ORIGINAL ARTICLE

Microalbuminuria in Ischaemic Stroke and its Relationship with Neurological Defects

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Abstract:

Stroke is the third common cause of death in developed countries. Ischaemic stroke accounts for about 83 percent of all cases. For ischaemic stroke, besides modifiable and non-modifiable risk factors, there are some potential new risk factors which include microalbuminuria. The objective of this study was to observe the association of microalbuminuria with ischaemic stroke and as well as consequent neurological deficits. This cross sectional study was done among 100 diagnosed patients of ischaemic stroke of both sexes. A structured questionnaire and checklist was used to collect data through face to face interview. Urinary microalbuminuria was measured in all study subjects and assessment of neurological defects was done by modified Rankin scale. The study revealed that the frequency of presence of microalbuminuria was significantly high in ischaemic stroke. Higher the level of microalbuminuria higher was the neurological deficit. So, microalbuminuria may be a marker for the process to develop the ischaemic stroke.

Introduction:

Stroke is defined as a focal neurological deficit due to a vascular lesion[1]. It is classified into two main types- ischaemic stroke and haemorrhagic stroke. Ischaemic stroke occurs as a result of an obstruction within a blood vessel. Obstruction may be either by thrombus around atherosclerotic plaque or by embolism.

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Besides the modifiable and non-modifiable risk factors there are some potential new risk factors. Potential risk factors are those where there has been no evidence that reducing exposure to any of them reduces the risk of stroke. Microalbuminuria is one of the potential risk factors for ischaemic stroke[2].

In a normal person, urinary protein excretion is less than 150 mg/day. The main plasma protein in the urine is albumin; daily excretion of albumin is less than 20 mg. Persistent excretion of increased amount of albumin in the range of 30-300 mg/day is called microalbuminuria. It may reflect generalized vascular damage that means endothelial dysfunction (ED) and ED is an early marker of atherosclerosis[3].

It is believed that there is a close relationship between ED, atherosclerosis and leakage of protein through glomerulus. ED can be considered when endothelial properties have changed in a way that is inappropriate with regard to the preservation of organ function. In ED, most potent endogenous vasodilator nitric oxide (NO) production or its activity is hampered which leads to arterial vasoconstriction. It causes increase in arterial as well as in glomerular pressure and permeability. There is another change in ED that is basement membrane loses its normal negative charges in glomerular membrane. All of these alterations in ED lead to protein leakage through the glomerular membrane[4].

In ED, bioavailability of NO decreases. NO inhibits oxidation of low density lipoprotein (LDL-C), leukocyte adhesion, and proliferation of vascular smooth muscles[5]. ED also comprises loss of surface heparin like proteoglycan molecules that prevent thrombus formation and inhibit smooth muscle growth, thereby promoting thrombus formation and increased intimal thickening[6]. All of these contribute to the process of development of atherosclerosis and this atherosclerosis leads to ischaemic stroke. So, microalbuminuria may be an indication for the initial stage of atherosclerosis and may be an warning for ischaemic stroke.

The present work was designed to evaluate the association of microalbuminuria with ischaemic stroke and also to find out its relationship with neurological deficits.

Materials and method:

This cross sectional study was done in the Department of Biochemistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), in co-operation with the Neurology Department of BSMMU, Dhaka Medical College Hospital, and a private hospital in Dhaka from January 2007 to December 2007. A total of 100 diagnosed patients (88 male and 12 female) of ischaemic stroke confirmed by CT and MRI of brain were included in the study. They were free from diabetes mellitus, hypertension, renal disease, heart failure, overt proteinuria and pregnancy. Informed consent was taken from all the study subjects preserving their rights, privileges and freedom. Spot urine was collected in ependrop and urinary microalbumin was estimated by immunometric assay. Neurological deficit of all study subjects was evaluated by the score of modified Rankin scale[7]. There are six scores in the scale which correspond with the severity of neurological deficit.

All data were recorded systematically in a preformed data collection form and were expressed as mean ± SD. Statistical analysis

Table-I : Status of albuminuria in study subjects

Microalbuminuria	Mean ± SD (mg/L)	Number of patients	Total
Presence of microalbuminuria	87.95 ± 55.31	64	100
Absence of microalbuminuria	6.03 ± 2.76	36	

was done by using SPSS for windows version 12.0. One way ANOVA test and Spearman's Rank correlation coefficient test was used to see the level of significance, 95% confidence limit ($p<0.05$) was taken as level of significance.

Results:

Total 100 ischaemic stroke patients of both sexes were selected for this study. Among them 88 were male and 12 were female. Mean (± SD) of age was 62.66 ± 10.45 with the range of 40-85 years.

The study subjects were divided on the basis of presence and absence of MA (cut off value was 20 mg/L). Among them, 64% subjects had MA where as 36% had no MA. The mean ± SD of MA was also calculated and found 87.95 ± 55.31 and 6.03 ± 2.76 respectively.

Study subjects were categorized into three groups on the basis of scores of Modified Rankin Scale (MRS). MA among these groups were compared and found significantly different ($p<0.001$).

For clinical correlation of MA with ICVD, Spearman's rho correlation test was done between MA and score of Modified Rankin Scale and it showed positive correlation ($p<0.001$).

Discussion:

In the present study the frequency of MA and it's correlation with neurological deficit in ischaemic stroke has been demonstrated by cross sectional study in 100 diagnosed ischaemic stroke patients. In this study, urinary MA was measured. The frequency of presence of MA was 64% in the study subjects.

Table- II : Comparison of MA among the different groups of the study subjects

Group (n = 64)	MA(mg/L) (Mean ± SD)	F-value	p-value
Group-1 (n=2)	72.50±53.03	12.719	<0.001
Group-2 (n-20)	53.55±29.82		
Group-3 (n=42)	115.76±53.01		

Group-1=Score of Modified Rankin Scale 3 Group-2=Score of Modified Rankin Scale 4
Group-3=Score of Modified Rankin Scale 5

Table-III: Correlation between microalbuminuria and score of Modified Rankin Scale (n = 64)

Independent variable / Dependent variable	r-value	p-Value
MA (mg/L) score of MRS	0.559	<0.001

It demonstrated a high frequency of MA in nondiabetic patients with ischaemic stroke. This finding is consistent with observation of Stowik et al[7].

There are six scores in modified Rankin scale (MRS)[8]. But in this study subjects only three category of scores (score 3- moderate disability, score 4- moderate to severe disability and score 5- severe disability) were found. Study subjects were divided into three groups according to the score of MRS. There were significant difference of MA between different groups ($p<0.001$). This study also revealed that urinary MA had positive correlation with different scores of MRS which indicates clinical correlation of MA that means higher the level of MA higher the neurological deficit. This finding simulates that of Stowik et al[8] study; they showed correlation between the presence of MA and severity of neurological deficit.

The findings in this study showed significantly higher microalbuminuria in ischaemic stroke patients and their positive correlation with neurological deficit and adverse clinical outcome.

From the present work it may be suggested that as the assessment of urinary MA is relatively an easy, reliable and inexpensive examination, it may be a new marker along with other established risk markers for not only to determine the initial stage of atherosclerotic change but also to alert for the development of ischaemic stroke in future.

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