

# Carotid Intima Media Thickness in Young Diabetics and Influences of Glycosylated Hemoglobin, Duration of Diabetes, Hypertension and Body Mass Index (BMI) on Early Atherosclerosis by Means of CIMT

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## Abstract

To study the carotid intima media thickness (CIMT) in young diabetics and influence of glycosylated hemoglobin (HbA1c), duration of diabetes, hypertension and body mass index (BMI) on early atherosclerosis by means of CIMT. The study population included young diabetics (10-25yrs) attending outpatient of GMCH from Nov 2011 to October 2012. Out of 45 subjects studied 28 were males. Higher values of CIMT was associated with longer duration of diabetes (85.7 %, > 1 year duration), and higher HbA1c values. 78.5% males (n=28) had higher CIMT as compared to 58.8% (n=10) females. Out of 38 subjects with BMI>20, thirty had higher CIMT. Higher CIMT values were observed in hypertensive subjects. Poorer glycemic control and longer disease duration have independent adverse effects on carotid IMT in youth with type 2 diabetes mellitus. Hypertensive individuals also have higher CIMT. These adverse effects are more likely to be observed in males. Higher BMI also predisposes to higher CIMT.

## Key Words

Diabetes, Urinary Tract Infection, Antibiotic Sensitivity

## Introduction

The worldwide prevalence of diabetes mellitus has risen dramatically over past two decades. From estimated 30 million in 1985 to 285 million in 2010. (1-3) A recent estimate suggested that diabetes was the fifth leading cause of death worldwide and was responsible for four million deaths.

In diabetics vascular damage begins in childhood beginning with endothelial dysfunction. Carotid Intima media thickness (CIMT) is an innovative non-invasive method that can be used to assess the subclinical atherosclerosis affecting young diabetics. (4-6)

Several studies have indicated CIMT to be closely related to extent of coronary stenosis in type 2 diabetics without history of coronary artery disease. (7-29) CIMT measurements have been shown to be an independent predictor of future cardiovascular events. Hence CIMT measurements can be used not only to assess the disease

progression but also is handy in determining future cardiovascular risk by a totally non-invasive method.

To address this issue, we sought to determine the factors that contribute to early changes in carotid IMT in youth with type 2 diabetes mellitus and to identify any predictors of increased carotid IMT

## Material and Methods

All young diabetics (10-25 yrs.) presenting to Government Medical College Hospital Jammu were eligible for the study which was conducted from November 1, 2011 to October 31, 2012 in the department of medicine. All individuals also had no evidence of diabetic ketoacidosis. The diagnosis of type 2 diabetes was based on the American Diabetes Association criteria. All the subjects were briefed regarding the study and the procedures to be carried out during the study.

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Data collection: Detailed clinical examination was done including height (meters), weight(kg), body mass index . Routine baseline investigations were conducted at central laboratory of GMCH like haemoglobin, Total leucocyte counts , differential counts , blood sugar - fasting and postprandial and baseline glycosylated haemoglobin (HbA1c).

All subjects underwent carotid ultrasound (B - mode )to determine carotid intima media thickness at department of radiology , GMCH Jammu. Values of CIMT between 0.05-0.06 cms was considered normal and above this was considered abnormal.

### Statistical analysis

All analyses were performed with Statistical Analysis Software SPSS version 12.0 and MS EXEL for windows.the values were expressed as percentages for qualitative and as mean + for quantitative data.the

association bwtween CIMT and risk factors were evaluated by Univaqriate analysis and crude odds ratio with 95%confidence interval. Chi square or Fisher square was used to evaluate statistical significance. Multivariate analysis / Logistic regression employed to assess the independent effect of risk factors on outcome . all P values were two tailored and value <0.05 were considered statistically significant unless stated otherwise.

### Results

Table 1 shows the age, sex and demography of the study population. Out of 45 subjects studied 28 were males and seventeen females .Thirty four subjects were between age group 20-25 and 28 belonged to urban background. Higher Hb1Ac values were found to be statistically significant (p=0.0002). Risk of higher CIMT was 10.5 times more among subjects with hypertension (p=0.01). Out of 38 subjects with higher BMI, about 78.9% had higher CIMT. The duration of diabetes in individuals

**Table 1. Age,Sex, Demographic Distribution of Subjects**

<b>Age</b>	10-19yrs	24.6% ,(N=11)
	20-25yrs	75.4%,(N=34)
<b>Sex</b>	Male	62.2%,(N=28)
	Female	37.8%,(N=17)
<b>Place</b>	Rural	37.8%,(N=17)
	Urban	62.2%,(N=28)

**Table.2 Relationship Between Cimt and Variables**

Variables		High Cimt	Normal Cimt	Crude Odds Ratio
Hbaic	>7%	95.6% (N=22)	4.4% (N=1)	26.40(2.78-622.39)
	<7%	45.4% (N=10)	54.6% (N=12)	
Hypertension	Present	93.5% (N=15)	6.3% (N=1)	10.59(1.15-244.22)
	Absent	58.6% (N=17)	41.4% (N=12)	
Bmi	>20	78.9% (N=30)	21.1% (N=8)	9.38(1.23-88.23)
	<20	28.5% (N=2)	71.5% (N=5)	
Duration Of Diabetes	<1yr	67.7% (N=21)	32.3% (N=10)	2.86(0.46-22)
	>1yr	85.7% (N=12)	14.3% (N=2)	
Gender	Male	78.5% (N=22)	21.5% (N=6)	2.57(0.57-11.88)
	Female	58.8% (N=10)	41.2% (N=7)	

**Table. 3 Results of Logistic Regression**

Variables	Regression Coefficient	Standard Error	Significance	Adjusted Odds Ratio(95% Ci)
Age	0.265	0.273	0.331	1.30(0.764-2.224)
BMI	0.816	0.394	0.039	2.26(1.04-4.898)
HBA1C	-1.003	1.663	0.546	0.367(0.014-9.544)
Hypertension	0.887	1.690	0.600	2.42(0.088-66.60)
Duration	0.024	0.092	0.793	1.02(0.855-1.227)

was also studied to be statistically significant as out of fourteen subjects twelve had high CIMT levels. As shown in table 3 .variables were entered into multivariate model and BMI was found to be independently associated with higher CIMT levels.

### Discussion

Diabetes mellitus is a multi-system disorder with micro plus macro vascular complications. Although adolescents and young adults have experienced a marked increase in the frequency of type 2 diabetes mellitus in the past two decades, little is known about the early development of cardiovascular disease and the atherosclerotic processes that occur in these youth.

This study demonstrates that increased carotid IMT is associated with higher HbA1c concentrations. Similar results were obtained in Shah Lawrence *et al* (22) 2009. The said study had established that each 1% increase in HbA1c is associated with approximately 30% increased odds of a thicker carotid IMT. These data suggest that poor glycemic control is associated with structural changes in the carotid artery that are consistent with early atherosclerosis.

Also duration of diabetes mellitus has been proved as an independent risk factor for early atherosclerosis Amy *et al*. In present study odds for having a thicker carotid IMT were three times higher in diabetics with duration of more than 1 yrs., however owing to small sample size this relationship was not statistically significant. Duration of diabetes and CIMT have not been extensively studied in adolescents with type 2 diabetes mellitus. Present study can add to previous significant studies depicting association between duration of diabetes and CIMT.

Obesity related abnormalities in carotid structure and function were proven. Our study also favors close relation between BMI and CIMT. Significantly higher CIMT values were observed in individuals with BMI 20 or higher(25)

Hypertensive individuals included in the present study were observed to have thicker IMT approximately eleven times higher risk as compared to non-hypertensive diabetics. Previous studies have concluded that male sex is associated with worse outcomes in carotid IMT. Our study stats also reveal that male diabetics were at 2. 5

times risk of having thicker CIMT. These findings suggest that the protective effect of female sex may still be present in youth with diabetes mellitus.

Although collective effects of aforementioned parameters couldn't be established statistically, Only BMI turned out to be the predictor of worse outcome in terms of higher CIMT.

This study enforces the results of previous studies in young diabetics in terms that HbA1c, duration of diabetes, in addition to BMI and hypertension are independent risk factors for development of atherosclerosis in adolescent and young diabetics.

HbA1c, Duration of diabetes, Hypertension, BMI and male gender all play vital roles in early endothelial dysfunction and atherosclerotic changes in carotid artery as measured by CIMT. Thus early detection of disease, good glycemic control and a check on other traditional cardiovascular risk factors can play key roles in retarding the early atherosclerotic changes and this can well be established by a non-invasive method of CIMT measurements. These measurements in long run can prove handy in preventing long term cardiovascular: cerebrovascular as well as peripheral vascular morbidities and mortalities related to diabetes mellitus.

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