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Study of Carotid Intima Media Thickness in Type Ii Diabetic Patients

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Abstract: *Carotid intima media thickness is commonly used as a diagnostic marker for atherosclerosis. CIMT which we measure is a tool which is non-invasive and helps to identify the complications of diabetes. Patients with type 2 diabetes mellitus mostly suffer from premature and severe atherosclerosis. The present research was carried out to study the carotid intima thickness in type 2 diabetic patients. The results showed that there was a significant increase in the carotid intima medial thickness observed in DM with Metabolic syndrome without BP component patients as compared to DM without Metabolic syndrome and also measuring the IMT of the common carotid artery can be a simple non-invasive method to measure generalized atherosclerosis and can be considered as marker of cardiovascular and cerebrovascular events in future.*

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I. Introduction

Carotid Intima Media Thickness (CIMT) is the area of the tissue starting at the luminal edge of the artery and ending at the boundary that is between the carotid media and the adventitia.[1]B-mode ultrasound is thus helping in measuring the composite thickness of the carotid intima and carotidmedia. The 'double-line pattern' is mentioned as the distance between the two echogenic lines that will represent the carotid lumen–intima interface and thecarotid media–adventitia interface. 0.6 mm to 0.7 mm is considered normal in healthy individuals and more than that is considered abnormal CIMT.[2]The carotid intima media thickness increases every year 0.005 mm to 0.010 /year and is independent of age.[3]The range of CIMT doesn't remain the same it so anything above 1 mm is considered abnormal.[4]

Diabetes mellitus is such a group of metabolic disorders in which there are elevated blood sugar levels and is very much associated with a risk of cardiovascular disease. Carotid intima media thickness is commonly used as a diagnostic marker for atherosclerosis. CIMT which we measure is a tool which is non-invasive and helps to identify the complications of diabetes. It does also help to evaluate the effectiveness of different treatment strategies used to treat people with diabetes.

Diabetes Mellitus is also associated with increase in mortality in cardiovascular patients. People who are at higher risk can be identified and this can help in the treatment strategies which will reduce the mortality and morbidity. CIMT measurement is comparatively easy and non-invasive technique to identify people with atherosclerosis. Patients with diabetes have been having higher CIMT than the normal population.

Patients with type 2 diabetes mellitus mostly suffer from premature and severe atherosclerosis. "The Framingham study pointed out that diabetic individuals have higher concentration of serum lipids, hypertension, obesity and thus are more prone to advanced atherosclerosis and its sequel i.e., coronary artery disease.''[5]

CIMT increases in the presence of macro vascular complications of diabetes. There are various treatment methods in diabetes which has shown to reduce complications in diabetes and which can also cause regression of CIMT. Thus, regular and routine measurement of CIMT may help to detect early in risk stratification and help in better use of different treatment strategies in patients with diabetes.

High resolution B mode ultrasound is a non-invasive technique used to assess atherosclerosis in superficial arteries like carotid arteries. It allows accurate measurement of distance between blood-intima and media- adventitia interfaces of carotid wall, which is defined as carotid intima media thickness(CIMT).[6]

Objective

1.To study the carotid intima media thickness in type II diabetic patients and to demonstrate the association of increased carotid intima media thickness with non-blood pressure component metabolic syndrome.

Methods

The study was conducted on Patients with Type 2 diabetes mellitus admitted in MGM Hospital, Kamothe,Navi Mumbai.

Fasting blood sugar was done on day of admission

Carotid Doppler was done and CIMT was calculated using B mode ultrasound.

Blood pressure measurements of patients were taken.Three readings were taken in right arm supine position. Mean values of second and third reading were taken.

Subjects were divided into those having non hypertensive component of metabolic syndrome when they had at least any 3 of the below mentioned criteria.

1) Body Mass Index (BMI) more than or equal to 30 kg/m^2.
2) Fasting blood sugar (FBS)morethan or equal to 110 mg/dl
3) Fasting Plasma Triglyceride (TG) more than or equal to 150mg/dl
4) High density Lipoprotein (HDL) less than or equal to 40 mg/dl.(men) and less than or equal to 50 mg/dl (women).

Accordingly the subjects were divided into two groups:

1) Group I – Diabetic patients without metabolic syndrome
2) Group II – Diabetic patients with non-blood pressure component metabolic syndrome

50 cases of type 2 diabetes mellitusadmitted in ICCU and ward, MGM Hospital,Kamothe out of which 24 patients were not having metabolic syndrome and 26 having non-blood pressure component metabolic syndromewere studied during the period of March2017 to October 2018.

Inclusion Criteria:

- Patients with type 2 diabetes of duration more than 2 years ,
- With age more than 35 years,
- Both sex
- Patients with systolic blood pressure less than or equal to 135 mm Hg and diastolic blood pressure with less than or equal to 80 mmHg were taken.

Exclusion Criteria:

- Patients with CHF
- Patients with renal disease
- Patients with Thyroid disease
- Patients with Hepatic disease
- Patients with Stroke
- Patients with Rheumatoid disease

Investigations

- FBS
- Lipid Profile
- High resolution B-mode ultrasonography of carotid arteries.

Statistical Analysis

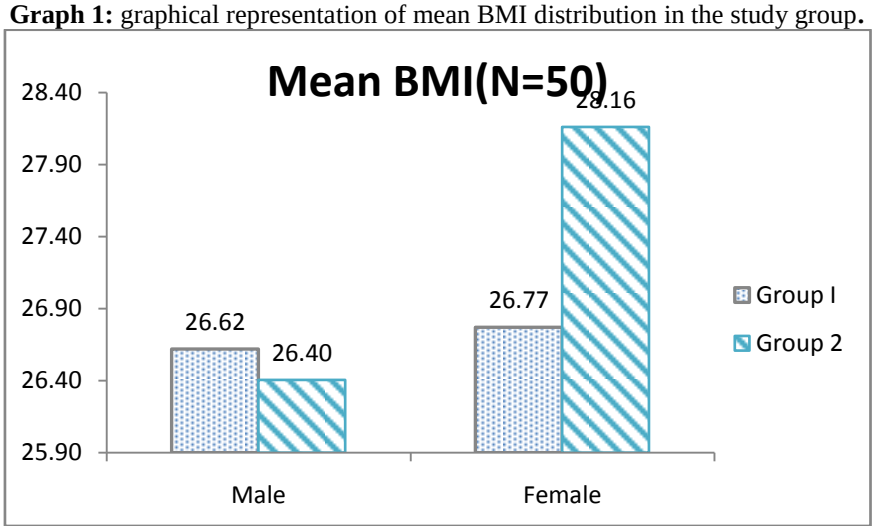
Table 1: BMI distribution in the study group

		Group (N=50)	
BMI	SEX	Group I(n=24)	Group 2(n=26)
18.2-34.4	Male	26.62	26.40
18.2-34.4	Female	26.77	28.16
	Mean	26.6375	26.7423

Table 2: mean BMI distribution with standard deviation in the study group.

Group Statistics						
Group		N	Mean	Std. Deviation	P-Value	Significance
BMI	Group I	24	26.6375	3.82518	0.92300	Non-Significant
	Group 2	26	26.7423	3.79359		

Graph 1: graphical representation of mean BMI distribution in the study group**.**

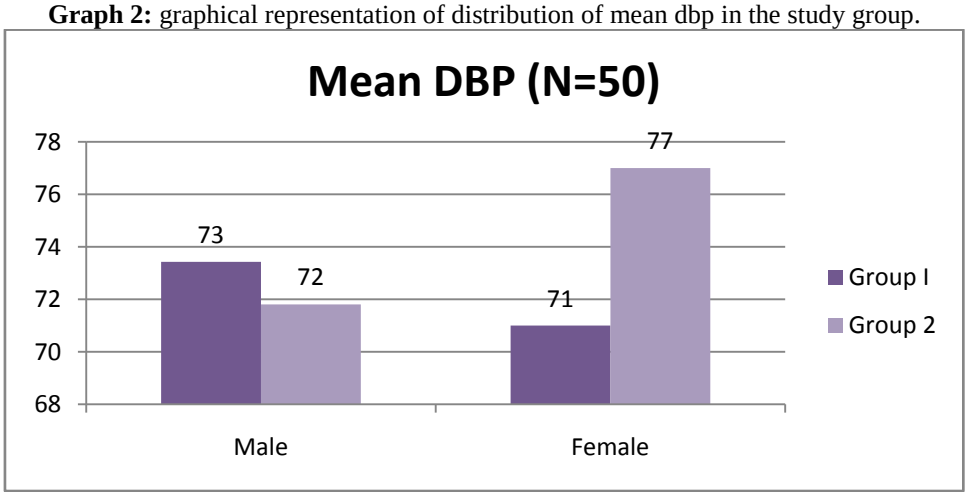


Group 1: Mean BMI levels in males was 26.62 and in females was 26.77
Group 2: Mean BMI levels in males was 26.40 and in females was 28.16

Table 3: distribution of mean diastolic blood pressure in the study group.

DBP	**SEX**	**Group I (n=24)**	**Group 2(n=26)**
<=80mmHg	Male	73	72
<=80mmHg	Female	71	77

Graph 2: graphical representation of distribution of mean dbp in the study group.



The table 1 and graph 1 shows mean of diastolic blood pressure in the study group and as shown mean DBP was almost equal in both groups.

Table 4:distribution of systolic blood pressure in the study group.

		TOTAL (n= 50)	
SBP	SEX	Group 1(n=24)	Group 2(n=26)
<=135mmHg	Male	125	125
<=135 mmHg	Female	119	123

Graph 3: graphical representation of distribution of mean sbp in the study group.

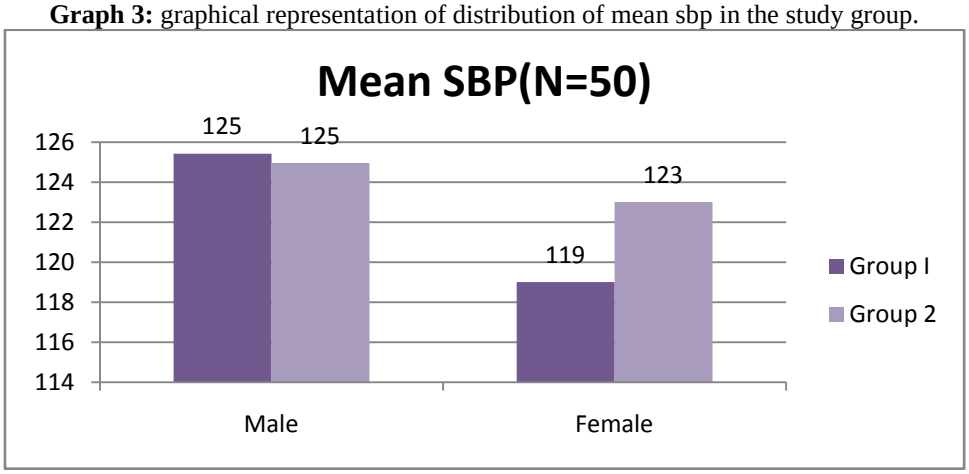


Table 2 and graph 2: Showed mean systolic blood pressure distribution in the study group.
There was no significant difference in mean systolic blood pressure in two groups.

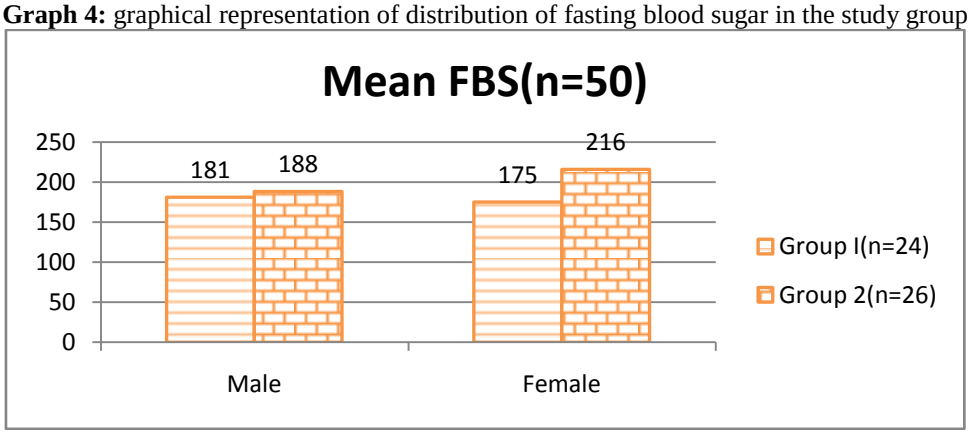
Table 5: distribution of fasting blood sugar in the study group

		GROUP(N=50)	
FBS	SEX	Group I(n=24)	Group 2(n=26)
180-290	Male	181	188
180-290	Female	175	216

Table 6: distribution of mean and standard deviation of fasting blood sugar in the study group.

Group Statistics						
Group		N	Mean	Std. Deviation	P-Value	Significance
FBS	Group I	24	180.42	41.642	0.039	Significant
	Group 2	26	193.77	37.553		

Graph 4: graphical representation of distribution of fasting blood sugar in the study group

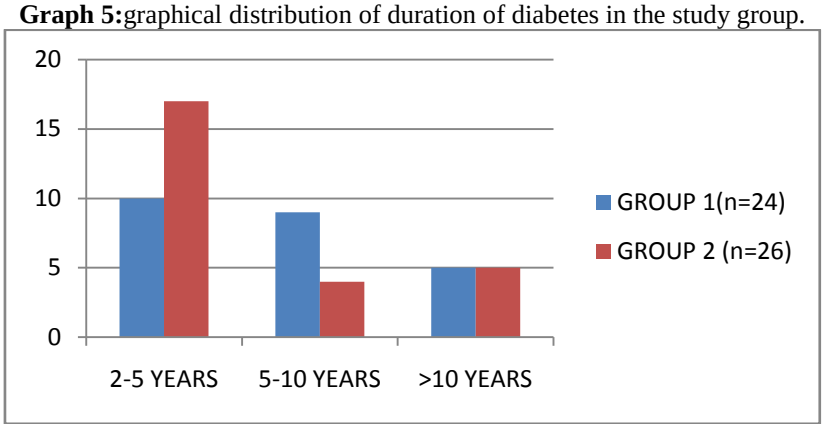


Group I: Mean FBS levels in males was 181 and females was 175
Group II:Mean FBS levels in males was 188 and females was 216.
Group 2 had higher meanFBS (193.7(n=26)) as compared to (180.4 (n=24))in group 1 with statistically significant p-value (0.039).

Table 7: distribution of duration of diabetes in the study group

	GROUP 1(n=24)	GROUP 2 (n=26)	TOTAL (n=50)
2-5 YEARS	10(41.6 %)	17(65.38%)	27 (55.08 %)
5-10 YEARS	9(37.5%)	4(15.38 %)	13 (26 %)
>10 YEARS	5(20.83%)	5(19.23%)	10 (20%)

Graph 5:graphical distribution of duration of diabetes in the study group.



Maximum number of patients had diabetes from 2-5 years 27 (55 %) with minimum from 5-10 years 10(20%)

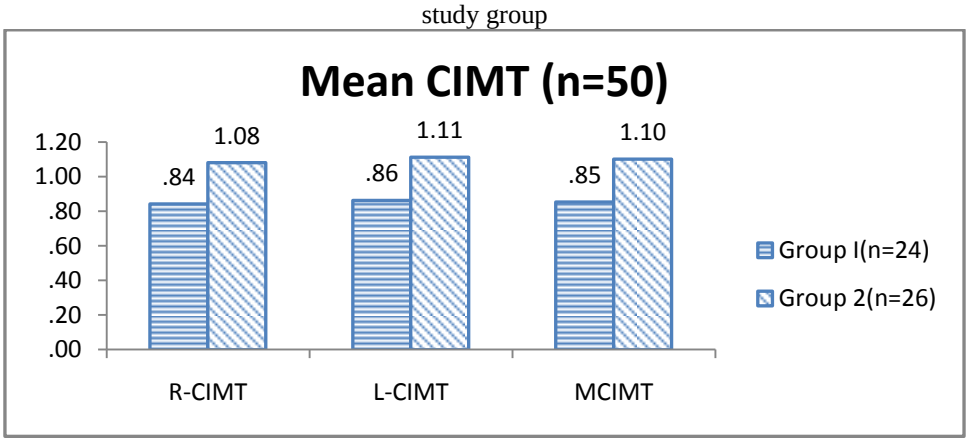
Table 8: distribution of left, right and mean common carotid artery intima media thickness in the study group

	Group(N=50)		
	Group I(N=24)	Group 2(N=26)	Total
R-CIMT	.84	1.08	.97
L-CIMT	.86	1.11	.99
MCIMT	.85	1.10	.98

Table9: mean and standard deviation of distribution of left,right and mean common carotid artery intima media thickness in the study group.

Group Statistics						
Group		N=50	Mean	Std. Deviation	P-Value	Significant
R-CIMT	Group I	24	.8417	.17673	.00000	Significant
	Group 2	26	1.0808	.23625		
L-CIMT	Group I	24	.8625	.18371	.00000	Significant
	Group 2	26	1.1115	.21086		
MCIMT	Group I	24	.8542	.17565	.00000	Significant
	Group 2	26	1.1019	.20808		

Graph 6: graphical representation of left right and mean common carotid arteryintima media thickness in the study group



Group I showed: Mean L-CIMT- 0.86, Mean R-CIMT -0.84, Mean CIMT-0.85
Group 2 showed: Mean L-CIMT-1.08, Mean R-CIMT-1.11, Mean CIMT-1.10

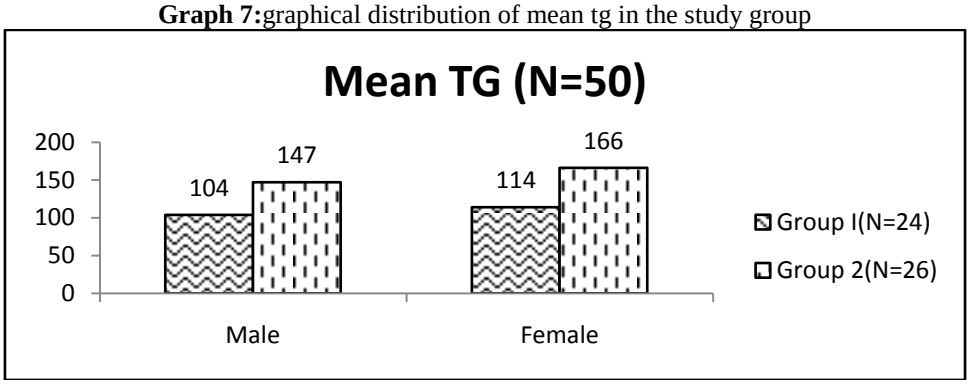
Table 10: distribution of fasting plasma triglycerides in the study group

		Group (N=50)	
TG	SEX	Group 1(N=24)	Group 2(N=26)
100-200	Male	104	147
100-200	Female	114	166

Table 11: distribution of mean tg and standard deviation in study group

Group Statistics						
Group		N	Mean	Std. Deviation	P-Value	Significance
TG	Group 1	24	104.96	50.061	0.001	Significant
	Group 2	26	150.69	36.943		

Graph 7:graphical distribution of mean tg in the study group



Group 1: Mean TG levels in males were104 andfemales were 114.
Group 2: Mean TG levels were 147 in males and 166 in females.
Table 11: Group 2 showed increase in serum triglycerides 150.69 (n=26) vs104.9 (n=24)than in group 1.P-valuewas 0.001 and it was statistically significant.

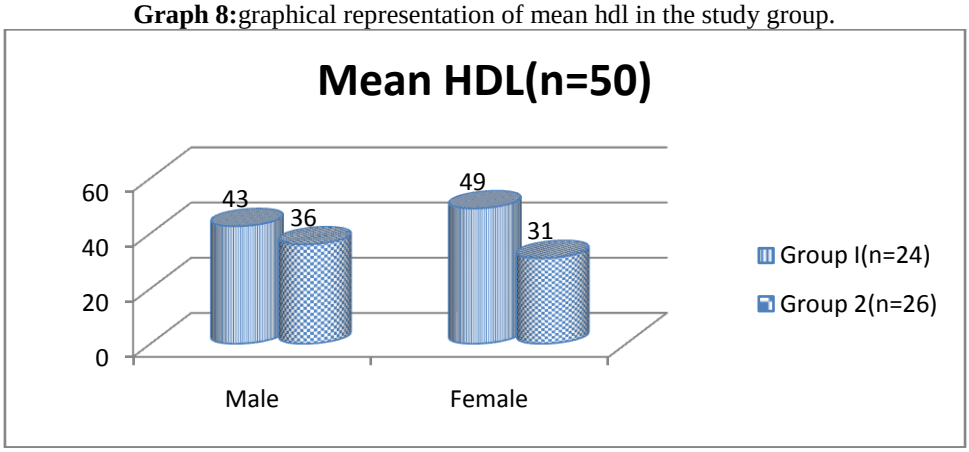
Table 12: distribution of fasting plasma hdl in study group

		Group(N=50)	
HDL	SEX	Group 1(N=24)	Group 2 (N=26)
22-56	Male	43	36
	Female	49	31

Table 13: distribution of mean hdl and standard deviation in study group

Group Statistics						
Group		N	Mean	Std. Deviation	P-Value	Significance
HDL	Group 1	24	43.38	10.770	0.003	Significant
	Group 2	26	35.04	8.326		

Graph 8:graphical representation of mean hdl in the study group.



Group 1: Mean HDL levels in males was 43 and females was 49.
GROUP II: Mean HDL levels in males was 36 and females was 31.
The mean value of HDL was significantly lower in group 2 (35.04) as compared to group 1 (43.3)

II. Results and Discussion

In DM patients without metabolic syndrome, the mean L-CIMT was 0.84, mean R-CIMT was 0.86 and mean of mean-CIMT was 0.85 whereas in DM patients with non blood pressure component metabolic syndrome, the mean L –CIMT was 1.08, R-CIMT was 1.1 and mean of mean CIMT was 1.10. L-CIMT, R-CIMT and M-CIMT were significantly higher in patients with non blood pressure component metabolic syndrome (p=0.000). A high mean CIMT was seen in 52 % population of our study.

In this study the type 2 diabetes mellitus patients with non blood pressure component metabolic syndrome had significantly raised mean common carotid IMT's than those who are free from metabolic syndrome. In the present study, mean BMI was 26.63 in both groups with p=0.9.In this study,group 2 had raised mean triglycerides(150.69) and low HDL (35.04) with p –value 0.001 and 0.003 respectively. These are similar to a study conducted byKavitaBendwal (2018) where all the patients were divided into 3 groups according to their triglyceride levels NN, NH and HH was 0.96 +-0.26,1.64+- 0.39 and 1.94 +-0.57mm respectively. The CIMT was higher in the NH and HH groups in comparison with that in the NN group with p<0.001.[7]

Type two diabetes mellitus patients with non blood pressure component metabolic syndromehad significant greater mean common carotid IMT (1.1 mm)with P<0.05than those who were free from metabolic syndrome (less than or equal to 0.8 mm) this co-relates to the cross study conducted by Marwan S.M. Al-Nimer and IsmailI.Hussein (2009). They reported increase in mean carotid intima media thickness type 2 diabeticpatients with non blood pressure component metabolic syndrome. Common carotid intima media thickness was (0.824 +- 0.155 mm) but not in the internal carotid artery in group II patients compared to group 1 patients(0.708 +- 0.113 mm).[8]There was another study conducted by Kovaite et. al. (2007) where prevalence of Metabolic syndrome was a significant predictor for the presence of plaques in carotid artery(OR+0.341, 95% Cl (0.173-0.673), p=0.002) however our study showed different result, that non blood pressure component metabolic syndrome had raised CIMT (1.11mm p= 0.000).[9]

III. Conclusion

Diabetes mellitus is a silent killer with a very high prevalence, early detection and good control is a key to preventing diabetic complications. Metabolic syndrome with diabetes increases cardiovascular risk factors. Measuring carotid IMT is a strong independent marker for predicting future cardiovascular and cerebrovascular events. Carotid intima media thickness was increased significantly in type II diabetic patients. There was significant increase in the carotid intima medial thickness observed in DM with Metabolic syndrome without BP component patients as compared DM without Metabolic syndrome. The present study showed measuring the IMT of the common carotid artery can be a simple non-invasive method to measure generalized atherosclerosis and can be considered as marker of cardiovascular and cerebrovascular events in future.

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