

Early detection of atherosclerosis in newly diagnosed type 2 Diabetes mellitus patients in comparison with Blood pressure, Body Mass Index and Smoking.

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ABSTRACT

Background: Type 2 diabetes is on the verge of becoming a pandemic in India. As type 2 diabetes shares several risk factors in common with coronary artery disease (CAD), such as age, hypertension, dyslipidemia, obesity, physical inactivity, and stress, an increase in the prevalence of diabetes indirectly implicates an escalating risk of CAD as well. Diabetic subjects are known to have a two to four times increased CAD risk, and CAD has been reported to occur two to three decades earlier in diabetic subjects as opposed to their nondiabetic counterparts. The life expectancy of people with diabetes is reduced by nearly eight years due to increased mortality. Coronary artery disease accounts for more than 80% of all deaths and 75% of all hospitalizations in diabetic subjects.

Methodology: A Cross sectional Observational study conducted in the Dept. of General Medicine. All newly diagnosed patients of Diabetes mellitus, attending diabetes OPD, AGMC & GBPH, subjected to inclusion and exclusion criteria. By census method, all the newly diagnosed type 2 diabetes mellitus patients visiting Diabetes OPD, AGMC & GBPH are considered for the study till the sample size is reached.

Results: Correlating mean CIMT with other continuous variables in the study by pearson's correlation test was done. Age($r=0.36$), are strongly correlated with mean CIMT [p value <0.001]. Systolic BP($r=-0.05$, $p=0.349$), Diastolic BP ($r=0.05$, $p=0.389$), BMI($r=-0.04$, $p=0.426$) was not significant.

Conclusion: The study aimed to evaluate atherosclerosis in newly diagnosed type 2 DM patients by measuring CIMT. It is found that nearly 2/3rd of the participants had atherosclerosis at the time of diagnosis of diabetes. Many modifiable and non-modifiable risk factors are associated with atherosclerosis.

Key words: Atherosclerosis, Diabetes mellitus, Hypertension, Obesity.

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorder that shares a phenotype of hyperglycemia. Worldwide prevalence of DM has risen dramatically over the past two decades, from 30million cases in 1985 to 463million in 2019. Type 2 DM accounts for 90- 95% of all DM & prevalence of type 2 DM is rising much more rapidly, presumably because of increasing obesity, reduced activity levels as countries become more industrialized, and the aging of the population. ^[1] Diabetes is the major cause of mortality and morbidity worldwide. The increase in morbidity and mortality rate in diabetes appears to relate to synergism of hyperglycemia with other cardiovascular risk factors like dyslipidemia, hypertension, obesity, reduced physical activity, and cigarette smoking. It was responsible for almost 5million deaths worldwide, accounting for 14.5% of global all cause mortality

in adults aged 20-79 years of age, majority of which are due to Cardio-vascular complications. [2][3] Carotid artery intima-media thickness (CIMT) is the measurement of distance from the lumen-intima interface to media-adventitia interface from the “double line” pattern in the longitudinal “tuning fork” view of B mode ultrasonography of common carotid artery. CIMT is considered the earliest and safest method of assessing atherosclerosis. [4] It is strongly associated with increased cardiovascular risk, independent of the traditional risk factors and helps in risk stratification by comparing the values to age and sex adjusted normograms. [5] Diabetes is an independent risk factor for Cardiovascular Diseases & people with diabetes have 2-4 fold increase risk for Cardio-Vascular Diseases. Across the full spectrum of fasting glucose, haemoglobin A1c (HbA1c), or 2-hour glucose test results, each standard deviation (SD) is associated with a 6–20% increased risk of CVD events. Even 1% increase in HbA1C more than normal increases coronary artery diseases risk by 11-16%. [6] Thus, after controlling all other known cardiovascular risk factors, type 2 DM increase CVD death rate twofold in men and four fold in women. ASCVD in the form of MI and stroke accounts for up to 80% of mortality in type 2 DM. [7]

MATERIALS AND METHODS

A Cross sectional Observational study conducted in the Dept. of General Medicine. All newly diagnosed patients of Diabetes mellitus, attending diabetes OPD, AGMC & GBPH, subjected to inclusion and exclusion criteria. By census method, all the newly diagnosed type 2 diabetes mellitus patients visiting Diabetes OPD, AGMC & GBPH are considered for the study till the sample size is reached. All data was recorded in the proforma designed specifically for this study. On completion of the study, data was entered into Microsoft excel spreadsheet for analysis. Data was recorded and analysed with computer using SPSS version 15.0 and Epi-info- version-7. Continuous data were analyzed by student's *t*-test. The categorical data were analysed by using two-tailed Fisher's exact test. Pearson's correlation test used to analyse mean CIMT and different variables. And finally, multivariate logistic regression analysis is used to find the factors influencing CIMT the most. *P* values less than 0.05 were considered significant.

RESULTS

TABLE 1: Distribution of patients according to BMI

BMI(Kg/m ²)		Frequency	Percentage
<18.5	Underweight	19	5.65
18.5-22.9	Normal	157	46.73
23-24.9	Overweight	40	11.90
25-29.9	Obese I	106	31.55
>30	Obese II	14	4.17
Total		336	100

Table 2: Distribution of participants by CIMT category

CIMT	Number	Percentage
High CVD risk	211	62.8
Normal	125	37.2
Total	336	100.0

Table-3
CIMT
gender, Mean
and
smoking,

Comparison	Correlation coefficient (r)	P value
Age	0.36	<0.001
SBP	-0.05	0.349
DBP	0.05	0.389
BMI	-0.04	0.426

Hypertension

	Mean CIMT	SD	P value
Gender Male	0.6	0.1	0.075
Female	0.7	0.1	
Smoking			
No	0.6	0.1	<0.001
Yes	0.8	0.2	
Hypertension			
Absent	0.7	0.2	0.224
Present	0.7	0.1	

Table-04 Correlation of mean CIMT with age, blood pressure and BMI

Categorical variables like Gender, Smoking, Hypertension are correlated with the MeanCIMT by Independent student t test. While relation between mean CIMT and Smoking was statistically significant (p<0.001), relation between mean CIMT and gender (p=0.075) & mean CIMT and Hypertension (p=0.224) was not significant.

Correlating mean CIMT with other continuous variables in the study by pearson’s correlation test was done. Age(r=0.36), are strongly correlated with mean CIMT [p value <0.001]. Systolic BP(r=-0.05, p=0.349), Diastolic BP (r=0.05, p=0.389), BMI(r=-0.04, p=0.426) was not significant.

Table-05: Association of demographic with Atherosclerosis

Variable	CIMT-normal		CIMT-High risk		P value
	Mean/n	SD/%	Mean/n	SD/%	
Age	48.1	8.9	46.5	7.7	0.113

GENDER					
Male	51	40.8	85	40.3	0.926
Female	74	59.2	126	59.7	
SMOKING					
No	125	100.0	165	78.2	<0.001
Yes	0	0.0	46	21.8	
BMI	23.5	3	23.4	3.4	0.768
SBP	122	12.8	121.1	9.6	0.527
DBP	78.7	8.8	78.9	6.7	0.83

BMI (p=0.76), HDL (p=0.86), SBP (p=0.52), DBP (p=0.83) are not associated with Atherosclerosis in the study population and smoking is associated with atherosclerosis in study population.

DISCUSSION

Atherosclerosis is a multifactorial disease with many modifiable and non-modifiable risk factors. Atherosclerosis in diabetes patients is a result of synergism of hyperglycemia with other cardiovascular risk factors like dyslipidemia, hypertension, obesity, reduced physical activity, and cigarette smoking. So, variables like hyperglycemia (FBS, PPBS, HbA1c), Hypertension (SBP, DBP), Lipid profile (S.cholesterol, Triglycerides, LDL, HDL, VLDL), age, gender, smoking, BMI are evaluated to determine their association and influence on the atherosclerosis. Analysis of data from the study population shows that, mean age of the study population is 47.1 ± 8.1 years and when distributed along the groups with interval of 10, 47.92% of the participants belonged to the age group of 40-49 years, 28.57% belonged to 50-59 years, 13.39% to 30-39 yrs group had and 10.12% to 60-69 yrs. Maximum number of participants belonged to the age group of 40-49 years, supporting the fact that type 2 diabetes is a middle age disease and Asians have younger age onset. A national survey (DESI) conducted in India by Ramachandra et al noted that the onset of diabetes occurred before age 50 in 54.1% of cases.^[8] The DECODA group involving 11 Asian cohorts concludes that — Indians had the highest prevalence of diabetes among Asian countries. The age at which the peak prevalence of diabetes was reached was 10 years younger in Indian compared with Chinese and Japanese subjects.^[9] Nearly 60% of the study population was male and 40% female. Most of the study population is relatively younger, <50 years. In the premenopausal age, women have less risk for diabetes than male. May be that is why males are more than females in number. 46 out of 336 participants i.e 13.7% were smokers and all were male. The numbers are much less than the epidemiological data available for India.^[10] Considering systolic BP ≥ 130 and Diastolic

BP > 80 mmHg as Hypertension, 46% of the participants were hypertensive The data matches with the Sowers JR et al.^[11] But, mean SBP is 122.4 ± 10.9 mmHg, DBP is 78.8 ± 7.6 mmHg.

Most of the patients were borderline or stage I hypertensive. Normal BMI and limits for obesity are set at lower values for Asians, since they have greater tendency to harmful intra-abdominal obesity at lower BMI and consequences for the metabolic and the cardiovascular health are disproportionate to the obesity.^[12] Mohan et al notes that at any given BMI, Indians have higher prevalence of type 2 DM.^[13] According to IOTF (International Obesity Task Force), BMI for Asians is categorized as follows: <18.5 as underweight. 18.5-22.9 as overweight, 25-29.9 as obese I, >30Kg/m² as obese II. 46.7% of my study population has normal BMI 11.9% were overweight. 31.5% were obese I, 4.17% were obese II. Mean BMI was 23.46 and median was 22.82Kg/m². It supports the observations from Mohan et al that south Asians are at risk of type 2 DM at lower BMI. Mean of LFW CIMT is 0.7±0.2 mm, Mean of RFW is 0.6±0.1mm. Left far wall CIMT is slightly more than the Right far wall as found in many other studies like ARIC, Rotterdam, MESA,..etc Mean of average of the two side walls i.e mean of mean CIMT is 0.7±0.1mm. considering the mean age of the study group, mean is greater than reference values for Indian population by Kasliwal et al. When categorized the mean CIMT into normal and high risk according to these age and sex adjusted reference values, 211 participants i.e 62.8% of newly diagnosed type 2 diabetes had atherosclerosis. Among them 61 patients had plaques, making upto 18% of the total study population. It is proved in many studies like. Jeevarethinam et al. plaques are more predictive of CVD risk than the high CIMT or coronary calcium scoring.^[14]

CONCLUSION

India is the second leading country with 70 million diabetes patients, 90-95% of which are type 2 Diabetes. The phenotype of diabetes is different with onset at the younger age and lower body mass index. Nearly half of the people with diabetes are undiagnosed and they present with one or more complications of diabetes at the time of diagnosis. Atherosclerotic cardiovascular diseases are the most common cause of morbidity and mortality among diabetes

The study aimed to evaluate atherosclerosis in newly diagnosed type 2 DM patients by measuring CIMT. It is found that nearly 2/3rd of the participants had atherosclerosis at the time of diagnosis of diabetes. Many modifiable and non-modifiable risk factors are associated with atherosclerosis.

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