

The correlation between carotid arteries intimal thickness with microalbuminuria of essential hypertension

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Abstract

Hypertension is major risk factor for the development of cardiovascular diseases and stroke, its impact on end stage renal failure is greatest. Microalbuminuria is frequently seen in patients with established essential hypertensive and which is predictor of a higher risk of cardiovascular dysfunction. In this study, 60 essential hypertensive subjects were included; these were divided in two groups, 30 essential hypertensive subjects with Microalbuminuria and 30 essential hypertensive subjects without Microalbuminuria. In essential hypertension subjects with Microalbuminuria systolic blood pressure 159.73 ± 10.28 was significantly [$p=0.02$] greater than in subject without Microalbuminuria 153.60 ± 9.60 . The mean Diastolic blood pressure 93.27 ± 6.76 in essential hypertension with Microalbuminuria was significantly [$p=0.04$] greater than subjects without Microalbuminuria 90.66 ± 4.37 . Also essential hypertension subject with Microalbuminuria in Body Mass Index [$p=0.000$], serum cholesterol level [$p=0.008$], serum Triglyceride [$p=0.006$] were significantly greater than essential hypertension subject without Microalbuminuria. The Carotid Artery Intima Medial Thickness in essential hypertensive subject with Microalbuminuria 0.871 ± 0.112 was greater than 0.72 ± 0.085 without Microalbuminuria and this difference was statistically significant [$p=0.000$]. The correlation in essential Hypertensive with Microalbuminuria of carotid Artery Intima Medial Thickness with Systolic Blood Pressure, Urinary Microalbumin was positively related and statistically significant. In without Microalbuminuria the correlation between carotid Artery Intima Medial Thickness with Systolic Blood Pressure, Serum Triglycerides, Urinary Microalbumin, LDL and VLDL was positively related and statistically significant.

Keywords: Hypertension, Microalbuminuria, carotid Artery Intima Medial Thickness.

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INTRODUCTION

Hypertensive is a major risk factor for the development of cardiovascular disease and stroke, its impact on end stage

renal failure is greatest. Hypertensive when compared to normotensives develop twice as much as heart disease, four times as much congestive heart failure and seven times as much stroke, while there is no critical level, the risk of cardiovascular disease rises progressively with level of systolic and diastolic blood pressure. Cardiovascular risks in hypertensive are also markedly affected by other coexisting risk factors. The impact of hypertensive on the genesis of ESRD is very significant¹. Microalbuminuria is frequently seen in patients with established essential hypertensive and is predictor of a higher risk for cardiovascular dysfunction. The urinary albumin excretion (UAE) in healthy subject ranges from 5-20 mg /24 hour^{4,5,6}. Viberti *et al* coined the term usual urinalysis but exceeding 20 microgram/min⁴. The term

Microalbuminuria is defined as urinary albumin excretion (UAE) rate higher than normal but lower than 20-200 μ g/min the lowest detection limit of proteinuria as measured by standard laboratory methods (in absence of urinary tract infection and acute illnesses including myocardial infarction)². Prevalence of an elevated UAE increases with age and with duration and severity of hypertension^{3,5}. Hypertensive target organ damage is more common in Microalbuminuria patients. Patients with elevated UAE have higher left ventricular mass^{5,6,7} a higher prevalence of hypertensive retinopathy⁸ and increased thickness of carotid artery and presence of plaque in the carotid artery^{9,10}. Hypertension accelerates atherosclerosis, recently considerable attention has been directed at the thickness of the carotid arteries as an early marker of atherosclerotic disease and as a means of showing the effectiveness of medical therapies in treating atherosclerosis. Non-invasive techniques such as B-mode ultrasound can directly assess the intima-media thickness (IMT)¹¹. The increasing incidence of cardiovascular disease in the Indian subcontinent motivated us to undertake this study in order to assess its mode in predicting atherosclerosis. In this study, all freshly detected untreated essential hypertensive subjects were evaluated for CIMT, Microalbuminuria and other correlated risk factors like smoking, BMI, lipid profile and relation between CIMT and these variables were studied and how these CIMT value with other parameters are related.

AIMS AND OBJECTIVES

1. To correlate Carotid Artery Intima-Medial Thickness with different parameters in with Microalbuminuria.

2. To correlate Carotid Artery Intima-Medial Thickness with different parameters in without Microalbuminuria
3. To analyse Carotid Artery Intima-Medial Thickness in subjects with Microalbuminuria and without Microalbuminuria.
4. To compare different parameters of subjects With Microalbuminuria and Without Microalbuminuria.

MATERIALS AND METHODS

This hospital based cross-sectional analytical study was carried out during the period of Jan.2007 to Nov.2008. A total of 60 freshly diagnosed essential hypertensive subjects were enrolled in the study. All the subjects were examined and investigated according to proforma that was predesigned and pre-tested. This study was approved by the ethical Committee of the institute in which study was carried out. Informed consent was obtained from all subjects enrolled in the study.

Methodology

Study Design: Cross-Sectional Observational study. Freshly detected and untreated hypertensive subjects attending medicine outpatient Department [OPD], Hypertension OPD or admitted to medicine wards in this institute and who were willing to participate in the study were enrolled in the present study.

Inclusion Criteria: Freshly diagnosed, untreated subjects of essential hypertension of both genders.

Exclusion Criteria

1. Subjects having over albuminuria, with causes like Diabetes Mellitus, Ischaemic heart disease, stroke, peripheral vascular disease, chronic renal failure, urinary tract infection.
2. Subject on antihypertensive therapy.

OBSERVATION AND RESULTS

Table 1: Comparison of mean Carotid Artery Intima Media Thickness according to Gender, Smoking, and serum Cholesterol, serum Triglycerides, serum LDL, Serum HDL and Body Mass Index:

Parameters	With Microalbuminuria (Group I) Mean \pm SD	Without Microalbuminuria (Group II) Mean \pm SD	t-value	p-value
Age	33.37 \pm 5.47	36.00 \pm 4.37	2.02	P=0.058 NS
Systolic Blood pressure	159.73 \pm 10.28	153.60 \pm 9.60	2.39	P=0.020 S
Diastolic Blood pressure	93.27 \pm 6.76	90.66 \pm 4.37	2.12	P=0.042 S
Body Mass Index	28.06 \pm 1.68	25.24 \pm 1.05	7.78	P=0.000 S
Serum Cholesterol	205.83 \pm 14.22	195.67 \pm 14.43	2.74	P=0.008 S
Serum Triglycerides	160.40 \pm 12.74	150.80 \pm 13.54	2.82	P=0.006 S

Serum HDL	42.07±5.52	42.97±4.90	0.667	P=0.507 NS
Serum LDL	117.20±7.09	110.46±10.63	2.89	P=0.005 S
Serum VLDL	32.13±2.69	30.37±2.68	2.55	P=0.014 S
Plasma Blood Sugar level [fasting]	75.03±8.93	76.13±8.50	0.488	P=0.627 NS
Serum Creatinine	1.34±0.32	1.25±0.026	1.15	P=0.254 NS
Blood Urea	30.03±5.74	29.60±7.04	0.261	P=0.759 NS
Urinary Microalbumin	55.26±15.83	11.89±2.80	14.77	P=0.000 S
Carotid Artery Intima Medial Thickness	0.87±0.112	0.72±0.085	5.89	P=0.000 S

If p < 0.05 significant and p ≥ 0.05 Not Significant

The mean and SD of age of subjects with Microalbuminuria in essential hypertensive was 33.37 and 5.47 respectively, where as in subjects without Microalbuminuria in essential hypertensive was 36.00 and 4.37, There was not statistical significant difference in age with Microalbuminuria and without Microalbuminuria [p=0.058]. The Mean systolic blood pressure with Microalbuminuria was 159.73±10.28 more than without Microalbuminuria was 153.60±9.60 and this difference was statistically significant [p= 0.020]. The Mean Diastolic blood pressure with Microalbuminuria was 93.27±6.76 more than without Microalbuminuria was 90.66±4.37 and this difference was statistically significant [p= 0.042]. The Mean Body Mass Index with Microalbuminuria was 28.06 ± 1.68 more than without Microalbuminuria was 25.24 ±9.60 and this difference was statistically significant [p= 0.000]. The Mean serum cholesterol level with Microalbuminuria was 205.83±14.22 more than without Microalbuminuria was 195.67±14.43 and this difference was statistically significant [p= 0.008]. The Mean serum Triglycerides level with Microalbuminuria was 160.40±12.74 more than without Microalbuminuria was 150.80±13.54 and this difference was statistically significant [p= 0.006]. The Mean serum high Density Lipoproteins [HDL] with Microalbuminuria was 42.07±5.52 more than without Microalbuminuria was 42.97±4.90 and this difference

was not statistically significant [p= 0.507]. The Mean serum Low Density Lipoproteins [LDL] with Microalbuminuria was 117.20±7.09 more than without Microalbuminuria was 110.46±10.63 and this difference was statistically significant [p= 0.005]. The Mean VLDL with Microalbuminuria was 32.13±2.69 more than without Microalbuminuria was 30.37±2.68 and this difference was statistically significant [p= 0.014]. The Mean plasma Blood Sugar level [Fasting] with Microalbuminuria was 75.03±8.93 more than without Microalbuminuria was 76.13±8.50 and this difference was not statistically significant [p= 0.627]. The Mean serum Creatinine in with Microalbuminuria was 1.34±0.32 more than without Microalbuminuria was 1.25±0.026 and this difference was not statistically significant [p= 0.254]. The Mean blood urea in with Microalbuminuria was 30.03±5.74 as compared to without Microalbuminuria was 29.60±7.04 and this difference was not statistically significant [p= 0.975]. The Mean Urinary Microalbumin with Microalbuminuria 55.26±15.83 was more as compared to without Microalbuminuria was 11.89±2.80 and this difference was highly statistically significant [p= 0.000]. The Mean Carotid Artery Intima Medial Thickness with Microalbuminuria 0.87±0.112 was more as compared to without Microalbuminuria was 0.72±0.085 and this difference was highly statistically significant [p= 0.000].

Table 2: Correlation of Carotid Artery Intimal Medial Thickness between Age, Systolic Blood Pressure, Diastolic Blood pressure, BMI, Serum Cholesterol, Serum Triglycerides, serum HDL, Serum LDL, Serum VLDL, Plasma Blood Sugar Level, Serum Creatinine, Blood Urea and Urinary Microalbumin:

Correlation Between	With Microalbuminia		Without Microalbuminia	
	r-value	P-value	r-value	P-value
CAIM vs Age	-0.191	P= 0.313 NS	0.051	P=0.789 NS
CAIM vs SBP	0.362	P=0.048 S	0.565	P=0.001 S
CAIM vs DBP	0.314	P= 0.091	0.115	P=0.546

CAIM vs BMI	-0.063	NS P= 0.742 NS	0.203	NS P=0.281 NS
CAIM vs serum Cholesterol	-0.056	P=0.771 NS	-0.010	P=0.960 NS
CAIM vs serum Triglycerides	0.235	P= 0.212 NS	0.571	P=0.001 S
CAIM vs serum HDL	0.059	P= 0.757 NS	-0.097	P=0.609 NS
CAIM vs serum LDL	0.177	P=0.35 NS	0.425	P=0.019 S
CAIM vs serum VLDL	0.181	P= 0.340 NS	0.538	P=0.002 S
CAIM vs Plasma Blood sugar level	-0.250	P= 0.183 NS	0.211	P=0.262 NS
CAIM vs Serum Creatinine	-0.155	P=0.413 NS	0.141	P=0.457 NS
CAIM vs Blood Urea	0.093	P= 626 NS	0.103	P=0.593 NS
CAIM vs Urinary Microalbumin	0.501	P= 0.005 S	0.346	P=0.046 S

If $p < 0.05$ significant and $p \geq 0.05$ Not Significant

The Mean Carotid Artery Intima Medial Thickness and Age were negatively correlated in with Microalbuminuria but they were not statistically significant [$p=0.313$], where as in without Microalbuminuria these are positively correlated and this difference was not significant [$p=0.789$]. The Mean Carotid Artery Intimal Medial Thickness and systolic Blood pressure were positively correlated in with Microalbuminuria but they were statistically significant [$p=0.048$], where as in without Microalbuminuria these are positively correlated and this difference was also significant [$p=0.001$]. Also The Carotid Artery Intima Medial Thickness and Diastolic blood pressure were positively correlated but statistically not significant in both with Microalbuminuria [$p=0.091$] and without were [$p=0.742$]. Where as in without Microalbuminuria these are positively correlated and this different was not significant [$p=0.281$]. The Carotid Artery Intimal Medial Thickness and Serum Cholesterol level were negatively correlated but statistically not significant in both with Microalbuminuria [$p=0.771$] and without Microalbuminuria [$p=0.960$]. The Carotid Artery Intimal Medial Thickness and Serum Triglycerides were positively correlated in both but statistically not significant in with Microalbuminuria [$p=0.091$] and statically significant without Microalbuminuria [$p=0.001$]. The Carotid Artery Intimal Medial Thickness and Serum HDL were positively correlated in with Microalbuminuria but they were not statistically significant [$p=0.771$]. Where as in without Microalbuminuria these are negatively correlated and this different was not significant [$p=0.609$]. The Carotid Artery Intimal Medial Thickness and Serum LDL were

positively correlated in both Microalbuminuria and without Microalbuminuria but they were not significant [$p=0.35$] in with Microalbuminuria. Where as in without Microalbuminuria this difference was significant [$p=0.019$]. The Carotid Artery Intimal Medial Thickness and Serum VLDL were positively correlated in with Microalbuminuria but they were not statically significant [$p=0.340$]. Where as in without Microalbuminuria these were positively correlated and this difference was significant [$p=0.002$]. The Carotid Artery Intimal Medial Thickness and plasma blood sugar level were negatively correlated in with Microalbuminuria but they were noy significant [$p=0.183$]. Where as in without Microalbuminuria these are positively correlated and this difference was not significant [$p=0.262$]. The Carotid Artery Intimal Medial Thickness and Serum Creatinine were negatively correlated in with Microalbuminuria but they were not significant [$p=0.413$]. Where as in without Microalbuminuria these are positively correlated andthis difference was not significant [$p=0.457$]. The Carotid Artery Intimal Medial Thickness and Blood urea were positively correlated in both with Microalbuminuria and without Microalbuminuria but they were not significant both. The Carotid Artery Intimal Medial Thickness and Urinary Microalbumin were positively correlated in both with Microalbuminuria and without Microalbuminuria they were significant in both groups.

DISCUSSION

Bigazzi R, Bianchi S *et al* [1995] divided 90 subjects in 30 hypertensive subjects in 30 hypertensive subjects with Microalbuminuria, 30 hypertensive subjects without

Microalbuminuria and 30 normotensives healthy subjects, they found that the mean age in subjects with Microalbuminuria (n= 30) was 52±1.5 years while it was 48±1.7 years in subjects without Microalbuminuria (n= 30) was 48±2.8 years in normotensives healthy subjects⁹. In present study, the mean age of subjects with Microalbuminuria [n= 30] was 33.37±5.47 years as compared to 36.00±4.37 years in subjects without Microalbuminuria [n= 30] and there were not statistically significant in age of with Microalbuminuria and without Microalbuminuria. The Carotid Artery Intimal Medial Thickness and Age in with Microalbuminuria was negatively correlated where as in without Microalbuminuria was positively correlated. Both in these groups they were statistically not significant. Willem F. Terpspra, John F *et al* [2002] reported mean BMI in subjects with Microalbuminuria [n= 14] was 28 ± 3 kg/m² as compared to 28± 4 kg /m² in subjects without Microalbuminuria [n= 159] and this difference was statistically significant¹². Katsuhiko Kohara, Yasuharu Tibara *et al* [2004] reported mean BMI in subjects with Microalbuminuria [n= 32] of 24 ± 3.3 kg/m² as compared to 23.0 ± 2.8 kg /m² in subjects without Microalbuminuria [n= 104]. This difference was statistically significant¹³. In present study mean BMI in subjects with Microalbuminuria was 28.06±1.68 kg/m² as compared to 25.24±1.05 kg /m² in subjects without Microalbuminuria and this difference was statistically significant [p=0.000]. The Carotid Artery Intimal Medial Thickness and BMI in with Microalbuminuria was positively correlated where as in without Microalbuminuria was also positively correlated, but both in these groups they were statistically not significant. R. Bigazzi, S. Bianchi *et al* [1995] in their study found that the mean serum cholesterol in subjects with Microalbuminuria was 220 ± 7.8 mg % while it was 203± 5.6 mg% in subjects of non Microalbuminuria and 196 ± 7.1 mg % in normal healthy subject this difference was not statistically significant⁹. But In present it found that difference was statistically significant and The Carotid Artery Intimal Medial Thickness and serum cholesterol in both with Microalbuminuria and without Microalbuminuria groups was negatively correlated, these groups they were not statistically significant. R. Bigazzi, S. Bianchi *et al* [1995] in their study found that the mean serum Triglycerides in subjects with Microalbuminuria was 1.85 ± 0.18 mmol / Ltr while it was 1.6 ± 0.11 mmol / Ltr in subjects of non Microalbuminuria and 1.5 ± 0.009 mmol / Ltr in normal healthy subject and this difference was statistically significant⁹. In present study, this difference was also statistically significant and The Carotid Artery Intimal Medial Thickness and serum Triglyceride in both with Microalbuminuria and without

Microalbuminuria groups was positively correlated, in relation in with Microalbuminuria was not significant where as in without Microalbuminuria relation was significant. R. pontremoli, F. Viazzi *et al* [1997] found that mean Carotid Artery Intimal Medial Thickness in hypertensive subjects with Microalbuminuria was 0.92±0.03 mm while in subjects without Microalbuminuria, was 0.76±0.05 mm and this difference was statistically significant¹⁴. Revera M, Ratto R, Viazzi *et al* [2002] found that the mean Carotid Artery Intimal Medial Thickness in hypertensive subjects with Microalbuminuria was 0.94±0.05 mm while in subjects without Microalbuminuria, was 0.75±0.06 mm and this difference was statistically significant¹⁵. In present study the mean Carotid Artery Intimal Medial Thickness in hypertensive subjects with Microalbuminuria was 0.87±0.112 mm while in subjects without Microalbuminuria was 0.72±0.085 mm and this difference was statistically significant.

CONCLUSION

Microalbuminuria is a novel predictor of cardiovascular risk in essential hypertensives. In this study, in essential hypertensive with Microalbuminuria and without Microalbuminuria groups, the Carotid Artery Intimal Medial Thickness with systolic Blood pressure, Urinary Microalbumin was positively correlated and also in both groups statistically significant. In essential hypertensive with Microalbuminuria, The Carotid Artery Intimal Medial Thickness and age, Body Mass Index, serum cholesterol, plasma Blood Sugar level, serum Creatinine were negatively correlated and Diastolic Blood pressure, Serum Triglycerides, Serum HDL, Serum LDL, Serum VLDL were positively correlated. In essential hypertensive without Microalbuminuria, The Carotid Artery Intimal Medial Thickness and serum cholesterol, serum HDL were negatively correlated and age, Body Mass Index, Diastolic Blood pressure, Serum Triglycerides, plasma Blood Sugar level, serum Creatinine, Serum LDL, Serum VLDL were positively correlated.

REFERENCES

1. M.Paul Anand ; “API Text book of Medicine”. 8th ed. Vol.1: Mumbai, The Association of Physicians of India 2008 cardiology : pp 531-540.
2. Viberti GC, Hill RD, Jarret RD [1982] ; “ Microalbuminuria as a predictor of clinical nephropathy in insulin dependent diabetes Mellitus Lancet : pp 1430-1432.
3. Marshali SM [1991] ; “Screening for Microalbuminuria, Which measurement ? “ Diabetic medicine vol.8, pp 706-711.

4. Palatini P, Graniero GR, Mormiro P [1996]. ; “ Prevalence and clinical correlates of Microalbuminuria in Stage I Hypertension, Results from the harvest Study. ” Am J Hypertens vol. 9 pp. 334-341.
5. Agrawal B, Beger A, Wol FK.[2003] : “ Microalbuminuria Screening by reagent strips predicts cardiovascular risk in hypertension “, Journal of Hypertens, vol.14,pp. 223-228.
6. Cerasola G,Cottone S, Hole G. [2003].: “ Microalbuminuria, renal dysfunction and Cardiovascular complications in essential hypertension “ J Hypertens vol.14, pp 915-920.
7. Redone J, Gomez-Sancher, Baldo E [1994]; “ Microalbuminuria is correlated with left ventricular hypertrophy in hypertensive patients “, J Hypertens, Vol.9.
8. Bisenbach G and Zazgornik J.[1994]: ” High Prevalence of Hypertensive retinopathy and coronary heart disease in hypertensive patients with persistent Microalbuminuria under short intensive antihypertensive therapy “, Clinical Nephrol, vol.41, pp.211-218.
9. Bigazzi R, Bianchi S, Campese VM, Baldari DM.[1995]: “ Increased thickness of the carotid artery in patients with essential hypertension and Microalbuminuria “, Journal of Human Hypertens, pp.827-833.
10. Ruilope LM and Rodicio JL.[1996] ; “ Hypertension, atherosclerosis and Microalbuminuria in ELISA study “, Blood Pressure 5 (suppl 4), pp.48-52.
11. Blultr EL.[1997] ; “ Evaluation and characterization of carotid plaque semin ultrasound CT MR “, vol.18, pp.57-65.
12. Willem F,Terpstra,Johan F.[2002]; ”Microalbuminuria is related to marked end organ damage in previously untreated elderly hypertensive patients”, Blood pressure,vol.11, pp 84-90.
13. Katsushiko K,Yasuharu Tabara, Rieko T.[2004]:”Microalbuminuria and arterial stiffness in general population :The Shimanami Health promoting Program [J-SHIPP]”, Hypertens, Vol.27,pp 471-477.
14. R.Pontremoli, Ravera M,Salfia A.[1997]: ”prevalence and clinical correlates of Microalbuminuria in essential hypertension : The Magic study“, Hypertension,vol.30, pp.1135-1143.
15. Revera M, Ratto R, Vittoretti S [2002]; “ Microalbuminuria and subclinical Cerebrovascular damage in essential Hypertension “, Journal of Nephrol, vol 15 (5),pp 519-524.

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