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Research Article

Evaluating the Role of Body Mass Index in Early Atherosclerotic Changes Detected by Carotid Intima-Media Thickness in Type 2 Diabetes

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Abstract

Background: Type 2 Diabetes Mellitus (T2DM) is associated with increased risk of atherosclerosis and cardiovascular disease. Carotid Intima Media Thickness (CIMT) is a non-invasive marker of early atherosclerosis. Although obesity and overweight are recognized risk factors for cardiovascular complications in diabetes, the association between Body Mass Index (BMI) and CIMT in T2DM patients in Indian populations remains underexplored.

Objective: To assess the prevalence of increased CIMT in T2DM patients and evaluate its association with BMI in a tertiary care setting.

Methods: This observational cross-sectional study included 100 T2DM patients attending Assam Medical College & Hospital, Dibrugarh. Patients were classified according to the World Health Organization (WHO) Asian BMI criteria: underweight (<18.5kg/m^2), normal (18.5–22.9kg/m^2), overweight (23–24.9kg/m^2), and obese (≥25kg/m^2). CIMT was measured bilaterally using ultrasonography; values >0.9mm were considered increased. Associations between BMI categories and increased CIMT were evaluated using appropriate statistical tests.

Results: Out of 100 patients, 27% were obese (BMI ≥25kg/m^2), 50% overweight (23–25kg/m^2), 23% had normal BMI (18.5–22.9kg/m^2), and none were underweight. Increased CIMT (>0.9mm) was observed in 42% of patients. Among those with increased CIMT, the distribution by BMI was: overweight (52.38%), normal (26.19%), obese (21.43%). Statistical analysis showed no significant association between BMI category and presence of increased CIMT (p>0.05).

Conclusion: Overweight and obesity are highly prevalent in Indian patients with T2DM, but in this cohort, BMI was not significantly associated with increased CIMT. These findings suggest that while excess weight is an important risk factor for cardiovascular disease, BMI alone may not predict the presence of early atherosclerotic changes in the carotid arteries among diabetic patients. Larger studies may clarify the relationship and guide risk assessment.

Introduction

Type 2 Diabetes Mellitus (T2DM) is now recognized not only for its metabolic disturbances but also for its macrovascular complications driven predominantly by atherosclerosis. South Asians, including Indians, develop cardiovascular risk at lower BMI levels compared to Western populations. Carotid Intima Media Thickness (CIMT) measured through ultrasonography offers a validated marker for the detection of subclinical atherosclerosis. Understanding the link between BMI-a simple anthropometric indicator of adiposity-and vascular changes is crucial for early identification and prevention of cardiovascular events in this high-risk group.

Materials and Methods

Study Design and Setting

This was a descriptive cross-sectional study conducted at Assam Medical College & Hospital, Dibrugarh.

Inclusion and Exclusion Criteria

One hundred consecutive patients diagnosed with T2DM, older than 13 years, attending outpatient and inpatient services, were included. Exclusion criteria were Type 1 DM, acute illness, pregnancy, known atherosclerotic disease, and conditions affecting body composition or red cell turnover.

Data Collection

Demographics (age, gender), body weight, and height were recorded. BMI was classified per WHO Asian criteria:

a. Normal: 18.5–22.9kg/m^2

b. Overweight: 23–24.9kg/m^2

c. Obese: ≥25kg/m^2

d. Underweight: <18.5kg/m^2

CIMT was measured using high-resolution B-mode ultrasonography. Both carotid arteries were imaged 1cm proximal to the bifurcation. Increased CIMT was defined as >0.9mm.

Statistical Analysis

Distribution of CIMT across BMI categories was studied. Significance of association was determined using chi-square tests. P-value <0.05 indicated statistical significance.

Results

Baseline BMI Distribution

a. Obese (≥25kg/m^2): 27 patients (27%)

b. Overweight (23–25kg/m^2): 50 patients (50%)

c. Normal (18.5–22.9kg/m^2): 23 patients (23%)

d. Underweight (<18.5kg/m^2): 0 patients (0%)

Prevalence of Increased CIMT

a. Increased CIMT (>0.9mm): 42 patients (42%)

b. Normal CIMT (≤0.9mm): 58 patients (58%)

Distribution of BMI Among Patients with Increased CIMT

(Table 1)

Table 1:

BMI Category	Number in CIMT >0.9mm Group	Percentage in CIMT >0.9mm Group
Obese (≥25kg/m^2)	9	21.43%
Overweight (23–25)	22	52.38%
Normal (18.5–23)	11	26.19%
Underweight (<18.5)	0	0%

There was no significant difference in BMI category proportions between patients with and without increased CIMT (p>0.05).

Descriptive Summary

a. Mean BMI of the cohort: 24.10±1.76kg/m^2

b. Overweight was the most prominent group among those with increased CIMT.

c. No underweight or morbidly obese patients were present in the sample.

Discussion

This study found that T2DM patients, even in an Indian tertiary care centre, exhibited high rates of overweight and obesity using WHO Asian BMI criteria. However, the prevalence of increased CIMT—a marker of early atherosclerosis—did not show a statistically significant correlation with BMI category. This is noteworthy given the well-established relationship between excess adiposity and cardiovascular risk; our results suggest that BMI alone may be insufficient to identify patients with subclinical atherosclerosis.

Several explanations may account for this finding. First, South Asians can manifest vascular risk at lower BMI and may be more susceptible to adverse risk due to fat distribution (such as visceral adiposity) not captured by BMI alone. Second, other metabolic risk factors (glycemic control, lipid profile, hypertension) may mediate vascular damage independent of BMI. This points toward the necessity of a multifactorial approach for cardiovascular risk assessment. Previous studies have shown mixed results, with some supporting a positive association between CIMT and BMI and others, including our study, demonstrating no such relationship. This could reflect population differences or sample size limitations. Limitations of this study include its modest sample size, single-centre design, and focus solely on BMI rather than other anthropometric indices (e.g., waist circumference, waist-to-hip ratio) [1-5].

Conclusion

While overweight and obesity are common in Indian patients with T2DM, there was no significant association between BMI category and increased CIMT in this cohort. Routine CIMT measurement may be considered for broader risk assessment, as BMI alone may not effectively discriminate patients at higher risk for early atherosclerotic changes. Larger studies with more comprehensive anthropometric measures are needed to clarify this relationship.

Acknowledgement

None.

Conflict of Interest

None.

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