

## Study Of Carotid Intima-Media Thickness As A Predictor Of Macrovascular Complications In Type 2 Diabetes Mellitus

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### Abstract

**Background:** Clinical and epidemiological studies have demonstrated that diabetics face increased cardiovascular disease morbidity and mortality with 3 out of 4 of them dying with cardiovascular complications. More than half of all diabetic deaths are accounted for by atherosclerotic disease. Intima media thickness (IMT), a measure of atherosclerotic vascular disease, is considered as a comprehensive picture of all alterations caused by multiple risk factors over time on the arterial walls. It can therefore be described as a robust indicator of vascular risk. Traditional and some emerging cardiovascular disease risk factors have shown a positive association with IMT in epidemiological studies of patients and the general population.

**Aim Of The Study:** To compare the carotid intima-media thickness in the case group and control population. To find the association of increased carotid intima-media thickness and CAHD/CVA/PVD.

**Materials & Methods:** This case-control study was conducted in the year august 2020- February 2021 at Shanthi Social Service, Singanallur, Coimbatore. patients with Type 2 DM patients presenting with macrovascular complications admitted in the medical ward will be included in the study. An equal number of age, sex, BMI, and comorbid conditions [ Systemic Hypertension] matched persons not having macrovascular complications attending OPD and inward will be included in the study as a control group.

**Results:** Body mass index is more in the case than the control group but not statistically significant. Fasting blood sugar is statistically significant (  $p < 0.01$ ) in the case then the control group. So, fasting blood sugar is elevated in the case than in the control group. Postprandial blood sugar is statistically significant ( $p < 0.01$ ) in the case than control group so, PPBS is more in the case group than the control group. Total cholesterol is statistically significant ( $p < 0.01$ ) in the case than in the control group, so total cholesterol is more in the case group than control group people. Serum LDL is statistically significant ( $p < 0.05$ ) in the case then the control group. So, Serum LDL is more in cases than controls. Carotid media intima thickness is significantly elevated in the case group than in the control group.  $P = 0.023$  ( $< 0.05$ ) which is statistically significant.

**Conclusion:** ultrasound-guided cimt measurement is a noninvasive, reproducible method for detecting early arterial structural changes associated with various risk factors for atherosclerosis. Hence measurement of carotid intima-media thickness by ultrasound doppler is reliable and helps in early medical intervention to take care of risk factors and lifestyle modification and may reduce The incidence of macrovascular complications of type 2 diabetes mellitus.

**Keywords:** Atherosclerosis, Type 2 Diabetes Mellitus, HyperTension, CIMT

## Introduction

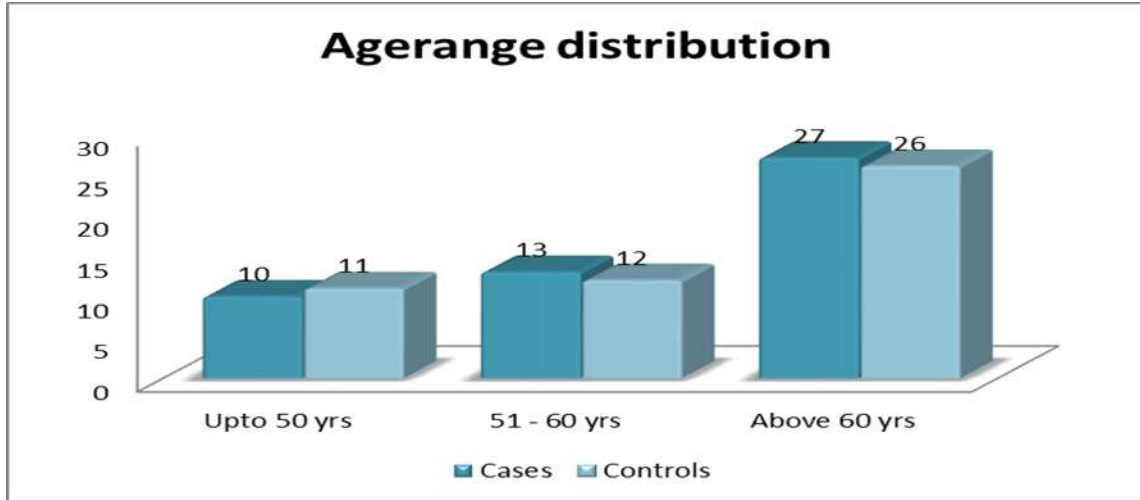
Carotid intima-media thickness (CIMT) is widely used as a marker of atherosclerosis, considered to be an important pathogenic mechanism of Macrovascular diseases. [1]Carotid artery intima-media thickness by B mode ultrasound is a simple, non-invasive and reproducible imaging parameter to evaluate atherosclerotic vascular diseases.[2] Recently, considerable attention has been directed at the carotid arteries' intima-media thickness as an early marker of atherosclerotic disease and as a means of showing the effectiveness of medical therapies in treating atherosclerosis. Non-invasive techniques such as B-mode ultrasound can directly assess the carotid intima-media thickness (IMT), which corresponds to the histologic intima and media thickness.[3] Ultrasound imaging of carotid vessels can provide information on Carotid Intima Medial Thickness (CIMT), wall diameter, plaque presence, and type, and calcification offers the ability to examine pre-symptomatic lesions, assess the atherosclerotic burden and hence the risk of macrovascular events. Such non-invasive screening procedures are valuable in identifying diabetic patients at risk for macrovascular complications.[4] In clinical settings, this can potentially lead to early interventions and treatment. The carotid arteries are among the vessels that are prone to developing overt atherosclerotic lesions in the presence of risk factors such as smoking, diabetes, hypertension, and dyslipidemia. Diabetes mellitus patients suffer unduly from premature and severe atherosclerosis. [5] The Framingham study shows that “diabetic individuals have higher serum concentrations of

lipids and hypertension, obesity, and thus they are more prone to metabolic syndrome and its sequelae, namely coronary artery disease (CAD), cerebrovascular disease and vascular atherosclerosis. In type 2 DM, carotid intimal thickness is significantly more than in corresponding healthy age and sex-matched nondiabetic subjects. Hence measurement of carotid intimal thickness using high-resolution B mode ultrasonography which is a non-invasive well-validated method is used to assess early manifestations of atherosclerosis. [6,7]

**Materials & Methods:** This case-control study was conducted in the year august 2020- February 2021 at Shanthi Social Service, Singanallur, Coimbatore **Patients** with Type 2 DM patients presenting with macrovascular complications admitted in the medical ward will be included in the study. An equal number of age, sex, BMI, and comorbid conditions [ Systemic Hypertension] matched persons not having macrovascular complications attending OPD and in ward will be included in the study as a control group.**INCLUSION CRITERIA:** Patients aged 35 TO 75years with type 2 diabetes mellitus, CAHD/CVD/PVD Diagnosed thorough medical history, clinical examination, and appropriate investigation including Electrocardiogram, EchoCardiograms, and Computer Tomography scan.**EXCLUSION CRITERIA:** Patient with type 1 diabetes mellitus, Patient with hemodynamic instability – bp<90/60 mm hg, Patients with renal disease and liver disease both acute and chronic and connective tissue disorders.

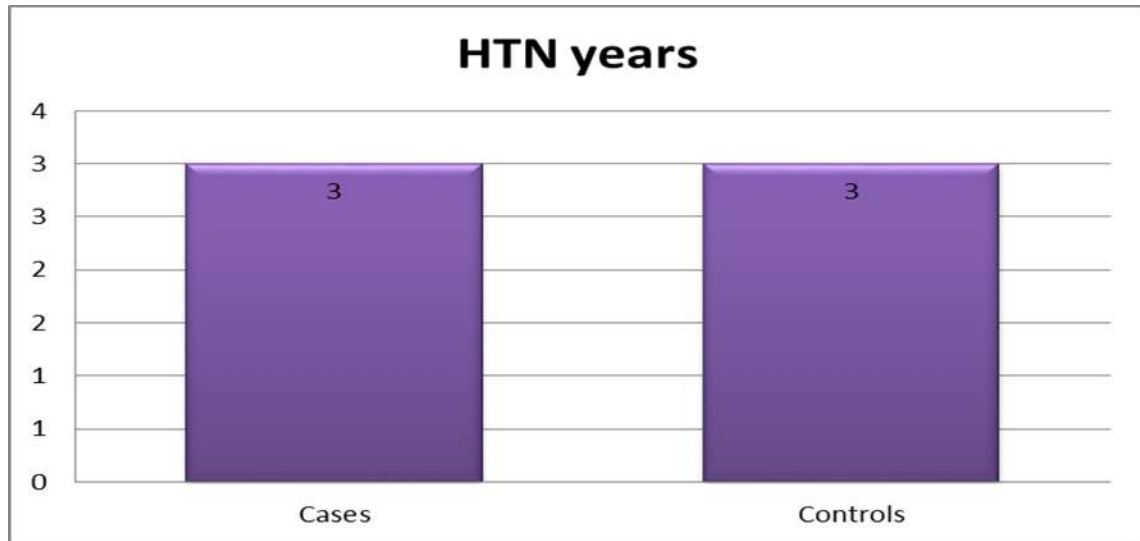
## Results

Graph :1 Age Distribution



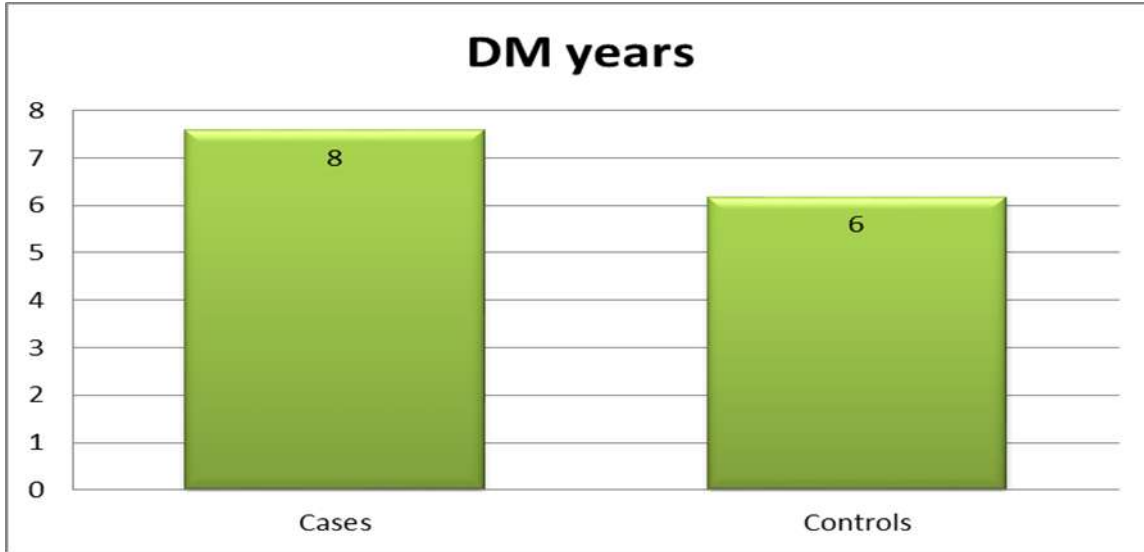
Graph :1 Equal number of cases and controls are selected in different age groups. statistically significant sex distribution difference in case and control group males and females are compared in case and control group. smoking distribution in case and control group matched equally.

Graph:2 Hypertension In Years In Case And Control Group:



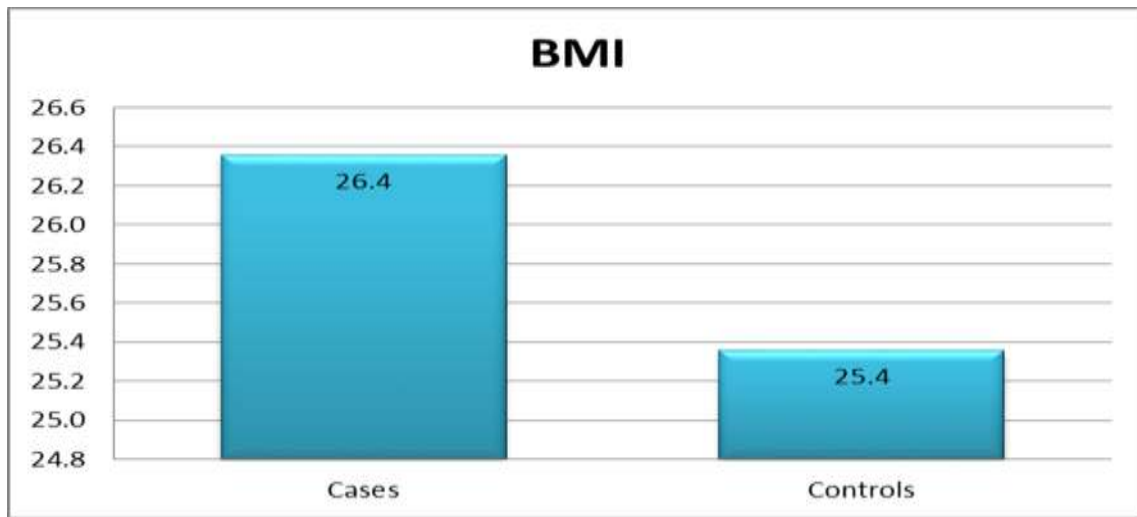
Graph:2 Hypertension in case and control group matched equally

**Graph :3 Duration Of Diabetes In Case And Control Group:**



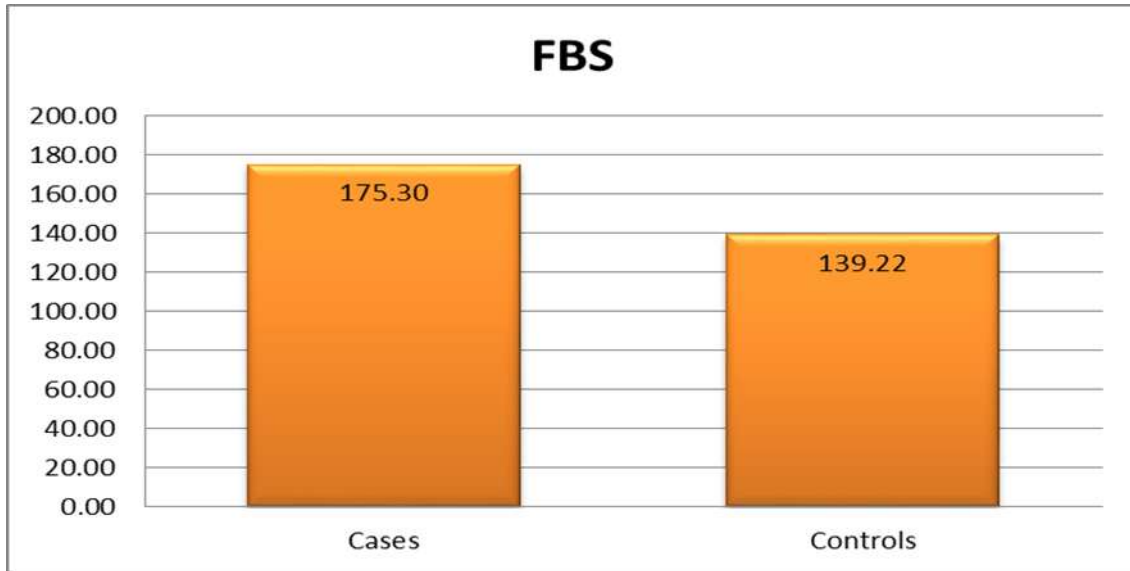
Graph :3 As, Duration of diabetes is significantly more in the case group than the control group.  $p = 0.014$  so,  $p$  is statistically significant

**Graph:4 Body Mass Index Distribution In Case And Control Group**



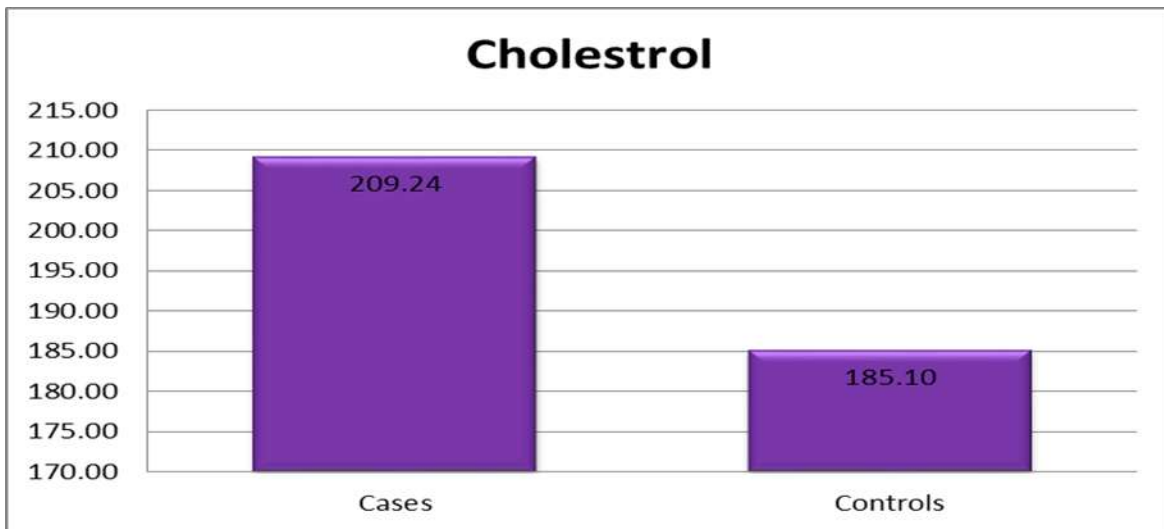
Graph:4 Body mass index is more in the case than the control group but not statistically significant

**Graph:5 Fasting Blood Sugar In Case And Control Group:**



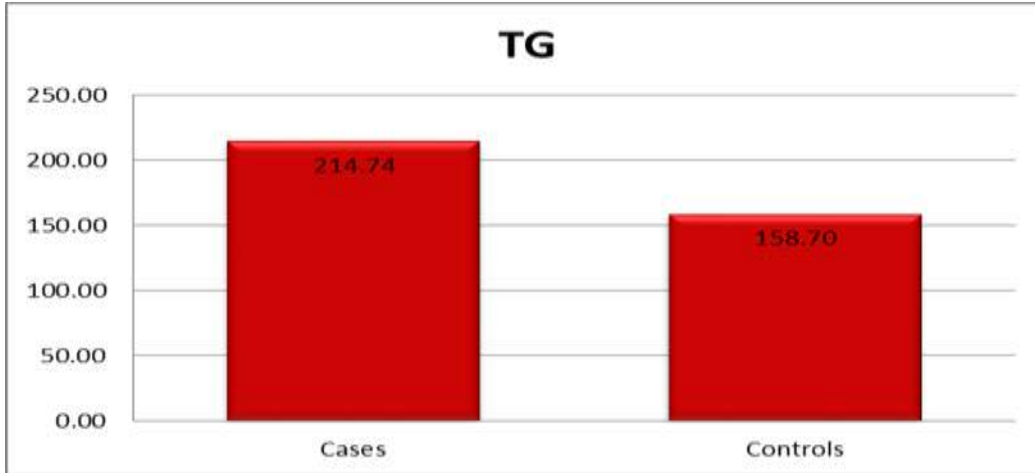
Graph:5 Fasting blood sugar is statistically significant ( $p < 0.01$ ) in the case than the control group. So, fasting blood sugar is elevated in the case than control group  $P = 0.000 (< 0.01)$  Postprandial blood sugar is statistically significant ( $p < 0.01$ ) in the case than control group so, PPBS is more in the case group than the control group

**Graph:6 Total Cholesterol In Case And Control Group**



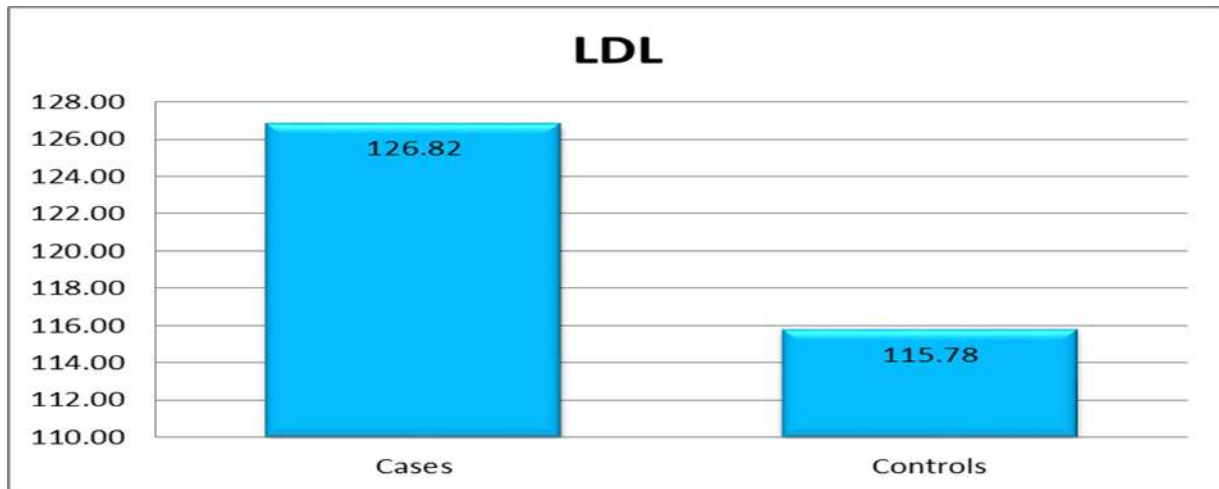
Graph:6 Total cholesterol is statistically significant ( $p < 0.01$ ) in the case than the control group, so total cholesterol is more in the case group than control group people.

**Graph:7 Serum Triglyceride Level In Case And Control Group:**

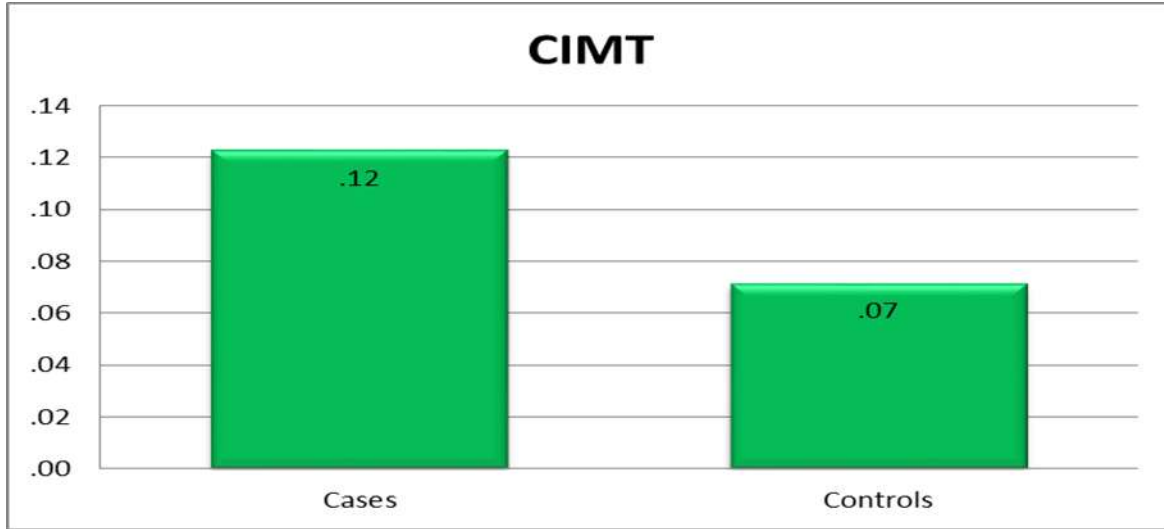


Graph:7 Serum triglyceride is statistically significant ( $p < 0.01$ ) in the case of the group than the control. So, Serum triglyceride is more in cases than controls.

**Graph:8 Serum Ldl In Case And Control Group:**



Graph:8 Serum LDL is statistically significant ( $p < 0.05$ ) in the case then the control group. So, Serum LDL is more in cases than controls.

**Graph:9 Carotid Intima-Media Thickness In Case And Control Group:**

Graph:9 So, when 0.008 mm is considered as mean, 34 cases and only 17 controls had CIMT more than 0.008 mm. Carotid media intima thickness is significantly elevated in the case group than in the control group.  $P = 0.023 (< 0.05)$  which is statistically significant.

### Discussion

Although CIMT is not yet routinely measured in clinical practice, its predictive value regarding cardiovascular complications has been established, giving it a potential role in the future for cardiovascular disease risk stratification and primary prevention.[8] This study has shown an increased tendency to atherosclerotic cardiovascular disease in both DM and hypertension going by their CIMT values. The similarity in values for both sides would suggest that in practice, measuring either side would suffice. [9]The increase in CIMT as an index of atherosclerosis occurs in conjunction with other cardiovascular risk factors. It would appear that going by the results in this study, the cases of DM had a greater cardiovascular disease burden.[10] Their burden of cardiovascular disease risk factors surpassed that of Hypertension in most cases, especially dyslipidaemias, waist-hip ratio, cigarette smoking, alcohol abuse, physical inactivity, and serum creatinine (results not shown). This is a case-control retrospective study that had a sample size of 50 diabetics with macrovascular complications as cases and without macrovascular complications as controls. This study was done to assess the value of carotid intima-media thickness in patients who had macrovascular complications in diabetes patients. [11]In this study age, sex, smoking, hypertension was

equally matched in cases and controls to decrease bias of these risk factors influencing the result of the study[12]. The present study emphasized that as the duration of diabetes increases there is a progression of CIMT which is statistically significant. 25 acute coronary syndrome patients, 20 cerebrovascular accident patients, 5 peripheral vascular disease patients with diabetes mellitus were included in the study, 50 diabetics without complications were included in the study, and carotid intima-media thickness in these patients was measured in these patients using B mode ultrasonogram [13]. The present study has demonstrated the role of traditional risk factors like total cholesterol, LDL Cholesterol, and triglycerides in the progression of atherosclerosis found to have statistical significance in cases than controls. [14]Serum HDL was significantly low in cases than controls. Both fasting and postprandial blood sugar was elevated in cases when compared with controls. [15]The normal intimal-medial thickness of the common carotid artery as evaluated by B mode ultrasound imaging was 0.80 mm approximately. [16]Out of 50 cases, 34 had CIMT of more than 0.008 mm which was considered as mean. Out of 50 controls, only 17 had CIMT of more than 0.008 mm. [17] On comparing carotid intima-media thickness in cases and controls. cases had mean CIMT as 0.12 mm and controls had mean CIMT as



0.07 mm. [18]CIMT was significantly increased in the case group than the control group and it is statistically significant  $p < 0.05$  using independent t-test. [19]Hence measurement of carotid intimal thickness using high-resolution B mode ultrasonography which is a noninvasive well-validated method is used to assess early manifestations of atherosclerosis and predictor of cardiovascular disease, cerebrovascular disease, peripheral vascular disease in asymptomatic as well as high-risk patients such as dyslipidemia, DM, HTN, and cigarette smoking.[20]

### Conclusion

The present study showed increased values of CIMT in Diabetic patients with macrovascular complications than Diabetic patients without macrovascular complications. Along with this risk factors like age, HTN, BMI, duration of DM, may correlate with CIMT either directly or indirectly influencing the disease process itself and contributing to atherosclerosis. Ultrasound-guided CIMT measurement is a noninvasive, reproducible method for detecting early arterial structural changes associated with various risk factors for atherosclerosis. Hence measurement of carotid intima-media thickness by ultrasound Doppler is reliable and helps in early medical intervention to take care of risk factors and lifestyle modification and may reduce the incidence of macrovascular complications of type 2 diabetes mellitus.

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