Study Of Carotid Intima Media Thickness In Patients Of Chronic Kidney Disease

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Abstracts: Background: Patients with Chronic Kidney Disease (CKD) are at high risk for developing cardiovascular disease (CVD). Carotid intima media thickness (CIMT) has been found to correlate with coronary artery atherosclerosis. Methodology: This was a prospective study of carotid intima media thickness in patients of CKD, done in the Department of Medicine, G.R. Medical College & J.A. Group of Hospitals, Gwalior (M.P.), India. A total of 70 patients of CKD and 35 age and sex matched controls were enrolled. Bilateral assessment of intima media thickness was done in common carotid artery and higher value of CIMT of any one carotid artery was recorded. Results: Out of total 70 patients of CKD, 42 were males. Clinical findings in CKD patients were anemia (92.5%), edema (71.4%), decreased urine output (41.42%), obesity (12.5%). Proteinuria (>300mg/24 hrs) was seen in 91.4% patients. CIMT in CKD patients was between 0.9-1.0mm whereas in controls was between 0.5-0.6mm. 62.5% of total patients (CIMT 0.91±0.24 to 1.15±0.24) were having mean BP between 90 to 130 mmHg, 12.7% of total patients (CIMT 1.00±0.26) were having mean BP>130 mmHg. CKD patients with dyslipidemia were having mean CIMT 1.08±0.19 in comparison to controls with dyslipidemia having mean CIMT 0.67±0.22. Conclusion: CIMT was increased in CKD patients with increased age, progression of stage of CKD and proteinuria. Mean CIMT was increased in all stages of CKD and there was no significant difference in CIMT in different stages of CKD. Patients having high mean blood pressure was having higher mean CIMT in comparison to patients having lower mean blood pressure, patient with dyslipidemia had high mean CIMT as compared to mean CIMT of controls having dyslipidemia. [Tiwari D NJIRM 2015; 6(6):11-14]

Key Words: Chronic kidney disease, Cardiovascular disease, End stage renal disease, carotid intima media thickness, atherosclerosis, Glomerular Filtration Rate

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Introduction: Chronic Kidney Disease (CKD) encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function and a progressive decline in glomerular filteration rate.[1,2] CKD patients are at high risk for developing cardiovascular disease (CVD). Cardiovascular events are more frequent than renal events in CKD and mortality rates are in fact higher than rates of reaching End Stage Renal Disease (ESRD). Cardiovascular diseases are about 20 times more common in CKD patients than general populations and accounts for 50% of overall deaths.[3] Carotid intima media thickness (CIMT) and plaque occurrence in carotid arteries are strong predictors of cardiovascular events. CIMT is a simple tool to assess the effect of atherosclerotic risk factors and is also an independent risk marker for future cardiovascular (CV) events.[4] CIMT is a measure of the thickness of the intima and media layer of the carotid artery assessed by B-mode ultrasound.[5]

Carotid intima thickening is a complex process, depending on a variety of factors, including hemodynamics, shear stress, and blood pressure. CIMT greater than 0.9-1.0 mm is indicative of atherosclerosis and increased risk of cardiovascular disease.[6] Risk of myocardial infarction increases by 11% with increase of common CIMT by 0.1mm.[7] CIMT has been found to be significantly higher in patients with diabetes than those without diabetics.[8]

Loss of renal functions has been reported to be associated with increased CIMT.[9] The factors responsible for exaggeration of atherosclerosis in CKD can be uremia, hypertension, diabetes, dyslipidemia, bone and mineral metabolic disturbances and oxidative stress. In CKD atherosclerotic lesion are frequently calcified as compared to fibro atheromatous in general population.[10] Various studies have suggested CIMT as predictor of CVD in patients of CKD undergoing hemodialysis.[11] Ishizaka et al showed even after adjusting for age, systolic blood pressure and smoking the CKD and its components (low eGFR and albuminuria) were associated with increased CIMT.[12]

The aim of the present study was to measure the CIMT in patients of CKD and to find out the correlation between CIMT and stage of CKD.

Materials And Methods: Study was conducted in the Department of Medicine, G.R. Medical College & J.A. Group of Hospitals, Gwalior (M.P.), India. After obtaining consent from patients suffering with chronic

kidney disease of all etiologies and persistent decrease in GFR<60mL/min/1.72m^2 were included. Patients suffering from acute kidney injury were excluded. Total 70 patients of CKD and 30 age & sex matched controls were enrolled between March 2012 to November.

Patient's clinical history including complaints, past history, personal history, and family history was taken. Patients were subjected to routine investigations like Complete Blood Count (CBC), random blood sugar (RBS), blood urea, serum creatinine, urine routine and microscopy, serum billirubin, SGPT, USG abdomen, lipid profile and X-ray chest. Anthropometry like height, weight and BMI was also recorded. GFR was calculated on the basis of age, sex and serum creatinine by computer generated modification of diet in renal disease (MDRD) equation.

Patients with CKD were subjected for high resolution B-mode carotid ultrasonography. Bilateral assessment of intimal thickness was done in common carotid artery and higher CIMT value of any carotid artery was recorded.

Hypertension was considered as blood pressure ≥140 mmHg systolic and/or ≥90 mmHg diastolic. Dyslipidemia was considered as LDL cholesterol ≥100 mg/dl or total cholesterol ≥200 mg/dl or HDL in males <40 mg/dl or HDL in females <30 mg/dl, triglycerides level ≥200 mg/dl or VLDL ≥30 mg/dl.

Anaemia was considered hemoglobin level of <13 gm/dl in males and <12 gm/dl in females.

Oliguria was considered as urine output <400 mL/24 hrs or <0.5 ml/kg/hr.

Analysis was done using SPSS software, t test was applied to compare the CIMT of patients and controls. ANOVA was applied to compare the variability of CIMT in between different stages and different number of risk factors among the patients and controls.

Results: Out of total 70 patients of CKD, 42 were males and maximum number of CKD patients were in age group between 30 to 60 years. Among 35 controls, 27 were males and majority was in the age range of 40 to 70 years. 92.5% patients were having anemia, 71.4% patients were having edema and 50% patients were having complaints of decreased urine output. 41.42% patients were underweight, 45% were having normal BMI and 12.5% were overweight.

Hypertension, dyslipidemia, diabetes and smokers were found in both CKD patients and controls (table 1).

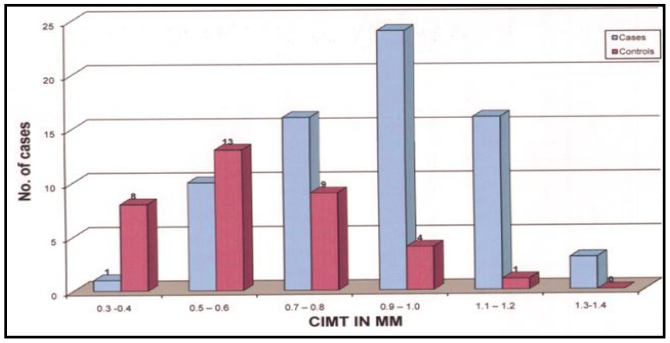
Table 1: Distribution of CKD Patients According to Presence of Risk Factors

Risk Factors	No. of patients (n=70)	No. of Controls (n=35)
Tobacco, Smoking	11 (15.7%)	10 (28.5%)
Diabetes	12 (17.1%)	5 (14.2%)
Dyslipidemia	21 (30%)	20 (57.5%)
Hypertension	44 (62.5%)	10 (28.5%)

Proteinutria (>300mg/24 hrs) was seen in 91.4% patients. Resting ECG was normal in 77.14% patients whereas LVH and hyperkalemia was present in 17.14% and 4.35% patients respectively. Resting ECG was normal in all controls.

CIMT of maximum number of patients was between 0.9-1.0mm whereas the CIMT of maximum number of controls was between 0.5-0.6mm (Figure 1)

Figure 1: Distribution of patients as per CIMT



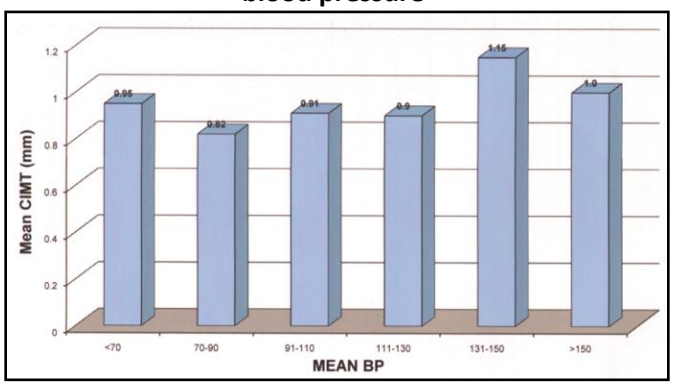
The stage wise distribution of CKD patients and their respective mean CIMT values are shown in table 2.

Table 2: CKD Stage Wise distribution of patients and mean CIMT value (n=70)

CKD Stage	No. of patients	CIMT VALUE (mm)
Stage III	13 (18.5)	0.96±0.24
Stage IV	11 (15.7)	0.9 ± 0.23
Stage V	46 (65.7)	0.87±0.22

62.5% of total patients were having mean BP between 90 to 130 mmHg, 12.7% of total patients has mean BP >130 mmHg. Patients having high mean BP was having higher mean CIMT in comparison to patients having lower mean BP (figure 2). Mean CIMT of controls was almost same among the different range of mean BP.

Figure 2: Distribution of patients according to mean blood pressure



CKD patients with dyslipidemia were having mean CIMT 1.08±0.19 in comparison to controls with dyslipidemia having mean CIMT 0.67±0.22.

CIMT of CKD patients was more than controls when compared with similar number of risk factors. CIMT of CKD patients significantly increased when number of risk factors was increased. CIMT of controls was not significantly increased when number of risk factors was increased.

Discussion: Cardiovascular diseases are the major cause of death in patients of CKD and atherosclerosis is the most frequent underlying cause. Atherosclerosis is highly prevalent in advanced renal failure and progresses faster in patients with renal dysfunction than in the general population.

In adults increased CIMT as assessed by ultrasonography, is a valid predictor of cardiovascular events. In this study mean CIMT of CKD patients was 0.90±0.23 which was significantly higher than age matched controls having CIMT 0.63±0.23 (P value < 0.0001). Similar results were reported by Kumar et al, where CIMT was found to be higher in ESRD patients than in age matched controls.[13]

Albuminuria is surrogate marker of endothelial dysfunction and a predictor of cardiovascular events. As per strong heart study of diabetic mellitus patients, albuminuria was independentely associated with left ventricular systolic & diastolic dysfunction. [14] In our study, 24 hour urinary protein was more than 300 mg in 91.4% patients and it was observed that CIMT value was higher in low grade albuminuria as compared to high grade albuminuria patients. Similar results were also found by Huang et al, who reported increased CIMT in patients having low grade albuminuria.[15]

CKD patients having high mean BP was having higher mean CIMT in comparison to patients having lower mean BP. Mean CIMT of controls was almost same among the different range of mean BP. Similar results were found by Kim et al, and they suggested that main cause of atherosclerosis in non-diabetic CKD patients was age and hypertension which were the main determinants of increased CIMT. [16]

Though the vascular calcification is seen in all the stages of the CKD, some studies have reported higher CIMT in later stages of CKD.[9] Paul et al has reported higher CIMT in CKD patients on hemo-dialysis as compared to non dialyzed patients.[11] We found significantly higher mean CIMT in all stages of CKD, but there was no significant difference among them. Similar results were observed by Querfeld et al, where they noted CIMT was significantly increased in all stages of CKD and after transplantation.[17]

In the present study CKD patients have significantly more carotid arterial wall thickness in comparison to age matched controls. The CIMT does not differ in different stages of CKD. As CKD patients are at higher risk of developing cardiovascular complications, CIMT can be used as an important tool to assess the risk. However the limitation of our study was the small study population and we have not studied the various other parameters responsible for atherosclerosis. Further larger studies are needed focusing on all the other parameters of atherosclerosis.

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Conflict of interest: None

Funding: None

Cite this Article as: Tiwari D, Jatav O, Gupta M, Sarraf S. Carotid Intima Media Thickness in CKD. Natl J Integr Res Med 2015; 6(6): 11-14