

International Journal of Radiology and Diagnostic Imaging



E-ISSN: 2664-4444
P-ISSN: 2664-4436
www.radiologypaper.com
IJRDI 2024; 7(3): 27-29
Received: 23-05-2024
Accepted: 28-06-2024

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Measurement of carotid intima media thickness in type 2 diabetes mellitus patients who underwent carotid Doppler in a tertiary hospital of Nepal

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DOI: <https://doi.org/10.33545/26644436.2024.v7.i3a.393>

Abstract

Objective: We conducted a descriptive cross sectional study to measure the carotid intima media thickness by ultrasonography in Type 2 Diabetes Mellitus patients attending our tertiary hospital.

Methodology: Study population consisted of 70 patients (42 males & 28 females) diagnosed with Type 2 Diabetes Mellitus and referred to Department of Radiology for Carotid Doppler examination. Inclusion criteria were age > 25 years, normotensive & diagnosed T2DM at least one year back. Type 1 Diabetic patients, hypertensive patients and patients with history of stroke were excluded from the study. B-mode ultrasonography of common carotid and internal carotid arteries of both side was performed by same Radiologist in Toshiba Aplio 400 USG machine using 7-12 MHz linear probe. Carotid intima media thickness (CIMT) was measured at common carotid artery, carotid bulb and internal carotid artery on each side and average value was calculated. Collected data was entered in SPSS 20 and analyzed.

Results: Mean CIMT was 0.88 ± 0.12 mm ranging from 0.71 mm to 1.4 mm. Mean CIMT value was more in male than in female. Mean age of the study population was 53.8 years. Mean CIMT was seen increasing with age with highest value of 1.20 ± 0.17 mm in 60 years or older and lowest value of 0.75 ± 0.08 mm in < 40 years.

Conclusion: This study showed patients with Type 2 Diabetes Mellitus have increased carotid intima media thickness and its measurement by ultrasonography is useful tool for early detection of risk of cardiovascular attack associated with the disease.

Keywords: Carotid intima media thickness, ultrasonography, type2 DM

Introduction

Carotid intima media thickness (CIMT) is an early marker of atherosclerosis ^[1]. It can be easily measured by ultrasonography in simple and non-invasive way. Measurement of CIMT by B-mode ultrasound correlates very well with histological intima and media ^[2]. Easily available ultrasonography technique can be utilized to measure CIMT in various relevant clinical conditions.

Type 2 Diabetes mellitus (T2DM) is one of the clinical condition which causes increase in CIMT due to atherosclerotic changes ^[3]. Screening of diabetic patients for increased CIMT by ultrasonography can detect risk of cardiovascular and cerebrovascular attack ^[4]. Increase in CIMT correlates well with duration of T2DM and other factors associated with the disease ^[5]. So, early identification of cardiovascular disease by measuring CIMT in T2DM should be practiced in low-resource countries to decrease the burden of emergency invasive tests like angiography and to reduce the overall morbidity and mortality from the disease.

We conducted this study to calculate the carotid intima media thickness (CIMT) in Type 2 Diabetes Mellitus (T2DM) patients who attended our tertiary hospital.

Methodology

We conducted this cross sectional study at Department of Radiology, National Academy of Medical Sciences, Bir Hospital, Kathmandu from July 1, 2022 to December 1, 2022. Patients diagnosed as Type 2 Diabetes Mellitus (T2DM) referred from Endocrinology Unit to Department of Radiology for Carotid Doppler evaluation were taken as samples. Inclusion criteria were age more than 25 years, normotensive & diagnosed T2DM at least one year back.

Type 1 Diabetic patients, hypertensive patients and patients with history of stroke were excluded from the study. 70 patients were selected after taking consent and using purposive sampling with fulfillment of inclusion criteria.

B-mode ultrasonography of common carotid and internal carotid arteries of both side was performed by same Radiologist in Toshiba Aplio 400 USG machine using 7-12 MHz linear probe to decrease inter-observer and inter-instrumental variation. Patient was positioned supine with neck extended (With pillow support under it) and rotated 45 away from side being examined so that the common carotid artery and internal carotid artery were well visualized. After application of acoustic gel, scanning of common carotid artery was started just above the clavicle in transverse plane and then the probe was rotated cranially through the carotid bifurcation keeping it parallel to the internal carotid artery to scan in longitudinal plane. The intima-media thickness of the far wall of the carotid vessels was measured as the distance between the leading edge of the lumen-intima interface and the leading edge of the media-adventitia interface as described by Touboul *et al.* [6]. Area of plaque, if seen, was avoided for measurement of CIMT to prevent inaccurate reading.

The following segments were measured

1. Common carotid artery at 1.5 cm proximal to the carotid bulb.
2. Carotid bulb.
3. Proximal internal carotid artery at 1cm from the bulb.

Each segment was scanned in longitudinal plane with the sound wave beamed perpendicular to the arterial surface of the near and far walls of the vessel giving the two parallel echogenic lines-the lumen-intima and media-adventitia interfaces. The inner echogenic line and the adjacent hypoechoic line were taken as combined thickness of the intima-media complex. The mean of the average of 3 measurements taken at each aforementioned site on both sides was calculated in millimeter (mm).

Entry and tabulation of collected data was done in SPSS 20. Data was analyzed and presented using frequency tables, percentages, graphs and means ± standard deviation. Associations between categorical and continuous variables were explored using the chi square and independent t-test while correlations between continuous variables were

explored using Pearson’s Correlation. Associations were deemed significant if P-value is less than or equal to 0.05 at 95% confidence interval.

Results

Out of the 70 participants, 42 were male (60%) and 28 were female (40%) (Figure 1). Mean age of the study population was 53.8 years ranging from 37 to 72 years. Mean carotid intima media thickness (mCIMT) was 0.88±0.12 mm ranging from 0.71mm (lowest) to 1.4 mm (highest). Mean CIMT value was found to be 0.94±0.14 mm in male and 0.86±0.11 mm in female participants (Table 1). Mean CIMT was seen increasing with age (Figure 2) with highest value of 1.20±0.17 mm in age group more than 60 years and lowest value of 0.75±0.08 mm in age group less than 40 years (Table 2).

Table 1: Mean CIMT value according to gender

Gender	Male	Female
mCIMT (in mm)	0.94±0.14	0.86±0.11

Table 2: Distribution of Mean CIMT according to age group

Age group	Mean CIMT (in mm)
<40 years	0.75
41-50 years	0.87
51-60 years	1.01
>60 years	1.20

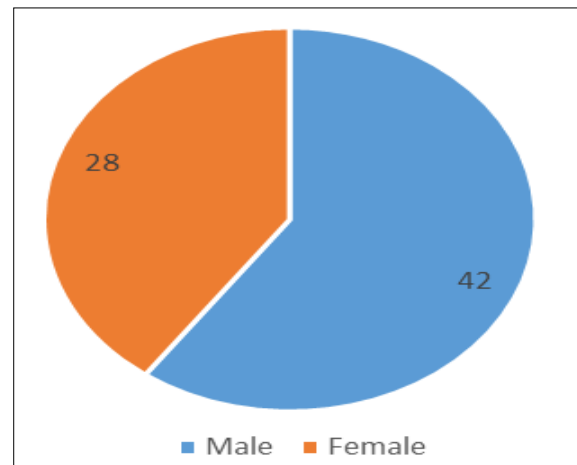


Fig 1: Distribution of male and female participants

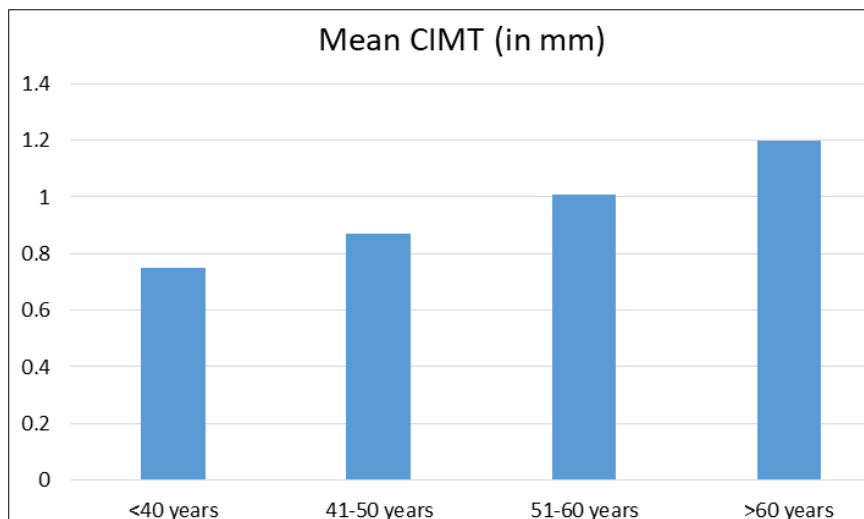


Fig 2: Mean CIMT value in increasing age group

Discussion

In this study, we measured the carotid intima media thickness (CIMT) in Type 2 Diabetes Mellitus (T2DM) patients who attended our tertiary hospital. Mean carotid intima media thickness (mCIMT) was found to be 0.88 ± 0.12 mm in our study which is well above mean CIMT in normal population, as shown by many previous studies. The reference upper limit of normal mean CIMT is 0.70 mm in female and 0.80 mm in male participants according to a study done by Randrianarisoa E *et al.* [7]. Similarly, Paul J. *et al.* showed the mean CIMT of healthy subjects including all age group was 0.75 mm [8]. Significantly increased mean CIMT in T2DM patients in comparison to normal healthy adults was seen in several studies done by MS Al-Nimer *et al.* [9], Kota SK *et al.* [10] and Kayastha P *et al.* [11] which is consistent with our study.

Mean CIMT value was seen higher in male (0.94 ± 0.14 mm) than in female (0.86 ± 0.11 mm) participants in our study. Similar finding of higher mean CIMT in male in comparison to female was shown by studies done by Pujia A *et al.* [12] which is consistent to our study. However, study done by Kayastha P *et al.* showed higher mean CIMT in female than in male and Baba MM *et al.* [13] showed no significant difference in male and female. So further study with larger sample size should be conducted to address this discrepancy. In our study, mean CIMT was seen increasing with age with highest value (1.20 ± 0.17 mm) in age group more than 60 years and lowest value (0.75 ± 0.08 mm) in age group less than 40 years. Studies done by Kayastha P *et al.* and Lehmann ED *et al.* also showed increased CIMT in older patients with T2DM which is consistent to our study. Increase rate of CIMT was more in patients with coronary artery disease (0.03-0.06 mm/year) than in general population (0.01 mm/year) as shown by Lehmann ED *et al.* [14].

Conclusion

Carotid intima media thickness in Type 2 Diabetes Mellitus patients attending our tertiary hospital was found to be more than normal range for healthy adults. Mean carotid intima media thickness (CIMT) was more in male than in female participants and was seen increasing with age. Measurement of carotid intima media thickness by ultrasonography is recommended in Type 2 DM patients for early detection of risk associated with cardiovascular attack.

Conflict of interest

There was no conflict of interest involved.

Limitation

As our study was hospital-based, we took sample from patients who came to hospital, so the results may not truly reflect the condition of general population.

References

- O'Leary DH, Polak JF, Kronmal RA, Savage PJ, Borhani NO, Kittner SJ, *et al.* Thickening of the carotid wall. A marker for atherosclerosis in the elderly? Cardiovascular Health Study Collaborative Research Group. *Stroke*. 1996 Feb;27(2):224-31.
- Baldassarre D, Amato M, Bondioli A, Sirtori CR, Tremoli E. Carotid artery intima-media thickness measured by ultrasonography in normal clinical practice correlates well with atherosclerosis risk factors. *Stroke*. 2000 Oct;31(10):2426-30.
- Al-Nimer MS, Hussein II. Increased mean carotid intima media thickness in type 2 diabetes mellitus

- patients with non-blood pressure component metabolic syndrome: A preliminary report. *Int J Diabetes Dev Ctries*. 2009 Jan;29(1):19-22.
- Robertson CM, Gerry F, Fowkes R, Price JF. Carotid intima-media thickness and the prediction of vascular events. *Vasc Med*. 2012 Aug;17(4):239-48.
- Butt MU, Zakaria M. Association of common carotid intimal medial thickness (CCA-IMT) with risk factors of atherosclerosis in patients with type 2 diabetes mellitus. *J Pak Med Assoc*. 2009 Sep;59(9):590-3.
- Touboul PJ, Hennerici MG, Mears S, Adams H, Amarencu P, Bornstein N, *et al.* Mannheim carotid intima-media thickness consensus (2004-2006). An update on behalf of the Advisory Board of the 3rd and 4th Watching the Risk Symposium, 13th and 15th European Stroke Conferences, Mannheim, Germany, 2004, and Brussels, Belgium, 2006. *Cerebrovasc Dis*. 2007;23(1):75-80.
- Randrianarisoa E, Rietig R, Jacob S, Blumenstock G, Haering HU, Rittig K, *et al.* Normal values for intima-media thickness of the common carotid artery: An update following a novel risk factor profiling. *Vasa*. 2015 Nov;44(6):444-50.
- Paul J, Shaw K, Dasgupta S, Ghosh MK. Measurement of intima media thickness of carotid artery by B-mode ultrasound in healthy people of India and Bangladesh, and relation of age and sex with carotid artery intima media thickness: An observational study. *J Cardiovasc Dis Res*. 2012 Apr;3(2):128-31.
- Al-Nimer MS, Hussein II. Increased mean carotid intima media thickness in type 2 diabetes mellitus patients with non-blood pressure component metabolic syndrome: A preliminary report. *Int J Diabetes Dev Ctries*. 2009 Jan;29(1):19-22.
- Kota SK, Mahapatra GB, Kota SK, Naveed S, Tripathy PR, Jammula S, *et al.* Carotid intima media thickness in type 2 diabetes mellitus with ischemic stroke. *Indian J Endocrinol Metab*. 2013 Jul;17(4):716-22.
- Kayastha P, Paudel S, Gurung G, Kumar P, Upadhyaya RP, Tuladhar S, *et al.* Mean Carotid Intima-Media Thickness in Patients with Type 2 Diabetes Mellitus Attending Tertiary Care Center: A Descriptive Cross-sectional Study. *JNMA J Nepal Med Assoc*. 2021 Dec 11;59(244):1243-1246.
- Pujia A, Gnasso A, Irace C, Colonna A, Mattioli PL. Common carotid arterial wall thickness in NIDDM subjects. *Diabetes Care*. 1994 Nov;17(11):1330-6.
- Baba MM, Talle MA, Ibinaiye PO, Abdul H, Buba F. Carotid Intima-Media Thickness in Patients with Diabetes Mellitus Attending Tertiary Care Hospital in Nigeria. *Angiol*. 2018;6:210.
- Lehmann ED, Riley WA, Clarkson P, Gosling RG. Non-invasive assessment of cardiovascular disease in diabetes mellitus. *Lancet*. 1997 Jul;350(1):S114-9.

How to Cite This Article

Bhattarai S, Adhikari BBS. Measurement of carotid intima media thickness in type 2 diabetes mellitus patients who underwent carotid Doppler in a tertiary hospital of Nepal. *International Journal of Radiology and Diagnostic Imaging*. 2024;7(3):27-29.

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