











Alif Ramli<sup>1, 2</sup>, Freddie Robinson<sup>1</sup>, Mohd Hafizuddin Ahmad<sup>1</sup>,  
Balachandar S. Sayapathi<sup>3</sup>, Carol Lim Kai Joo<sup>3</sup>, Syakeel Muhammad<sup>3</sup>,  
Nirmal Kaur<sup>4</sup>, Anisah Jantim<sup>4</sup>, Ismail Las<sup>5</sup>, Norimah Yusof<sup>6</sup>

<sup>1</sup>Department of Public Health Medicine, Faculty of Medical and Health Sciences, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia

<sup>2</sup>Medical Care Quality Section, Medical Development Division, Ministry of Health Malaysia, Putrajaya, Malaysia

<sup>3</sup>Penampang Area Health Office, Sabah, Malaysia

<sup>4</sup>Sabah State Health Department, Sabah, Malaysia

<sup>5</sup>Selangor State Health Department, Selangor, Malaysia

<sup>6</sup>Universiti Malaya, Kuala Lumpur, Malaysia

# Factors Associated with Diabetes Complications among People with Type 2 Diabetes in Sabah, Malaysia: A Cross-Sectional Study

## Introduction

The rising prevalence of type 2 diabetes (T2D) and diabetes complication result in substantial healthcare expenses, particularly given the considerable government subsidies provided to the healthcare system in Malaysia [1]. It is essential to periodically research diabetes complications and related variables to identify evolving trends and devise a plan of action. The objective of this study was to determine the prevalence and factors associated with diabetes complications among people with T2D in Sabah, Malaysia.

## Methods

This cross-sectional study was carried out at six primary healthcare clinics in Kota Kinabalu and Penampang areas in West Coast Division, Sabah from April 2023 to July 2023. A total of 287 patients with sub-optimally controlled T2D (HbA1c > 6.5%) who met inclusion criteria (diagnosed with T2D, ≥ 18 years old, on T2D medications and HbA1c > 6.5%) and provided written consent were included in the analysis. Demographic and medical data were obtained from the patients' medical records. This study received ethical approval from the Ministry of Health Malaysia's Medical Review and Ethics Committee (ethical approval: NMRR-ID-23-0097-XP1(IIR)).

The diabetes complication in this study refers to having at least one of the diabetes-related complications that had been identified by physicians and recorded in patients' medical records, which include retinopathy, stroke, ischemic heart disease, nephropathy, and diabetes-related foot problems. The definition of diabetes complications in this study was in line with the latest Sixth Clinical Practice Guidelines for the Management of Type 2 Diabetes Mellitus by the Ministry of Health Malaysia [2].

Address for correspondence:

Freddie Robinson, PhD

Department of Public Health Medicine, Faculty of Medical and Health Sciences, Universiti Malaysia Sabah, 88400 UMS Road, Kota Kinabalu, Sabah, Malaysia; e-mail: [freddie@ums.edu.my](mailto:freddie@ums.edu.my)

phone: + 60168324477

Clinical Diabetology 2024, 13; 2: 126-127

DOI: [10.5603/cd.99653](https://doi.org/10.5603/cd.99653)

Received: 5.03.2024 Accepted: 17.03.2024

Early publication date: 15.04.2024

**Table 1. Multivariable Analysis of the Association of Diabetes Complications with Age, Marital Status, Diabetes Duration and Polypharmacy**

Variable	Multivariable logistic regression OR (95% CI), p-value
Age [years]	1.044 (1.003–1.087), p = 0.034 <sup>a</sup>
Marital status	
Married	1
Unmarried	2.674 (1.174–6.092), p = 0.019 <sup>a</sup>
Diabetes duration [years]	1.065 (1.002–1.132), p = 0.042 <sup>a</sup>
Polypharmacy	
No	1
Yes	4.612 (1.637–12.997), p = 0.004 <sup>a</sup>

<sup>a</sup>p-value < 0.05; CI — confidence interval; OR — odds ratio

Multiple logistic regression models were used to estimate odds ratio (OR) [and 95% confidence interval (CI)] for diabetes complications using SPSS version 28.

## Results

Trained medical officers identified and briefed 420 potential eligible study participants who attended the participating healthcare clinics about taking part in this study. One hundred thirty-three individuals were excluded who refused to participate in the study or did not meet the criteria. A total of 287 participants with T2D were included in this study (mean age = 53.31 years, female = 54.4%, mean diabetes duration = 6.23 years). The prevalence of diabetes complications was 12.9%. Most participants were Dusun-Kadazan ethnicity (41.1%), with education level of secondary and below (96.5%), and overweight [mean body mass index (BMI) = 29.65]. Age (OR = 1.044, 95% CI: 1.003–1.087), unmarried (OR = 2.674, 95% CI: 1.174–6.092), diabetes duration (OR = 1.065, 95% CI: 1.002–1.132) and polypharmacy (OR = 4.612, 95% CI: 1.637–12.997) were associated with increased risk of diabetes complications (Tab. 1) after adjusting for age, marital status, diabetes duration and polypharmacy.

## Discussion

Factors associated with diabetes complications among people with T2D is age, unmarried status, diabetes duration and polypharmacy. The findings of this study are comparable to other studies [3, 4]. Similarly, a study done in China documented that the odds of

vascular complications was higher in unmarried patients than in married patients (OR = 1.41, 95% CI: 1.12–1.77) [3]. This information could be useful in developing methods for managing and preventing diabetes complications such as an effective intervention to improve glycemic control incorporating health education on self-care management.

The limitations of this study include small sample size, and due to the nature of the cross-sectional study, the findings may not be generalizable and not suitable to examine cause-and-effect relationships.

## Article information

### Funding

The study was supported by the UMSGreat Grant (Project code: GUG0563-1/2022) of the Universiti Malaysia Sabah.

### Acknowledgments

The authors would like to thank the Director General of Health Malaysia for his permission to publish this article. We sincerely thank the Sabah State Health Department as well as the clinics' management for the given permissions and support to conduct this study. This study received ethical approvals from the Ethical Committee of Faculty Medical and Health Science, Universiti Malaysia Sabah (Approval code: JKEtika 1/23 (27)) and the Ministry of Health's Medical Review and Ethics Committee (Ethical approval: NMRR-ID-23-0097-XP1(IIR)).

### Conflict of interest

The authors declare no conflict of interest.

## REFERENCES

1. Direct Health-care Cost of Noncommunicable Diseases in Malaysia. Ministry of Health Malaysia, Putrajaya 2022. [https://www.moh.gov.my/moh/resources/Penerbitan/Rujukan/NCD/NCD\\_Laporan/HEALTH-COST\\_of\\_NCDs-7a-WEB.pdf](https://www.moh.gov.my/moh/resources/Penerbitan/Rujukan/NCD/NCD_Laporan/HEALTH-COST_of_NCDs-7a-WEB.pdf) (4.03.2024).
2. Clinical Practice Guidelines. Management of Type 2 Diabetes Mellitus (6th Edition). Ministry of Health Malaysia, Putrajaya 2020. [https://mems.my/wp-content/uploads/2021/01/CPG\\_T2DM\\_6thEdition\\_2020.pdf](https://mems.my/wp-content/uploads/2021/01/CPG_T2DM_6thEdition_2020.pdf) (4.03.2024).
3. Li J, Chattopadhyay K, Xu M, et al. Prevalence and associated factors of vascular complications among inpatients with type 2 diabetes: A retrospective database study at a tertiary care department, Ningbo, China. *PLoS One*. 2020; 15(6): e0235161, doi: 10.1371/journal.pone.0235161, indexed in Pubmed: 32574208.
4. Arambewela MH, Somasundaram NP, Jayasekara HB, et al. Prevalence of Chronic Complications, Their Risk Factors, and the Cardiovascular Risk Factors among Patients with Type 2 Diabetes Attending the Diabetic Clinic at a Tertiary Care Hospital in Sri Lanka. *J Diabetes Res*. 2018; 2018: 4504287, doi: 10.1155/2018/4504287, indexed in Pubmed: 29951551.