



## Evaluation of Carotid Intima Media Thickness as a Preclinical Atherosclerosis Marker in Diabetic Patients of North India

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### Abstract

**Objective:** To evaluate carotid intima media thickness as a preclinical atherosclerosis marker in diabetic marker in diabetic patients.

**Method:** The study was conducted in PG Department of Medicine in Cardiology Unit, SN Medical College, Agra, Patients of any age group willing to take part in the study were included. Determination of Carotid intima media thickness (CIMT) was done by standard USG machine with high frequency probe.

**Results:** In our study the mean duration of diabetes was 5.7 years with SD of 4. The mean CIMT in patients with diabetes of less than 5yrs (n=23) was 0.78 with SD of 0.07, while the mean CIMT in patients who have diabetes for more than 5 yrs is 0.87mm with SD 0.003. Using t test to compare the two groups, the p value was less than 0.001. This shows the impact of duration of diabetes with carotid intima media thickness and hence risk for atherosclerosis complication. Some patients in our study have short duration of diabetes but have high CIMT value which may be due to the late detection of diabetes.

**Conclusion:** CIMT measurements is an effective, noninvasive tool which can assist in identifying people with diabetes who are at higher risk of developing microvascular and macrovascular complications. It may also help to effectiveness of various treatment strategies used to treat people with diabetes.

**Keywords:** B-Mode USG, CIMT, Atherosclerosis, Diabetes.

### Introduction

Diabetes mellitus is associated with a high risk of cardiovascular disease which is the most common cause of mortality in people with diabetes<sup>1,2</sup>. CVD accounts for more than 80% of deaths in people with diabetes.<sup>3,4</sup> A two–three fold increased risk of CVD in people with diabetes compared with

the background population has been reported by various research groups<sup>5,6</sup>. Diabetes is also associated with increased incidence and extent of peripheral arterial disease<sup>7</sup>. The recent burden of CAD, atherosclerosis has been a serious health issue in developing country in present day. It has been suggested by the atherosclerotic risk project

that the atherosclerosis process occurs at the same time in carotid, cerebral and coronary arteries<sup>9</sup>. Early preclinical detection of atherosclerosis provides a window of opportunity for the presymptomatic detection of CAD, identification of high risk subject is the application of appropriate preventive strategy. For the preclinical detection various non-invasive tests are emerged in recent years out of which CIMT is suppose to be most promising one.

CIMT can be detected by using standard ultrasound machine equipped with high transducer usually 5-12Hz. Intima media thickness was defined as the distance from the luminal edge of intima margine to the leading edge of media adventia margin. Various conventional risk factors are contributing to the atherosclerosis like cigarette smoking, hypertension, diabetes, low HDL, obesity out of which diabetes is the most important emerging conventional risk factor for atherosclerosis in the north Indian population. Diabetes Patients has 2-4 folds high risk for CAD compared to non diabetic population.

CIMT is healthy middle-aged adults measures 0.6 to 0.7mm and greater than 1.20mm is considered abnormal<sup>8</sup>. Diabetes is also associated with many diseases which predisposes to atherosclerosis, so in the light of above mentioned effects present study is undertaken for the measurement of CIMT thickness in diabetic population of north India to formulate better preventive strategy in the preclinical phase of atherosclerosis.

### Material and Method

Present study includes 103 patients from PG Department of medicine, SNMC Agra out of these 103 patients 42 patients was diabetic and 61 patients were non diabetic. For the detection of diabetes ADA criteria which includes fasting blood sugar as > 125mg/dl and post prandial after 2hours meal were taken as >200 mg/dl or WHO criteria of random blood sugar of >200mg/dl in symptomatic patients like polyuria, polydypsea, polyphagia were considered as diabetic. In present study CIMT measurement is done by standard

USG machine with high frequency probe ,the patient should be supine with slight hyperextension and rotation of neck in direction opposite to probe. The B Mode images are used and cyclic variations in IMT should be taken into account.

Complete history of the patient should be taken with routine investigations like CBC ,LFT, RFT, Chest xray , ECG and patient were further classified on the basis of risk factors considered in account for Age, Sex, hypertension, Dyslipidemia, smoking and obesity.

### Observation

A total of 103 patients were included in the study these patients were further divided into cases and control. 42 cases were included in the cases group and 61 were included in control group ,the mean CIMT in cases were 0.82mm ,standard deviation was 0.07 and standard error of the mean was 0.01, upper limit of 95% confidence interval was 0.85 while the lower limit was 0.8 while among the control population (N=61) the mean CIMT was 0.07 and the standard error of the mean was 0.01.The upper limit of confidence interval was 0.8 while the lower limit was 0.78.The presence of diabetes was found to have a significant correlation with CIMT (p value < 0.001) hence risk for atherosclerosis.

**Table - 1**

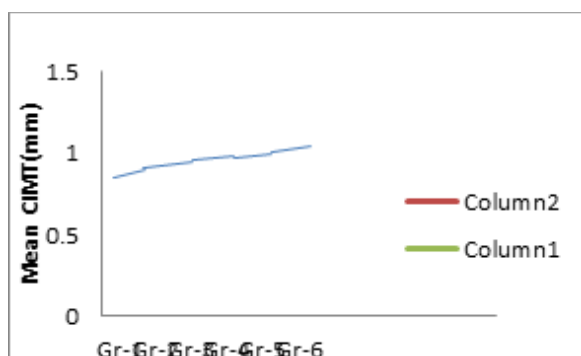
CIMT	CASES	CONTROLS
N	42	61
Mean CIMT	0.82mm	0.78mm
SD	0.07	0.07
SEM	0.01	0.01
95% UPPER LIMIT CONFIDENCE	0.85	0.8
95% LOWER LIMIT OF CONFIDENCE	0.8	0.78

Again these cases were further subdivided into subgroups into 6 subgroups have number risk factors group 1 has no risk factors while group 6 has 5 for more risk factors.

**Table -2**

GROUPS	Mean CIMT mm	N	SD	SEM
GR-1	0.67	3	0.09	0.05
GR-2	0.74	5	0.02	0.01
GR-3	0.81	11	0.04	0.01
GR-4	0.85	10	0.03	0.01
GR-5	0.88	8	0.03	0.01
GR-6	0.92	4	0.02	0.01

Table shows the mean CIMT among the subgroups of cases this table shows that as a patient has more of risk factors then CIMT was found to be more by using ONE WAY ANOVA test .The variation of the mean CIMT was found to be significant p value < 0.001 indicating the significant impact of the risk factors on the CIMT among the cases and also the additive effect the risk factors have on increasing the risk for atherosclerosis.



**Table 3**

AGE GROUPS	35-50	51-65	66-80
N	7	26	9
MEAN CIMT (mm)	0.73	0.84	0.85
SD	0.08	0.05	0.05
SEM	0.03	0.01	0.01

Table shows the comparison of the different age groups of the cases, there were 7 patients n=7 in the age group 35-50, 26 patients n=26 in the age group 51-65 and 9 patients (n=9) in the age group 66-80 .the mean CIMT of the three age groups were compared using ONE WAY ANOVA test the p value was < 10.001 indicating the significant impact of age on CIMT and risk for atherosclerosis.

**Table 4**

	<5 YRS	>5 YRS
N	23	19
MEAN CIMT(mm)	0.78	0.87
SD	0.07	0.03
SEM	0.01	0.008

The mean duration of diabetes in the cases was  $5.7 \pm 4$  years. The mean CIMT in patients with diabetes of <5 years duration was  $0.78 \pm 0.07$  while the mean CIMT in patients with diabetes of >5 years duration was  $0.87 \pm 0.03$ . Using t test the p value was found to be < 0.001 which is considered to be very significant indicating the impact of the duration of diabetes with carotid intima media thickness and hence risk for CAD.

**Table 5**

	MALES	FEMALES
N	22	20
MEAN CIMT	0.85	0.8
SD	0.06	0.07
SEM	0.01	0.01

Among the control have a higher mean CIMT then the female. The mean CIMT among the males n=22 was 0.06 and SEM was 0.01. In the female n=20 the mean CIMT was 0.8 standard deviation was 0.07and SEM was 0.01 using t test male sex was found to have a significant impact on the CIMT with p value < 0.001 .

**Discussion**

Ultrasonographic assessment of endothelial function of bracial artery flow mediated dilation and evaluation of carotid intima media thickness has been used as a marker of CAD in people with diabetes CIMT is the area of tissue starting at the luminal edge of the artery and ending at the boundary between the media and the adventia, it is measured using B MODE USG as the composite thickness of intima and media. CIMT in healthy middle aged adults measures 0.6-0.7mm ,CIMT is age dependent and increases at a rate of 0.5-0.10 mm per year, different portion of carotid artery have been used to measure the CIMT, common carotid bifurcation, internal carotid are commonly used.

However in the study by Iglesias de sol found that CIMT measured at common carotid bifurcation, internal carotid found that all the measurement sites has the same ability to predict further cardiovascular event<sup>10</sup>. Early studies has reported ethnic difference in the CIMT where black were found to have higher CIMT values then whites, the study evaluate the diabetic patients of agra attending the outpatient department or attending the PG department of medicine in SNMC Agra , the mean CIMT value of the cases group were  $0.8\pm 0.07$  while in control group the mean CIMT was  $0.78\pm 0.07$  which shows significant correlations between diabetes and CIMT, P value 0.001, V Mohan, Ravi kumar et al in the Chennai urban population study have also reported that the diabetic patients have higher CIMT values then the non diabetic subjects.

Won Sang Yo, Hee Jin Kim, et al has concluded in their study that patients with more than one risk factors for atherosclerosis has higher risk for CAD<sup>12</sup>. In our study the CIMT among the different subgroups of cases was compared using one –way Anova test, the p value was 0.001 this shows the relationship of increasing number of risk factors on increased thickness of carotid intima media. The CIMT among the different age groups of cases were compared and it was found that increasing age have a significant impact on intima-media thickness. The Chennai urban population study has reported the same result. This may also be attributed to the fact that older persons also tend to have other risk factors for atherosclerosis, like HTN . The mean CIMT in the age group of 51-65 in our study, this may be due to the smaller sample size in the older age group in the study. Largest study may be needed to confirm the result. Other studies have reported that increasing age is an important risk factor for CIMT progression.

Some studies have reported that diabetic patients with longer duration of diabetes have higher risk for CAD in comparison to those with a shorter duration. In our study the mean duration of diabetes was 5.7 years with SD of 4. The mean

CIMT in patients with diabetes of less than 5yrs (n=23) was 0.78 with SD of 0.07, while the mean CIMT in patients who have diabetes for more than 5 yrs is 0.87mm with SD 0.003. Using t test to compare the two groups, the p value was less than 0.001. This shows the impact of duration of diabetes with carotid intima media thickness and hence risk for atherosclerosis complication. Some patients in our study have short duration of diabetes but has high CIMT value which may be due to the late detection of diabetes.

### Conclusion

Carotid intima media thickness may thus be used as screening method to detect early stages of diabetes patients, the importance of this method increases with duration of diabetes and with the presence of risk factors. In our study there was a significant correlation of CIMT with Diabetes as compared to non diabetes, it also correlates with the duration of the diabetes, other factors which can infiltrate the CIMT values in our studies as Age, Sex and presence of number of risk factors. Thus assessment of CIMT provides an excellent opportunity to evaluate the atherosclerotic risk in people with diabetes and can further be used to facilitate better use of various treatment strategy in patients with diabetes.

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