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Original Research Article

Micro-albuminuria in non-diabetic acute ischaemic stroke: prevalence and its co-relation with stroke severity

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ABSTRACT

Background: Microalbuminuria is not only a predictor of subsequent kidney disease, but also an indicator of generalised endothelial injury and a manifestation of endothelial dysfunction. The present study is aimed to determine the prevalence of microalbuminuria among non–diabetic ischaemic stroke patients and find its correlation with ischaemic stroke which eventually will aid us in coming up with potent strategies to provide better prevention and cure.
Methods: The present study was conducted in Department of Medicine in collaboration with Department of Biochemistry and Department of Radiology, Guru Nanak Dev Hospital, Amritsar, Punjab, India after taking approval from institutional thesis and ethical committee. The study included 60 patients (30 Cases + 30 Controls) in age group 20-80 years diagnosed as stroke and haemorrhage ruled out by NCCT Brain/MRI Brain at admission. Cases were patients with history of hypertension with acute ischaemic stroke. Controls were age and sex matched patients with no history of hypertension with acute ischaemic stroke. The microalbuminuria was assayed by immunoturbimetry. The stroke severity was assessed by NIH Stroke Severity scale. P value less than 0.05 was considered the level of significance.
Results: The overall prevalence of microalbuminuria in acute ischaemic stroke patients was 41.67%. When comparing NIH SS (National Institutes of Health Stroke Scale) score with the levels of albumin in urine, there was a significant positive correlation with urinary albumin levels and stroke severity in the patients having urinary albumin levels in microalbuminuria range both in Case group and Control group with P value less than 0.05.
Conclusions: Urine albumin excretion had a positive correlation with the NIH SS Score of the patient in acute ischemic stroke. Those with a higher NIH SS Score had a higher rate of urine albumin excretion and vice versa. Therefore, measurement of microalbuminuria may help to assess those who are at increased risk of severe stroke and may require a more aggressive management.

Keywords: Ischaemic stroke, Microalbuminuria, National Institutes of health stroke scale

INTRODUCTION

Stroke is becoming an important cause of premature death and disability in low-income and middle-income countries like India, largely driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors. As a result, developing countries are exposed to a double burden of both communicable and non-communicable diseases. The poor are increasingly affected by stroke, because of both the changing population exposures to risk factors and, most tragically, not being able to afford the high cost for stroke care.

Majority of stroke survivors continue to live with disabilities, and the costs of on-going rehabilitation and long term-care are largely undertaken by family members, which impoverish their families.[1,2]

Worldwide, stroke is the commonest cause of mortality after coronary artery disease (CAD). Also, it is the commonest cause of chronic adult disability. The lifetime risk of stroke after 55 years of age is 1 in 5 for women and 1 in 6 for men. More than four-fifth of all strokes occur in developing countries.[3] The realization that atherosclerosis is an inflammatory disease has led to a search for new stroke risk factors such as microalbuminuria and treatment.

Microalbuminuria i.e. slightly elevated urinary albumin excretion was initially demonstrated in patients of diabetes mellitus (DM), where it was shown to be associated with atherogenic changes in cardiovascular risk profile and to predict increased mortality and cardiovascular disease.[4] Microalbuminuria is not only a predictor of subsequent kidney disease, but also an indicator of generalized endothelial injury and a manifestation of endothelial dysfunction. This is believed to be an early step in the atherosclerotic process leading to coronary artery disease.

The relationship between microalbuminuria and the development of vascular disease is strengthened by its presence in acute ischaemic heart disease, diastolic dysfunction, congestive heart failure (CHF), acute stroke, peripheral arterial disease, carotid atherosclerosis, and arterial hypertension. Thus, microalbuminuria might serve as a diagnostic window for the whole vasculature and not simply as a marker of impaired renal function. The current understanding, however, suggests that mechanisms of vascular injury associated with microalbuminuria are different between those with and those without diabetes who also have hypertension.[5]

The prevalence, progression and regression of microalbuminuria in various disease processes like diabetes, hypertension and coronary artery disease has been repeatedly investigated in several land mark trials and have confirmed its significance. There are a few published studies in the literature from the west on microalbuminuria in cerebrovascular diseases. Observations made from these studies confirm the association of microalbuminuria in cerebrovascular disease similar to those in vascular disorders of heart and kidney. Hence an attempt has been made to study microalbuminuria among non–diabetic cerebrovascular accident patients from this part of the country as it would enhance our understanding of disease and eventually aid us in coming up with potent strategies to provide better prevention and cure.

METHODS

An open, prospective, observational, comparative study was conducted in Department of Medicine in collaboration with Department of Biochemistry and Department of Radiology, Guru Nanak Dev Hospital, Amritsar, Punjab, India after taking approval from institutional thesis and ethical committee. The study included 60 patients (30 Cases + 30 Controls) in age group 20-80 years admitted in Government Medical College Amritsar diagnosed as CVA and haemorrhage ruled out by NCCT Brain/MRI Brain at admission. Cases were patients with history of hypertension with acute ischaemic stroke.

Controls were age and sex matched patients with no history of hypertension with acute ischaemic stroke. All patients were enrolled after taking informed consent from the patients/relatives in their vernacular language. The patients were subjected to detailed systemic examination as per proforma attached. Patients and attendants who did not give consent, Established kidney disease patients, patients of Diabetes Mellitus (known case or new cases with random blood sugar >200 or HbA1c >6.5), patients with Chronic inflammatory disease and urinary tract infection were excluded from the study.

Detailed history was recorded in all cases who were admitted with clinical picture suggestive of acute stroke. The patient or the caregivers were interviewed to establish the past medical and personal history. General physical examination was done as a routine. Cardiovascular system, respiratory system, abdominal examination was also done as part of routine examination.

Every patient underwent NCCT/MRI brain on admission as per stroke protocol and in those with ischemic changes were included in the study. Urine Albumin Excretion was estimated in a 24 hours Urine collection performed on day 2 in semi auto analyzer by immunoturbidimetric assay and expressed as mg/day. Central Nervous System was examined in detail and severity of neurological deficit was assessed per NIH stroke scale on day 1. Based on NIH SSS Score cases were categorized into 3 levels. Those with score <7 level 1 (mild neuro-deficit), 7-15 into level 2 (moderate neuro-deficit) and >15 into level 3 (severe neuro-deficit).

Statistical analysis

The statistical software SPSS Ver. 21 was used for statistical analysis. The mean ± standard deviation was calculated. Pair-wise comparison between the cases and controls as well as patients with and without microalbuminuria was performed using Student's Unpaired t-test. The values of P <.05 were considered as significant. The qualitative variables were compared using the chi-square test.

RESULTS

The mean age of patients was 64.10 years in Case group and 59.90 years in Control group. Male to female ration of patients was 29:31. In Case group, 15 (50%) were positive for microalbuminuria whereas in Control group, 10 were positive (33.33%). Among 60 patients, 25 (41.67%) were positive for microalbuminuria. Mean age

of patients with microalbuminuria was 69.20 years in case group and 69.40 years in control group whereas mean age of patients without microalbuminuria was 59.00 years in case group and 55.15 years in control group thereby signifying age as a significant risk factor for microalbuminuria.

Table 1: Age distribution of cases.

Age group in years	No. of patients in case group (n=30)	No. of patients in control group (n=30)	Total
20-40	2	3	5
41-60	6	11	17
61-80	22	16	38
Mean + S.D.	64.10±11.505	59.90±13.984	

Table 2: Number of cases and controls having microalbuminuria.

Microalbuminuria	Case	Control	Total
Yes	15 (50%)	10 (33.33%)	25 (41.67%)
No	15 (50%)	20 (66.67%)	35 (58.33%)

There was no correlation between blood pressure at presentation and urine albumin excretion in patients with or without microalbuminuria which may be because of some degree of acute dysautonomia in acute stroke events that may not reflect the actual blood pressure of the patient.

Table 3: Comparing age with microalbuminuria.

Group	Microalbuminuria	Mean age± S.D.	P value
Cases	Yes	69.20±9.86	
	No	59.00±1.01	0.012
Controls	Yes	69.40±10.36	
	No	55.15±13.28	0.006

Table 4: Distribution of risk factors of stroke.

Risk factor	Case	Control	Total
Smoking	9	7	16
Dyslipidemia	13	15	28
AF	7	7	14
IHD	7	6	13
LVH on ECG	12	0	12
Obesity	6	2	8
Family H/o stroke	3	4	7

Among 60 stroke patients, Smoking was present in 16 (26.67%), Dyslipidemia in 28 (46.67%), AF in 14(23.33%), IHD in 13(21.67%), LVH in 12 (20%), Obesity in 8 (13.33%) and Family history of stroke in 7 (11.67%).

The mean albumin levels in patients with a history of hypertension i.e. case group as a whole were 50.97 as compared to 31.00 for controls, the difference between the two values being significant showing hypertension as a significant risk factor for microalbuminuria.

In Case group, the mean urinary albumin in patients with NIHSS <7 was 28.67, 7-15 was 34.33 and >15 was 93.55 and in Control group, the mean urinary albumin in patients with NIHSS <7 was 11.75, 7-15 was 25.95 and >15 was 78.00 thereby showing a significant positive correlation with urinary albumin levels and stroke severity in the patients having urinary albumin levels in microalbuminuria range both in Case group and Control group.

Table 5: Comparing BMI with mean albumin levels in urine.

Group	BMI	Mean albumin in urine
Case	Normal	27.20±19.28
	Overweight	49.29±40.84
	Obese	94.50±18.26
Control	Normal	16.74±13.64
	Overweight	53.33±25.41
	Obese	66.00±5.66

Table 6: Comparing mean albumin levels in urine in case and control groups.

Group	Mean albumin levels in microalbuminuria positive	Mean albumin levels in group as a whole
Case	83.46±29.03	50.97±38.84
Control	65.00±13.52	31.00±25.83

Table 7: Comparing NIH SS with mean albumin excretion in case and control group.

NIH SS	Mean albumin in case group	Mean albumin in control group
<7	28.67± 29.12	11.75± 1.71
7-15	34.33± 24.40	25.95± 19.91
>15	93.55± 31.06	78.00± 6.78

DISCUSSION

This study was a prospective, observational and comparative study of the levels of albumin in urine of acute ischaemic stroke patients and its correlation with severity of stroke per NIH SS. A total of 60 patients were enrolled which were divided into two groups. Cases were hypertensives with acute ischaemic stroke. Controls were non-hypertensives with acute ischaemic stroke.

In this study albumin levels were done in 24 hour urine collection of all 60 patients and the level of urinary albumin was compared with stroke severity per NIH SS.

Maximum number of ischaemic stroke patients in the study conducted were in the 61-80-year age group which is similar to the study by Maskey et al, where maximum patients belonging to age group > 60 years.[6] The mean age in the study was 64.10 years in cases and 59.90 years in controls. This parameter is closely related to study by Vaidya CV et al with a mean age 61 years and Awad SM et al with a mean age of 63.6 years.[7,8] 8.33% of our patients were in the >40 age group which is comparable to a study by Aiyar et al which had 9.2 percent cases below 40 age group.[9]

The prevalence of microalbuminuria in hypertensive stroke patients in this study was 50% as compared to 33.33 percent in non-hypertensive stroke patients. A study by Sabharwal RK et al found 33.3% prevalence in hypertensive subjects. Bigazzi et al reported 40% prevalence in a group of 123 patients with essential hypertension.[10,11]

The prevalence of microalbuminuria in the control group i.e. non-diabetic non-hypertensive stroke patients was 33.33 percent. In PREVEND study and HUNT study, the prevalence was 5-7% in non-diabetic non-hypertensive healthy subjects.[12,13] The difference could be since even in control group present patients were not healthy but were having stroke. So they were already having some kind of endothelial dysfunction which is the basic pathology of microalbuminuria.

When comparing age with microalbuminuria, the mean age of patients in Case group with microalbuminuria was 69.20 years whereas the mean age of patients in Control group with microalbuminuria was 69.40 years. Between these groups the value is statistically non-significant. But when comparing the age between patients having microalbuminuria and patients without microalbuminuria in both the groups, the value became statistically significant thereby indicating that age is a risk factor for microalbuminuria. This study is similar to the study by PC Mathur et al which showed a similar association of microalbuminuria with age.[14]

There was also no correlation between blood pressure at presentation and urine albumin excretion in patients with or without microalbuminuria. The plausible explanation is that there is a certain degree of acute dysautonomia in acute stroke events that may not reflect the actual blood pressure of the patient.

The prevalence of microalbuminuria in patients with BMI>24.9 kg/m^2 was 70.96%. A study done by Pavan M et all found 48% prevalence in obese patients.[15] The high prevalence may be due to small sample size. Also when comparing the levels of urinary albumin levels with BMI, a significant correlation was found between them thereby indicating obesity as a risk factor for microalbuminuria. This is similar to a study by Løkkegaard et al and Valensi et al who found similar results.[16,17]

The mean albumin levels in patients with a history of hypertension i.e. case group were 50.97 as compared to 31.00 for controls, the difference between the two values being significant. This positive relation is also seen when we further compare albumin levels of microalbuminuria positive patients as well as microalbuminuria negative patients in cases and controls showing hypertension as a significant risk factor for microalbuminuria. This is similar to the studies by Ali et al and Poudel et al.[18,19]

When comparing NIH SS score with the levels of albumin in urine, there was a significant positive correlation with urinary albumin levels and stroke severity in the patients having urinary albumin levels in microalbuminuria range both in Case group and Control group. A study done by Toth et al and Muralidhara et al found similar association.[20,21]

CONCLUSION

The overall prevalence of microalbuminuria in acute ischaemic stroke patients was 41.67%. Urine albumin excretion had a positive correlation with the NIH SS Score of the patient in acute ischemic stroke. Those with a higher NIH SS Score had a higher rate of urine albumin excretion and vice versa. Therefore, measurement of microalbuminuria may help to assess those who are at increased risk and to triage those who may need a more aggressive management protocol.

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REFERENCES

1. Bonita R, Beaglehole R. Stroke prevention in poor countries: time for action. Stroke. 2007;38(11):2871-2.
2. Pandian JD, Srikanth V, Read SJ, Thrift AG. Poverty and stroke in India: a time to act. Stroke. 2007;38(11):3063-9.
3. Seshadri S, Beiser A, Kelly-Hayes M, Kase CS, Au R, Kannel WB, et al. The lifetime risk of stroke:

estimates from the Framingham Study. Stroke. 2006;37(2):345-50.
4. Parving HH, Osterby R, Ritz E, Brenner BM, Levine S, Saunders WB. Microalbuminuria in Diabetic nephropathy. The Kidney. Philadelphia. 2000;8:1731-73.
5. Gosling P. Microalbuminuria: a marker of systemic disease. Br J Hosp Med. 1995;54:285-7.
6. Maskey A, Parajuli M, Kohli SC. A study of risk factors of stroke in patients admitted in Manipal Teaching Hospital, Pokhara. Kathmandu Univ Med J KUMJ. 2011;9(36):244-7.
7. Vaidya C, Majmudar D. A retrospective study of clinical profile of stroke patients from GMERS Medical College and Hospital, Gandhinagar, Gujarat. Int J Clin Trials. 2014;62-6.
8. Awad SM, Al-Jumaily HF, Al-Dulaimi KM, Abdulghafoor RH. Assessment of major risk factors among stroke patients. Saudi Med J. 2010;31(9):1028-31.
9. Aiyar et al. A study of clinic-radiological correlation in cerebrovascular stroke (A study of 50 cases). Guj Med J. 1999;52:58-63.
10. Sabharwal RK, Singh P, Arora MM, Somani BL, Ambade V. Incidence of microalbuminuria in hypertensive patients. Indian J Clin Biochem. 2008;23(1):71-5.
11. Bigazzi R, Bianchi S, Campese VM, Baldari G. Prevalence of microalbuminuria in a large population of patients with mild to moderate essential hypertension. Nephron. 1992;61(1):94-7.
12. Romundstad S, Holmen J, Kvenild K, Hallan H, Ellekjaer H. Microalbuminuria and all-cause mortality in 2,089 apparently healthy individuals: a 4.4-year follow-up study. The Nord-Trøndelag Health Study (HUNT), Norway. Am J Kidney Dis Off J Natl Kidney Found. 2003;42(3):466-73.
13. Hillege HL, Wilbert MT, Bak JAAA, Giller IH, Grobber DDE, Harry JGM Crijns, et al. Microalbuminuria in non-diabetic non-hypertensive population. J Intern Med. 2001;249:519-26.
14. Mathur PC, Punckar P, Muralidharan R. Microalbuminuria In Nondiabetic Acute Ischaemic Stroke - An Indian Perspective. Ann Indian Acad Neurol. 2005;8(4):237.
15. Pavan M, Ranganath R, Chaudhari AP, Shetty M. Obesity as an Independent Risk Factor for the Development of Microalbuminuria. Nephro-Urol Mon. 2011;3(4):276-9.
16. Løkkegaard N, Haupter I, Kristensen TB. Microalbuminuria in obesity. Scand J Urol Nephrol. 1992;26(3):275-8.
17. Valensi P, Assayag M, Busby M, Pariès J, Lormeau B, Attali JR. Microalbuminuria in obese patients with or without hypertension. Int J Obes Relat Metab Disord J Int Assoc Study Obes. 1996;20(6):574-9.
18. Ali A, Taj A, Amin MJ, Iqbal F, Iqbal Z. Correlation between Microalbuminuria and Hypertension in Type 2 Diabetic Patients. Pak J Med Sci. 2014;30(3):511-4.
19. Poudel B, Yadav BK, Nepal AK, Jha B, Raut KB. Prevalence and Association of Microalbuminuria in Essential Hypertensive Patients. North Am J Med Sci. 2012;4(8):331-5.
20. Toth P, Koller A, Pusch G, Bosnyak E, Szapary L, Komoly S, et al. Microalbuminuria, indicated by total versus immunoreactive urinary albumins, in acute ischemic stroke patients. J Stroke Cerebrovasc Dis Off J Natl Stroke Assoc. 2011;20(6):510-6.
21. Muralidhara N, Rajanna R, Varakanahalli S, Goyal V. Prevalence of microalbuminuria in patients with non-diabetic acute ischemic stroke. Int J Res Med Sci. 2015;3(4):954-7.

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