

Relation of Lipid Profile and Carotid Intima Media Thickness in Patients with Diabetes and Pre-diabetes: A Comparative Study from Tertiary Care Centre of NorthWest India

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Abstract

Introduction:

Diabetes is a Chronic Metabolic Disease characterised by high levels of Blood Sugar. It is strongly associated with Dyslipidemia and Atherosclerosis. The presence of Atherosclerosis can be measured by Carotid Intima Media Thickness. It can also be used to track the Regression, Arrest or Progression of Atherosclerosis. As Diabetes, Dyslipidemia and Atherosclerosis are strongly related, we did a study of Carotid Intima Media Thickness and its relation with Lipid Profile in Pre-Diabetic and Diabetic Patients.

Methodology:

Study included 116 Pre-Diabetic and 96 Diabetic Patients. CIMT was measured in those patients who had fulfilled the Inclusion criteria. B - Mode Ultrasound Imaging was done to evaluate the Normal Carotid Media Thickness which was 0.74 ± 0.14 mm. Patient's Lipid Profile was done and their findings were compared.

Result:

In present study, it was found that, all Lipid Profile Parameters were significantly higher ($p < 0.005$) in Diabetic Group than Pre-Diabetic Group except HDL ($p = 0.054$). Mean value of Left and Right Internal Carotid IMT (IC-IMT) was found significantly more in Diabetic Group ($p < 0.005$). Mean IC-IMT was also found to be more in Diabetic Group ($p < 0.005$). Also, for a given Triglyceride Level/ LDL level, CIMT was more in Diabetic Patients as compared to Pre-Diabetic Patients.

Conclusion:

Patients with Impaired Blood Glucose Levels, it is crucial to control the risk factors like Dyslipidemia to avert the increase of Intima Media Thickening, thus, preventing Diabetic Complications timely

Key Message:

Earlier screening of pre-diabetics and diabetics for vascular complications may be helpful in preventing morbidity in such patients in long term.

Keywords: Diabetic, Non-diabetic, Carotid Intima Media Thickness (CIMT), Dyslipidemia, High-density lipoprotein (HDL), Low-density lipoprotein (LDL), Triglycerides (TG)

Introduction

Diabetes Mellitus (DM) is a group of Metabolic Diseases characterised by hyperglycaemia resulting from defects in insulin secretion, insulin action, or both.¹ Diabetes is strongly associated with

Dyslipidemia, Atherosclerosis and Coronary Vascular Disease. Dyslipidemia is the most important risk factor for Atherosclerosis and contributes to increase risk of developing Coronary Vascular Disease. Previous studies had demonstrated that Low-Density Lipoprotein (LDL) is the Primary Atherogenic Lipoprotein and High-Density Lipoprotein (HDL) is the predominant Anti-Atherogenic Lipoprotein. Therefore, measurements of Total Cholesterol (TC), HDL Cholesterol (HDL-C), and LDL Cholesterol (LDL-C) is widely recommended.² Coronary Vascular Disease in Pre-diabetic Patient is more than that of Non-diabetic patient.³ On this basis, it is of clinical relevance to evaluate the characteristics of Subclinical Atheromatous Disease in the Pre-diabetic stage. There is a need of Non-Invasive Test which can detect the Cardiovascular Involvement before Cardiovascular complication sets in. CIMT is a tool

which can detect Atherosclerosis early before occult Cardiovascular Complication occurs.⁴⁻⁵ It can also be used to track the Regression, Arrest or Progression of Atherosclerosis. The assessment of carotid atherosclerosis by ultrasonography measurement of Internal Carotid Intima Media Thickness (IC-IMT) took over as being the Important Marker of Atherosclerosis.⁶

Methods

Patients seen on Outdoor or Admitted in Intensive Care Unit /High Dependency Care Unit / Ward under Department of General Medicine/ Department of Endocrinology, Mahatma Gandhi Hospital , Jaipur were included in the study (Table 1. Showing inclusion and exclusion criteria for recruitment of patients in the study). A total of 212 patients were taken out of which 116 were Pre-diabetic and 96 were Diabetic.

Table 1. Inclusion and exclusion criteria in the study

<u>Inclusion Criteria</u>	<u>Exclusion Criteria</u>
<ul style="list-style-type: none"> Type 2 Diabetes Mellitus patients according to ADA 2007 Criteria 	<ul style="list-style-type: none"> Patient with History of Cardiovascular Disease, Peripheral Vascular Diseases, Renal Disease, Hypertension or Cerebrovascular Disease
<ul style="list-style-type: none"> Patients of both genders with age > 25 year and < 65 year. 	<ul style="list-style-type: none"> Smokers & Alcoholics
<ul style="list-style-type: none"> Patients diagnosed as Pre-diabetics or Diabetics 	<ul style="list-style-type: none"> Patient on Drugs Modifying CIMT (ACE inhibitors, statins, aspirin & ARB)
	<ul style="list-style-type: none"> Those who are not willing to give consent

It was an Observational Study conducted after taking Ethical Clearance and Informed Consent among 212 cases. Relevant patient details were obtained. Detailed history of symptoms was taken. Clinical examination of patient was done. Ultrasonographic scan of the Carotid Arteries was performed in Diabetic and Pre-diabetic patients and it was compared with their Lipid Profile report.

ASSESSMENT OF CAROTID INTIMA MEDIA THICKNESS : CIMT is measured between the Intimal Luminal and the Medial Adventitial

Interfaces of the Carotid Artery. The space between two hyper-echoic lines corresponds to IMT. Carotid IMT was defined as the distance from the leading edge of the First echogenic line to the leading edge of the Second echogenic line on the scan.⁷ Carotid IMT was measured on both sides and the average value was taken out as the Mean CIMT. IMT value of more than 0.8 mm is suggestive of Significant Atherosclerosis.

High LDL cholesterol, HbA1c, and Low HDL cholesterol levels are closely associated with C-IMT value. CIMT is Significantly Higher in Patients of

Diabetes and Pre-diabetes with Deranged Lipid Profile. There was significant correlation of CIMT with age, HbA1c and Plasma Blood Glucose Levels in Patients with Diabetes Mellitus than Pre-Diabetics. 9-11

Results

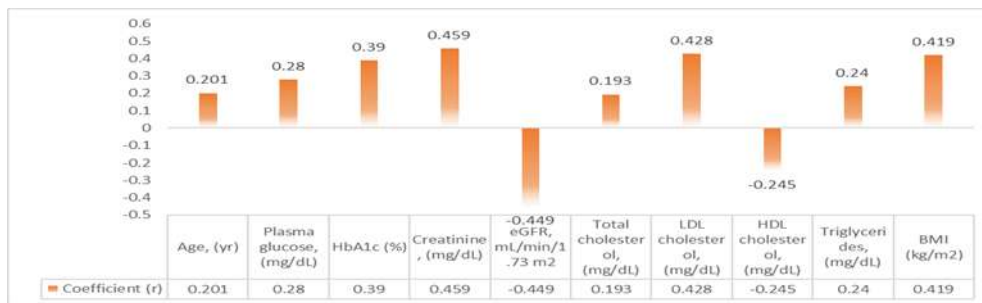
In present study, it was found that, all Lipid Profile Parameters were significantly Higher in Diabetic

Group than Pre-Diabetic Group except HDL. Mean value of Left and Right Internal Carotid IMT was found significantly more in Diabetic Group. Left Common Carotid IMT was also found to be more in Diabetic Group. Mean IC-IMT and CC-IMT was also found to be more in Diabetic Group. Also, for a given Triglyceride Level/ LDL level, CIMT was more in Diabetic Patients as compared to Pre-Diabetic Patients. (Figure 1. and Table 2.).

Table 2. IC-IMT in pre-diabetic and diabetic groups

Variable	Pre-diabetes N=116	T2DM N=96	P-value
Right internal carotid IMT, mm	0.88±0.10	0.98±0.12	<0.005
Left internal carotid IMT, mm	0.92±0.09	0.99±0.19	<0.005

Figure 1. Logistic regression to assess the associated with IC-IMT and risk factors significantly correlated with IMTs.



Discussion

The main finding of this study was that IC-IMT was significantly higher in patients with Type 2 diabetic than pre-diabetic. Another important finding is that IC-IMT values are positively correlated with LDL cholesterol and negatively correlated with HDL cholesterol. IC-IMT is an easy to use, simple, inexpensive, noninvasive, and objective evaluation method used in the diagnosis and follow-up of atherosclerotic vascular diseases. DM is a major and known risk factor for the development of atherosclerosis. Increased IC-IMT is closely associated with asymptomatic or subclinical atherosclerosis and is recommended as a routine examination in patients with DM. Patients with prediabetes reported to have increased IC-IMT in this study. Therefore, it is important to diagnose patients

early in the prediabetes stage and without an increase in IC-IMT. However, in a few studies involving patients with DM and prediabetes, there was an increase in IC-IMT in patients with DM in comparison to pre-diabetic patients. Our study has some important limitations. First of all, the number of patients included in the study was relatively adequate, but our study was single-centered. Multicenter studies involving more patients are needed. In addition, our study was cross sectional and patients with newly diagnosed DM were taken and we could not have an idea whether DM duration would change study data. In our study, the presence of atheroma or plaque (IC-IMT >1.5 mm) in the carotid artery was included among the exclusion criteria, if this exclusion criterion was not taken and plaque index evaluation was done, it could give

information about localized atherosclerosis in prediabetes patients. In a recent study, it was reported that IC- IMT normal value was accepted as constant, but it could change with the patient's risk factors and especially age.

Conclusion

From this study it may be concluded that the increase in IC-IMT, which is an indicator of Subclinical Atherosclerosis, can be used to determine the development of early. Atherosclerosis in Patients with Diabetes Mellitus and in patients who are Pre-diabetic. CIMT should be done in Patients who are Pre-diabetic as they are at Higher Risk of Developing Atherosclerosis. Also, it is crucial to control the risk factors like Dyslipidemia to avert the increase of Intima Media Thickening, thus, preventing Diabetic Complications timely. The present study was conducted in single-centered individuals with the same ethnic identity. Therefore, the information obtained in this study should be supported by multicenter studies with different ethnic backgrounds and more patients.

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