

## STUDY OF CORRELATION BETWEEN MICROALBUMINURIA AND ACUTE ISCHEMIC STROKE

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### Abstract

**Background:** Microalbuminuria is the excretion of the albumin in minute quantity which is not detected with normal dipstick method. It is estimated to be the excretion of 30 - 300 micrograms of albumin in urine and has been called as microalbuminuria. Ischaemic stroke is defined as the acute onset in neurological deficit following sudden occlusion of blood supply to the brain tissue due to any cause.

**Aim:** • To study the correlation between microalbuminuria and other risk factors for acute ischemic stroke

**Methods:** As per the minimum sample sizing a total of 104 patients of Acute ischaemic stroke were studied. Among these patients, 47 patients had the presence of microalbuminuria, and the rest of the 57 had no Microalbuminuria. Since for comparison purposes, the entire study group was divided into two groups: Group A: Patients with microalbuminuria; Group B: Patients without microalbuminuria.

**Results:** Microalbuminuria was present in most 45.19% of the patients out of the 104 patients studied. Presence of MA was significantly correlated to the Glasgow coma scale for assessing the prognostic significance. Lower the GCS the prevalence and the values of the MA were more. There was no significant correlation between the Age and the presence of MA. There was no significant gender discrepancy with the presence of MA. There was no significant correlation between the presence of ECG changes and the presence and absence of MA. No significant correlation was withdrawn from the presence of smoking history and the presence of MA. Also, there was no significant correlations established between the lipid parameters and MA.

**Conclusion:** This study may serve to add the data that is already available in pertaining to the significant risk factors and other parameters. Its importance in the other systemic diseases and its behaviour has to be further studied, and its prognostic significance has to be established. In our study, we found out that the presence was around 45.19% of the entire study group. We could also infer that the Presence of MA may also serve as an important prognostic indicator for the neurological outcomes of the disease.

### Introduction

Microalbuminuria is the excretion of the albumin in minute quantity which is not detected with normal dipstick method. It is estimated to be the excretion of 30 - 300 micrograms of albumin in urine and has been called as microalbuminuria.<sup>i</sup> Ischaemic stroke is defined as the acute onset in neurological deficit following sudden occlusion of blood supply to the brain tissue due to any cause.<sup>ii</sup>

Many studies have been published in the past demonstrating the interaction between the microalbumin excretion and the small vessel damage which would have manifested and involving the heart, the kidneys and the brain.<sup>iii</sup> This cerebro-renal interaction has been implicated with small vessel damage; the cerebral and glomerular small vessels might have a common soil of pathogenesis, as these organs are closely connected to each other through anatomic and vaso-regulatory similarities since small vessel disorder is systemic disorder information about damage in one organ may be provided by damage through another organ.<sup>iv</sup>

As in kidneys, the prime markers of damage would be proteinuria and microalbuminuria and also reducing estimated glomerular filtration rate whereas in the central nervous system the imaging studies like MRI etc have been the mainstay for diagnosis as in small vessel ischaemic changes.<sup>v</sup> Many of the western studies have evidently proven the association of urine albumin excretion and cerebral ischemia, whereas, there is lacking Indian data in the same subject.

### Aim and Objectives

- To study the profile of microalbuminuria in cases of acute ischemic stroke i.e. less than 24 hours
- To study the correlation between microalbuminuria and other risk factors for acute ischemic stroke
- To study the prevalence of microalbuminuria in major subtypes of acute ischemic stroke

### Material and Methods

**Sources of Data:** The study was conducted on patients presenting with a history of acute ischaemic stroke at tertiary care centre located in central India.

**Study Subjects:** The study conducted on patients who present with a history of acute ischaemic stroke within 24 hours of the onset of symptoms, and the diagnosis confirmed by the CT scan.

**Sample Size:** As per the minimum sample sizing a total of 104 patients of Acute ischaemic stroke were studied. Among these patients, 47 patients had the presence of microalbuminuria, and the rest of the 57 had no Microalbuminuria. Since for comparison purposes, the entire study group was divided into two groups: *Group A:* Patients with microalbuminuria; *Group B:* Patients without microalbuminuria.

**The study Protocol:** Case series study.

**Study period:** 1 year, From November 2015 to October 2016.

**Selection of study groups:**

**Inclusion criteria**

- The patients with a history of acute ischaemic stroke presenting within 24 hours of the onset of symptoms and the diagnosis being compared by computed tomography scan of the brain, and also subjected to stroke protocol wherever necessary will be included in the study.

**Exclusion criteria**

- Kidney disease with etiology of both acquired and congenital.
- Liver disorders.
- Chronic inflammatory gastrointestinal disorder
- Neoplasm
- Endocrine Disorders – Diabetes mellitus, hypo/hyperthyroidism
- Dyslipidemias
- Those on NSAIDs or other immunosuppressant and other Nephro-toxic drugs.
- Fever or any other focus of infection.
- Inflammatory Rheumatic disease.
- Hypertension

**Procedure:**

All the patients were screened for the presence of symptoms that gives a clue of possible CVA especially were attended, and the detailed history was taken regarding the time of onset and the progression of the disease with respect to the neurological deficits. The detailed neurological examination was done to access the extent of the neurological deficits on the patients.

On arrival, the baseline sugars were taken with Glucometer and monitored further throughout the course in the hospital as and when required, and also the Electrocardiogram was also taken. The diagnosis of the Ischaemic stroke was confirmed by the computed tomography of the brain or even followed with the stroke protocol as and when required. And the size of infarct was differentiated into Lacunar or major artery involvement (non-lacunar) as per the diagnostic criteria of Department Radiology. Most patients with poor GCS or with extensive

neurological deficits were catheterized with Foley's catheter, and the 24-hour urine collection was subjected to the microalbuminuria estimation. The microalbumin is estimated using Erba 5X Chem Semi-Auto analyzer, by Kinetic method and is expressed in mg/day. The kits were also supplied by Erba Pvt Ltd. The patient's urine protein excretion value between 30 and 300 per day was taken to be positive for Microalbuminuria.

The ECG changes were studied with respect to standard norms. The Glasgow coma scale was also accessed according to the standard scaling. Taking Eye-Opening, Verbal and Motor responses into consideration. Fully informed consent was obtained from all the study subjects, having been explained regarding the study the patients involved and the bearable expenses. The study was conducted only on obtaining fully informed consent.

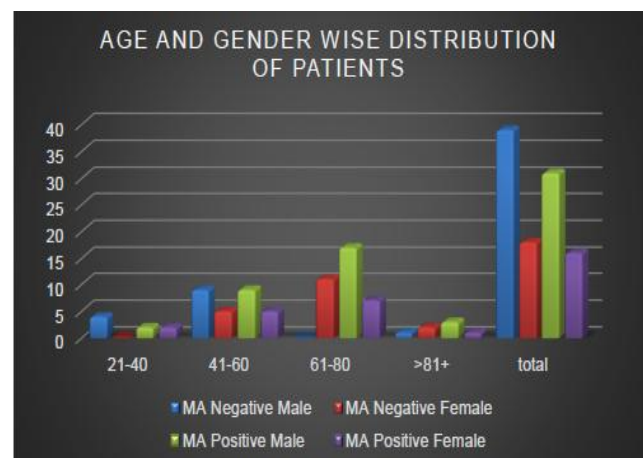
**Limitations of the study:**

The parameters of the study were confined to only the estimation of MA, the functional outcome and death or further follow up could not be obtained during the study. Since this is a tertiary centre, there is a possibility of an anticipated selection bias, especially with the seriously ill patients. For which the study settings may have had to be widened.

**Statistical analysis:**

Statistical analysis was done using SPSS Software, version 18. Percentages and proportion were used for qualitative data, Chi-square for the association. Mean and standard deviation for quantitative data, unpaired student-'t' test for differences were performed. P-value <0.05 was considered as statistically significant.

**Results**



**Figure 1:** Age and gender-wise distribution of the study subjects

From Figure 1, it can be sorted out that the maximum number of male and female patients of both the Group A and Group B were in the age group of 61-80 years. Also, there is a male preponderance among the MUA positive patients and MAU negative patients.

**Table 1:** Baseline characteristics of all the basic components of the studies

Baseline characteristics of subjects studied	MA Negative (Mean ± SD)	MC Positive (Mean ± SD)	T	P
Age	64.14 ± 12.8	61.9 ± 15.9	0.78	0.43
PR	84.3 ± 11	80.7 ± 10.5	1.68	0.09
SBP	130.39 ± 13.2	130.55 ± 11.6	0.06	0.94
DBP	82.9 ± 9.8	82.2 ± 7.8	0.37	0.71
GCS	14.82 ± 0.3	13.8 ± 1.5	4.68	0.0001
RBS	132.1 ± 28.8	129.4 ± 27.6	0.48	0.62
Sr Creatinine	1.0 ± 0.29	1.01 ± 0.28	0.19	0.84
B Urea	30.8 ± 13.5	35 ± 14.3	1.52	0.13
Triglyceride	94.4 ± 21.1	86 ± 27.5	1.75	0.08
T Chol	151.2 ± 35.6	141.0 ± 43.7	1.3	0.196
MAU	13.3 ± 8.6	110.7 ± 64.4	11.11	0.0001
Hb%	11.6 ± 1.4	11.7 ± 1.52	0.47	0.63

Table 1 shows that apart from PR, GCS, Triglyceride and MAU, there is no statistically significant difference in any other variables between MA negative and MA positive patients. PR, GCS, Triglyceride and MAU are statistically significantly different between MA negative and MA positive patients.

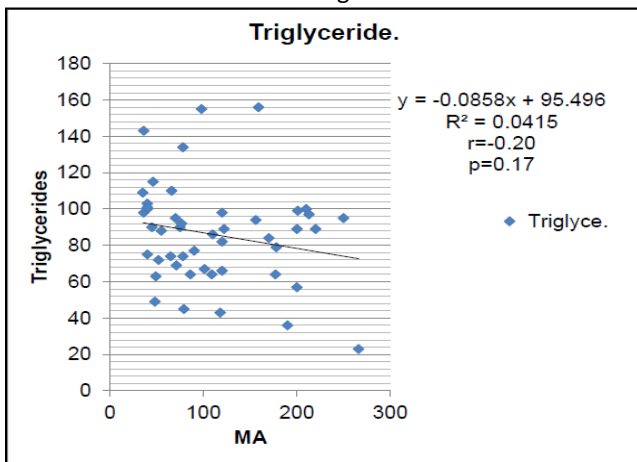
**Table 2:** Correlation between the MA, GCS and the Age of the patients

Relation	r (correlation coefficient)	p	
Age v/s MA	0.07	0.442	Not Significant
Age v/s GCS	0.01	0.86	Not Significant
MA v/s GCS	0.16	0.1	Not Significant

It was found that when the Age and MA were compared the r (correlation coefficient) was 0.07, and the p-value of 0.442, hence it was not significant.

The age and the GCS were compared with r (correlation coefficient) was 0.01 with the p-value of 0.86, hence was not significant.

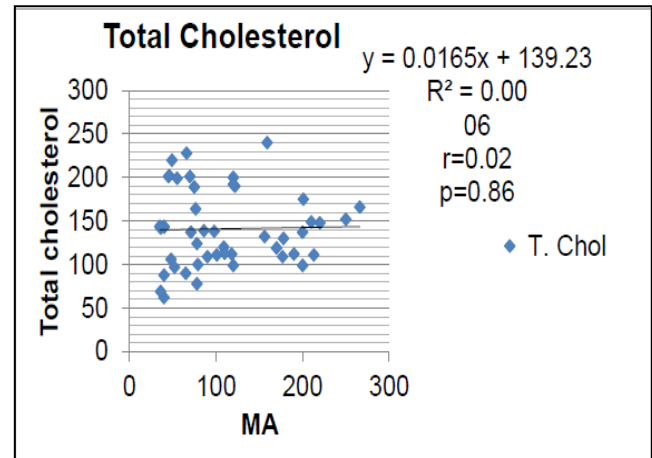
Also, the MA and the GCS were compared, with the r (correlation coefficient) of 0.16 and the p-value of 0.1. Hence no significant correlation ship was drawn from that. Hence among the above values, no significant correlation was established between the age and GCS and MA.



**Figure 2:** Comparison of presence of MA with Triglycerides

Figure 2 shows an error graph showing the co-relationship with the Triglyceride values and the values of the

microalbuminuria involving both Group A and Group B. The p-value is 0.17, it can be said that there was no significant correlation between the triglyceride levels and the MA.



**Figure 3:** Comparison with the presence of MA with the Total Cholesterol

Figure 3 state the comparison of the total cholesterol with the MAU of both Group A and Group B patients. Since the p-value is 0.86, no significant correlation ship between the two was withdrawn.

**Table 3:** Comparing MA

Parameter	MA	t	P		
ECG	Present	65.5 ± 71.9	0.7	0.48	Not Significant
	Absent	54.8 ± 63.9			
Smoking	Present	78.1 ± 75.6	1.7	0.08	Not Significant
	Absent	51.4 ± 61.9			

Both the parameters were calculated, and no significant correlation was drawn from them, as stated above.

**Table 4:** Comparing GCS

Parameter	GCS	t	P		
Smoking	Present	14.1 ± 1.5	0.86	0.39	Not Significant
	Absent	14.4 ± 1.0			

Table 4 suggests there was no significant correlation between the history of smoking and the GCS of patients at presentation among both Group A and Group B.

**Table 5:** Microalbuminuria and the Infarct sub-group type

	Lacunar Infarct	Non-Lacunar Infarct	Combined	Chi-square value	P
MA Positive	23	18	6	0.045	0.9775
MA Negative	28	21	8		

All the cases were divided according to the 2 major subtypes of the ischaemic stroke as lacunar or Small vessels ischaemic changes and large vessels involvement or the non-lacunar infarct according to the radiological

protocol. These patients from both the groups were compared and analyzed, and there was no significant co-relationship between the size of the infarct and the presence or absence of MA.

### Discussion

In our study, the prevalence of microalbuminuria was 47 among the 104 patients, which is about 45.19 %, which was also confirmed about by some previous Indian studies.<sup>vi,vii</sup> With different study samples, the total percentage prevalence was estimated for them to be higher compared to our studies. And also these studies have shown significant correlation statistics to other risk factors like hypertension and diabetes etc.

Assessment of the Glasgow coma scale has been taken to estimate the prognosis of the patients in our study. Many of the well-known studies<sup>viii,ix</sup> in the west, have considered Scandinavian Stroke scale and the NIHSS (National Institute of Health Stroke Scale) to correlate between ischaemic stroke and microalbuminuria.<sup>x</sup>

In a few of the previous studies<sup>xi,xii</sup> the Glasgow Coma scale had a significant correlation with stroke and its outcome. In our study, the mean GCS was  $13.8 \pm 1.5$  among the MA positive patients, and it was  $14.82 \pm 0.3$  among MA negative patients, which clearly states that the GCS was significantly lower in patients with MA when compared to patients without MA. P-value of 0.0001. Hence the presence of Microalbuminuria proves to be an important marker for prognosis in ischaemic stroke. It may serve as an assessment marker in case patients requires aggressive medical intervention.

In this study microalbuminuria, we have compared Age Gender and the presence of MA. In many of the studies<sup>xiii,xiv</sup> it has been significantly proven to have a correlation between age and MA. No significant correlation was found between the age and the extent of MA among group A and group B. Furthermore, the age was divided into < 60 years and > 60 years. In both groups, it was found that the number of patients was significantly high in the age group of more than 60 years than below 60 years.

We could conclude in Group A the number of patients was more among the >60 years groups than the <60 years, with a significant male preponderance. Among the Group B, the number was also more in the group of >60years than the <60years group also with the male preponderance. Among the age group of >60 years of age, there is significant male preponderance in both Group A and B. In the age group of <60 years. Also, there was male preponderance among both Group A and Group B. Whereas other studies<sup>xv,xvi</sup> also inferred that there are significant male preponderance and the number of patients in the age group of more than 65 years. But does not give any significance regarding the

prognostic value or the outcomes of the same when compared to the age and the gender.

In our study we did not found any significant correlation between the age and the GCS. Similarly there was no correlation between the sex and GCS as well. Some of the studies<sup>xvixviii</sup> have suggested the severity of the age and GCS and the extent of neurological deficits.

In our study, there was no significant correlation established between the patients with ECG changes s/o IHD. Both Group A and Group B there were patients with e/o ECG changes, but no conclusion could be drawn about the correlation with MA. Also, the patients of group A and Group B were had patients with a history of Smoking, although no correlation was established with respect to GCS and MA.

The Sizes of the infarcts of all the patients was studied according to the radiological protocol, as lacunar (Small vessel ischaemic changes) and non-lacunar (Major vessel involvement). Among the Group A, the number of patients with lacunar infarcts was 23 and the non-lacunar infarcts were 18 and some of the patients had both changes combined were 6 in number. And Group B had the Lacunar infarct cases of 28, and the Non-lacunar changes of 21 patients, and combined changes of 8 patients. The statistical analysis was done and the no significant correlation was inferred. Hence the size of the infarct had no correlation in patients with or without MA.

### Conclusion

Microalbuminuria has been extensively studied in the western countries and has successfully established its association with the acute ischaemic stroke. This study may serve to add the data that is already available in pertaining to the significant risk factors and other parameters. Its importance in the other systemic diseases and its behaviour has to be further studied and its prognostic significance has to be established.

In our study, the aim was to study the MA in the acute ischaemic stroke patients, and we found out that the presence was around 45.19% among the entire study group. We could also infer that the Presence of MA may also serve as an important prognostic indicator for the neurological outcomes of the disease.

More studies are to be encouraged to in order to find the relationships between the MA and its significance in other systemic involvement, and its pathological alterations as a risk factor for Ischaemic stroke.

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