0.079
	≥ 140/90	116(55.2)	44(20.9)	160(76.2)	
Packed cell volume (%)	< 36	68(32.4)	31(14.8)	99(47.2)	0.037
	≥ 36	91(43.3)	20(9.5)	111(52.8)	

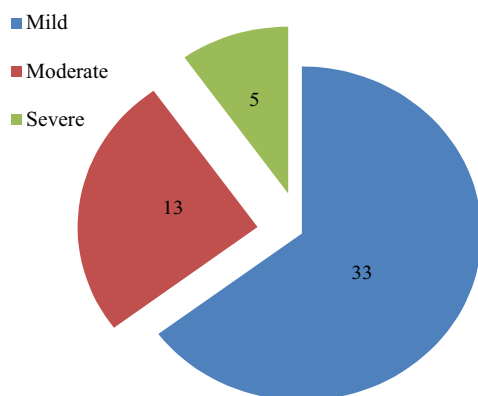


Figure 1: Severity of Renal Dysfunction

DISCUSSION

This study evaluated the hospital prevalence of renal dysfunction in acute stroke patients. Renal dysfunction was identified in 24% of the sample population. Though there is paucity of data on this subject, few remotely conducted studies reported hospital prevalence of 28 to 38%. [2,3] The reported prevalence of 24% is high, though lower than 28% to 38% reported previously. This disparity could result from the possible different definitions for renal dysfunction used in these studies, genetic and environmental factors variations amongst the study populations as the former was in the Caucasians while the later was on black Africans. Also, the quoted studies were reported about a decade ago

which suggest that there could have been significant improvement in health care delivery. The 24% prevalence reported in this study could have under reported the real burden as there are more sensitive markers of renal dysfunction like urine micro-albuminuria assay. Renal dysfunction serves both as a risk factor for stroke and as a complication of stroke. [4,5] Renal dysfunction also worsens the prognosis of stroke and increases the risk of stroke recurrence. [6]

The mechanism of stroke in renal dysfunction is multi-factorial and include endothelial dysfunction, accelerated arteriosclerosis, and impaired cerebral autoregulation. [7,8]

The mechanisms of renal dysfunction following acute stroke is also multi-factorial and include central autonomic network, dehydration, neuroendocrine system, cerebral autoregulation, and inflammatory mediators. [9-12]

The pattern of renal dysfunction in this study showed that majority had mild renal dysfunction, while the rest had moderate and severe renal dysfunction respectively in descending order of magnitude. Though majority had mild renal dysfunction, Leoncini et al reported associated threefold higher incidence of mortality from cardiovascular events in patients that have mild renal dysfunction. [17]

Hemorrhagic stroke, alteration in consciousness and

presence of anemia were noted to be statistically associated with renal dysfunction.

The pattern of association between hemorrhagic stroke and renal dysfunction in this study was also reported by Shrestha *et al.*[18] This association is multi-factorial. It is related to the fact that hypertension is risk factor for both hemorrhagic stroke and renal dysfunction.[19,20] Furthermore, renal dysfunction is a strong risk factor for hemorrhagic stroke due to multiple reasons which include platelet dysfunction, low platelet count, use of heparin during hemodialysis and use of anticoagulants for thromboembolic risk. [21]

Alteration in consciousness is also associated with renal dysfunction. This is not unexpected as alteration of consciousness is a known clinical feature of renal dysfunction. [22] It is also noted that hemorrhagic stroke which commonly cause alteration in consciousness is also strongly associated with renal dysfunction. [19,20,21]

The presence of anemia is also noted to be associated with renal dysfunction. This association is expected as anemia is a common clinical feature of renal dysfunction. [23] This is related to erythropoietin deficiency, circulating uremic-induced inhibitors of erythropoiesis, shortened red blood cell survival, and nutritional deficiencies of folate and vitamin B12, due to anorexia. [23] Anemia was present in almost half of the study population, and it is a known poor prognostic factor for stroke. [24]

There was no significant association between renal dysfunction and age, sex, blood glucose and blood pressure. The absence of association of renal dysfunction and age was unexpected. This is because renal dysfunction is reportedly more preponderant in the elderly population due to the higher prevalence of the risk factors. [25] The effect could have been nullified by more preponderance of hemorrhagic stroke [26] and pre-eclampsia in the young people. The above finding could also be related to the case definition of renal dysfunction used in this study which may have missed some cases.

The lack of association between renal dysfunction and sex is not expected as renal dysfunction is reportedly known to be higher in male folks in

general population. [27] It could be related to the sample size or the definition of renal dysfunction.

Hyperglycemia did not have significant association with renal dysfunction in this study. This is unexpected as diabetes is a known risk factor for renal dysfunction. [28] The absence of the association could be related to the hypoglycemic effects of renal dysfunction in diabetes patients. [29] The mechanisms of hypoglycemic effects include altered drug metabolism, autonomic neuropathy, anorexia, malnutrition, infections, associated cardiac and hepatic disease, impaired renal glucose release, and decreased renal clearance of insulin. [30]

Hypertension was not associated with renal dysfunction in this study. This is surprising as hypertension is a known risk factor and a complication of renal dysfunction. [20] The above lack of association could stem from the fact that hypertension is a very common risk factor for stroke as > 75% of the study population had hypertension. There could be a reactive rise in blood pressure following stroke. [31] This could mask the expected association between renal dysfunction and hypertension.

Conclusions and Recommendations

The prevalence of renal dysfunction is high in acute stroke patients. It is associated with hemorrhagic stroke, alteration in consciousness and the presence of anemia. There is paucity of data of renal dysfunction in acute stroke in Nigeria.

There is a need for a more collaborative multi-center studies on the renal dysfunction in acute stroke to highlight the real burden in Nigeria and Africa at large. There is a need for assessment of renal functions in every acute stroke patient and ensure prompt treatment through multi-disciplinary approach.

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