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TO EVALUATE THE ASSOCIATION OF RISK FACTORS WITH INCREASED CAROTID INTIMA MEDIA THICKNESS IN NEWLY DIAGNOSED TYPE 2 DIABETES MELLITUS- A STUDY FROM THE HILL STATE OF NORTH INDIA

Endocrinology

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ABSTRACT

Diabetes mellitus is a metabolic disorder characterized by the presence of chronic hyperglycemia accompanied by impairment in metabolism of carbohydrates, lipids and proteins. Diabetes mellitus is probably one of the oldest diseases known to man. Even though the prevalence of micro-vascular complications is less in Indians but prevalence of macro-vascular complications in the form of premature coronary artery disease is reported to be high as compared to other ethnic groups. In Diabetes, the major long-term complications are related to damage to blood vessels in the form of atherosclerosis. Atherosclerosis is a generalized phenomenon and is more or less present equally in the coronary, cerebral, and the carotid arteries. Many modalities are used to measure risk of CVD due to atherosclerosis. CIMT is one of the best indices for the detection of "early-stage" atherosclerosis, which is located between CV risk factors and "hard" clinical CVD. CIMT is associated with aging, vascular risk factors, and prevalence of CVD. Increased CIMT is strongly associated with aging and hypertension. CIMT increases almost 3- fold in patients between ages of 20 and 90 years. Left ventricular hypertrophy, which is caused by hypertension, is also associated with increased CIMT. It has been shown that exposure to cardiovascular risk factors (LDL-Cholesterol, systolic blood pressure, Body mass Index and smoking) in childhood is associated with increased CIMT. This study was planned to see the association of CIMT with other risk factors in diabetic patients.

KEYWORDS

Carotid intima media thickness, type 2 Diabetes Mellitus, Hypertension, Plaque, Atherosclerosis

INTRODUCTION:

Diabetes mellitus is a metabolic disorder characterized by the presence of chronic hyperglycemia accompanied by impairment in metabolism of carbohydrates, lipids and proteins. Diabetes mellitus is probably one of the oldest diseases known to man. It was reported in Egyptian manuscript about 3000 years ago **[1].** The most recent data of the International Diabetes Federation suggest that each year 5 million deaths are directly attributable to diabetes mellitus, which is more than the burden of HIV/AIDS, tuberculosis and malaria combined.. India has the highest number of Diabetic subjects in the world being called as "Diabetic capital of the world". There are currently 40.9 million diabetic patients and number is expected to increase by 60.9million by year 2025. Even though the prevalence of micro-vascular complications is less in Indians but prevalence of macro-vascular complications in the form of premature coronary artery disease is reported to be high as compared to other ethnic groups. **[2]** Patients with diabetes mellitus suffer unduly from premature and severe atherosclerosis and vascular diseases, which are the major cause of morbidity and mortality**. [3].** The Framingham study pointed out that diabetic individuals have higher serum concentrations of lipids , hypertension, obesity, and thus are more prone to advanced atherosclerosis and it's consequences namely cerebro vascular disease, coronary artery disease (CAD), aortic atherosclerosis, and peripheral vascular disease. Atherosclerosis being the major risk factor is accelerated in patients with diabetes mellitus. Reports have shown that atherosclerotic process takes place simultaneously in carotid, cerebral and coronary arteries. The morbidity and mortality in type 2 diabetics is also approaching very high levels in India as number of patients with diabetes and its complication are increasing every year. In Diabetes, the major long-term complications are related to damage to blood vessels in the form of atherosclerosis. Atherosclerosis is a generalized phenomenon and is more or less present equally in the coronary, cerebral, and the carotid arteries**.[4]** In most of the ischemic stroke and coronary heart disease the underlying pathophysiology is atherosclerosis having the risk factors which are modifiable and non-modifiable. The modifiable risk factors include diabetes, hypertension, smoking, and hyperlipidemia. Early identification of individuals at high-risk for CVD and subsequent intervention are required. In contrast, sophisticated cardiac imaging modalities (e.g.,myocardial perfusion scintigraphy, coronary computed tomography angiography and coronary angiography) can determine the presence and severity of CAD with a high degree of sensitivity and specificity. However, it is difficult to use these modalities as a screening tool, because of their potential of significant adverse effects, technical difficulty and high cost. Therefore, non-invasive and inexpensive indices of subclinical and silent atherosclerosis with more than moderate predictive ability are required. Carotid ultrasonography is one of the probable candidates. In 1986,Pignoli published the first paper on the relation between carotid intima-media histology and a double line pattern identified as the intima-media complex at the same site with ultrasound. Since that time, ultrasonography of carotid arteries has become a frequently used method to detect early signs of atherosclerosis, i.e. increased thickness of the arterial wall or plaque occurrence. It is a safe, non-expensive, feasible and accurate method In addition ,numerous studies have shown that CIMT is associated with both CVD and its risk factors**[5].** Thus, CIMT is one of the best indices for the detection of "early-stage" atherosclerosis, which is located between CV risk factors and "hard" clinical CVD. CIMT is associated with aging, vascular risk factors, and prevalence of CVD. Increased CIMT is strongly associated with aging and hypertension. CIMT increases almost 3- fold in patients between ages of 20 and 90 years. Left ventricular hypertrophy, which is caused by hypertension, is also associated with increased CIMT. It has been shown that exposure to cardiovascular risk factors (LDL-Cholesterol, systolic blood pressure, Body mass Index and smoking) in childhood is associated with increased CIMT. Patients with diabetes mellitus or impaired glucose tolerance have increased CIMT than control subjects. Associations were also found between CIMT, insulin resistance, and metabolic syndrome. Hence this study was planned to evaluate the association of various risk factors if any with the increased CIMT in this part of the country where the terrain,cultural entities are different from other parts of the country.

AIMS AND OBJECTIVES:

To evaluate the association of risk factors with increased Carotid Intima Media Thickness in newly diagnosed Type 2 Diabetes Mellitus patients.

MATERIALS AND METHODS:

This cross-sectional study was carried out in the department of internal medicine RPGMC Tanda,Himachal Pradesh. The study was started after approval from insitutional ethics committee .It was done for a period of 12 months starting from June 2018 to May 2019. The subjects were randomly selected from outdoor patients attending Diabetic Clinic in the department of internal medicine at RPGMC TANDA.

CRITERIA FOR TYPE2-DIABETES MELLITUS.

The criterion used for the diagnosis of type 2diabetes was fasting

plasma glucose ≥126mg/dl or symptoms of hyperglycemia and random plasma glucose ≥200 mg/dl as per ADA criterion..

Newly diagnosed were the patients who were diagnosed with T2DM either at presentation or within 24 months of presentation. Resting blood pressure equal to or more than 140/90 mmHg or those already on antihypertensive drugs were classified as hypertensives. The cut off value for hypercholesterolemia was taken as 200m/dl and for hypertriglycedremia was taken as 400mg/dl.

Inclusion Criteria-

1. Patients with T2DM attending diabetic clinic as outdoor patients.
2. Patients of T2DM of both sex.
3. Patients of T2DM with hypertension.
4. Patients of T2DM with duration of <2years.

Exclusion Criteria-

1. Patients with type 1DM
2. Secondary DM
3. Overt renal failure
4. Congestive heart failure
5. Valvular heart disease
6. Urinary tract infection
7. Acute coronary syndrome
8. Undergone carotid endarterectomy, hepatic diseases, cardioem bolic stroke, known coagulation disorders or HIV infection or recent inter current illness were excluded from the study.

All patients studied underwent detailed assessment of history .Thorough general physical examination including anthropometric measurements and systemic examination for atherosclerotic vascular disease was done. For BMI (body mass index) a cut off value of 23kg/m² was adopted for this study as per the WHO standards for Asian Indians. For measuring waist circumference, a point at the highest point of iliac crest crossing the mid axillary line on the right side of trunk was taken and the circumference was measured horizontally at normal respiration. Hip circumference was measured at the widest point between the hips and buttocks. Waist hip ratio (WHR) was defined as the waist circumference divided by the hip circumference. Cut off values for waist circumference were 90cms and 80cms for men and women respectively, and the corresponding waist-hip ratios were 0.88 and 0.81 for men and women respectively as per the WHO standards for Asian Indians. The Ankle Brachial Index(ABI), a surrogate marker of atherosclerosis, was calculated as the ratio of ankle systolic blood pressure as the numerator over the higher brachial systolic blood pressure as the denominator. The blood pressure was measured with electronic blood pressure measuring machine.

Routine and special investigations including fasting and 2hour post prandial plasma glucose, lipid profile, ECG, urine microalbumin-creatinine ratio and glycosylated hemoglobin were performed in all patients. The fasting plasma glucose (FPG) and fasting lipid profile (FLP) were obtained after at least 12 hours of overnight fasting using the Randox auto analyzer and the 2hour post prandial plasma glucose (PPBG) estimation was also done. The value of LDL was calculated using the Freidwald's formula when the values of triglycerides were less than 400mg/dl and direct estimation was done when triglyceride values were more than 400mg/dl. Dyslipidemia was defined based on the National Cholesterol Education Programme ATP3 (NCEP ATP3) guidelines and the normal cut off values were taken as total cholesterol less than 200mg/dl; LDL less than 100mg/dl; triglyceride less than 150mg/dl and values outside these limits were considered as abnormal. For HDL cholesterol a value less than 40mg/dl was considered low as per NCEP-ATP3 guidelines.

Glycosylated hemoglobin (HbA1C) was estimated by column chromatography method. Patients were categorized as those having a HbA1C value of less than 7.5% which indicates good control of diabetes and those having HbA1C values more than 7.5% which indicate poor glycemic control.

Carotid artery intima media thickness (CIMT) was measured by the B mode ultrasound installed in cardiology department at RPGMC TANDA having a transducer with a mid- frequency of 7.5 MHz. The ultrasound machine used had a sensitivity range of 0.1 mm i.e., each division was equivalent to 0.1 mm. Scans were performed on both the right and left extracranial carotid arteries. The CIMT values were measured in six well defined arterial segments-near walls and far wall of distal 6mm of common carotid, the carotid bulb and proximal 6mm of internal carotid arteries on both the sides. The final CIMT considered was the average of the CIMT values at the 12 sites examined. Since CIMT is considered as a candidate marker of cardiovascular risk, its normal value is interpreted in terms of increased risk rather than in terms of statistical distribution within a population. An upper limit of 0.9mm was chosen for the present study based on epidemiological data currently available. All the measurements were done by a single operator to avoid interobserver variation. All readings were taken and interpreted by same investigator. The standard statistical procedures were used to calculate relation between variables. Measurement of carotid intima media thickness: The distance between the leading edge of the first bright line (the blood–intima interface) of the far wall and the leading edge of the second bright line (media–adventitia interface) indicates CIMT.

Statitical Analysis

All calculations were performed using the Microsoft Excel Program and Standard statistical procedures were used to calculate the relation between by using software like MedCalc and Graphpad. Logistic regression model was used to find relation between variables. P value <0.05 was taken as significant. Data were presented in form of percentage and proportions. Qualitative variables were tested using Chi square test and the p values were calculated between the groups having CIMT less than and more than 0.9mm. p values of ≤0.05 were considered statistically significant. Averages were expressed between groups as mean ±standard deviation or as percentage. Multivariate analysis was done using the multiple linear regression model

OBSERVATIONS AND RESULTS

Between June 1, 2018, and May 31, 2019, 60 patients with newly diagnosed Type 2 Diabetes Mellitus who met the eligibility criteria were included in the study. Of the 60 patients included in the study, 35 were males and 25 were females. Male to female ratio was 1.4:1. The mean age of the patients in the study was 48.33 ± 8 years. The youngest patient was a 28years old male and the oldest patient was 72 years old. Maximum patients 30 (50%) were in the age group 41-50years followed by 14(23.3%) patients in the age group 51-60 years. Table 1

Table 1. Age Distribution Of Patients

Age Group	Frequency	Percentage
21-30	1	1.6
31-40	10	16.6
41-50	30	50
51-60	14	23.3
61-70	4	6.6
71-80	1	1.6

The mean duration of T2DM was 1.5 ± 0.6 years with 54 patients (90%) having it for more than one year. 16 patients (26.6%) were smokers and all smokers were males.

Among 60 patients, 18 patients (30%) had associated hypertension. 4 patients (4/18=22.2%) had isolated systolic hypertension.

The mean BMI was 25.0 ± 3.3kg/m^2 , more than 50% patients were obese (34/60, 56.6% patients). One patient was underweight, 16 patients (26.6%) had normal BMI, and 9 patients (15%) were overweight.

The mean waist circumference was 96.8 ± 8.7 cms and 54 patients (90%) had increased waist circumference. Mean WHR was 0.98 ± 0.14 and increased Waist to Hip Ratio (WHR) was found in 51 patients (85%). The mean ABI was 1.02 ± 0.05 and 8 patients (13.3%) had increased ABI.

Laboratory Parameters

The mean Hb was 12± 1.5 gm%.Among the 60 patients, 34 patients (56.6%) were having anemia.

Out of 35 males patients, anemia was seen in 17 patients (48.5%) where as 68% (17/25 patients) female patients had anemia. The RBS varied from 154 - 469 mg% with a mean of 262.9 ± 75.1 mg %. The FBS was 157.1± 44 mg % with a range of 80- 314 gm%. 18 patients (30%) had FBS less than 130mg%, 33 patients (55%) had FBS

between 131-200mg%, 7 patients (11.6%) had FBS between 201-300mg% and in 2 patients it was more than 300mg%.

The HBA1C varied from 5.5 to 15.5 %. 66.6% of the patients had HBA1C between 7.5 to 11.5 %. Very high HBA1C of more than 11.5% was present in 12 patients (20%). The mean serum cholesterol level was 171 ± 49 mg% and 20 patients (33.3%) had hypercholesterolemia i.e. cholesterol more than 200mg%. The mean triglyceride levels were 228.3± 116.2mg%**.** Urine albumin creatinine ratio **(**UACR) was raised in 34 patients (56.6%).

The mean CIMT was 0.79± 0.19 cms with minimum of 0.45cms and maximum of 1.25cms. 30 patients (50%) had significant increase in CIMT. The mean of various parameters in patients with increased CIMT (Group 1) and with normal CIMT (Group 2)is shown in Table 2. The mean age in the two groups was 49.7 ± 6.9 and 46.9 ± 8.7 years with p value of 0.167. Sex ratio in both the groups was similar. The mean SBP in Group 1 was 122.8 ± 15.9 mmHg and it did not differed from Group 2 where it was 127.5 ± 11.3mmHg. The DBP was also similar in the two Groups being 76.2 ± 10.7mmHg and 80.7 ± 8.9mmHg respectively. Smoking status was equal in both the Groups.

Table 2 : Mean Of Variables In Two Groups

Parameters	CIMT > 0.9 (n=30) Gp-1	CIMT < 0.9 (n=30) Gp-2	P value
Age (in yrs)	49.7 ± 6.9	46.9 ± 8.7	0.167
Males	18	17	0.793
Females	12	13	
SBP	122.8 ± 15.9	127.5 ± 11.3	0.190
DBP	76.2 ± 10.7	80.7 ± 8.9	0.81
ABI	1.01± 0.07	1.04± 0.03	0.86
Smoking	12 (33.3%)	14 (41.1%)	
BMI	24.9 ± 3.9	25.1 ± 2.5	0.780
WC	99.1 ± 9.0	94.4 ± 8.0	0.037
WHR	0.99± 0.1	0.91 ± 0.7	0.035
FBS	161.3 ± 39.2	153.0 ± 48.7	0.470
RBS	275.5 ± 77.5	250.4 ± 71.7	0.199
HBA1C	10.2 ± 2.4	9.3 ± 2.1	0.193
Cholesterol	177.9 ± 48.1	164.1 ± 49.8	0.278
Triglycerides	246.1 ± 144.1	210.6 ± 77.2	0.241
Hb	12.4 ± 1.4	11.6 ± 1.4	0.036

The mean BMI in Group 1 was 24.9 ± 3.9 years and in Group 2 it was 25.1 ± 2.5 years with p value of 0.780. The mean Waist circumference and mean WHR were significantly higher in patients with increased CIMT. The FBS ,RBS, HbA1C, cholesterol and Triglyceride levels were comparable in the two groups. Mean hemoglobin in Group 1 was significantly raised with mean of 12.4 ± 1.4gm%.

The frequency of various risk factors with presence of increased CIMT is shown in

Table 3

Table 3 : Frequency Of Risk Factors In Relation To Significant Cimt

Parameters	Patients enrolled (n=60)	CIMT > 0.9 mm (n=30) Gp-1	CIMT < 0.9mm (n=30) Gp- 2	P value
Comorbidities	18(30%)	9(30%)	9 (30%)	1.000
Hypertension	6 (10%)	4 (13.3%)	2(6.6%)	0.389
Smokers	16 (26.6%)	9 (30%)	7 (23.3%)	0.559
BMI > 23 Kg/m2	42(70%)	20(66.6%)	22(73.3%)	0.573
Increased WC	54(90%)	26(86.6%)	28(93.3%)	0.389
Increased WHR	51(85%)	27(90%)	24(80%)	0.278
HBA1C > 7.5%	50(83.3%)	26(86.6%)	24(80%)	0.488
Cholesterol>200mg	20(33.3%)	10(33.3%)	10(33.3%)	1.000
ABI <0.9	8(13.3%)	8 (26.6%)	0 (0%)	0.002
UACR >	34(56.6%)	16(53.3%)	18(60%)	0.6.2
Plaque	10 (16.6%)	10(33.3%)	0(0%)	0.001

All patients with increased Ankle Brachial Index had increased CIMT whereas none of the patients in Group 2 had increased ABI. 42.3% patients in Group 1 and 57.7% patients in Group 2 had normal ABI. ABI was significantly correlated with increased CIMT with p value of 0.002. 20 patients (47.6%) had increased BMI in Group 1 and in Group 2, 22 patients (52.4%) had increased BMI. Patients with normal BMI were 55.6% and 44.4% in Group 1 and Group 2 respectively. BMI was not related with increased CIMT. Out of the 51 patients with raised WHR , 27 patients (52.9%) were in Group 1 and 24 patients (47.1%) were in Group 2. Increased WHR was not related with the presence of significant CIMT. Among 54 patients with increased WC, only 26 patients (48.1%) had increased CIMT . Increased WC was not associated with occurrence of increased CIMT. In 50 patients with HbA1C more than 7.5%, 26 patients (52%) had increased CIMT and 24 patients (48%) did not have increased CIMT. Fig 7 Among patients with hypercholesterolemia 50% patients had increased CIMT and 50% patients were normal CIMT. Out of 34 patients with raised UACR, the patients with increased and normal CIMT were 16 (47.1%) and 18 (52.9%) respectively. There was no relation of increased CIMT with HBA1C, Hypercholesterolemia and UACR. All patients (10 in number) with evidence of plaque had increased CIMT

DISCUSSION

In the present study, a total number of 60 patients were studied and the majority of patients (73.3%) were in the 5th to 6th decade. The mean age of the patients in the study was 48.3 ± 8 years and 58% patients were males with male to female ratio of 1.4:1. Verma et al found similar age and sex distribution where in the newly diagnosed patients with diabetes mellitus they reported mean age of 46.8 years with 70% being males**.[6]** In National Urban Diabetes Survey (NUDS) A Ramachandran et al also reported that maximum cases were diagnosed in the age group of 40-59 years with no significant difference in the genders. V Mohan et al in their study Chennai Urban Rural Epidemiology Study (CURES-17) reported mean age in the range of 38–41years and gender distribution of 42–50% males**.[7]** 16 patients (26.6%) were smokers. Co morbidities were present in 18 patients (30%). Similar occurrence of co morbidities was reported by Verma et al.[6] The mean BMI was 25.0 ± 3.3 kg/m^2, more than 50% patients were obese (34/60, 56.6% patients). One patient was underweight, 16 patients (26.6%) had normal BMI, and 9 patients (15%) were overweight. The mean waist circumference was 96.8 ± 8.7 cms and 54 patients (90%) had increased waist circumference. Mean WHR was 0.98 ± 0.14 and increased Waist to Hip Ratio (WHR) was found in 51 patients (85%). It was comparable to study by Verma et al who reported that though the waist circumference was normal in 48% of patients, 79.3% of patients had abnormally high waist-hip ratio.[6]. Similar results were reported by R Gayathri et al who in their study found that the waist circumference was normal in 50% of patients and 77.3% of patients had abnormally high waist-hip ratio. The mean blood pressure was 138/86mmHg and 6 patients (10%) had hypertension. The presence of hypertension was less in our study as compared to two other studies by Verma et al and R Gayathri et al where 30% and 20% patients were hypertensive**.[8,9**]. The mean ABI was 1.02 ± 0.05 and 8 patients (13.3%) had increased ABI.

The mean Hb was 12 ± 1.5 gm %. The FBS was 157.1 ± 44 mg % with a range of 80- 314 gm%. The RBS varied from 154 - 469 mg% with a mean of 262.9 ± 75.1 mg %. The HBA1C was 9.7±2.3 % . The mean serum cholesterol level was 171 ± 49 mg% and 20 patients (33.3%) had hypercholesterolemia i.e. cholesterol more than 200mg%. The mean triglyceride levels were 228.3± 116.2 mg%. UACR was raised in 34 patients (56.6%) and 10 patients (16.6%) had plaque. The mean CIMT was 0.79± 0.19 cms with minimum of 0.45cms and maximum of 1.25cms. 30 patients (50%) had significant increased CIMT. 9 patients in each group had co morbidities and there was no relation of increased CIMT with presence of co morbidities. In 6 patients with hypertension, 4 patients (66.7%) had raised CIMT and among 54 normotensive patients raised CIMT was present in 26 patients (48.1%). Hypertension was not related with presence of increased CIMT. Among the smokers 56.3% had increased CIMT where as 43.8% did not have increased CIMT. 47% of the patients with increased CIMT were non-smokers. There was no relation of smoking with occurrence of increased CIMT. Verma et al also found that smoking did not have any association with CIMT **[6]** 42.3% patients in Group 1 and 57.7%patients in Group 2 had increased ABI. All patients with increased Ankle Brachial Index had increased CIMT whereas none of the patients in Group 2 had normal ABI. ABI was significantly correlated with increased CIMT with p value of 0.002. It was similar to study byWinckler K et al who reported

significant association between CIMT and ABI in subjects withDM (p <.040) and in subjects without DM (p <.001).[**10**] The magnitude of the association between CIMT and ABI was larger in subjects with DM compared with subjects without DM.

In 1106 subjects aged 55-74 from TheEdinburgh Artery Study **[11]** a significant inverse linear association between carotid IMT and ABI was found which is in accordance with the current study**[12]**Similar were the findings of Verma et al who found that ankle-brachial pressure index (ABI) is associated with CIMT, p value for this association was highly statistically significant with p value of 0.0001**[6]** 20 patients (47.6%) had increased BMI in Group 1 and in Group 2, 22 patients (52.4%) had increased BMI. Patients with normal BMI were 55.6% and 44.4% in Group 1 and Group 2 respectively. BMI was not related with increased CIMT. Verma et al also found no correlation of BMI with CIMT.[23]Similar were the findings of a study where they found no definite association between body mass index and CIMT**.[8]**

Out of the 51 patients with raised WHR , 27 patients (52.9%) were in Group 1 and 24 patients (47.1%) were in Group 2. Increased WHR was not related with the presence of significant CIMT. On the contrary in their study , Verma et al reported that that 95% of those with increased CIMT had abnormal waist-hip ratio with a significant p value of 0.004.[6]In another study CIMT was found to be higher among those with central obesity as assessed by the waist- hip ratio with a highly significant P value of 0.004 **[8].**

Among 54 patients with increased WC, only 26 patients (48.1%) had increased CIMT . Increased WC was not associated with occurrence of increased CIMT. Similar were the findings of Verma et al.[14] In 50 patients with HbA1C more than 7.5%, 26 patients (52%) had increased CIMT and 24 patients (48%) did not have increased CIMT. In contrast to it Verma et al found that 76.46% of those with HbA1C values greater than 8% had increased average intima media thickness with a significant p value of 0.004 [9]. The difference could be due to different cut off for HbA1C, 7.5% and 8%.

Among patients with hypercholesterolemia 50% patients had increased CIMT and 50% patients had normal CIMT. In a study the authors found that Dyslipidemia did not have any association with CIMT**[9].**Felicitas U. Idigoet al studied the lipid profiles and CIMT of 181subjects without cardiovascular risk factors.[13]Across all segments of both carotid arteries, lipid profiles were significantly and moderately associated with but not predictive of CIMT. Although lipid profiles were moderately associated with CIMT, they are not significant predictors of CIMT; hence combining them with CIMT does not improve the diagnostic sensitivity of sonography in atherosclerosis screening.

Out of 34 patients with raised UACR, the patients with increased and normal CIMT were 16 (47.1%) and 18 (52.9%) respectively. There was no relation of increased CIMT with UACR. On the contrary RGayathri et al in their study of 44 patients found that as the urine albumin excretion rate increased from normal albuminuria to macroalbuminuria, an increase in the proportion of patients with increased carotid artery intima media thickness was observed ranging from 50% in normal albuminuric group to 83.33% in macroalbum inuric group.[8]

LeenaMykannen et al[15] in the Insulin resistance Atherosclerosis study reported that subjects with microalbuminuria had greater Common carotid artery CIMT than those without microalbuminuria. Similar results were demonstrated by Gilles F.H Diercks et al[14] whose study showed that urine albumin excretion is strongly related to subclinical atherosclerosis (assessed by CIMT) in type 2diabetic patients.

SUMMARY AND CONCLUSIONS

- This study showed that half of the newly diagnosed Type 2 Diabetes Mellitus patients had early atherosclerosis as measured by Carotid Intima Media Thickness (CIMT).
- In these newly diagnosed Type 2 Diabetes Mellitus patients, Ankle Brachial Index is significantly associated with increased CIMT.
- Smoking status and presence of hypertension is not associated with increased CIMT.
- BMI, WC and WHR do not affect the thickness of CIMT.
- Laboratory parameters like HbA1C, Hypercholesterolemia and UACR are not associated with increased CIMT.
- Only 30% patients were having good control of blood sugar.
- More than 50% of these patients are anemic; anemia is more common in females than males (68% vs 48.5%).
- 16% patients are having Plaques in carotid arteries - Established atherosclerosis.

To conclude –The study reveals that newly diagnosed Type 2 Diabetes Mellitus patients have significant high values of CIMT. The study also shows a strong association of Ankle Brachial Index with CIMT in T2DM patients. Assessment of CIMT is relatively an inexpensive mean of measuring subclinical atherosclerosis, should be included in routine evaluation of subjects with T2DM

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