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# A Study on "Correlation Between Microalbuminuria and Acute Ischemic Stroke in Non-Diabetic Patients and its Prognostic Significance in Stroke Patients"

KEYWORDS: Microalbuminuria, Scandinavian Stroke Scale, Urinary albumin excretion rate, Barthel's Index.

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**ABSTRACT** ***Background****: Microalbuminuria(MA) is thought to be a marker of abnormal vascular permeability and its presence is considered as kidney's notice for markedly enhanced cerebrovascular risk. It is considered as an indicator of increased mortality in diabetes mellitus, hypertension and acute myocardial infarction.*

***Objectives****: The aim of the study was to evaluate the incidence of microalbuminuria in patients with acute ischemic stroke and prognostic significance of microalbuminuria in these patients.*

***Methodology****: The present study included 100 patients admitted into Osmania General Hospital diagnosed with ischemic stroke confirmed by CT scan brain, within 24 hours after the onset of symptoms. The control group consisted of 100 age and gender matched subjects examined within 6 to 12 months after ischemic stroke. Patients with diabetes, abnormal urine analysis, renal insufficiency, systemic infection, smoking, alcoholism, previous vascular events were excluded from the study. The severity of neurologic deficit was measured by the Scandinavian Stroke Scale (SSS). The albumin excretion rate was measured using spot urine collection by Micral Test. The patients were re-examined 6 weeks later for the assessment of activities of daily living using Barthel's Index.*

***Results****: Microalbuminuria was found in 47 of 100(47%) patients with acute ischemic stroke and 10 0f 100(10%) of controls. Patients with microalbuminuria scored lower on Barthel's Index 6 weeks later.*

***Conclusion****: The present study found that patients with acute ischemic stroke were 4.7 times more likely to have microalbuminuria when compared to the controls. Measuring albumin excretion rate seems to be a reliable indicator of outcome 6 weeks after the stroke.*

## INTRODUCTION:

A stroke or cerebrovascular accident is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause[1]. Stroke is one of the leading causes of mortality and morbidity in adults worldwide, posing serious medical, socio-economic and rehabilitation problems. Throughout the world there are unfavourable trends in stroke risk factor profile and is well suited for prevention since it has high prevalence, high burden of illness and economic cost, well defined modifiable risk factors and effective prevention measures[2,3].

There are numerous risk factors for stroke but only in one half of the cases it can be explained by the conventional risk factors[4]. Numerous factors such as markers of inflammation like C-reactive protein, intercellular adhesion molecule-1etc, infectious agents like Chlamydia pneumoniae, Helicobacter pylori and Cytomegalovirus; Homocysteine; Renin-angiotensin system; Tissue factor; Fibrinogen; Lipoprotein(a) etc., have been proposed as new risk factors for stroke[5].One more addition to the growing list is 'Microalbuminuria'.

Microalbuminuria or dipstick negative albuminuria is conventionally defined as urinary albumin excretion between 30-300 mg/24 hour for timed 24 hours urine collections and between 20-200 mg/L for untimed samples[6].The importance of microalbuminuria was first appreciated in the early 1980s when two landmark studies in London and Denmark independently reported that it was predictive of development of overt diabetic nephropathy and progressive renal failure[7,8].Since then, various studies have established the significance of microalbuminuria in several conditions.

Several studies have shown that microalbuminuria in diabetic patients predicts diabetic nephropathy as well as increased cardiovascular and overall mortality[9]. Microalbuminuria has been found to be associated with wide variety of inflammatory conditions like rheumatoid arthritis, inflammatory bowel disorder and surgery etc[10,11]. Highly significant association between microalbuminuria and carotid artery intima-media thickness has been reported, a finding which suggests that microalbuminuria may be a marker for early development of carotid artery atherosclerosis and points to a possible linkage between microalbuminuria and atherothrombotic stroke mechanism[12].

**AIMS AND OBJECTIVES:** To estimate the presence of microalbuminuria and to evaluate its prognostic significance in non-diabetic patients with acute ischaemic stroke.

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**METHODOLOGY:** This is a prospective case control study of 100 patients of acute ischemic stroke admitted into Osmania General Hospital, Hyderabad, over a period of 2 years from 2013 August till 2014 September.

**Inclusion criteria**
- Patients of age>18 years and both sexes with first time ischemic stroke within 24 hours of onset of symptoms.
- Ischemic lesion confirmed by CT scan brain.
- Hypertensive patients whether taking treatment or not are included
- Informed consent obtained from all the patients.

**Exclusion criteria**
- Patients with hemorrhagic stroke.
- Patients with diabetes.
- Systemic infection including bacterial meningitis.
- Renal insufficiency of any cause and abnormal urinalysis.
- Major trauma and surgery.
- Alcoholics and smokers.
- H/O Previous vascular events.

Detailed history, clinical examination and relevant laboratory investigations (CT scan brain, urine analysis, serum glucose levels, blood urea, serum creatinine and fasting lipid profile, ECG, 2D Echo and albumin excretion rate using Micral test) were done. The severity of stroke was assessed using Scandinavian Stroke Scale.

**Statistical analysis** was done using the statistical Software namely SPSS 11.0 and Systat 8.0. Chi-square and Fisher Exact Test were used to test the significance of proportions of predisposing factors and presence of microalbuminuria between cases and controls. Student t test (Two tailed) was used to test the significance of mean pattern of parameters between cases and controls and microalbuminuria positivity and negativity

**RESULTS**

In this comparative study we had 100 patients with acute ischemic stroke and 100 controls of old ischemic stroke.

| Table 1. Age distribution in study population | | |
|---|---|---|
| Age in years | Cases (number & %) | Controls (number & %) |
| <20 | 5(5%) | 6(6%) |
| 21-30 | 8(8%) | 10(10%) |
| 31-40 | 15(15%) | 16(16%) |
| 41-50 | 20(20%) | 19(19%) |
| 51-60 | 32(32%) | 27(27%) |
| 61-70 | 15(15%) | 16(16%) |
| >70 | 5(5%) | 6(6%) |
| Total | 100 | 100 |
| Mean±SD | 47.67±15.9 | 47.67±15.9 |

As shown in Fig.1 the mean age of cases as well as controls was 47.67±15.9 years with a range between 18-76 years in cases and 20-81 years in controls. There were 70(70%) males & 30(30%) females among cases and 64(64%) males and 36(36%) females in control group. Hence cases and controls were age(p=0.174) and sex matched.

The cases and controls were matched for predisposing factors including hypertension.

Among the cases, 36(36%) had right hemiparesis and 52(52%) had left hemiparesis while 12(12%) had no weakness.

CT Scan results revealed that middle cerebral artery(52%) infarct predominated the study population followed by anterior cerebral artery(22%), posterior cerebral artery(18%) and combined lesions(8%).

The blood sugar levels were slightly higher in cases (90.6±8.6) compared to controls (81.8±8.2) despite being in non diabetic range but were not statistically significant. Other parameters like blood pressure, blood urea and serum creatinine were similar among cases and controls.

| Table 2. Incidence of microalbuminuria among study population. | | | |
|---|---|---|---|
| Microalbuminuria | Cases (number & %) | Controls (number & %) | P value |
| Present | 47(47%) | 10(10%) | 0.027 |
| Absent | 53(53%) | 90(90%) | |

As shown in Table 2 and Fig 1 microalbuminuria was present in 47% of cases compared to 10% in controls. Hence patients with acute ischemic stroke were 4.7 times more likely to have microalbuminuria with p=0.027 which was statistically significant.

The mean age of patients with microalbuminuria was 47.68±13.77 years while that of patients without microalbuminuria was 49.15±14.86 years. Hence presence of microalbuminuria was found to increase with age but not to the statistically significant level.

Out of 47 patients with microalbuminuria 24(51.1%) had altered consciousness while 10/53 (18.86%) patients without microalbuminuria had altered consciousness. Hence microalbuminuria was found to be associated with more severe stroke.

In patients with microalbuminuria, total cholesterol was 206.30±38.78, HDL was 43.40±7.95, LDL was 123.70±38.01 and triglycerides 181.20±54.16 while in patients without microalbuminuria, total cholesterol was 190.18±79.78. the difference was not statistically significant.

| Table 3. Mean pattern of Scandinavian Stroke Scale(SSS) in patients with MA | | | |
|---|---|---|---|
| SSS | MA present | MA absent | Total |
| Range | 8-20 | 10-44 | 8-44 |
| Mean±SD | 15.6±4.5 | 26.2±8.2 | |
| Inference Value | P=0.001 | | |

The severity of stroke was assessed by SSS and was found to be significantly lower in the presence of MA when compared to patients without microalbuminuria(Table 3) which was statistically significant (p=0.001).

| Table 4. Mean pattern of Barthel's Index | | | |
|---|---|---|---|
| Barthel Index | MA present | MA absent | Total |
| Range | 50-70 | 45-100 | 45-100 |
| Mean±SD | 54.7±4.1 | 73.02±14.9 | |
| P value | 0.0001 | | |

Assessment of activity of daily living b Barthel's Index(Table 4) after 6 weeks showed that it was lower in patients with microalbuminuria when compared to patients without MA which is statistically significant (p=0.001).

**DISCUSSION**

The present study is a comparative study consisting of 100 acute ischemic stroke patients as cases and 100 old stroke patients as controls undertaken to investigate:

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The incidence of microalbuminuria in acute ischemic stroke patients.

The correlation between Scandinavian Stroke Scale and Barthel's Index and presence of microalbuminuria.

| Table 5. Incidence of microalbuminuria comparison with other studies | | |
|---|---|---|
| Study | **MA in cases** | **MA in controls** |
| Turaj et al[13] | 46.1% | 13.5% |
| Beamer et al[14] | 29% | 10% |
| Slowik A et al[15] | 46.7% | 16.7% |
| Present study | 47% | 14% |

Our study found that among age and sex matched cases and controls with similar predisposing factors, patients with new stroke were 4.7 times more likely to have microalbuminuria reaching statistically significant level(p=0.027). The finding was similar to that of other studies including Turajet al[13], Beamer et al[14]and Slowik A et al[15] as shown in Table 5.

| Table 6. Gender and microalbuminuria | | |
|---|---|---|
| STUDY | MA present | MA absent |
| Turaj et al | | |
| Males | 12(50%) | 14(50%) |
| Females | 12(50%) | 14(50%) |
| Present study | | |
| Males | 28(60%) | 42(60%) |
| Females | 19(40%) | 11(40%) |

The study revealed slight female preponderance between patients with microalbuminuria than those without microalbuminuria but did not reach statistically significant level. The above study by Turajet al[13]showed that no gender difference.

| Table 7. Loss of consciousness and microalbuminuria | | | |
|---|---|---|---|
| | **With MA** | **Without MA** | **P Value** |
| Turaj et al[13] | 35.5% | 14.3% | <0.05 |
| Present study | 51.1% | 18.45% | <0.05 |

As shown in Table 7 presence of loss of consciousness was more in patients with MA compared to those without MA which was statistically significant. The study by Turajet al[13]also had similar findings. Hence, presence of microalbuminuria was found to correlate with the severity of stroke.

The severity of stroke was assessed by SSS and was found to be significantly lower in the presence of MA when compared to patients without microalbuminuria and the assessment of activity of daily living by Barthel's Index after 6 weeks was lower in patients with microalbuminuria when compared to patients without MA similar to other studies.

**CONCLUSION:**

Various clinical studies have documented microalbuminuria as a risk factor for ischemic stroke. The present study found microalbuminuria in 47% of non-diabetic acute ischemic stroke patients and is consistent with previous studies associating Microalbuminuria with atherosclerotic vascular disease. In the present study, measurement of microalbuminuria was also found to be reliable predictor of stroke outcome 6 weeks after stroke. Whether the correlation is related to more advanced age of patients with microalbuminuria and to the worse neurological deficit during the course of the disease or microalbuminuria is an independent prognostic indicator of poor outcome in stroke patients remains to be established.

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