Original Article

Prevalence of Microalbuminuria and Its Association with Stroke Severity in Patients with Acute Ischemic Stroke: A Hospital-Based Observational Study

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Abstract

Background: Microalbuminuria is an indicator of endothelial dysfunction and systemic vascular damage. It is also expressed in acute ischemic stroke (AIS), which can imply more severe stroke damage and microvascular destruction. The current research aims to identify the rate of microalbuminuria among AIS patients, as well as how it correlates with the severity of stroke. **Material and Methods:** This was a hospital-based observational study that involved 120 consecutive patients with AIS clinically and radiologically confirmed. Clinical and demographic information was taken. The National Institutes of Health Stroke Scale (NIHSS) was used to measure the stroke severity. The spot urine albumin-creatinine ratio (ACR) was used to measure microalbuminuria, with results of 30-300 mg/g considered positive. Patients were classified as having microalbuminuria or as having negative results. Some statistical analysis was also conducted, which determined the associations between microalbuminuria and stroke severity. **Results:** The microalbuminuria was observed in 52 (43.3%) patients. Patients with microalbuminuria had a significantly higher mean NIHSS score than those without (14.6±3.8 vs. 9.2±2.9; $p < 0.001$). There was a more severe stroke (NIHSS >15) in the microalbuminuria group (65.4%) compared to the non-microalbuminuria group (26.5%) ($p < 0.001$). Microalbuminuria also had a strong relationship with hypertension and diabetes mellitus ($p < 0.05$). **Conclusion:** AIS has microalbuminuria that is prevalent and highly related to the severity of stroke. Urinary ACR measurement can be a good and easy biomarker to stratify the risk of using individual variations in acute ischemic stroke.

Keywords: Acute ischemic stroke; Microalbuminuria; NIHSS; Stroke severity; Endothelial dysfunction; Prognosis.

Received: 05 January 2026 **Revised: 23 January 2026** **Accepted: 19 February 2026** **Published: 24 April 2026**

Introduction

Ischemic stroke accounts for almost 85 percent of stroke cases, with stroke being one of the major causes of mortality and long-term disability across the world.[1] The World Health Organisation indicated that stroke is a significant cause of disease burden throughout the world, especially in low- and middle-income nations, in which incidence and case-fatality rates are on the increase.[1] Acute ischemic stroke (AIS) is caused by the acute disruption of cerebral blood circulation caused by occlusion of the arteries, which causes injuries and necrosis of the neurons. Early detection of factors that correlate with stroke severity is essential for risk prevention, prognostication, and therapeutic decision-making.[2]

Endothelial dysfunction is a central focus in the pathogenesis of atherosclerosis, hypertension, diabetes mellitus, and cerebrovascular disease.[2] Microalbuminuria, which is the amount of urinary albumin excretion of 30-300 mg/day or a higher ratio of albumin to creatinine in spot urine samples, is quite commonly considered a measure of failure of endothelial systems, which are more globalised and the microvascular damage.[3] It indicates increased vascular permeability and endothelial integrity, which are fundamental to renal and cerebral pathology.

Several epidemiological analyses have proven that microalbuminuria is a significant risk factor for cardiovascular events, including stroke.[4,5] The Chronic Kidney Disease Prognosis Consortium stated that high albuminuria is closely associated with an increased risk of stroke and cardiovascular death in various groups of people, regardless of such conventional risk factors.[4] In addition, microalbuminuria was reported to correlate with carotid intima-media thickness, arterial stiffness, and small-vessel disease, suggesting that it can serve as a surrogate marker of overall vascular damage.[6]

Microalbuminuria can indicate extensive endothelial malfunction and increased cerebrovascular malfunction in acute stroke patients with acute ischemic stroke. In past clinical experience, the higher rates of microalbuminuria between stroke

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DOI: 10.21276/amit.2026.v13.i1.610

How to cite this article: Goyal D, Khan TM, Dhanni VK. Prevalence of Microalbuminuria and Its Association with Stroke Severity in Patients with Acute Ischemic Stroke: A Hospital-Based Observational Study. Acta Med Int. 2026;13(1):1125-1128.

patients and controls have been noted, and a strong correlation has been found between the level of albuminuria and the severity scores of stroke.[7,8] The National Institutes of Health Stroke Scale (NIHSS), developed by the National Institute of Neurological Disorders and Stroke, is a standardised tool for evaluating stroke severity and adjusting treatment.[9] The use of simple, inexpensive biomarkers, such as microalbuminuria, that correlate with NIHSS scores will help improve early prognostic assessment in the acute bed.

Although there is increasing evidence of the importance of microalbuminuria in cardiovascular/cerebrovascular risk reduction, there is little data on the prevalence of microalbuminuria and its relation to stroke severity in hospital-based populations in developing nations. Hence, the current research was conducted to identify the rate of microalbuminuria in patients with acute ischemic strokes and how it correlates with the severity of stroke measured using the NIHSS.

Materials and Methods

Study Design and Setting: This was a hospital-based observational study in the department of medicine of a tertiary care hospital. The participants of the study were the consecutive patients admitted to the hospital with a clinical/radiographic confirmed (CT/MRI brain) acute ischemic stroke. The research was conducted within a specified study area, with ethical consent obtained from the Institutional Ethics Committee. Patients or their legally authorised representatives signed the written informed consent.

Study Population: A total of 120 adult patients (>18 years) with a first-ever or recurrent acute ischemic stroke reported to present within 72 hours of the occurrence of the symptoms were recruited. Patients who have suffered a hemorrhagic stroke, have chronic kidney disease, those with overt proteinuria, those with a urinary tract infection, and those with known nephrotic syndrome were excluded. Demographic information, vascular risk factors (hypertension and diabetes mellitus), and clinical history were collected using a structured pro forma.

Clinical and Laboratory Evaluation. The National Institutes of Health Stroke Scale (NIHSS) was used to evaluate the severity of stroke at admission. According to NIHSS scores, patients were divided into mild, moderate, and severe stroke cases. Urinary albumin-creatinine ratio (ACR) was measured from spot urine on the 24th hour of admission. The definition of microalbuminuria was an ACR of 30-300mg/g. Regular laboratory examinations were performed, including blood glucose and renal tests.

Statistical Analysis: The data were keyed in and processed using the right statistical service. Continuous variables were reported as mean±standard deviation, and categorical variables as frequencies and percentages. The Student t-test and the Chi-square test were conducted to compare groups (microalbuminuria-positive and -negative). A p-value of less than 0.05 was taken to be significant.

Results

The patients included in the study were 120 participants with acute ischemic stroke. The mean age was 61.8±11.4 years, and males constituted the majority (56.7%). Sixty-five percent and forty-three percent of patients had hypertension and diabetes mellitus, respectively. Microalbuminuria was then identified in 43.3%. The total mean NIHSS score was 11.5±4.2 [Table 1].

Microalbuminuric patients had higher mean NIHSS scores than non-microalbuminuric patients (14.6±3.8 vs. 9.2±2.9; $p < 0.001$). Severe stroke (NIHSS ≥15) was more prevalent in the microalbuminuria group (65.4%), as compared to the non-microalbuminuria group (26.5%) [Table 2, Figure 2]. Microalbuminuria was greatly related to hypertension and diabetes mellitus. Microalbuminuria was detected in 57.7% of hypertensive patients ($p = 0.02$) and in 61.5% of diabetic patients ($p = 0.01$), as shown in [Table 3].

Stroke severity distribution analysis showed that severe stroke was significantly higher in patients with microalbuminuria, and mild and moderate strokes were common in patients with no microalbuminuria [Table 4]. [Figure 1] shows the general prevalence of microalbuminuria in the study population.

Table 1: Baseline Demographic and Clinical Characteristics (n = 120)

Variable	Number (%) / Mean ± SD
Age (years)	61.8 ± 11.4
Male	68 (56.7%)
Female	52 (43.3%)
Hypertension	78 (65.0%)
Diabetes Mellitus	52 (43.3%)
Microalbuminuria	52 (43.3%)
Mean NIHSS Score	11.5 ± 4.2

Table 2: Comparison of NIHSS Scores Between Groups

Parameter	Microalbuminuria Present (n=52)	Microalbuminuria Absent (n=68)	p-value
Mean NIHSS Score	14.6 ± 3.8	9.2 ± 2.9	<0.001
Severe Stroke (NIHSS ≥15)	34 (65.4%)	18 (26.5%)	<0.001

Table 3: Association of Microalbuminuria with Risk Factors

Risk Factor	Microalbuminuria Present n (%)	Microalbuminuria Absent n (%)	p-value
Hypertension (n=78)	45 (57.7%)	33 (42.3%)	0.02
No Hypertension (n=42)	7 (16.7%)	35 (83.3%)	
Diabetes (n=52)	32 (61.5%)	20 (38.5%)	0.01
No Diabetes (n=68)	20 (29.4%)	48 (70.6%)	

Table 4: Distribution of Stroke Severity According to Microalbuminuria Status

Stroke Severity (NIHSS)	Microalbuminuria Present (n=52)	Microalbuminuria Absent (n=68)
Mild (≤5)	4 (7.7%)	18 (26.5%)
Moderate (6–14)	14 (26.9%)	32 (47.0%)
Severe (≥15)	34 (65.4%)	18 (26.5%)

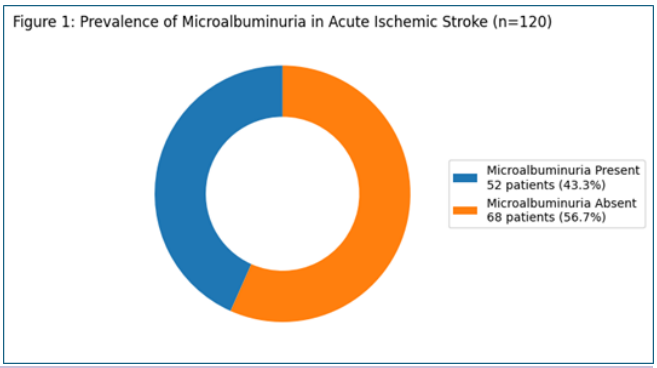

Figure 1: Prevalence of Microalbuminuria in Patients with Acute Ischemic Stroke

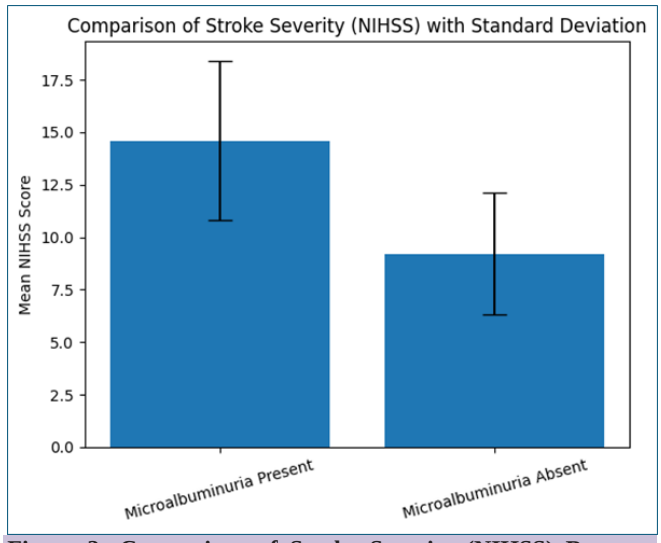

Figure 2: Comparison of Stroke Severity (NIHSS) Between Patients With and Without Microalbuminuria

Discussion

The current research indicates a high incidence of microalbuminuria (43.3) in patients who continue to suffer from acute ischemic stroke (AIS) and indicates that the patient population with microalbuminuria is significantly related to the severity of stroke, as indicated by elevated NIHSS scores and the presence of severe stroke. These results align with current evidence indicating that early neurological deterioration (END) is a significant predictor of poor outcomes in AIS.

Early neurological recovery has been largely identified as an indicator of adverse functional recovery and mortality. Liu et al,[9] conducted a prospective multicenter cohort study demonstrating that END was a significant prognostic determinant in patients with AIS. On the same note, Park et al,[10] have shown that neurologic decline is a common occurrence following AIS or TIA and is independently linked to unfavourable outcomes. Ryu et al,[11] also highlighted the close relationship between stroke progression and long-term outcome on the one hand, and presenting severity and early clinical course on the other. In the same direction, our results agree with these studies, as patients with microalbuminuria had very high NIHSS scores, indicating a higher risk of faster progression.

Albuminuria has become one of the most promising biomarkers for predicting neurological deterioration. Kanamaru et al,[12] demonstrated that albuminuria was a predictor of END in patients with AIS. Similarly, Vynckier et al,[13] proposed clinical and imaging factors associated with deterioration in lacunar stroke, which supports the idea that microvascular dysfunction plays a significant role in stroke development. Sabir Rashid et al,[14] also noted that vascular and inflammatory biomarkers play a significant role in predicting END and functional outcomes. This finding of a strong correlation between microalbuminuria and severe stroke in the current study supports the hypothesis that endothelial dysfunction and systemic microvascular damage are factors leading to poorer premortem neurological conditions.

Microalbuminuria in AIS was also studied directly in previous studies. According to Thampy and Pais,[15] microalbuminuria was linked with the severity of stroke and poor early penetration. We have similar results with higher NIHSS scores in patients with microalbuminuria, which is significantly high. Besides, Liu et al,[16] have shown that high functional outcomes are closely linked to neurological deterioration, underscoring the prognostic value of identifying high-risk patients early in the course of the disease.

Alongside premature degradation, long-term functional outcomes were also reported in association with albuminuria. Watanabe et al,[17] demonstrated that higher urinary creatinine ratios and albumin at admission were indicators of poor functional recovery from AIS. Lee and Lee also noted that albuminuria and not a lower estimated glomerular filtration rate were significantly related to repeat vascular events and death in the aftermath of ischemic stroke.[18] In this way, Sander et al,[19] demonstrated that microalbuminuria is associated with chronic vascular risk even during post-stroke rehabilitation. These results confirm our observation that microalbuminuria reflects generalized endothelial dysfunction and can serve as a surrogate marker of overall vascular injury for stroke severity.

Combined, the literature on the topic has proven the usefulness of albuminuria as a bio-prognosticator of endothelial dysfunction, neurological progression, and poor outcomes in AIS. Our research contributes to this evidence by showing that microalbuminuria is significantly prevalent in a hospital-based sample, and that it correlates with elevated NIHSS scores and infarctions of severe stroke. Our findings are consistent with previous studies, which enhance the clinical usefulness of urinary albumin evaluation as a non-invasive, non-traumatic, and inexpensive test with sound prognostic value in the acute patient.

Limitations: To begin with, it was performed at only one tertiary care facility, resulting in a rather small sample size that can

impose limitations on generalisability. Second, microalbuminuria was determined from a single spot urine sample rather than from serial measures. Third, there was a lack of long-term functional follow-up, limiting the scope of prognostic outcome on an acute basis. Larger longitudinal, multicenter follow-up studies should acknowledge these findings.

Conclusion

Patients with acute ischemic stroke have a high incidence of microalbuminuria, and this finding has been strongly linked with microalbuminuria prevalence linked to stroke severity based on the NIHSS. The observation of such microalbuminuria is probably due to underlying endothelial dysfunction and systemic microvascular injury, and it adds to the increased neurological impairment at presentation. Urinary albumin-creatinine ratio could be a helpful biomarker for stratifying risk early and prognosticating in acute ischemic stroke, given its simplicity, availability, and cost.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Aburahma AF, Avgerinos ED, Chang RW, et al. Society for Vascular Surgery clinical practice guidelines for management of extracranial cerebrovascular disease. J Vasc Surg. 2022;75(1S):4S-22S.
2. Yu WM, Abdul-Rahim AH, Cameron AC, et al. The incidence and associated factors of early neurological deterioration after thrombolysis: results from SITS registry. Stroke. 2020;51:2705-2714.
3. Pavuluri KS, Pathi D, Dash SK, Das P, Panda SS. Microalbuminuria as a predictor of early neurological deterioration and poor functional outcomes in acute ischemic stroke. Cureus. 2024;16(4):e58311.
4. Huang H, Jiang XF, Yang XY, Liu Y. Urinary microalbumin predicts early neurological deterioration in acute ischemic stroke: a study based on etiological classification. J Stroke Cerebrovasc Dis. 2024;33(12):108044.
5. Strain WD, Elyas S, Wedge N, Mounce L, Henley W, James M, Shore AC. Evaluation of microalbuminuria as a prognostic indicator after a TIA or minor stroke in an outpatient setting: the ProMOTE study. BMJ Open.2021;11:e043253.
6. Li F, Chen QX, Peng B, Chen Y, Yao T, Wang G. Microalbuminuria in patients with acute ischemic stroke. Neurol Res. 2019;41(6):498-503.
7. Mok Y, Ballew S, Stacey R, et al. Albuminuria and prognosis among individuals with atherosclerotic cardiovascular disease: the ARIC study. J Am Coll Cardiol. 2021;78(1):87-89.
8. Zhou Y, Luo Y, Liang H, Wei Z, Ye X, Zhong P, Wu D. Predictors of early neurological deterioration in patients with acute ischemic stroke. Front Neurol. 2024;15:1433010.
9. Liu H, Liu K, Zhang K, Zong C, Yang H, Li Y, et al. Early neurological deterioration in patients with acute ischemic stroke: a prospective multicenter cohort study. Ther Adv Neurol Disord. 2023;16:17562864221147743.
10. Park TH, Lee JK, Park MS, et al. Neurologic deterioration in patients with acute ischemic stroke or transient ischemic attack. Neurology. 2020;95:e2178-e2191.
11. Ryu WS, Hong KS, Jeong SW, et al. Association of ischemic stroke onset time with presenting severity, acute progression, and long-term outcome: a cohort study. PLoS Med. 2022;19:e1003910.
12. Kanamaru T, Suda S, Muraga K, Okubo S, Watanabe Y, Tsuruoka S, Kimura K. Albuminuria predicts early neurological deterioration in patients with acute ischemic stroke. J Neurol Sci. 2017;372:417-420.
13. Vynckier J, Maamari B, Grunder L, et al. Early neurologic deterioration in lacunar stroke: clinical and imaging predictors and association with long-term outcome. Neurology. 2021;97:e143-e152.
14. Sabir Rashid A, Huang-Link Y, Johnsson M, Wetterhäll S, Gauffin H. Predictors of early neurological deterioration and functional outcome in acute ischemic stroke: the importance of large artery disease, hyperglycemia and inflammatory blood biomarkers. Neuropsychiatr Dis Treat. 2022;18:1993-2002.
15. Thampy A, Pais CC. Early clinical implications of microalbuminuria in patients with acute ischaemic stroke. J Clin Diagn Res. 2016;10:OC31-OC34.
16. Liu P, Liu S, Feng N, Wang Y, Gao Y, Wu J. Association between neurological deterioration and outcomes in patients with stroke. Ann Transl Med. 2020;8:4.
17. Watanabe Y, Suda S, Kanamaru T, et al. High urinary albumin/creatinine ratio at admission predicts poor functional outcome in patients with acute ischaemic stroke. Nephrology (Carlton). 2017;22:199-204.
18. Lee SJ, Lee DG. Relationship between kidney dysfunction and ischemic stroke outcomes: albuminuria, but not estimated glomerular filtration rate, is associated with the risk of further vascular events and mortality after stroke. PLoS One. 2016;11:e0155939.
19. Sander D, Weimar C, Bramlage P, Brandt T, Rosin L, Siebler M. Microalbuminuria indicates long-term vascular risk in patients after acute stroke undergoing in-patient rehabilitation. BMC Neurol. 2012;12:102.