e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(10); 223-228

Original Research Article

Assessment of Atherosclerosis Risk in South Asian Type 2 Diabetes Mellitus Patients

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Received: 20-08-2022 / Revised: 20-09-2022 / Accepted: 12-10-2022
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Conflict of interest: Nil

Abstract

Introduction: Cardiovascular diseases are the leading cause of mortality and morbidity in diabetes mellitus patients. Identifying asymptomatic high-risk patients at the earliest and treating them to reduce the risk is the priority. Carotid artery intima-media thickness (CIMT) would give better risk stratification than traditional ASCVD risk calculator in South Asian type 2 diabetes mellitus population.

Methods: Based on history, examination and laboratory reports, data is used in ASCVD calculator to estimate risk and categorize into low, borderline, intermediate, and high risk. CIMT measured by B mode ultrasonography of both left and right side common carotid artery is averaged to get AvCIMT which is categorised into high risk if it is more than 75th percentile for the age and sex.

Results: When categorized based on ASCVD calculator, 226(67.3%) belonged to low risk, 40(11.9%) borderline, 55(16.4%) intermediate, 15(4.5%) to high risk. When AvCIMT was categorized, among 336, 125 participants (37.2%) were normal, 211 participants (62.8%) had high CVD risk. Among the high-risk category, 61 of them, that is 18% of total population had Plaque.

Conclusion: ASCVD risk calculator underestimates CVD risk in South Asian type 2 diabetes mellitus population. Integrating CIMT measurement would help in better stratification.

Introduction

Cardiovascular diseases (CVD) are responsible for more than 80% mortality among diabetes mellitus patients. [1] So, there is great interest in identifying asymptomatic patients at high risk at the earliest, who might be candidates for more intensive evidence based medical intervention that reduce CVD risk, among people with diabetes mellitus. FRS, WHO, UKPDS, AHA's ASCVD risk calculators

are being used to calculate 10-year CVD risk. It has age, sex, S. Cholesterol, smoking, diabetes, systolic blood pressure (SBP) as components in risk assessment. Based on this, intensity of the treatment is decided. [2]

Prevalence of type 2 diabetes has rapidly increased in native and migrant Asian populations [3]. In Asia, the diabetes phenotype appears to be somewhat different from that of United States and Europe, with an onset at a lower Body Mass Index (BMI) and younger age, greater visceral adiposity, and reduced insulin secretory capacity.And the pathogenesis of atherosclerosis doesn't necessarily involve elevated serum lipid levels. [4] The age at which the peak prevalence of diabetes was reached was approximately 10 years younger in Indian compared with Chinese and Japanese subjects. [5] Carotid artery Intima-Media thickness (CIMT) by high-resolution B-mode ultrasound is a non-invasive method to quantify the atherosclerosis and CVD risk. For every 0.1mm increase in CIMT, the relative risk for IHD increases by 15% and stroke increases by 18%. [6] ASE states that, CIMT supplements the traditional risk calculators, especially in those who are considered at intermediate risk, re-classifying them for better management. [7] There remains great potential for ASCVD risk reduction in this population, provided this gap in guideline-driven care is acknowledged and rectified. [8] Aim & Objective of this study is to compare the Atherosclerosis risk by ASCVD risk calculator and CIMT values in newly diagnosed type 2 diabetes population in south Asia.

Methods:

We included 336 consecutive type 2 diabetes mellitus patients diagnosed for the first time, attending diabetes OPD at our institution, during 1 year period (2021). After obtaining informed consent, sociodemographic data, Smoking history, vitals, Body Mass Index (BMI) were recorded on a Performa. Patients on any regular medications and who have any history suggestive of cardiovascular diseases were excluded from the study.

Venous blood samples were collected after 12 hours of fasting for investigations viz., FBS, HbA1c, serum Lipid profile. Respective data was entered in the AHA's ASCVD risk calculator to categorize the subjects into Low, Borderline, Intermediate and High risk for CVD. [9] B-mode USG of Common carotid Artery was performed with high resolution ultrasound machine equipped with 7MHz linear transducer, for all the subjects by the same ultra-sonographer who was blinded for the clinical data and mean CIMT was obtained according to ASE guidelines for both right and left sided CCA. [10] CIMT is the measurement of thickness between lumen-intima to media-adventia interface of the distal 1cm of the longitudinal view of common carotid artery in B mode ultrasonography (Fig1)

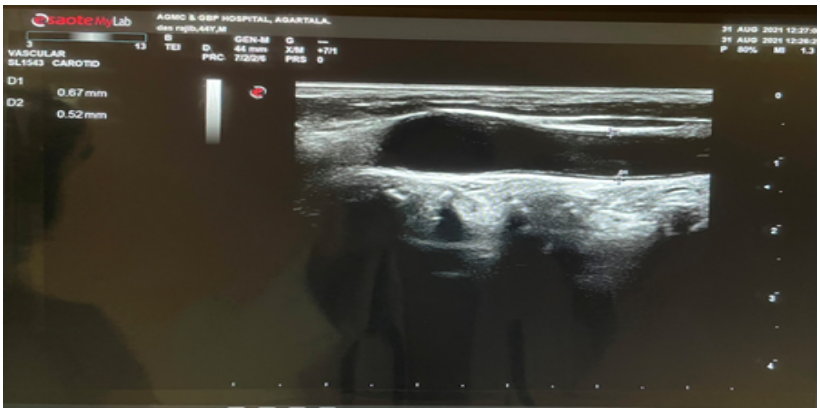

Figure 1: measuring CIMT of right CCA on longitudinal view by B-mode USG

The right and left sided mean CIMT values are averaged to get Average CIMT (AvCIMT) which is then compared to the age and sex adjusted reference values from SCORE-India study. [10] According to ASE guidelines, patients having thickness equal to or more than the 75th percentile or the plaque is considered to have high risk and others as normal/low risk for atherosclerosis. Focal wall thickening more than 50% of the surrounding wall and encroaching into the lumen is considered as Plaque (Fig2).

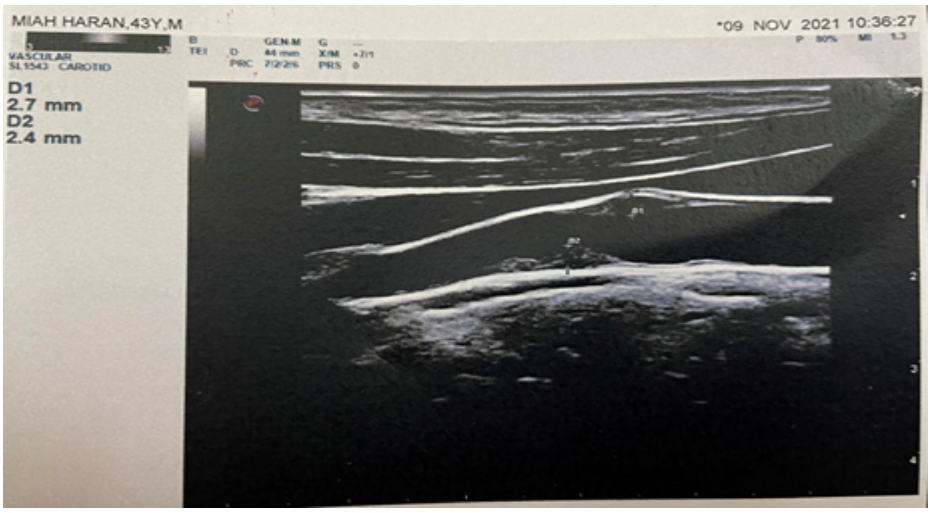

Figure 2: plaques seen on both walls of CCA in one of the participants

Plaque thickness is not included in the CIMT values and considered as separate entity as present or absent.

Data was entered in the SPSSv17 software and subjected to chi square analysis to compare the assessment of atherosclerosis by ASCVD risk calculator and CIMT.

The study was conducted with the approval of the Research and Ethical committee of our institution. Participants gave written informed consent before their inclusion in the study.

Results:

Age of the study population ranged from 31-65years with the mean of 47.1±8.1. Maximum number of study participants belong to the age group of 40-49 years with 161 participants out of 336 i.e. 47.92%. Male population is 200 (59.5%) participants & the female population is 136 (40.5%). Distribution of different clinical and biochemical parameters in the study population is given in table 1. When AvCIMT was categorized, among 336, 125 participants (37.2%) were normal, 211 participants (62.8%) had high CVD risk. Among the high-risk category, 61 of them, that is 18% of total population had Plaque. When categorized based on ASCVD calculator, 226(67.3%) belonged to low risk, 40(11.9%) borderline, 55(16.4%) intermediate, 15(4.5%) to high risk. Both the categories were subjected to statistical analysis (table 2). It is found that 2/3rd of the low risk ASCVD had high risk CIMT, while none of the high risk ASCVD had normal CIMT.

Table 1: Distribution of different clinical and biochemical parameters in the study population

Parameter	Mean	SD
Serum. Cholesterol(mg/dL)	178.9	49.9
TGL (mg/dL)	183.5	105.2
LDL (mg/dL)	105.1	42.3
HDL (mg/dL)	43.7	5.7
VLDL (mg/dL)	29.4	9.3
FBS (mg/dL)	182	70
PPBS (mg/dL)	284.9	112.3
HbA1C (%)	8.7	2.1
SBP (mmHg)	121.4	10.9
DBP (mmHg)	78.8	7.6
BMI(Kg/m^2)	23.46	3.25

Table 2: Comparison of risk stratification by ASCVD calculator and CIMT in study population

ASCVD	CIMT-normal		CIMT-High risk		P value
	n	%	n	%	
Low risk	88	38.9	138	61.1	
Borderline	7	17.5	33	82.5	<0.001
Intermediate	30	54.5	25	45.5	
High risk	0	0	15	100	
Total	125		211		

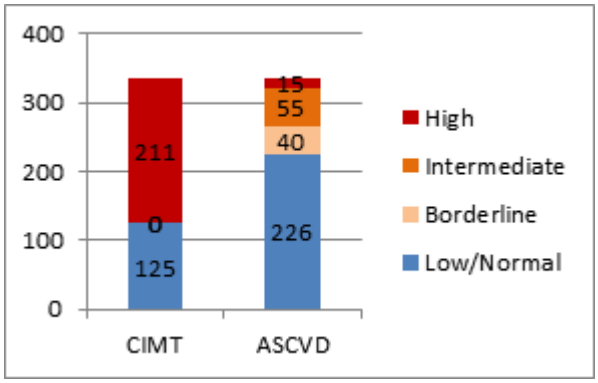

Figure 3: Graphical Representation of Table 2.

Discussion:

In our study only 15(4.5%) patients belonged to ASCVD high risk category whereas 211(62.3%) patients had high risk by CIMT. So, ASCVD seems to underestimate the risk of CVD in south Asian type 2 Diabetes mellitus population. ASCVD calculator gives only 10year risk assessment. Family history of CVD, familial hypercholesterolemia, albuminuria, duration of diabetes and smoking are not factored in the equation although they have influence on the atherosclerosis. Whereas CIMT is direct visualization and quantification of the atherosclerosis. It is the safest earliest method to assess atherosclerosis, even before the onset of retinopathy or proteinuria in people with diabetes. [11,12] In clinic-based settings across Asia, one in five adult patients had young-onset diabetes. ASE has standardized the technique of measurement and

recommends it for the intermediate CVD risk group of ASCVD calculator for better rest ratification. It states value >75th percentile for the age and sex to be considered as high risk. In our study, 65(19%) patients that were at intermediate risk by ASCVD calculator, when subjected for CIMT measurement, 25 of them had high risk CIMT. Although AHA recommends CIMT measurement only on intermediate risk category, when we subjected low risk patients to CIMT measurement, we found that 2/3rd of the low risk ASCVD had high risk CIMT. And none of the high risk ASCVD had normal CIMT N. Garg et al compared different CVD risk calculators and CIMT in acute mi patients, 30% of which were diabetics, among Indian population. In this study also, ASCVD calculator performed worst among others. [13] Bansal et al studied different CVD risk calculators and their relationship with CIMT and Coronary calcium score in the Indian cohort. In this study too, ASCVD performed poorly to correlate with CIMT and in estimation of CVD risk. [14] Jamthikar et al integrated CIMT to calculate Vascular age and used this instead of chronological age in the FRS and ASCVD risk calculator module to get better results. [15] In the recent NCEP guidelines, DM is considered as CVD equivalent and recommends high intensity therapy. Intensity of therapy is based on the Lipid profile. But, as we noticed in our study, the lipid profile is modestly deranged, mostly observed only in patients with very poor glycemic parameters. [16] We acknowledge that, case-control study would have been a better study design and comparing different CVD risk calculators to know which one works best for our population would increase the significance of the study. [17] Also, need to follow up the present study population for CVD events to confirm the significance of the study.

Conclusion:

ASCVD risk calculator underestimate the risk of CVD in south Asian Type 2 Diabetes Mellitus population. CIMT measurement would help, not only in intermediate risk but even the low-risk patients for better stratification and management of the patients.

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