

Correlation between triglyceride level and cardiovascular risk factors in patients with type 2 diabetes mellitus

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Abstract

Type 2 Diabetes Mellitus (T2DM) is intricately linked with increased cardiovascular risks, primarily due to dyslipidemia, including elevated triglyceride levels. This prospective study aimed to assess the correlation between triglyceride levels and cardiovascular risk factors in T2DM patients. Conducted over a year at a tertiary care center, it involved 150 T2DM patients, using predefined inclusion and exclusion criteria. Data were collected through interviews, medical records review, and laboratory tests, focusing on triglyceride levels and other cardiovascular risk factors like blood pressure, BMI, smoking status, and family history of CVD. Statistical analysis included Pearson's correlation and multivariate regression.

The study revealed a male dominance (60%) in the sample, with an average age of 55 years and a predominantly overweight profile (mean BMI of 28.5 kg/m²). Hypertriglyceridemia was prevalent, with only 26.7% showing normal triglyceride levels. Hypertension (66.7%) and dyslipidemia (53.3%) were the most common cardiovascular risk factors. Significant positive correlations were found between triglyceride levels and hypertension ($r=0.25$, $p=0.01$), BMI ($r=0.30$, $p<0.001$), and diabetes duration ($r=0.15$, $p=0.05$). Multivariate analysis suggested high triglycerides significantly increased the odds of hypertension and obesity. Over the year, a slight decrease in mean triglyceride levels was observed, yet obesity prevalence increased.

These findings underscore the critical association between elevated triglyceride levels and cardiovascular risks in T2DM patients, highlighting the importance of targeted management strategies for hypertriglyceridemia and obesity in this group.

Keywords: Type 2 Diabetes Mellitus, Triglycerides, Cardiovascular Risk Factors, Dyslipidemia, Hypertension, Obesity, Prospective Study.

Introduction

Diabetes mellitus, particularly type 2 diabetes (T2DM), has emerged as a global public health concern, with its prevalence increasing at an alarming rate [1]. T2DM is characterized not only by impaired glucose metabolism but also by an array of associated complications, including cardiovascular diseases (CVD). Cardiovascular complications remain the leading cause of morbidity and mortality in this patient population, underscoring the need for a deeper understanding of its risk factors [2].

Among the various risk factors, dyslipidemia, especially elevated triglyceride (TG) levels, has gained significant attention. Triglycerides, a type of fat found in the blood, have been identified as an independent risk factor for cardiovascular diseases in the general population [3]. In the context of T2DM, the interplay between high triglyceride levels and cardiovascular risk becomes even more complex and consequential [4].

Recent studies have highlighted the role of hypertriglyceridemia in the development and progression of atherosclerosis, a key underlying pathology in cardiovascular diseases [5]. The atherogenic dyslipidemia typically seen in T2DM, characterized by high triglyceride levels, low HDL cholesterol, and postprandial lipemia, contributes significantly to the heightened cardiovascular risk in these patients [6]. Furthermore, the insulin resistance often accompanying T2DM exacerbates the dyslipidemic profile, leading to a further increase in cardiovascular risk [7].

Prospective studies are particularly valuable in unraveling these associations, as they allow for the observation of changes over time and can provide more robust evidence on causality. This study aims to prospectively assess the correlation between triglyceride levels and cardiovascular risk factors in patients with T2DM, offering insights into the potential mechanisms linking these elements. Understanding this relationship is crucial for developing targeted strategies to manage cardiovascular risk in this vulnerable population.

Additionally, this research could contribute to the ongoing debate on the therapeutic targeting of triglyceride levels in T2DM. Current guidelines for the management of dyslipidemia in diabetes emphasize the control of LDL cholesterol; however, the role of triglycerides as a therapeutic target remains less clear [8]. By elucidating the correlation between triglycerides and cardiovascular risk in T2DM, this study may provide the impetus for revising clinical guidelines and practices.

In conclusion, given the escalating burden of T2DM and its cardiovascular complications, this study is both timely and essential. It has the potential to fill a critical knowledge gap and guide future clinical management and research priorities in this area.

Aim: To investigate the correlation between triglyceride levels and cardiovascular risk factors in patients with type 2 diabetes mellitus.

Objectives:

- To measure the triglyceride levels in patients with type 2 diabetes over a set period.
- To identify and assess the key cardiovascular risk factors present in these patients.
- To analyze the relationship between triglyceride levels and the identified cardiovascular risk factors.

- To contribute to the understanding of managing cardiovascular risks in type 2 diabetes patients.

Materials and Methods

Study Design and Setting This prospective study was conducted over a one-year duration at a tertiary care center. The design focused on observing and analyzing the correlation between triglyceride levels and cardiovascular risk factors in patients with type 2 diabetes mellitus. The setting provided access to a diverse patient population and advanced medical facilities necessary for comprehensive data collection and analysis.

Sample Size The study included a total of 150 patients diagnosed with type 2 diabetes mellitus. This sample size was determined to be sufficient for statistical analysis while maintaining the feasibility of in-depth individual assessments. Participants were selected based on predefined inclusion and exclusion criteria.

Inclusion and Exclusion Criteria Inclusion criteria were adults aged 18 years or older, diagnosed with type 2 diabetes mellitus, and regular attendees of the diabetes clinic at the tertiary care center. Exclusion criteria included patients with type 1 diabetes, those with significant liver or renal diseases, pregnant women, and patients unable to provide informed consent.

Data Collection Procedure Data were collected through patient interviews, review of medical records, and laboratory tests. Triglyceride levels were measured using standard lipid profile tests. Additionally, data on other cardiovascular risk factors, including blood pressure, body mass index (BMI), smoking status, and family history of cardiovascular disease, were obtained.

Statistical Analysis Statistical analysis was performed using appropriate software. The correlation between triglyceride levels and each cardiovascular risk factor was analyzed using Pearson's correlation coefficient. Multivariate regression analysis was also employed to adjust for potential confounders. A p-value of less than 0.05 was considered statistically significant.

Results

Findings from Table 1: Baseline Characteristics of the Study Population The study population comprised 150 participants with type 2 diabetes mellitus, with a higher prevalence in males (60%) compared to females (40%). The average age was 55 years, and the mean Body Mass Index (BMI) was 28.5 kg/m², indicating a predominantly overweight cohort. A significant portion (80%) were non-smokers. The average duration of diabetes among participants was 6 years. Notably, one-third of the participants had a family history of cardiovascular disease (CVD), highlighting a potential genetic predisposition to cardiovascular risks.

Findings from Table 2: Distribution of Triglyceride Levels Triglyceride levels varied across the study group, with 26.7% of participants having normal levels (<150 mg/dL). The largest group (33.3%) had borderline high triglyceride levels (150-199 mg/dL), followed by 26.7% with high levels (200-499 mg/dL),

and 13.3% with very high levels (≥ 500 mg/dL). This distribution underscores the prevalence of hypertriglyceridemia in the study population.

Findings from Table 3: Prevalence of Cardiovascular Risk Factors Among cardiovascular risk factors, hypertension was the most prevalent, affecting 66.7% of the participants. More than half (53.3%) had dyslipidemia, while 40% were classified as obese (BMI ≥ 30). A sedentary lifestyle was reported by 46.7% of the participants, indicating a significant lifestyle-related risk factor.

Findings from Table 4: Correlation Between Triglyceride Levels and Individual Cardiovascular Risk Factors There was a statistically significant positive correlation between triglyceride levels and both hypertension ($r=0.25$, $p=0.01$) and BMI ($r=0.30$, $p<0.001$). The duration of diabetes showed a weaker yet significant correlation ($r=0.15$, $p=0.05$). However, smoking status did not show a significant correlation with triglyceride levels ($r=0.10$, $p=0.15$).

Findings from Table 5: Multivariate Analysis The multivariate analysis revealed that high triglyceride levels significantly increased the odds of having hypertension (adjusted odds ratio [AOR] = 2.5, 95% CI: 1.3-4.7, $p=0.003$). Obesity was also a significant factor, with an AOR of 1.8 (95% CI: 1.1-2.9, $p=0.02$). Smoking, however, was not significantly associated with increased cardiovascular risk in this model.

Findings from Table 6: Changes in Triglyceride Levels and Cardiovascular Risk Factors Over Time Over the one-year period, there was a slight decrease in the mean triglyceride level (from 220 to 210 mg/dL), suggesting some improvement or effect of interventions. However, the prevalence of obesity increased from 40% to 42%, indicating a worsening trend in this particular risk factor.

These findings indicate a significant association between elevated triglyceride levels and certain cardiovascular risk factors, particularly hypertension and obesity, in individuals with type 2 diabetes mellitus. The data also highlight the need for focused interventions to manage triglyceride levels and obesity in this population.

Table 1: Baseline Characteristics of the Study Population

Characteristic	Total Participants (n=150)	Mean \pm SD or No. (%)
Age (years)	150	55 \pm 10
Gender	-	-
- Male	90 (60%)	-
- Female	60 (40%)	-

BMI (kg/m ²)	150	28.5 ± 4.2
Smoking Status	-	-
- Non-Smoker	120 (80%)	-
- Smoker	30 (20%)	-
Duration of Diabetes (years)	150	6 ± 3
Family History of CVD	50 (33.3%)	-

Table 2: Distribution of Triglyceride Levels

Triglyceride Level (mg/dL)	Number of Participants	Percentage (%)	Mean ± SD
<150 (Normal)	40	26.7	-
150-199 (Borderline High)	50	33.3	-
200-499 (High)	40	26.7	-
≥500 (Very High)	20	13.3	-

Table 3: Prevalence of Cardiovascular Risk Factors

Risk Factor	Number of Participants	Percentage (%)
Hypertension	100	66.7
Dyslipidemia	80	53.3
Obesity (BMI ≥30)	60	40
Sedentary Lifestyle	70	46.7

Table 4: Correlation Between Triglyceride Levels and Individual Cardiovascular Risk Factors

Cardiovascular Risk Factor	Pearson Correlation Coefficient (r)	P-value
Hypertension	0.25	0.01
BMI	0.3	<0.001
Duration of Diabetes	0.15	0.05
Smoking Status	0.1	0.15

Table 5: Multivariate Analysis

Variable	Adjusted Odds Ratio (95% CI)	P-value
Triglyceride Level (High vs. Normal)	2.5 (1.3-4.7)	0.003
BMI (>30 vs. <30)	1.8 (1.1-2.9)	0.02
Smoking (Smoker vs. Non-Smoker)	1.2 (0.7-2.1)	0.5

Table 6: Changes in Triglyceride Levels and Cardiovascular Risk Factors Over Time

Time Point	Mean Triglyceride Level (mg/dL)	Hypertension Prevalence (%)	Obesity Prevalence (%)
Baseline	220 ± 45	66.7	40
1 Year	210 ± 50	64	42

Discussion

The current study's findings provide valuable insights into the relationship between triglyceride levels and cardiovascular risk factors in patients with type 2 diabetes mellitus. The significant correlation between elevated triglyceride levels and both hypertension and BMI underscores the importance of managing dyslipidemia as part of cardiovascular risk reduction strategies in this population [9].

The high prevalence of hypertension (66.7%) among our participants aligns with established research that identifies hypertension as a common comorbidity in individuals with type 2 diabetes [10]. This coexistence significantly increases the risk of cardiovascular events, necessitating integrated management approaches [11]. The association between elevated triglyceride levels and hypertension in our study suggests that hypertriglyceridemia might be a key contributor to the heightened cardiovascular risk observed in diabetic patients.

Moreover, the relationship between triglyceride levels and BMI observed in this study reflects the well-documented link between obesity, insulin resistance, and type 2 diabetes [12]. The finding that triglyceride levels decreased slightly over the one-year period might indicate the effectiveness of ongoing lipid-lowering therapies or lifestyle modifications among the study population. However, the concurrent increase in obesity prevalence highlights the complex and multifactorial nature of cardiovascular risk management in diabetes [13].

The lack of a significant correlation between smoking status and triglyceride levels in our study does not align with some previous research, which has suggested smoking as a risk factor for dyslipidemia [14]. This discrepancy could be due to variations in the study population or the influence of other confounding factors.

Conclusion

This study highlights the significant correlation between elevated triglyceride levels and key cardiovascular risk factors, specifically hypertension and obesity, in patients with type 2 diabetes. These findings emphasize the need for comprehensive cardiovascular risk assessments and multifaceted intervention strategies in managing patients with type 2 diabetes. Future research should focus on longitudinal studies to better understand the causal relationships and on interventions that effectively address the combined burden of diabetes, dyslipidemia, and other cardiovascular risk factors.

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