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Cardiology

CORRELATION BETWEEN CAROTID INTIMA MEDIA THICKNESS AND HBA1C LEVELS IN NEWLY DETECTED TYPE 2 DIABETES MELLITUS PATIENTS.

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ABSTRACT **Background:** The carotid intima media thickness (CIMT) is increased in patients with postprandial hypertriglyceridemia despite normal fasting triglyceride levels. **Objetives:** 1. To determine the carotid intima media thickness (CIMT) and HbA1c levels in newly diagnosed type 2 diabetic patients. 2. To find out correlation between carotid intima media thickness (CIMT) and HbA1c levels in newly diagnosed type 2 diabetic patients. **Materials & Methods-** This present cross sectional study was done in a tertiary health care centre on 201 study subjects. **Results:** In right side of carotid artery, 11 patients were there whose post meal glucose were more than 400 & also having carotid intima media thickness >0.09mm. Similar findings were found in left side of carotid artery also. Co-relation between carotid intima media thickness & Post prandial blood glucose level was found to be statistically significant. Carotid intima media thickness >0.9mm was found more in patients having increased HbA1c. And the relation between glycocylated haemoglobin & carotid intima media thickness was found statistically significant on both sides. ($p<0.05$). **Conclusion:** The significant correlation between HBA1C level and carotid intima media thickness in this study suggests that carotid intima media thickness estimation is an early risk factor assessment tool in type 2 diabetics.

KEYWORDS : Carotid Intima Media Thickness, Hba1C, Type II diabetes mellitus

INTRODUCTION

Diabetes is frequently associated with the development of premature atherosclerotic vascular disease. This increased risk has been attributed to the high prevalence of multiple atherosclerotic risk factors among diabetic patients. Coronary artery disease in type 2 diabetics cannot be accounted for by the levels of four major risk factors identified viz. hypertension, smoking, total serum cholesterol and age suggesting a role for other factors. [1]

The dyslipidemia that accompanies type 2 diabetes plays an important role in the pathogenesis of accelerated atherosclerosis. The most important components of this dyslipidemia are an elevated very low-density lipoproteins (VLDL), total triglycerides (TG's) and a decreased high-density lipoproteins (HDL) concentration in the serum. [2]

Atherosclerosis, unless in a severe form, is often asymptomatic, so that a direct examination of the vessel wall is necessary to detect affected individuals in the early stages. Measurement of the carotid intimal-medial thickness (CIMT) of the common carotid artery (CCA) by B-mode ultrasound was found to be a suitable noninvasive method to visualize the arterial walls and to monitor the early stages of the atherosclerotic process. An increased CIMT was observed in type 2 diabetic patients. This increase in carotid intima media thickness is associated with an increased risk of ischemic heart disease (IHD) and cerebrovascular disease (CVD) in diabetics. [3]

The carotid intima media thickness (CIMT) is increased in patients with postprandial hypertriglyceridemia despite normal fasting triglyceride levels. Sonographic evaluation of the carotid artery intima–media thickness is a simple, noninvasive and reproducible imaging parameter to evaluate atherosclerosis and predict coronary artery disease. Recently, considerable attention has been directed at the wall thickness of the carotid arteries as an early marker of atherosclerotic disease and as a means of showing the effectiveness of medical therapies in treating atherosclerosis. [4] Noninvasive techniques such as B-mode ultrasound can directly assess the intima–media thickness (IMT), which corresponds to the thickness of the histologic intima and media. [5]

The increasing incidence of cardiovascular disease in the Indian society and the possible utility of the simple technique of IMT measurement were the motivation to undertake this study. Sonographic evaluation of the carotid artery intima–media thickness is a simple, noninvasive and reproducible imaging parameter to evaluate atherosclerosis and predict coronary artery disease. [6]

So we conducted this study to investigate correlation between the carotid artery intima-media thickness (CIMT) and Hba1c Levels in Newly Diagnosed type 2 Diabetes mellitus in patients attending tertiary care centre.

MATERIALS & METHODS

This was a non-interventional, cross sectional study of patients who were newly detected to have Type-2 Diabetes Mellitus in a tertiary care centre. Patients who satisfied the inclusion criteria were selected at random from the outpatient department, speciality endocrinology clinic and indoor patients of a tertiary care centre. Study was conducted during a period of January 2016 to June 2018 on 201 patients.

This study was conducted after proper permission of ethical committee in December 2016. Newly diagnosed type 2 diabetes patients (as per American Diabetes Association 2016 guidelines) with age more than 18 years were included in the study.

Known diabetic patients on treatment, Smokers, Patients with previous history of cardiovascular diseases,patients having 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) were excluded from study.

The present study was conducted in a tertiary care teaching center. Study population was identified from outpatient department (OPD), endocrinology OPD and those admitted in wards who satisfied inclusion criteria. Endocrinology OPD is conducted under the department of Medicine every week on Tuesdays at 3 PM to 5.30PM. Endocrinologist is the in charge of this specialty clinic. Informed written consent was taken from patient. Once patient was enrolled in the study patient was thoroughly interviewed, examined and investigated by the investigator. Routine investigations, BSL Fasting and PP were done from CCL of the institution. HbA1C was measured with the commercially available HbA1C testing kits in the department laboratory by a biochemist. After these selected patients were given appointment date for carotid Doppler. On appointment date follow up

with the patient and carotid Doppler was done under the supervision of a cardiologist. In the present institution there is cardiology department having four cardiologists who do echo by rotation.

This study was done under guidance of one cardiologist. Investigator was also trained and certified for conducting carotid doppler for the research purpose. Carotid doppler of every selected patient was done on Philips HB 11 Scan B Machine with was used. The examination was done by the investigator under the guidance of cardiologist. The examination was performed as follows- patient lying supine position with the neck slightly extended and head directed away from the side of interest, image was obtained systematically at the common carotid artery, intima media interference was recognized image was zoomed and 2 values were obtained and mean of the both values was taken. The examination was done bilaterally one after the other on common carotid artery. After the carotid Doppler , Preformulated proforma was filled, and the data was entered in master chart in MS-excel on regular intervals. Data of 200 selected patients was analyzed with the help of SPSS software version 20. On analysis of data observations were noted and results were formulated.

RESULTS

In present study majority of study subjects were belong to age group 41-60 years followed by above 60 years, only 13 % were in age group 21-40 years. In this present study out of total 201 study subjects, male were 107 and remaining 94 were female. (Pie Diag.1)

Table No.1: Distribution of study subjects according to HbA1c (n=201)

HbA1c level	Number (%)
<6.5	43 (21.39)
6.5-7.5	47 (23.38)
7.6-8.5	58 (28.85)
8.6-9.5	33 (16.42)
>9.5	20 (9.96)
Total	201 (100)

Most of the study subjects have HbA1c level between 7.6-8.5 i.e. (28.85 %) followed by between 6.5 to 7.5 (23.38%). Only 9.96 % have HbA1c level more than 9.5

Table No.2: Carotid Intima media thickness of right & Left common carotid artery

Carotid intima media thickness	Right side	Left side
<0.9 mm	124	113
>0.9 mm	77	88
Total	201	201

77 study subjects have raised carotid intima media thickness (>0.9 mm) on right side & 88 study subjects on left side.

Table No. 3: Relation between fasting blood glucose level and carotid intima media thickness

FBS	126-200	>200	P VALUE
RIGHT CIMT >0.9MM	39	37	0.005
RIGHT CIMT <0.9MM	88	36	
LEFT CIMT >0.9MM	48	37	0.0056
LEFT CIMT <0.9MM	80	35	

(CIMT- carotid intima media thickness)

In right side of carotid artery, 37 patients were there whose fasting glucose were more than 200 & also having carotid intima media thickness >0.09mm. similar findings were found in left side of carotid artery also. Co-relation between carotid intima media thickness & fasting blood glucose level was found to be statistically significant (P <0.05)

Table No.4: Relation between post prandial blood glucose level and carotid intima media thickness

PPBS	200-400	>400	P VALUE
RIGHT CIMT >0.9MM	65	11	0.008
RIGHT CIMT <0.9MM	119	05	
LEFT CIMT >0.9MM	75	11	0.03
LEFT CIMT <0.9MM	109	05	

(CIMT- carotid intima media thickness)

In right side of carotid artery, 11 patients were there whose post meal glucose were more than 400 & also having carotid intima media thickness >0.09mm. Similar findings were found in left side of carotid artery also. Co-relation between carotid intima media thickness & Post prandial blood glucose level was found to be statistically significant (P <0.05)

Table No.5: Relation between age & carotid intima media thickness

Age (In years)	Right sided thickness		P value (X2 test)	Left sided thickness		p value (X2 test)
	<0.9	>0.9		<0.9	>0.9	
21-40	14	14	0.074 (5.191)	15	13	0.053 (5.849)
41-60	78	36		72	42	
>60	32	27		26	33	
Total	124	77		113	88	

In this study among 201 study subjects, it was found that carotid intima media thickness >0.9mm was found in 77 patients in right side and 88 patients in left side. In both side the thickness >0.9mm were found in age group 41-60 years.

But the relation between age & carotid intima media thickness was not found statistically significant on both sides.

Table No.6: Relation between gender & carotid intima media thickness

Gender	Right sided thickness		P value (X2 test)	Left sided thickness		P value (X2 test)
	<0.9	>0.9		<0.9	>0.9	
Male	71	36	0.146 (2.105)	64	43	0.273 (1.200)
Female	53	41		49	45	
Total	124	77		113	88	

In this study among all study subjects, it was found that carotid intima media thickness >0.9mm was found in more in males as compared to female on both sides. And the relation between gender & carotid intima media thickness was not found statistically significant on both sides.

Table No.7: Relation between BMI & carotid intima media thickness

BMI	Right sided thickness		P value (X2 test)	Left sided thickness		P value (X2 test)
	<0.9	>0.9		<0.9	>0.9	
<24.9	43	32	0.326 (0.961)	43	32	0.805 (0.060)
>25	81	45		70	56	
Total	124	77		113	88	

In this study among all study subjects, it was found that carotid intima media thickness >0.9mm was found more in patients having BMI >25 kg/M^2. And the relation between BMI & carotid intima media thickness was not found statistically significant on both sides.

Table No.8: Relation between waist hip ratio & carotid intima media thickness

WHR	Right sided thickness		P value (X2 test)	Left sided thickness		P value (X2 test)
	<0.9	>0.9		<0.9	>0.9	
Normal	49	37	1.310 (0.234)	52	34	1.101 (0.294)
Increased	75	40		61	54	
Total	124	77		113	88	

In this study among 201 study subjects, it was found that carotid intima media thickness >0.9mm was found more in patients having increased waist hip ratio. And the relation between WHR & carotid intima media thickness was not found statistically significant on both sides.

Table No.9: Relation between HbA1c & carotid intima media thickness

HbA1c	Right sided thickness		P value (X2 test)	Left sided thickness		P value (X2 test)
	<0.9	>0.9		<0.9	>0.9	
<6.5	40	11	0.0044 (8.103)	37	14	0.0065 (7.404)
>6.5	84	66		76	74	
Total	124	77		113	88	

In this study among 201 study subjects, it was found that carotid intima media thickness >0.9mm was found more in patients having increased HbA1c. And the relation between glycocylated haemoglobin & carotid intima media thickness was found statistically significant on both sides. ($p<0.05$).

DISCUSSION:

HBA1C level reflect the blood glucose level of last 3 months. It also reflect level of blood sugar level control. Based on the results of studies such as the Diabetes Control and Complications Trial (DCCT), which showed that tight blood glucose control could reduce the risk of diabetic eye, kidney and nerve disease, the American Diabetes Association (ADA) recommends that people with diabetes try to keep their HbA1c in 5.7-6.4 range [7]

In our study of 201, 43(21.39%) patients had HBA1Clevel less than 6.5%, 158 (78.60%) of the patients had HBA1C level more than 6.5%. so in our study most of the patients blood sugar were high as indicated by raised HBA1C value.

Malthesh M K et al [8] in their study compared CIMT and HBA1clevel in relation with age and sex. They found that A total of 200 newly diagnosed diabetic patients. The observed HbA1C range was 6.17-13.67% (mean =10.21% ±2.41).

Serdar Olt et al [9] in their study found that 69,2% of the patients were female, 30,8% were male. The mean age of the patients were 58,4 ±10,7 year. The mean HbA1c values of the patients were 8,6 ±2,03 %.

In our study of 201 patients 75 patients had increased CIMT with post prandial blood level between 200 to 400 mg/dl and 11 patients had increased CIMT with post prandial blood glucose level more than 400 mg/dl, 109 patients had normal CIMT with blood glucose level between 200 to 400 mg/dl and 5 patients had normal CIMT with post prandial level more than 400 mg/dl on left side.on applying chi square test ,increased CIMT value on leftt side correlated well with fasting blood glucose level with p value 0.05.

Liu Gao,lingling BAI, Yukun Li et al [10] in their study of association between carotid intima media thickness and fasting blood glucose level. They concluded that the mean carotid intima media thickness increased by 0.002mm with each increase 1mmol/l(18 mg/dl) in fasting blood glucose level (p value 0.023).

Aydin Y ,et al [11] in their study of evaluation of carotid intima media thickness in impaired glucose and impaired glucose tolerance. They concluded both in impaired fasting glucose and impaired glucose tolerance patients had increased carotid intima media thickness with p value 0.001

CONCLUSION

The significant correlation between HBA1C level and carotid intima media thickness in this study suggests that carotid intima media thickness estimation is an early risk factor assessment tool in type 2 diabetics. Positive correlation between fasting and postprandial blood sugar levels with carotid intima media thickness implies that strict control of fasting and post prandial glucose level needed to prevent major cardiovascular and cerebrovascular diseases.

REFERENCES

1. Michiel L. Bots, Arno W. Hoes, Peter J. Koudstaal, Albert Hofman, Diederick E. Grobbee. Common carotid intima-media thickness and risk of stroke and myocardial infarction: the Rotterdam Study. Circulation. 1997; 96:1432-1437
2. Hodis HN, Mack WJ, LaBree L, Selzer RH, Liu CR, Liu CH. The Role of Carotid Arterial Intima-Media Thickness in Predicting Clinical Coronary Events. Ann Intern Med. 1998 Feb 15; 128(4):262-910.
3. Leary DH, Polak JF, Kronmal RA, Manolio TA, Burke GL, Wolfson SK Jr.Carotid-artery intima and media thickness as a risk factor for myocardial infarction and stroke in older adults. N Engl J Med. 1999 Jan 7; 340(1):14-22
4. Bigazzi R, Bianchi S, Nenci R, Baldari D, Baldari G, Campese VM. Increased thickness of the carotid artery in patients with essential hypertension and microalbuminuria. J Hum Hypertens. 1995; Oct; 9(10): 827-33
5. M Adaikkappan, R Sampath, AJW Felix, S Sethupathy. Evaluation of atherosclerosis by B Mode Ultrasonographic study in Hypertensive patients compared with Normotensive Patients. IJRI 2002 12:3:365-368
6. Sidney C. Smith, Philip Greenland, Scott M. Grundy. Beyond secondary prevention: identifying the high risk patient for primary prevention. Executive summary. Circulation. 2000; 101:111
7. Sosensko, J.M. et al. "Glycosylation of various haemoglobin in normal and diabetic subject", diabetes care 1980; 3: 590-3
8. Malthesh M K. Correlation Between the Carotid Artery Intima-Media Thickness And Hba1c Levels in Newly Diagnosed Diabetic Patients in An Urban Population Around Davangere. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 6 Ver. IX (June 2016), PP 111-114.
9. Serdar Olt, Mehmet Şirik. The relationship between HbA1c and carotid intima-media thickness in type 2 diabetic patients. Pan African Medical Journal. 2016; 23:224.
10. Gao L, Bai L, Shi M, Ni J, Lu H, Wu Y, Tu J, Ning X, Wang J, Li Y. Association between carotid intima-media thickness and fasting blood glucose level: A population-based cross-sectional study among low-income adults in rural China. J Diabetes Investig. 2017 Nov;8(6):788-797. doi: 10.1111/jdi.12639. Epub 2017 Mar 22. PMID: 28160451; PMCID: PMC5668475.
11. Aydin Y, Berker D, Ustün I, Gül K, Erden G, Kutlucan A, Yilmaz Aydin L, Güler S. Evaluation of carotid intima media thickness in impaired fasting glucose and impaired glucose tolerance. Minerva Endocrinol. 2011 Sep;36(3):171-9. PMID: 22019748.