

Factors Associated with Dietary Practices among Patients with Diabetes in a Malaysian Primary Care Clinic: A Cross-Sectional Study

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ABSTRACT

OBJECTIVE: To evaluate dietary practices and their associated factors among patients with Type 2 Diabetes Mellitus (T2DM) in a primary care clinic in Malaysia.

METHODOLOGY: A cross-sectional study was conducted from June 2024 to January 2025, involving 332 purposively sampled T2DM patients. Data were collected using a self-administered questionnaire that included sociodemographic information and a modified Nutrition Health Promoting Behavior instrument. Descriptive and inferential analyses were performed using IBM SPSS Statistics version 30, and binary logistic regression was used to identify factors associated with dietary practice.

RESULTS: 61.7% of the participants demonstrated good dietary practices, while 38.3% exhibited poor practices. Regression analysis showed that gender and ethnicity were significantly associated with dietary practices. Female patients were more likely to follow good nutritional practices (AOR = 2.60, $p < 0.001$), whereas Chinese participants were less likely to adhere compared with Malay patients (AOR = 0.15, $p < 0.001$). No significant difference was observed between Malay and Indian patients.

CONCLUSION: Gender and ethnicity were associated with dietary practices among patients with T2DM in this primary care setting. Female patients demonstrated better adherence, whereas Chinese participants were less likely to follow recommended practices than Malay patients. These findings suggest that culturally tailored interventions may help improve dietary practices, particularly for Chinese patients, although the results are limited to this setting and should be interpreted with caution.

KEYWORDS: Type 2 diabetes mellitus, dietary adherence, ethnicity, diabetes duration, Malaysia

INTRODUCTION

Diabetes mellitus, particularly Type 2 Diabetes Mellitus (T2DM), is an escalating global public health challenge. As of 2024, an estimated 537 million adults worldwide are living with diabetes, with projections indicating this number will rise to 783 million by 2045¹. In Malaysia, the prevalence of diabetes varies significantly across ethnic groups, with the highest rates observed among Indians (25.10%), followed by Malays (15.25%) and Chinese (12.87%)². Despite extensive government efforts, including national public health campaigns and expanded access to healthcare services, diabetes remains a leading cause of mortality in the country, contributing to over 70% of all deaths³. The increasing incidence of diabetes in Malaysia has been primarily attributed to factors such as urbanization, sedentary lifestyles, and significant changes in dietary patterns⁴. If left unmanaged, T2DM can lead to severe complications, including

cardiovascular diseases, kidney failure, vision loss, and limb amputation⁵. To prevent disease complications, it is essential to enhance the knowledge, attitudes, and appropriate actions of patients and their families⁶.

Emerging evidence suggests that modifying dietary patterns is a promising approach in the prevention and management of T2DM⁷. For instance, a study in South Ethiopia found that individuals with very low monthly incomes were 4.87 times more likely to have poor dietary habits due to limited access to nutritious food⁸. Furthermore, patients who received dietary counseling fewer than two times were 5.88 times more likely to engage in unhealthy eating behaviors⁹. A similar study at Jimma University Medical Centre revealed that less than half of diabetic patients exhibited good dietary and self-care practices, with sociodemographic factors, diabetes-related knowledge, social support, and emotional distress identified as significant determinants of dietary practice⁹.

In Malaysia, many patients with T2DM fail to meet dietary guidelines. One study reported that patients had inadequate intake of fruits, vegetables, fish, and dairy products, which may contribute to poor glycaemic control¹⁰. While medication adherence is generally high, adherence to dietary recommendations is notably lower. In Rio de Janeiro, 93.5% of T2DM patients adhered to their prescribed medications, but only 29.2% followed dietary

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doi: 10.22442/jlumhs.2026.01530



guidelines¹¹. A similar trend was observed in Saudi Arabia, where the majority of T2DM patients demonstrated poor dietary adherence despite high medication compliance¹². In Malaysia, only 16.4% of T2DM patients fully adhered to dietary plans¹³. Previous studies have identified common barriers to dietary adherence, including lack of motivation, insufficient knowledge, social barriers, an unsupportive work environment, limited time, and environmental factors¹⁴.

Additionally, most T2DM patients are elderly, making it challenging to alter long-established eating habits or reduce portion sizes. These practices are often deeply ingrained and seen as incompatible with personal preferences and local food norms¹⁵. Moreover, patients frequently struggle to comprehend medical information due to the use of complex, formal language and prefer content to be delivered in a simpler, more relatable, and engaging manner¹⁶.

Although numerous studies in Malaysia have examined dietary adherence among T2DM patients, limited research has focused on understanding behavioral patterns and the factors that influence nutritional practices. Therefore, this study aims to assess the level of dietary practices among T2DM patients and the factors associated with these practices in a selected primary care clinic in Malaysia.

METHODOLOGY

Study Design

This cross-sectional study was conducted from June 2024 to January 2025.

Population and Sample

The study population consisted of patients with T2DM attending a selected primary care clinic in Malaysia. Participants were recruited using purposive sampling, and the required sample size of 332 was calculated using a single proportion formula. The sample size calculation was based on an estimated HbA1c prevalence of 22.4%¹⁷, with a 95% confidence level, a 5% margin of error, and a 20% non-response rate. Eligible participants were Malaysian adults aged ≥ 18 years, diagnosed with T2DM, and currently receiving treatment at the clinic.

Instrument

A two-part questionnaire was used for data collection. Part A gathered sociodemographic and diabetes-related data, while Part B employed a modified version of the Nutrition Health Promoting Behavior (NHPB) questionnaire¹⁸, adapted for cultural relevance. The instrument consisted of 28 items across three domains: healthy food selection, meal planning, and calorie assessment. Responses were measured on a 4-point Likert scale (1 = never to 4 = always). The dietary behavior scores were adapted from Primanda Y 2011¹⁹ and classified into two categories: poor (scores 28–55.9) and good (scores 56–112). Content validity was assessed by three specialists in endocrinology (CVI = 0.98), and reliability was evaluated through a pilot study involving

30 respondents, demonstrating excellent internal consistency (Cronbach's $\alpha = 0.97$).

Data Collection

Data were collected using self-administered questionnaires distributed via Google Forms. The survey link was provided in person at the clinic through the Diabetic Resource Centre. Written informed consent was obtained from all participants, and the researcher was present to provide clarification during the completion of the questionnaires. No time limit was imposed on participants when completing the questionnaire.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 30. Descriptive statistics were used to summarize sociodemographic characteristics and dietary practices, with continuous variables presented as means (SD) and categorical variables as frequencies and percentages. Inferential statistics included simple logistic regression, and variables with $p < 0.25$ or those considered clinically important²⁰ were entered into multivariable binary logistic regression to identify independent factors. Model fit was assessed using the Hosmer–Lemeshow test, the classification table, and the area under the ROC curve. Statistical significance was set at $p < 0.05$.

Ethical Statement

Ethical approval was granted by the Institut Latihan Kementerian Kesihatan Malaysia (ILKKM) and the participating primary care clinic. Written informed consent was obtained from all participants, who were assured of confidentiality and anonymity.

RESULTS

Characteristics of Respondent

A total of 332 participants completed the questionnaire, achieving a 100% response rate. The majority of participants were male (51.2%), Malay (66.3%), and Muslim (66.3%). More than half reported a monthly household income between RM1,000 and RM5,000 (51.8%), while 34.6% had no formal education. Approximately half of the participants were married (50.0%), and most had been diagnosed with T2DM for 1–5 years (57.8%). Nearly all participants had received diabetes education (90.4%). Detailed sociodemographic characteristics are provided in **Table I** below.

Level of dietary practices

As shown in **Table II**, the majority of participants (61.7%, $n = 205$) demonstrated good dietary practices, while 38.3% ($n = 127$) exhibited poor dietary practices.

Association between sociodemographic background and dietary practice

Table III shows the association between sociodemographic factors and dietary practices among patients with T2DM. Binary logistic regression revealed that gender and ethnicity were significantly associated with dietary practices. In this sample, female patients had higher odds of following good

dietary practices compared to male patients (AOR = 2.60; 95% CI: 1.44–6.42; $p < 0.001$). Chinese participants were significantly less likely to demonstrate good dietary practices compared to Malay participants (AOR = 0.19; 95% CI: 0.101–0.362; $p < 0.001$). No significant association was observed between Malay and Indian participants. Other sociodemographic factors, including marital status, income, duration of diabetes, and education level, were not significantly associated with dietary practices.

Table I: Characteristics of Participants (n=332)

Characteristics	f	%
Gender		
Male	170	51.2
Female	162	48.8
Ethnic		
Malay	220	66.3
Chinese	65	19.6
Indian	47	14.1
Religion		
Islam	220	66.3
Christian	38	11.4
Hindu	47	14.2
Buddha	27	8.1
Education level		
Non-formal	115	34.6
Primary	42	12.7
Secondary	79	23.8
University	96	28.9
Marital status		
Single	102	30.7
Married	166	50.0
Widowed	65	19.3
Monthly income		
<RM1000	125	37.7
RM1000-RM5000	172	51.8
>RM5000	35	10.5
Duration of diabetes		
1-5 years	192	57.8
6-10 years	77	23.2
>11 years	63	19.0
Have received diabetes education		
Yes	300	90.4
No	32	9.6

Table II: Level of Dietary Practices

Characteristics	f	%
Dietary practices		
Good practices	205	61.7
Poor practices	127	38.3

Variable selection was performed using the forward likelihood ratio (LR) method. No significant interactions were found between significant variables.

The final model had an overall 66.9%. The area under the curve (AUC) was 0.703, indicating acceptable discrimination, and the Hosmer–Lemeshow test was not significant ($p=0.633$) suggesting the model is fit.

DISCUSSION

The present study found that 61.7% of participants demonstrated good dietary practices, reflecting a relatively positive pattern of self-care behaviors among individuals with T2DM in this primary care setting. This proportion was higher than that reported in studies conducted in Malaysian tertiary hospitals, where non-compliance has been linked to limited dietary knowledge and ingrained eating habits²¹. However, despite these encouraging practices, many patients still reported suboptimal glycemic control, often due to inadequate self-management, particularly in dietary adherence²². The relatively better practices observed in this study may reflect the impact of ongoing health education and counseling within this clinic. Nevertheless, cultural factors remain a significant challenge, as Malaysian dietary patterns are deeply rooted in traditional habits, such as the centrality of white rice in daily meals^{23,24}. Moreover, a lack of sustained motivation and limited follow-up support may hinder long-term adherence, indicating that dietary education should emphasize continued patient engagement rather than one-time counseling. Although these findings provide valuable insights, they were derived from a single primary care setting using purposive sampling and may not be generalizable to all T2DM populations.

In this study, female patients were significantly more likely to adhere to healthy dietary practices than male patients. This finding is consistent with previous research among Ethiopian populations^{25,26}, which suggests that women may be more aware of their health conditions²⁷ and more engaged in dietary self-care behaviors related to T2DM management. In contrast, a study conducted in Jordan reported that female patients were more likely to engage in poor dietary practices than their male counterparts²⁸. These mixed findings suggest that cultural and social contexts may influence gender differences in dietary behavior. Nevertheless, given the cross-sectional design and single-setting nature of this study, causality cannot be inferred, and these findings may not be generalizable to other populations.

This study also found a significant association between ethnicity and dietary practices, with Chinese patients having lower odds of adhering to healthy dietary practices than their Malay counterparts. These findings are consistent with previous research reporting that Malay participants demonstrated greater adherence to dietary recommendations than Chinese and Indian participants²⁹. This pattern may reflect the influence of sociocultural factors on health behaviours in Malaysia's multicultural context, where each ethnic

Table III: Simple Logistic Regression and Binary Logistic Regression Results

Variable	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Gender				
Male	1			
Female	1.43 (0.916, 2.231)	0.116	2.60 (1.444, 6.420)	<0.001
Ethnic				
Malay	1			
Chinese	0.24 (0.132, 0.439)	<0.001	0.19 (0.101, 0.362)	<0.001
Indian	0.86 (0.451, 1.635)	0.143	1.41 (0.710, 2.793)	0.327
Religion				
Islam	1			
Christian	0.58 (0.292, 1.165)	0.126	0.39 (0.142, 1.808)	0.115
Hindu	0.86 (0.4512, 1.635)	0.243	0.72 (0.334, 1.550)	0.401
Buddha	0.71 (0.302, 1.253)	0.188	0.46 (0.777, 1.789)	0.103
Education level				
Non-formal	1			
Primary	0.90 (0.434, 1.869)	0.178	0.34 (0.135, 1.852)	0.152
Secondary	1.53 (0.816, 2.868)	0.184	1.65 (0.766, 3.571)	0.200
University	0.23 (0.127, 0.408)	<0.001	0.09 (0.043, 1.191)	0.118
Marital status				
Single	1			
Married	0.80 (0.486, 1.307)	0.168	1.44 (0.721, 2.859)	0.255
Widowed	0.43 (0.121, 1.046)	0.205	2.44 (0.561, 7.774)	0.324
Monthly income				
<RM1000	1			
RM1000-RM5000	0.34 (0.208, 0.563)	<0.001	0.36 (0.216, 2.592)	0.122
>RM5000	0.14 (0.062, 0.330)	<0.001	0.16 (0.070, 1.379)	0.244
Duration of diabetes				
1-5 years	1			
6-10 years	1.14 (0.671, 1.937)	0.228	0.13 (0.105, 2.851)	0.076
>11 years	0.35 (0.145, 0.776)	0.033	0.42 (0.172, 1.066)	0.578
Received diabetes education				
Yes	1			
No	0.19 (0.560, 2.588)	0.635	-	-

group has distinct dietary norms and cultural beliefs. The observed differences in dietary practices may be attributed to variations in food preferences, social norms, and access to culturally appropriate dietary advice. Non-Malay participants often reported challenges in modifying staple foods such as white rice, noodles, and coconut-based dishes, which are deeply embedded in traditional diets²⁹. Similar trends have been observed in earlier studies, where non-Malay ethnic groups were more likely to consume high-glycemic or deep-fried foods, leading to poorer adherence to dietary recommendations¹³. Additionally, research on weight management and diabetes programs among minoritized ethnic groups has highlighted the importance of cultural beliefs, social support, and traditional dietary habits in influencing dietary behavior³⁰. While these findings provide insight into potential cultural barriers to dietary modification,

they should be interpreted cautiously due to the single-setting design and purposive sampling, which may limit generalizability.

In contrast, no significant association was found between Malay and Indian participants regarding their dietary practices. This finding is consistent with results from another study that reported no significant differences in nutritional practices among ethnic groups after adjusting for socioeconomic status, health knowledge, and access to nutritional counseling³¹. This suggests that broader social determinants, rather than ethnicity alone, may play a substantial role in shaping dietary behaviors. While ethnicity can influence eating habits, the present findings indicate that interventions should extend beyond cultural norms to address other key barriers, such as food affordability, family support, and individualized meal planning. Previous research has

shown that culturally relevant interventions that incorporate both education and regular follow-up significantly improve adherence across diverse ethnic groups³². These findings highlight the importance of a comprehensive approach to dietary management for T2DM - one that integrates cultural, social, and economic factors to promote sustainable behavior change. Nevertheless, as this study was conducted in a single primary care clinic using purposive sampling, the findings should be interpreted with caution. They may not be generalizable to the broader population. This study has several limitations. First, the cross-sectional design restricts the ability to establish causal relationships between factors such as gender, ethnicity, and dietary practices. Second, the use of self-reported data may introduce bias, as participants could over-report healthy behaviours, particularly regarding nutritional practices. Third, purposive sampling from a single primary care clinic may limit the generalizability of the findings. The study also did not explore the cultural aspects of dietary practices in depth, and factors such as psychological distress and healthcare access were not fully considered, which may influence nutritional practices. Lastly, the findings may not apply to other countries or settings with differing healthcare systems and cultural norms.

CONCLUSION

The overall dietary practices among patients with T2DM in this primary care setting were generally good. Gender and ethnicity were significantly associated with dietary practices. Nevertheless, ongoing efforts are needed to enhance awareness of healthy dietary behaviors through culturally tailored, long-term interventions. Persistent barriers, including cultural dietary preferences, socioeconomic challenges, and limited access to individualized nutritional support, remain. As this study was conducted in a single setting using a cross-sectional design, the findings may not be generalizable to all T2DM populations. Future research should examine these factors in greater depth and employ longitudinal or experimental designs to establish causal relationships, providing more robust evidence to guide the development of effective dietary interventions.

ACKNOWLEDGMENT

The authors thank the patients, experts, and everyone who voluntarily participated in the research.

Ethical permission: Ethical approval was granted by the Institut Latihan Kementerian Kesihatan Malaysia (LKKMAS[PP]600-3/2/1) and the participating primary care clinic. Written informed consent was obtained from all participants, who were assured of confidentiality and anonymity.

Conflict of interest: There is no conflict of interest between the authors.

Financial Disclosure / Grant Approval: This

research was supported by the UMY Fellowship Program 2025.

Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Wan Mamat WH: Verified data analysis, review and editing

Ahmead N: Review and editing

Ismalina Isa SN: Review and editing

Arini M: Review and editing

Mohd Jafri WNIW: Data collection, analysis

Abdul Kadir FIM: Conceptualization

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