

Correlation Between the Carotid Artery Intima-Media Thickness And Hba1c Levels in Newly Diagnosed Diabetic Patients in An Urban Population Around Davangere

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Abstract

Objective : To determine the CIMT and HbA1c levels in newly diagnosed diabetic patients and correlate between the two and to see whether diabetes manifests as an increase in the thickness of Carotid walls as early as diagnosis and to determine the usefulness of the CIMT estimation as an early risk factor assessment tool in diabetics.

Methods: 200 patients meeting the required criteria were selected at random from the IPD/OPD in the age group 30-70. Demographic, anthropometric and laboratory data were taken. HbA1c was used as the diagnostic criteria for Type 2 Diabetes according to the American Diabetes Association. CIMT was measured using B-mode real time ultrasound.

Results: The HbA1c levels of newly diagnosed Type 2 diabetes patients correlated with increase in their CIMT, which was significant . A total of 200 newly diagnosed diabetic patients (74 male and 126 female) completed all the assessments. The baseline clinical characteristics of the patients are depicted in Table 1. The observed HbA1C range was 6.17-13.67% (mean =10.21% \pm 2.41). The CIMT measured was within the range 0.039 to 0.172 cm (mean=0 .82 \pm 0.033 cm). Multiple variable linear regression with CIMT as dependent and HbA1c, Age, SBP, DBP, Diet, and Sex as variables shows that the model is significant ($P < 0.05$, Adjusted R²= .359). Independently, HbA1c significantly positively correlates with Carotid intima-media thickness ($P < 0.05$). Age, SBP and DBP found to have a positive independent correlation with CIMT, although it was not significant ($P > 0.05$). Diet and sex had no correlation with CIMT. This implies that CIMT variations can be detected in the early stages might be earlier and progress faster than previously thought. Early assessment and prevention should be considered in this of Type 2 Diabetes.

Conclusion: The significant correlation between HbA1c and CIMT in this study suggests that onset of the subclinical atherosclerotic vascular changes in young patients with diabetes target population. In order to achieve this CIMT can be used as a risk assessment tool even in newly diagnosed diabetics routinely.

Key-words: type 2 diabetes mellitus, carotid intimal thickness, HbA1C

I. Introduction

Vascular complications due to atherosclerosis are a major cause of morbidity and mortality in type 2 diabetic patients, more so in India where the number of diabetics is approaching very high levels¹. The number of patients with diabetes in India is currently around 40.9 million and is expected to rise to 101 million by 2030. Vascular complications are the major outcome of type 2 Diabetes Mellitus progression, which reduce the quality of life and cause heavy economic burden to the health care system and increases diabetic mortality. Cardiovascular disease is the main cause of mortality and morbidity worldwide². It has been suggested that Cardiovascular risk estimation by classical risk factors (blood pressure, glucose, cholesterol) and circulating biomarkers may fail to adequately predict the risk of cardiovascular events. Imaging biomarkers of vascular damage might integrate the long lasting cumulative effects of all traditional and non-identified CV risk factors and can be detected as target organ damage before clinical events occur at a stage when interventions may be effective. It has been suggested by the atherosclerotic risk project that the atherosclerotic process occurs at the same time in carotid, cerebral and coronary arteries³. Carotid Intima-Media thickness is increasingly used as a surrogate marker for atherosclerosis. Because it can be measured relatively simply and non-invasively, it is well suited for use in large-scale population studies⁴. Carotid artery intima media thickness measurements are being widely applied as a measure of atherosclerosis in studies on determinants of presence and progression of atherosclerosis⁵⁻⁸. A number of longitudinal studies have examined the relationship between CIMT and future events, most frequently the incidence of Cardiac events (myocardial infarction, angina pectoris, coronary artery disease) and Cerebrovascular events (stroke or transient ischaemic attack)⁹⁻¹⁰.

Thus, CIMT is a very helpful tool in risk factor assessment for atherosclerosis and other Coronary Artery Diseases, early assessment of which can help in identifying individuals at higher risk, who are still asymptomatic.

II. Aims & Objectives

- i. To determine the CIMT and HbA1c levels in newly diagnosed diabetic patients and correlate between the two and to see whether diabetes manifests as an increase in the thickness of Carotid walls as early as diagnosis.
- ii. To determine the usefulness of the CIMT estimation as an early risk factor assessment tool in diabetics.

III. Materials & Methods

Study Design

This was a non-interventional, cross sectional study of patients who were detected to have Type-2 Diabetes Mellitus on their first visit to the centre where the study was conducted.

Study Population

200 patients meeting the required criteria were selected at random from the IPD/OPD at SSIMS and RC Hospital, Davangere.

Inclusion Criteria

Newly diagnosed diabetics (according to the American Diabetes Association criteria¹¹) in the age group 30-70.

Exclusion Criteria

To ensure that only asymptomatic individuals are selected for the study, the following were excluded from the study:

Smokers, Patients with previous history of cardiovascular diseases, peripheral vascular diseases, hypertension or Cerebrovascular events, Patients with renal disease, Patients on drugs that might modify the CIMT (statins, aspirin, ACE inhibitors and Angiotensin Receptor Blockers)¹²

Collection Of Data & History Taking

A detailed history was taken. Any previous disorders, including cardiac, cerebral, renal and endocrine disorders and whether the patient is on any medication.

Hypertension was defined as resting blood pressure taken by random BP of >140 mm Hg systolic and/or 90 mm Hg diastolic as per JNC VII Criteria. Body Mass Index (BMI was used as a measure of overall adiposity). The current ADA diagnostic criteria for diabetes was maintained– fasting plasma glucose ≥ 7.0 mmol/l (126mg/dl) or 2–h plasma glucose ≥ 11.1 mmol/l (200mg/dl). HbA1C was measured with the commercially available HbA1C testing kits.

Cimt Measurement- Ultrasound Imaging: B-mode real-time ultrasound, done using a Philips HB 11 Scan Machine, was used to assess the IMT of the carotid artery by use of a protocol identical to that used in the Cardiovascular Health Study. The screening examination was performed unilaterally on the right common carotid artery.

IV. Statistical Analysis

The results were analyzed using appropriate statistical tests. Quantitative data was expressed as mean \pm standard deviation (SD). For continuous variables, normality was first checked by Kolmogorov-Smirnov Normality test, and only if the data showed a normal distribution, variables were given as the mean \pm S.D. Statistical significance of quantitative variables between different categories was analysed using t test. Pearson's correlation coefficient (r) was used to indicate significant linear relationship among quantitative variables and regression analysis was done. A P value <0.05 was considered as significant. Any p value <0.001 was taken as highly significant.

V. Results

A total of 200 (74 male and 126 female) newly diagnosed diabetic patients completed all the assessments. The baseline clinical characteristics of the patients are depicted in Table. The observed HbA1C range was 6.17- 13.67% (mean =10.21% \pm 2.41). The CIMT measured was within the range 0.039 to 0.172 cm (mean=0.82 \pm 0.033 cm). Bivariate correlation analyses showed that the correlation between HbA1C with CIMT was significant (P < 0.05) with r = 0.546; There was no difference in the CIMT or HbA1c levels when compared with age (P > 0.05). Multiple variable linear regression with CIMT as dependent and HbA1c, Age, SBP, DBP,

Diet, and Sex as variables shows that the model is significant. HbA1c significantly positively correlates with Carotid intima-media thickness ($P < 0.05$). Age, SBP and DBP found to have a positive independent correlation with CIMT, although it was not significant ($P > 0.05$). Diet and sex had no correlation with CIMT. β -values for HbA1c, age, SBP and DBP were .584, .566, .558 and .570 respectively. On the paired sample t-test conducted, there was a very significant correlation ($P < 0.001$) between CIMT and HbA1c ($t=17.075$).

VI. Discussion

Measurement of carotid artery intima media thickness by non invasive B mode ultrasonography can detect atherosclerosis at an early preclinical stage and help in the diagnosis of asymptomatic cardiovascular disease¹³. In this study, we compared carotid intima media thickness and HbA1c levels in newly diagnosed Type 2 diabetic patients .We found significant increases in the CIMT in patients with Type 2 diabetes which correlated with their HbA1c level. In another study Matsumoto et al¹⁴ observed that CIMT correlated strongly with HbA1c values. This implies that CIMT variations can be detected in the early stages of type 2 Diabetes and also CIMT correlated strongly with HbA1c values. We also found a positive correlation between age and blood pressure, although not very significant.. Our study had more females than males (63% females vs. 37% males), however It does not reflect the frequency or incidence of diabetes in the area because our criteria of excluding smokers and drinkers led to rejection of more men than women. In order to select only asymptomatic patients, smokers, patients with previous history of cardiovascular diseases, peripheral vascular diseases, hypertension, renal diseases, patients on drugs that modify CMT(statins, aspirin, ACE inhibitors, Angiotensin Receptor Blockers, Clopidogrel etc) were excluded¹². Because of its association with known cardiovascular risk factors, Carotid intima-media thickness reflects atherosclerotic progression. In this study, we found out that changes of CIMT in newly diagnosed diabetics correlated with their HbA1c levels from the onset of diabetes and hence CIMT estimation is usefull as an early risk factor assessment tool in diabetics .

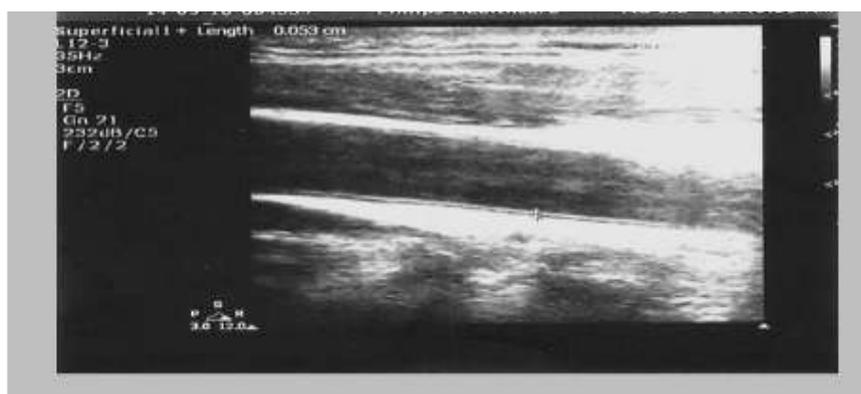
VII. Conclusions

This study has shown that CIMT estimation is an early risk factor assessment tool in diabetics. The onset of the subclinical atherosclerotic vascular changes in young patients with diabetes might be earlier and progress faster than previously thought which is indicated by a significant correlation between HbA1c and CIMT in this study. Early assessment and prevention should be considered in this target population. Thus the predictive value of this non invasive investigation, may alert the clinician to the risk of events early enough to intervene, in order to prevent major cardiovascular or cerebrovascular catastrophes. In order to achieve this CIMT can be used as a risk assessment tool even in newly diagnosed diabetics routinely.

Table : Base Line Charecteristics

	minimum	maximum	Mean with SD
Age(in years)	30	70	56±6.34
HbA1C Levels(in %)	6.17	13.67	10.21 ± 2.41
CIMT(in cm)	0.039	0.172	0.082 ± 0.033
SBP(in mm of Hg)	100	140	122.50 ± 18.81
DBP(in mm of Hg)	60	100	78.50 ± 0.50

Figure: An ultrasound demonstrating CIMT taken during study



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