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STUDY OF URINE MICROALBUMIN LEVELS IN NON-DIABETIC HYPERTENSIVE PATIENTS

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ABSTRACT

Hypertension is common, asymptomatic readily detectable disease that leads to lethal complications like stroke, myocardial infarction and renal disease. Microalbuminuria is one of the earliest indicators of kidney injury and is an important cardiovascular risk factor and appears to be a marker of early arterial disease in patients with/ without diabetes and/or hypertension. Therefore, the study was conducted to analyze urine microalbumin levels and lipid profile parameters in non-diabetic hypertensive patients. 100 diagnosed cases of hypertension of age group between 35-60 years were selected. 100 healthy individuals were selected and they formed the control group. Measurements of serum total cholesterol, triglycerides, HDL-c, LDL-c by using standard enzymatic kits and urine microalbumin by immunoturbidimetric method were carried out using Beckman coulter auto analyzer. Non- diabetic hypertensive patients showed a significant increase in urine microalbumin levels compared to control group. Microalbumin levels found to correlate positively with LDL-c. The finding suggest that microalbuminuria can be used as a predictor for the early detection of cardiovascular and renal changes along with the lipid profile parameters to prevent the mortality.

KEYWORDS: **Hypertension, Microalbuminuria (MA), Lipid profile, cardiovascular events.**

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INTRODUCTION

Hypertension is one of the major risk factor for cardiovascular disease and a leading cause of mortality and morbidity worldwide[1]. The hypertension was defined as systolic blood pressure more than or equal to 140 mm of Hg and diastolic blood pressure more than or equal to 90 mm of Hg or those individuals currently taking antihypertensive treatment[2]. Urinary albumin leakage is a manifestation of generalized vascular damage[3]. Microalbuminuria (MA) is defined as the excretion of 30 to 300 mg of albumin per day in urine and has been reported to be associated with increased cardiovascular risk and progressive renal damage[4]. MA in non-diabetic individuals seems to be a sign from the kidneys that the vasculature, mainly the endothelium, is not functioning properly. This may be confirmed by the following evidences: a) Vasodilation in response to some stimuli is reduced in normal elderly individuals with MA. B) Among non-diabetic hypertensive individuals, those with MA show higher levels of von Willebrand factor (VWF). Since VWF has been associated with occlusive thrombosis, elevations of this factor may contribute to an increase in cardiovascular disease[5]. Among non-diabetic hypertensive individuals, MA is associated with higher blood pressure levels, higher cholesterol levels, and lower HDL-c levels. Microalbuminuria reflects vascular damage and appears to be a marker of early arterial disease. For this reason, the assessment of urinary albumin excretion is an important aspect for risk factor stratification in hypertensive patients. Therefore in our study we have analyzed the urine microalbumin levels and lipid profile parameters in non-diabetic hypertensive patients as MA may cause renal and cardiovascular damage and seems to be a sensitive marker for detecting new onset of other cardiovascular events like hypertension. This may help us to identify the high risk group and to plan effective treatment strategies.

MATERIALS AND METHODS

The study protocol was performed in accordance with the approval of the Institutional Ethics Committee (ECN: 745/ IEC/2015) and informed written consent was taken from all subjects.

Patient selection

Inclusion criteria

100 patients who were clinically diagnosed as hypertensives (BP ≥140/90 mm Hg) [Increased Blood Pressure were classified according to the Joint National Committee report VII] and non- diabetic, in the age group of 30-65 years were selected and the study included both male and female patients.

Exclusion criteria

Patients with Impaired glucose tolerance**,** Diabetes Mellitus**,** Chronic Kidney Disease**,** Chronic Heart Disease and Urinary Tract Infection. Control group comprises of 100 subjects, apparently healthy, normotensive (BP <120/80 mm Hg, no previous history of hypertension/ anti-hypertensive drugs), non-diabetic (blood glucose values <110 mg/ dL (fasting) and <140mg/dL (post prandial), individuals without renal disease and any other systemic illness were selected for the study. Venous blood was collected from all the participants after 12 hours overnight fast. 2 ml of the blood sample was collected in an oxalate fluoride vacutainer for estimation of fasting plasma glucose (FPG). 3ml of blood collected in a plain vacutainer, was allowed to clot and serum was separated by centrifugation at 3000 RPM for 10 minutes. Serum total cholesterol (TC), triglycerides (TGL), High Density Lipoprotein- cholesterol (HDL-c) and Low Density Lipoprotein- cholesterol (LDL-c) were measured by using standard enzymatic kits in Beckmann coulter auto analyzer on the same day of sample collection. Random urine sample was collected, because it is subjected to both incidental diurnal variation and the prevalent concentration/dilution of that urine sample, giving an over-estimation and under-estimation respectively of the true albumin excretion. Urine sample was measured by using immunoturbidimetric method in Beckmann coulter auto analyzer on the same day of sample collection. Statistical analyses were performed using SPSS version 21.0. The statistical significance between patients and controls were analysed by using student's't' test and correlation between MA and LDL-c were calculated using Pearson correlation method.

RESULTS

The study included 100 non-diabetic hypertensive patients and 100 healthy controls. Comparison was made between the two groups using student's't' test. Among the lipid profile parameters the mean levels of total cholesterol and LDL-c were found to be significantly altered between the two study groups. Non-diabetic hypertensive patients showed a significant increase in urine microalbumin levels (36.82± 11.83, 1.21 ± 0.99; p< 0.0001*) when compared to the control group. Urine microalbumin levels in hypertensive patients was found to correlate positively with LDL-C (r= 0.67, p=0.001*).

Table 1
Comparison of Blood pressure between the control and hypertensive patients

Parameters	Control (n=100)	Hypertensive patients (n=100)	'p' value
SBP (mm Hg)	112.50 ± 7.96	146.40 ± 11.24	<0.0001*
DBP (mm Hg)	73.70 ± 4.85	89.80 ± 12.71	<0.0001*

The values are statistically significant if the 'p' value is <0.05*.

Table 2
Comparison of biochemical parameters between the control and hypertensive patients

Parameters	Control (n=100)	Hypertensive patients (n=100)	'p' value
Urine microalbumin(mg/L)	1.21 ± 0.99	36.82 ± 11.83	<0.0001*
FPG (mg/dL)	94.48 ± 9.56	96.01 ± 6.94	0.1966
Urea (mg/dL)	27.39 ± 6.08	38.15 ± 4.64	<0.0001*
Creatinine (mg/dL)	0.78 ± 0.19	0.97 ± 0.18	<0.0001*
Total cholesterol (mg/dL)	174.26 ± 10.35	198.18 ± 20.15	<0.0001*
Triglycerides (mg/dL)	150.00 ± 7.40	151.90 ± 17.21	0.3117
HDL-c (mg/dL)	42.56 ± 3.02	42.00 ± 4.53	0.3054
LDL-c (mg/dL)	121.34 ± 6.63	136.74 ± 13.83	<0.0001*
VLDL-c (mg/dL)	29.94 ± 1.51	30.45 ± 3.41	0.2085

The values are statistically significant if the 'p' value is <0.05*.

Table 3
Pearson's correlation analysis between urine microalbumin and LDL-c in patients with hypertension

Parameters	Mean ± SD	r-value	p-value
Urine microalbumin(mg/L)	36.82 ± 11.83		
LDL-c (mg/dL)	136.74 ± 13.83	r= 0.67	p=0.001*

The values are statistically significant if the 'p' value is <0.05*.

DISCUSSION

Microalbuminuria (MA) is an accepted marker of generalized endothelial injury and dysfunction. It predicts progression to diabetic nephropathy and is closely related to vascular disease in diastolic dysfunction, congestive heart failure or severe arterial hypertension. It serves as an indirect window to monitor the status of the whole vasculature[6, 7]. The presence of microalbuminuria was associated with an increased relative risk of primary endpoints (MI, stroke or cardiovascular death). The risk of cardiovascular events is increased progressively with an increase in the levels of urine microalbumin[8]. In our study, urine microalbumin levels are increased in hypertensive subjects when compared to control group. According to Cirillo, correlation with microalbuminuria is blood pressure, whether systolic or diastolic. The relationship between blood pressure and microalbuminuria is continuous and gradual because the prevalence of microalbuminuria increases with the severity of hypertension[9]. In our study, serum TC concentrations are significantly higher in hypertensive patients than in control group. This is consistent with earlier observations in parts of the world[10]. High levels of serum cholesterol are known to increase the risk of developing macro vascular complications such as coronary heart disease (CHD) and stroke [11]. Many epidemiological studies indicate a progressive increase in CHD risk as the serum TC exceeds 5.0 mmol/L[12]. LDL-c has an important role in the transport of cholesterol from the liver to the peripheral tissues. Previous studies have shown that elevated LDL-c levels increased the risk for the development of atherosclerosis. LDL cholesterol undergoes oxidation due to various factors and oxidized LDL plays a key role in the initiation and development of atherosclerotic plaque in the coronary arteries. The increase in the LDL-c/HDL-c ratio was a better indicator of the atherogenic tendency[13]. The mean levels of cholesterol and LDL-c are found to be significantly elevated in hypertensive subjects compared to controls. We have found that the urine microalbumin levels in hypertensive patients correlate positively with LDL-c (r= 0.67, p=0.001*). A positive correlation between the atherogenic lipid profile parameters and microalbuminuria clearly indicated the role of the latter in the development of atherosclerosis. Abnormal vasodilatation, endothelial dysfunction, inflammation and abnormal coagulation may be involved in this process[14]. Some clinical trials have suggested that a significant lowering of LDL-c could reduce the level of microalbuminuria due to improvement in endothelial dysfunction[15, 16]. Several strategies are available to lower urinary albumin excretion in the microalbuminuric range. Widely known is the albuminuria-lowering effect of antihypertensive agents, in particular those that intervene in the renin-angiotensin-aldosterone system. However, statins and glycosaminoglycans also have been proved to lower albuminuria[17].

CONCLUSION

The mean levels of urine microalbumin were significantly increased in hypertensive patients compared to controls. Microalbuminuria was positively correlated with LDL-c. Studies on urine microalbumin levels may help us to understand the various risk factors associated with the progression of renal and cardiovascular disease. Our findings may provide evidence for the screening of patients with high risk for cardiovascular disease and the early prevention and treatment is beneficial to reduce the harmful effects.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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