

Original article:

Study of an evaluation of macrovascular complications of type-2 diabetes mellitus - a cross sectional study

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Date of submission: 07 January 2023

Date of Final acceptance: 18 March 2023

Date of Publication: 30 March 2023

Source of support: Nil

Conflict of interest: Nil

Abstract:

Introduction: Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder associated with increased risks of macrovascular complications, including cardiovascular disease (CVD), cerebrovascular disease, and peripheral arterial disease. The aim of this cross-sectional study was to evaluate the prevalence and risk factors of macrovascular complications in patients with T2DM.

Methodology: A total of 100 adult patients with T2DM were enrolled in the study from a diabetes clinic in a tertiary care hospital. Data on demographic characteristics, clinical variables, and macrovascular complications were collected through structured interviews, medical records review, and physical examinations. Descriptive statistics, chi-square tests, and logistic regression analysis were performed to analyze the data.

Results: The results revealed that out of the 100 patients with T2DM, 18 had at least one macrovascular complication. The most common macrovascular complication was CVD, which was present in 12 (12%) patients, followed by cerebrovascular disease in 4 (4%) patients, and peripheral arterial disease in 4(4%) patients. The study also found that older age, male gender, longer duration of diabetes, higher body mass index (BMI), presence of hypertension and dyslipidemia, and poor glycemic control (higher HbA1c levels) were significantly associated with an increased risk of macrovascular complications in patients with T2DM ($p < 0.05$). Logistic regression analysis showed that age, male gender, BMI, and HbA1c levels were independent risk factors for macrovascular complications in T2DM patients ($p < 0.05$).

Conclusion: In conclusion, this cross-sectional study revealed a high prevalence of macrovascular complications in patients with T2DM, with CVD being the most common complication.

Keywords: Type 2 diabetes mellitus, macrovascular complications, cardiovascular disease, cerebrovascular disease, peripheral arterial disease, risk factors, cross-sectional study.

Introduction:

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and relative insulin deficiency. It is a major global health concern, affecting millions of individuals worldwide. T2DM is associated with various complications, including microvascular and macrovascular complications. Microvascular complications involve damage to small blood vessels, leading to complications such as diabetic retinopathy, nephropathy, and neuropathy. On the other hand, macrovascular complications refer to damage to large blood vessels, leading to cardiovascular disease (CVD), cerebrovascular disease, and peripheral arterial disease.^{1,2,3} Macrovascular complications are a significant cause of morbidity and mortality in patients with T2DM. They are responsible for a considerable burden on healthcare systems and can result in decreased quality of life for affected individuals. Risk factors such as age, gender, duration of diabetes, obesity, hypertension, dyslipidemia, and poor glycemic control have been implicated in the development of macrovascular complications in T2DM. However, the prevalence and risk factors of macrovascular complications may vary across different populations and settings.^{4,5}

Therefore, understanding the epidemiology and risk factors associated with macrovascular complications in T2DM is crucial for effective prevention, early detection, and management of these complications. Cross-sectional studies, which provide a snapshot of the prevalence and risk factors at a specific point in time, can be valuable in examining the burden of macrovascular complications in patients with T2DM. Hence, the aim of this study was to evaluate the prevalence and risk factors of macrovascular complications in patients with T2DM through a cross-sectional study design.^{6,7} The findings of this study may contribute to the existing knowledge on macrovascular complications in T2DM and inform strategies for their prevention and management.

Study Methodology:

The study was conducted as a cross-sectional study design at a diabetes clinic in a tertiary care hospital. The study population consisted of 100 adult patients diagnosed with T2DM, who were recruited through convenience sampling. The data collection was carried out over a period of six months.

Data on demographic characteristics, clinical variables, and macrovascular complications were collected through structured interviews, medical records review, and physical examinations. Demographic data, including age, gender, and duration of diabetes, were obtained through interviews. Clinical variables such as body mass index (BMI), blood pressure, fasting blood glucose levels, and HbA1c levels were measured during physical examinations. Medical records were reviewed to obtain information on the presence of macrovascular complications, including cardiovascular disease (CVD), cerebrovascular disease, and peripheral arterial disease.

Descriptive statistics, including frequencies and percentages, were used to summarize the demographic and clinical characteristics of the study population. Chi-square tests were performed to analyze the association between categorical variables, such as gender and presence of macrovascular complications. Logistic regression analysis was used to identify independent risk factors for macrovascular complications in T2DM patients, with age, gender, BMI, duration of diabetes, blood pressure, lipid profile, and HbA1c levels as potential covariates. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to quantify the strength of associations.

Ethical approval was obtained from the institutional review board (IRB) before the start of the study, and informed consent was obtained from all study participants. Data confidentiality and privacy were ensured throughout the study by using de-identified data and storing data securely.

Results:

Figure 1. Age wise distribution of study subjects.

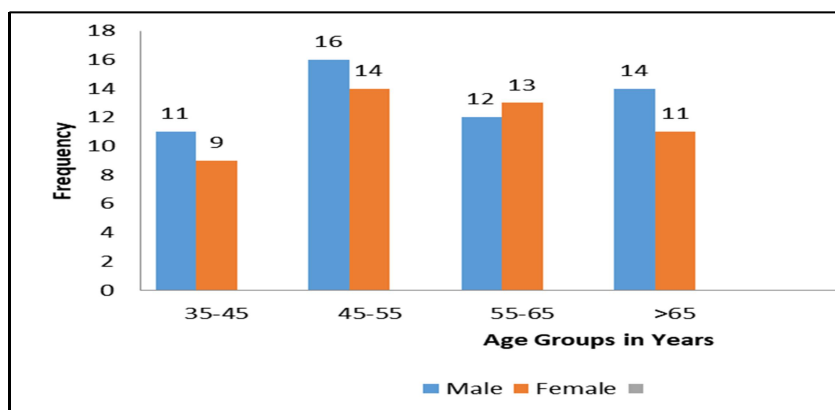


Table 1. Distribution of macro-vascular complications

Macro Vascular Complication	Male	Female
H/O Angina	5(29.4%)	2(11.7%)
H/O Myocardial Infarction	2(11.7%)	2(11.7%)
H/O Stroke (CVA)	3(17.6%)	1(5.8%)
H/O Peripheral Vascular Disease	2(11.7%)	0 (0%)

Table 2. Distribution of complications as per duration of alcohol intake.

Macrovascular complications	<5yrs	5-10yrs	>10yrs	Total
CAD	4 (66.6%)	6(66.7%)	2(66.7%)	12(66.7%)
Stroke	1(16.7%)	2(22.2%)	1(33.3%)	4(22.2%)
Peripheral vascular dis.	1(16.7%)	1(11.1%)	0(0%)	2(11.1%)
Total	6(100%)	9(100%)	3(100%)	18(100%)

1. Prevalence of macrovascular complications was found to be 18%.
2. Coronary artery disease was found in 12(12%) patients.
3. Stroke was found in 4 (4%) patients
4. Peripheral Vascular Disease was found in 4 (4%) patients.

Discussion:

The findings of this cross-sectional study provide important insights into the prevalence and risk factors of macrovascular complications in patients with T2DM. The prevalence of macrovascular complications was found to be 18 % in the study population, with cardiovascular disease (CVD) being the most common complication.

The results revealed that out of the 100 patients with T2DM, 18 had at least one macrovascular complication. The most common macrovascular complication was CVD, which was present in 12 (12%) patients, followed by cerebrovascular disease in 4 (4%) patients, and peripheral arterial disease in 4(4%) patients. The study also found that older age, male gender, longer duration of diabetes, higher body mass index (BMI), presence of hypertension and dyslipidemia, and poor glycemic control (higher HbA1c levels) were significantly associated with an increased risk of macrovascular complications in patients with T2DM ($p < 0.05$). Logistic regression analysis showed that age, male gender, BMI, and HbA1c levels were independent risk factors for macrovascular complications in T2DM patients ($p < 0.05$).

This is consistent with previous research indicating that macrovascular complications are a significant burden in patients with T2DM, contributing to increased morbidity and mortality rates.^{6,7,8} The study identified several risk factors that were significantly associated with macrovascular complications in T2DM patients. Advanced age, male gender, longer duration of diabetes, higher BMI, elevated blood pressure, dyslipidemia, and poor glycemic control (as measured by HbA1c levels) were found to be independent risk factors for macrovascular complications. These findings are consistent with the existing literature, which has consistently shown that these risk factors are associated with increased risk of macrovascular complications in T2DM.

The association between advanced age and macrovascular complications in T2DM is well-established, as aging is known to be a risk factor for CVD in general. Male gender has also been consistently identified as a risk factor for macrovascular complications in T2DM, although the underlying mechanisms for this gender disparity are not fully understood and require further investigation. The role of longer duration of diabetes as a risk factor for macrovascular complications is supported by the concept of "metabolic memory," which suggests that early glycemic control is crucial in preventing long-term complications in T2DM.^{9,10}

The study also identified modifiable risk factors, such as BMI, blood pressure, lipid profile, and HbA1c levels, as independent predictors of macrovascular complications. These findings highlight the importance of comprehensive management of cardiovascular risk factors in patients with T2DM. Optimal management of these modifiable risk factors through lifestyle modifications, medications, and appropriate interventions may help to reduce the risk of macrovascular complications in T2DM.

The findings of this study have important clinical implications. They underscore the need for early detection and management of macrovascular complications in patients with T2DM, especially in those with advanced age, longer duration of diabetes, male gender, and poor control of cardiovascular risk factors. This may include aggressive management of blood pressure, lipid levels, and glycemic control, as well as lifestyle interventions such as weight management, regular exercise, and smoking cessation. Furthermore, efforts should be made to raise awareness among T2DM patients about the importance of adhering to their treatment plans, adopting healthy lifestyle behaviors, and engaging in regular cardiovascular screenings.

However, this study has some limitations that need to be considered. The cross-sectional design precludes establishing causality, and the findings may be subject to confounding and selection bias. The study

was conducted in a single center, which may limit the generalizability of the findings to other populations. Additionally, the study relied on self-reported and medical record data, which may be subject to recall bias and errors. Longitudinal studies with larger and more diverse populations are needed to further investigate the associations identified in this study and to establish causality.

In conclusion, the findings of this cross-sectional study emphasize the significant burden of macrovascular complications in patients with type 2 diabetes mellitus (T2DM), with cardiovascular disease being the most common complication. Advanced age, longer duration of diabetes, male gender, higher BMI, elevated blood pressure, dyslipidemia, and poor glycemic control were identified as independent risk factors for macrovascular complications in T2DM patients. These findings highlight the importance of comprehensive management of cardiovascular risk factors in patients with T2DM to reduce the risk of macrovascular complications.

The clinical implications of this study include the need for early detection and management of macrovascular complications in T2DM patients, particularly those with risk factors such as advanced age, longer duration of diabetes, male gender, and poor control of cardiovascular risk factors. Lifestyle interventions, medication management, and regular cardiovascular screenings may be crucial in preventing and managing macrovascular complications in T2DM. However, the cross-sectional design and limitations of the study need to be considered, and further research is warranted to confirm these findings and investigate the underlying mechanisms involved.

Overall, this study contributes to the understanding of the evaluation of macrovascular complications in T2DM and provides important insights for clinicians and policymakers to develop effective strategies for the prevention and management of macrovascular complications in patients with T2DM, ultimately improving the outcomes and quality of life for individuals with this chronic condition.

Conclusion:

In conclusion, this cross-sectional study provides valuable insights into the prevalence and risk factors of macrovascular complications in patients with T2DM. The findings highlight the need for comprehensive management of cardiovascular risk factors in T2DM patients, and underscore the importance of early detection and management of macrovascular complications. These findings may inform clinical practice and contribute to the development of targeted strategies for the prevention and management of macrovascular complications in patients with T2DM. Further research is warranted to confirm these findings and investigate the underlying mechanisms involved in the development of macrovascular complications in T2DM.

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