https://doi.org/10.46389/rjd-2026-2218
www.rjdnmd.org

Rom J Diabetes Nutr Metab Dis
2026; volume 33, issue 2, pages 237–247

Original Article

The relationship between nutrition literacy and the consumption of high-glycemic-index foods and fasting blood glucose levels in people with diabetes

Haipa Irdayanti[1]*, Ratih Kurniasari[1], Eka Andriani[1]

[1] Department of Nutrition, University of Singaperbangsa Karawang, Karawang, Indonesia

* Correspondence to: Haipa Irdayanti, Department of Nutrition, University of Singaperbangsa Karawang, Jl. Lingkar Tanjungpura, Karawang Timur, Jawa Barat 41314, Indonesia. Phone: +62 87848755149; E-mail: 2210631220008@student.unsika.ac.id

Received: 11 April 2026 / Accepted: 2 June 2026

Abstract

Type 2 diabetes mellitus is a growing health problem in Indonesia and is closely linked to dietary patterns and individuals' ability to understand nutritional information. This study aims to analyze the relationship between nutritional literacy and the consumption of high-glycemic index (GI) foods with fasting blood glucose levels in patients with type 2 diabetes mellitus. This study employed an analytical observational design with a cross-sectional approach. The study sample consisted of 46 respondents selected using purposive sampling in the service area of the Telukjambe Community Health Center. Data were collected via the Nutrition Literacy Scale for Diabetic Patients questionnaire, the Food Frequency Questionnaire (FFQ), and fasting blood glucose measurements. Data analysis was performed using the chi-square test. The results showed a significant association between nutrition literacy and fasting blood glucose levels (p=0.007), as well as an association between the consumption pattern of high-glycemic index foods and fasting blood glucose levels (p=0.005). Respondents with low nutrition literacy and a higher frequency of consuming high-GI foods tended to have higher fasting blood glucose levels. The conclusion of this study indicates that nutritional literacy and dietary patterns play a crucial role in controlling blood glucose levels in patients with type 2 diabetes mellitus. Therefore, improving nutritional literacy and adopting a low-glycemic-index diet are necessary measures for diabetes management.

Keywords: type 2 diabetes mellitus, nutritional literacy, glycemic index, fasting blood glucose

Introduction

Diabetes mellitus (DM) is one of the major health issues in Indonesia, with its prevalence continuing to rise each year. DM is often referred to as a "silent killer" because it often goes unnoticed and is only detected after complications have developed. According to International Diabetes Federation, (2025) [1], Indonesia ranks fifth in the world in terms of the number of people with diabetes. The 2023 Indonesian Health Survey shows that the prevalence of diabetes in Indonesia reached 11.7% among people aged 15 and older, with type 2 diabetes accounting for the highest proportion at 50.2% [2]. In West Java Province, the prevalence of diabetes is 2.2% [2]. According to data from the Karawang District Health Office for 2025, the prevalence of diabetes in Karawang District stands at 2.2%. This high rate underscores the critical importance of diabetes management, particularly through monitoring blood sugar levels as the primary indicator of disease management.

Elevated blood glucose levels are influenced by a combination of interacting clinical, behavioral, and social factors. Age, duration of diabetes, and the presence of comorbidities such as hypertension and dyslipidemia have been shown to be associated with poorer glycemic control due to progressive beta-cell damage and increased insulin resistance [3]. In addition, patients with diabetes require pharmacological therapy in the form of oral antidiabetic medications, such as metformin, sulfonylureas, SGLT2 inhibitors, and GLP-1

agonists, as well as insulin, tailored to each patient's clinical condition, comorbidities, and HbA1c target [4]. However, the success of pharmacological therapy is heavily influenced by patient adherence; poor medication adherence has been shown to be a strong predictor of poor glycemic control and elevated blood sugar levels [5]. Therefore, non-pharmacological therapy also plays an important role as a supportive strategy in helping to control blood sugar levels in people with diabetes.

One of the key components of non-pharmacological therapy is dietary management, which is influenced by an individual's ability to understand nutritional information [6]. Nutrition literacy is one of the factors that influence patients' attitudes and dietary behaviors in their daily meal planning. Nutrition literacy refers to an individual's ability to obtain, manage, and understand various nutrition-related information [7]. Individual decisions regarding nutrition play a major role in determining dietary patterns and physical activity levels; this is related to the nutritional information that is accessed [8]. Conversely, a lack of nutritional knowledge often leads patients to make poor food choices, fail to understand the importance of monitoring their blood sugar, and fail to follow dietary recommendations or adopt a healthy lifestyle [9].

A study by Adhania at Arifin Achmad General Hospital in Pekanbaru (2024) showed a significant correlation between health literacy and adherence to self-monitoring of blood glucose among patients with type 2 diabetes, with those who had high health literacy being 17 times more likely to monitor their blood glucose effectively [10]. Adequate nutritional knowledge has been shown to improve dietary adherence and patients' ability to manage their blood sugar levels on a daily basis [11]. In addition to knowledge, the types of food consumed particularly based on the glycemic index (GI) also affect blood sugar stability.

Consuming foods with a high glycemic index, such as white rice, white bread, and processed foods, causes a sharp rise in blood glucose levels and puts a greater strain on insulin, thereby accelerating the development of insulin resistance and worsening blood sugar control in people with type 2 diabetes [12]. Consuming foods with a high glycemic index and glycemic load is a major risk factor for hyperglycemia and impaired blood sugar control in type 2 diabetes [13]. Consistency in maintaining a low-glycemic diet has a significant impact on blood sugar stability and the prevention of diabetes complications [14].

The research site, the Telukjambe Community Health Center located in East Telukjambe Subdistrict, was selected because it had the highest prevalence of diabetes in Karawang Regency 3.9% in 2025. This figure is higher than the overall prevalence of diabetes in Karawang Regency, which stands at 2.2%. Therefore, the Telukjambe Community Health Center is representative of conditions at the regency level. Additionally, the Telukjambe Community Health Center is situated in a heterogeneous area with a diverse population. Based on this background, the researchers were interested in analyzing the relationship between nutrition literacy and high-GI dietary patterns with blood glucose levels among patients with type 2 diabetes at the Telukjambe Community Health Center..

Material and methods

Study design and patients

This study was an analytic observational study with a cross-sectional design using a quantitative approach. The study aimed to analyze the relationship between nutrition literacy, consumption patterns of high glycemic index foods, and fasting blood glucose levels among patients with type 2 diabetes mellitus (T2DM).

The population consisted of 2,576 patients with T2DM in the working area of Telukjambe Public Health Center. A total of 46 respondents were selected using a purposive sampling technique. The sample size was determined using the Isaac and Michael formula (minimum sample size = 41 respondents), with an additional 10% added to anticipate dropouts. This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Surakarta (No. 6196/B.1/KEPK-FKUMS/III/2026).

Laboratory and data collection

Data were collected using medical records, glucometer measurements, sociodemographic questionnaires, the Nutrition Literacy Scale in Diabetic Patients, and a Food Frequency Questionnaire (FFQ) based on the list of high glycemic index foods issued by the Indonesian Ministry of Health (2019).

Fasting blood glucose levels were obtained through glucometer measurements and medical records. Sociodemographic characteristics were collected using structured questionnaires. Nutrition literacy was assessed using the Nutrition Literacy Scale in Diabetic Patients, while dietary intake patterns were evaluated using the FFQ focusing on the consumption frequency of high glycemic index foods.

https://doi.org/10.46389/rjd-2026-2218

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 25.0. Univariate analysis was conducted to describe respondent characteristics, while bivariate analysis was performed to determine the relationship between variables. The chi-square test was used to analyze the association between nutrition literacy, consumption patterns of high glycemic index foods, and fasting blood glucose levels. Statistical significance was determined at $p<0.05$.

Results

The results of the study show that the majority of respondents were in the ≥45 age group, accounting for 58.7%, while respondents under 45 years of age accounted for 41.3%. These findings indicate that the majority of type 2 diabetes patients in this study were in the pre-elderly age group, which, from an epidemiological perspective, is a high-risk group for glucose metabolism disorders. The age range of respondents in this study was 35–55 years. Additionally, based on gender, the majority of respondents were female, accounting for 80.4%, while males accounted for only 19.6%. This distribution indicates that women predominate as patients with type 2 diabetes in this study.

Respondent characteristics based on educational level show that the majority of respondents had completed primary education (elementary school), accounting for 56.5%. These results indicate that the majority of type 2 diabetes patients in this study come from groups with relatively low educational levels. Educational level can influence an individual's ability to understand health information, including information related to diabetes management and the adoption of appropriate dietary patterns.

Furthermore, based on employment status, it was found that the majority of respondents were unemployed, accounting for 84.8%. This finding indicates that the majority of type 2 diabetes patients in this study belong to the group without active employment. This condition warrants attention because employment status is closely linked to physical activity levels, lifestyle, and socioeconomic conditions that can influence blood sugar control.

Based on treatment history, the majority of respondents were found to be taking diabetes medication, accounting for 60.9%. These results indicate that the majority of patients have undergone pharmacological therapy, although there remains a proportion of respondents who have not yet started or do not regularly take their medication. This situation suggests the potential for suboptimal blood sugar control among patients with type 2 diabetes mellitus.

Meanwhile, based on family history, the majority of respondents had no family history of diabetes, accounting for 80.4%, while only 19.6% had a family history. These findings suggest that the incidence of type 2 diabetes among respondents is likely influenced more by non-genetic factors, particularly lifestyle, diet, and physical activity. In terms of the duration of diabetes, the majority of respondents had a disease duration of <5 years (76.1%), while 23.9% had a duration of ≥5 years. These results indicate that the majority of respondents are in the early to intermediate stages of type 2 diabetes.

Based on the results of fasting blood glucose tests, the majority of respondents had fasting blood glucose levels in the high category (60.9%), while 39.1% had normal fasting blood glucose levels. These results indicate that the majority of type 2 diabetes patients in this study have not yet achieved optimal glycemic control (Table 1).

Bivariate analysis in this study was conducted using the chi-square test to determine whether there was

Table 1: Frequency distribution of respondent characteristics.

Respondent characteristics	n	%
Age		
<45 years old	19	41.3
≥45 years old	27	58.7
Gender		
Female	37	80.4
Male	9	19.6

Table 1: Continued.

Respondent characteristics	n	%
Level of education		
Elementary school	26	56.5
Junior high school	12	26.1
Senior high school/vocational high school	8	17.4
Employment status		
Employed	7	15.2
Unemployed	39	84.8
Medication use		
Yes	28	60.9
No	18	39.1
Family history of diabetes		
Yes	9	19.6
No	37	80.4
Duration of diabetes		
≥5 years	11	23.9
<5 years	35	76.1
Fasting blood sugar		
Normal	18	39.1
High	28	60.9
Total	46	100.0

a significant association between the independent and dependent variables. The results in Table 2 show that there is a significant association between nutrition literacy and fasting blood glucose (FBG) levels in patients with type 2 diabetes mellitus. Based on the statistical test results, a p-value of 0.007 ($p<0.05$) was obtained, indicating that the relationship is statistically significant. This finding suggests that higher nutritional literacy is associated with better fasting glycemic control, whereas low nutritional literacy is linked to a higher risk of hyperglycemia.

In this study, nutritional literacy was analyzed through five main factors: the ability to read nutritional information, categorize foods, calculate food portions, understand the impact of food on health, and prepare meals. These five factors simultaneously influence respondents' dietary behaviors, which ultimately affect the control of fasting blood glucose levels (Table 2).

In addition, the study results also indicate a potential association between the consumption of foods with a high glycemic index and fasting blood glucose levels. Based on the analysis in Table 3, respondents who frequently consumed foods with a high glycemic index were more likely to fall into the high FPG category (47.9%) compared to the normal FPG category (6.5%). Conversely, respondents who rarely consumed foods with a high glycemic index were more likely to be in the normal FPG category (32.6%) compared to the high FPG category (13.0%).

This difference in proportions indicates that the frequency of consuming foods with a high glycemic index influences an increase in fasting blood glucose levels. The more frequently respondents consume foods with a high glycemic index, the greater the tendency for an increase in fasting blood sugar levels. Conversely, limiting the consumption of foods with a high glycemic

https://doi.org/10.46389/rjd-2026-2218

Table 2: Analysis of the relationship between nutrition literacy and fasting blood sugar.

Variable	Fasting blood sugar				Total		p-value
	Normal		High				
	n	%	n	%	n	%	
Nutrition literacy							
Good	14	30.4	9	19.6	23	50.0	0.007
Poor	4	8.7	19	41.3	23	50.0	
Total	18	39.1	28	60.9	46	100.0	

Note: * – The chi-square correlation is significant at the 0.05 level of significance.

index tends to be associated with better glycemic control in patients with type 2 diabetes mellitus (Table 3).

Discussion

Age

The results of the study indicate that the majority of respondents were in the ≥45 age group, accounting for 58.7%, while those under 45 years of age accounted for 41.3%. These findings are consistent with Arfania, (2021) study, which showed that the majority of people with diabetes are in the 41–60 age range [15]. Additionally, data from the Karawang Regency Health Office (2024) also indicate a high prevalence of diabetes in the 40–59 age group, thereby reinforcing the finding that risk increases in this age group.

The aging process is associated with pancreatic beta cell dysfunction through mechanisms of oxidative stress, chronic inflammation, and reduced glucose responsiveness, leading to diminished insulin secretion capacity. Age is associated with first-phase insulin secretion, indicating that as age increases, the pancreas's initial response to rising blood glucose levels tends to decline [16]. This condition can be further exacerbated by insulin resistance, which is common in older adults [17].

Gender

Based on the data presented in Table 1, it is evident that the majority of respondents were female, accounting for 80.4%, while males accounted for only 19.6%. Physiologically, women have a higher risk of developing type 2 diabetes, particularly after entering menopause. Generally, natural menopause occurs in women between the ages of 45 and 55 [18]. Decreased estrogen levels are associated with increased insulin resistance and fat redistribution to the visceral area, which contributes to elevated blood glucose levels [19]. This condition indicates that hormonal changes in women are a key factor in the increased risk of impaired glucose metabolism.

In men, the hormone testosterone plays a role in maintaining muscle mass and insulin sensitivity, thereby supporting glucose utilization by body tissues [20]. However, a decrease in testosterone levels contributes

Table 3: Analysis of the relationship between high-glycemic-index food consumption patterns and fasting blood glucose levels.

Variable	Fasting blood sugar				Total		p-value
	Normal		High				
	n	%	n	%	n	%	
High glycemic index food consumption patterns							
Rarely	15	32.6	6	13.0	21	45.7	0.005
Often	3	6.5	22	47.9	25	54.3	
Total	18	39.1	28	60.9	46	100.0	

Note: * – The chi-square correlation is significant at the 0.05 level of significance.

to an increase in visceral fat, which triggers the release of pro-inflammatory cytokines, leading to insulin resistance in muscles and the liver as well as sarcopenia, which impacts the body's ability to absorb glucose [21]. This indicates that both women and men experience physiological changes that can affect blood glucose regulation, albeit through different mechanisms.

Level of education

Based on the research findings, it was found that the majority of respondents had completed primary education (elementary school), accounting for 56.5%. These findings are consistent with a study conducted by Nurvitasari *et al*., (2025) which showed that educational level is associated with the incidence of type 2 diabetes, with individuals with lower educational levels being more likely to have the condition [22]. Additionally, research by Suswani *et al*. (2025) also indicates that the majority of people with diabetes have a low level of education. This situation can be linked to limitations in understanding health information and the ability to access education regarding disease prevention and management, which ultimately may influence healthy lifestyle behaviors [23].

Educational level is one factor that can influence an individual's ability to receive, understand, and apply health information, including in the management of DM. This aligns with the research by Wati *et al*., (2025) which states that knowledge levels are associated with an individual's ability to control DM risk factors [24]. Thus, educational level can play an indirect role through increased knowledge in supporting disease management.

Employment status

Based on the research findings, it was found that the majority of respondents were unemployed, accounting for 84.8%. These findings are consistent with the study by Anshori, (2022) which showed that employment status and daily activities are associated with the health status of individuals with type 2 diabetes, particularly through differences in physical activity levels and lifestyle across occupational groups [25]. Individuals who are not employed tend to have lower levels of physical activity, which may contribute to an increased risk of insulin resistance and impaired glucose metabolism. Other studies indicate that low physical activity correlates with elevated blood glucose levels in older adults with type 2 diabetes, suggesting that employment status associated with sedentary daily activities may increase the risk of hyperglycemia [26].

Physical activity plays a crucial role in enhancing insulin sensitivity and glucose utilization by muscle tissue. When physical activity is low, glucose uptake by muscles decreases, causing glucose to accumulate in the blood in individuals with type 2 diabetes [27].

Medication use

The results of the study show that the majority of respondents—60.9%—take medication. These findings are consistent with the study by Awaliyah *et al*., (2024) which demonstrated that adherence to antidiabetic medication is significantly associated with blood glucose levels in patients with type 2 diabetes mellitus [28]. Patients who adhere to their medication regimen have better-controlled blood glucose levels compared to those who do not, underscoring the crucial role of pharmacotherapy in diabetes management.

Metformin suppresses hepatic gluconeogenesis and enhances peripheral insulin sensitivity, while sulfonylureas stimulate insulin secretion from pancreatic beta cells. Non-adherence disrupts these mechanisms, leading to blood glucose fluctuations and failure to achieve glycemic targets. A study by Renaldia *et al*., (2021) tates that non-adherence to pharmacological therapy leads to persistent hyperglycemia and chronic complications in type 2 diabetes [29]. Non-adherent patients exhibit unstable glucose levels, in contrast to the adherent group, which achieves good regulation.

Family history of diabetes

Based on the research findings, it was found that the majority of respondents had no family history of diabetes, accounting for 80.4%, while only 19.6% had a family history. Lifestyle factors are one of the key determinants in the development of type 2 diabetes. Research by Febrianti *et al*., (2025) shows a significant association between an unbalanced diet and low physical activity with elevated blood sugar levels in patients with type 2 diabetes, even more so than genetic factors [30]. Additionally, research by Nur & Dafriani, (2018) also states that behavioral factors such as unhealthy eating patterns, lack of physical activity, and obesity are the primary drivers of hyperglycemia in type 2 diabetes patients in Indonesia, surpassing the influence of genetics in determining metabolic conditions [31]. A sedentary lifestyle exacerbates the accumulation of visceral fat, which disrupts insulin signaling, thereby accelerating disease progression.

https://doi.org/10.46389/rjd-2026-2218

An unhealthy lifestyle causes an energy imbalance that triggers the accumulation of visceral fat. Visceral fat is metabolically active and produces pro-inflammatory cytokines such as TNF-α and IL-6 that interfere with insulin function, leading to insulin resistance and elevated blood sugar levels [32]. A study by Rahim, (2024) shows that unhealthy lifestyles, such as a lack of physical activity and an unbalanced diet, are significantly associated with the incidence of type 2 diabetes [33]. Sedentary individuals have a higher risk of impaired glucose metabolism due to increased visceral fat mass, which triggers chronic inflammation [34].

Nevertheless, while family history is a non-modifiable risk factor, its impact can be minimized through healthy lifestyle changes such as dietary adjustments, increased physical activity, and adherence to treatment [33]. Lifestyle modifications can delay or prevent type 2 diabetes in genetically at-risk individuals by up to 58%, according to intervention studies [34].

Duration of diabetes

Most respondents had had diabetes mellitus for <5 years (76.1%), while 23.9% had had the condition for ≥5 years. Duration of diabetes is one of the key factors associated with blood glucose control. The longer the duration of the disease, the greater the risk of decreased pancreatic beta cell function and increased insulin resistance, making glycemic control more difficult to achieve [35]. This is consistent with the study by Nugroho *et al*., (2021) which showed that a diabetes duration of ≥5 years is significantly associated with elevated blood glucose levels [36].

Pathophysiologically, type 2 diabetes is progressive. In the early stages, the body is still able to compensate by increasing insulin secretion (hyperinsulinemia) to counteract insulin resistance. However, over time, pancreatic beta cells become exhausted, leading to a gradual decrease in insulin production and an increase in blood glucose levels. This condition contributes to the development of chronic hyperglycemia and increases the risk of complications. Additionally, a longer duration of the disease is also associated with an increased risk of complications, such as diabetic neuropathy, which is more commonly found in patients with a diabetes duration of more than 5–10 years compared to those with a shorter duration [37]. However, the occurrence of hyperglycemia is influenced not only by the duration of the disease but also by other factors such as glycemic control and overall metabolic status.

Fasting blood sugar

Based on the study results, it was found that the majority of respondents had fasting blood glucose levels in the high category, at 60.9%, while 39.1% of respondents had normal fasting blood glucose levels. Fasting blood glucose levels are a key indicator in assessing the success of type 2 diabetes management because they reflect the body's ability to maintain glucose homeostasis after a period of fasting, which is heavily influenced by insulin function and hepatic glucose production [20]. Elevated fasting blood glucose levels in type 2 diabetes result from a combination of insulin resistance and increased hepatic glucose output. In patients with type 2 DM, there is impaired insulin action in peripheral tissues and the liver; consequently, the liver continues to produce and release glucose into the circulation even when blood glucose levels are already high, contributing to elevated postprandial blood glucose levels and fasting hyperglycemia [38].

The results of this study indicate that high fasting blood glucose levels can be influenced by behavioral factors, such as non-adherence to dietary patterns, low levels of physical activity, and irregular medication intake. Previous research has shown that a diet high in GI and fat and low in fiber is significantly associated with elev ated blood glucose levels in patients with type 2 diabetes [39] In addition, low physical activity can reduce glucose utilization by skeletal muscle, thereby increasing the risk of hyperglycemia, including during fasting.

Furthermore, treatment adherence, particularly regarding the use of oral antidiabetic medications, has been shown to have a significant association with glycemic control. Patients who are non-adherent to their medication tend to have uncontrolled blood sugar levels compared to those who are adherent [40]. These findings align with the results of this study, in which, although the majority of respondents had had DM for <5 years, the proportion of uncontrolled blood glucose levels remained high. This indicates that in addition to disease duration, other factors such as medication adherence and lifestyle play a significant role in determining blood glucose levels.

Relationship between nutrition literacy and fasting blood sugar

The results of the statistical test using the Chi-square analysis yielded a p-value of 0.007, indicating that there is a statistically significant association between nutrition literacy and HbA1c levels in people

with diabetes. These findings are consistent with the study by Seckiner *et al.*, (2026) which showed that nutrition literacy is associated with better metabolic control in people with diabetes [41]. Nutrition literacy plays a role in enhancing an individual's ability to understand nutrition-related information and manage their diet, which is ultimately associated with better metabolic parameters. In line with this, Ozdemir *et al.*, (2025) emonstrated that food literacy is associated with eating behavior patterns and glycemic parameters in patients with type 2 diabetes [42]. Individuals with higher literacy levels tend to have healthier eating patterns, which in that study were associated with better metabolic outcomes. This indicates that nutritional literacy can serve as a factor supporting glycemic control through behavioral change mechanisms.

A study by Jafari *et al.*, (2023) shows that health literacy plays a role in improving the quality of life of people with diabetes by enhancing their understanding and ability to manage the disease [43]. A study by Karkhah *et al.*, (2025) also confirms that nutritional knowledge is one of the key determinants in diabetes management [44]. Individuals with limited knowledge are approximately 9.3 times more likely to have abnormal blood sugar levels compared to those with good knowledge [45]. In this context, nutritional understanding serves as a key component in fostering eating behaviors aligned with recommendations, thereby helping to control blood sugar levels.

Limitations in understanding and using information on nutrition labels can lead to less healthy consumption patterns of packaged foods, including the potential for higher sugar intake. A study by Alshahrani *et al.*, (2023) of diabetic patients at primary care facilities found that the majority of patients had limited knowledge of food labels and faced difficulties in reading and interpreting the information, with only a small proportion able to understand nutrition labels without difficulty [46]. These comprehension barriers contribute to patients' inability to accurately identify the content of sugar, fat, and other nutrients, which can ultimately hinder efforts to control sugar intake and manage blood sugar levels. In line with this, a study by Haeriah *et al.*, (2025) found that literacy regarding packaged food labels is associated with food selection skills (food skills), where individuals with low literacy tend to have limitations in evaluating the nutritional content of food products, thereby affecting their ability to control blood sugar [47].

Additionally, the ability to categorize foods and calculate portion sizes is a crucial component of nutritional literacy that supports diabetes management. These skills enable individuals to classify foods into major groups such as carbohydrates, proteins, fats, vegetables, and fruits in accordance with balanced dietary guidelines, such as the "My Plate" concept. This understanding helps individuals select appropriate food types and quantities, including consideration of the glycemic index. Consuming foods with a low glycemic index is known to help maintain stable blood glucose levels [48]. This study aligns with the research by Aguatina *et al.*, (2025) which showed that individuals with good health literacy tend to optimally follow the 3J dietary pattern (type, quantity, and schedule), which is significantly correlated with a reduction in fasting blood sugar levels in patients with type 2 diabetes [49].

Understanding the impact of food on health is a key component of nutritional literacy that plays a role in determining individual dietary behavior. Consumption of foods high in simple sugars and with a high GI can cause a rapid increase in blood glucose levels, which, if sustained over time, will lead to elevated fasting blood sugar levels. Conversely, individuals who understand this tend to choose foods with a low GI, resulting in more stable blood glucose levels [50]. This understanding is then put into practice through food preparation skills as the final component of nutrition literacy.

These skills are directly linked to dietary quality, as individuals who can prepare their own meals tend to reduce their intake of added sugars, salt, and excess fat compared to those who consume ready-to-eat foods. Additionally, cooking skills also support improved self-management in people with diabetes, particularly in controlling carbohydrate portions and choosing healthier cooking methods. Research by Chen *et al.*, (2022) indicates that interventions focused on improving dietary skills can enhance food management capabilities in people with diabetes [51].

Relationship between high-glycemic-index food consumption patterns and fasting blood glucose levels

Statistical analysis using the Chi-square test revealed a significant association between high-GI dietary patterns and blood glucose levels in patients with type 2 diabetes mellitus (p=0.005). High-GI foods cause a rapid rise in blood glucose levels due to the rapid digestion and absorption process. High-GI foods produce a greater glycemic response compared to low-GI foods,

https://doi.org/10.46389/rjd-2026-2218

thereby directly impacting blood sugar level fluctuations [52]. In patients with type 2 diabetes mellitus, this condition becomes more complex due to insulin resistance, which prevents glucose from being optimally utilized by the body's cells.

The results of this study are consistent with research conducted by Ramadhani *et al.*, (2025) which found that dietary patterns are significantly associated with unstable blood glucose levels in patients with type 2 diabetes mellitus ($p<0.05$). The study explained that uncontrolled eating patterns, particularly those high in simple carbohydrates, directly contribute to elevated blood glucose levels. A similar finding was reported by Ramadhani *et al.*, (2025) which found that the GI and glycemic load of foods are associated with blood glucose levels in diabetic patients, where consumption of foods with high GI values leads to a faster and more significant increase in blood glucose [53].

Additionally, research by Dianti *et al.*, (2025) indicates that a diet high in simple carbohydrates and sugar is correlated with an increased incidence of type 2 diabetes and worsens glycemic control. This research confirms that foods with a high GI contribute to fluctuations in blood sugar levels due to their ability to rapidly increase blood glucose levels [54]. These findings are supported by Aprianie *et al.*, (2025) stating that diet, particularly the consumption of high-sugar foods, plays a role in influencing blood sugar levels [55].

Foods with a high GI contain carbohydrates that are easily digested and rapidly absorbed in the digestive tract, causing a rapid spike in blood glucose levels. This triggers the pancreas to secrete large amounts of insulin in response to the rise in blood glucose. However, in people with type 2 diabetes, who typically have insulin resistance, this response becomes ineffective, leaving glucose circulating in the blood at high levels [52].

Repeated consumption of high-GI foods can lead to overstimulation of pancreatic beta cells. Continuous exposure to high glucose levels can cause beta cell dysfunction, gradually reducing the pancreas's ability to produce insulin [56]. This condition ultimately exacerbates the chronic hyperglycemia that is a hallmark of type 2 diabetes.

From a behavioral perspective, a pattern of consuming high-GI foods is often associated with a habit of consuming processed foods and sugary drinks, as well as low fiber intake. Fiana *et al.*, (2025) found that dietary adherence is strongly associated with blood glucose levels, with individuals who do not adhere to a diabetes diet tending to have higher blood sugar levels [57]. This suggests that the frequency and type of food consumed have a direct impact on patients' glycemic status.

Conclusions

This study shows that the majority of people with type 2 diabetes are over 45 years old (58.7%), female (80.4%), have an elementary school education (56.5%), are unemployed (84.8%), have no family history of diabetes (80.4%), and have had diabetes for less than 5 years (76.1%). Additionally, 39.1% of respondents were non-compliant with medication, and 60.9% had high fasting blood sugar levels. The analysis results also showed a significant association between nutritional literacy and fasting blood glucose levels, as well as between dietary patterns featuring high-glycemic-index foods and fasting blood glucose levels. Thus, nutritional literacy and dietary patterns play a crucial role in controlling blood glucose levels in individuals with type 2 diabetes.

Acknowledgements

The authors would like to express their sincere gratitude to all participants who took part in this study. The authors also thank the healthcare staff and administrators of Puskesmas Telukjambe for their assistance during the data collection process and for supporting the implementation of this research. Appreciation is also extended to the academic supervisors and colleagues for their valuable guidance, suggestions, and encouragement throughout the preparation of this manuscript.

Conflict of interest

The authors declare no conflict of interest.

References

1. International Diabetes Federation I. IDF Diabetes Atlas 11th Edition [Internet]. Vol. 11th editi, International Diabetes Federation. 2025. Available from: https://www.idf.org/aboutdiabetes/type-2-diabetes.html
2. Kemenkes RI. Survei Kesehatan Indonesia (SKI). Kementrian Kesehatan Republik Indonesia. 2023. 1–965 p.
3. Ahmed Y, Kamaleldien F, Abuelass M, Babiker S, Abdelwahab H, Mukhtar M, et al. Determinants of Poor Glycemic Control

Among Type 2 Diabetes Patients: A Systematic Review. Cureus. 2025;17(4).
4. American Diabetes Association. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes — 2024. Diabetes Care. 2024;47(January):158–78.
5. Bulu A, Wahyuni TD, Sutriningsih A. Hubungan Antara Tingkat Kepatuhan Minum Obat dengan Kadar Gula Darah pada Pasien Diabetes Melitus Tipe II. Nurs News (Meriden). 2019;4:1.
6. Bastami F, Mardani M, Rezapour P. Development and psychometric analysis of a new tool to assess food literacy in diabetic patients. BMC Nutr [Internet]. 2022;8(1):1–11. Available from: https://doi.org/10.1186/s40795-022-00626-4
7. Erina Masri, Novida Shella Nasution, Risya Ahriyasna. Literasi Gizi dan Konsumsi Gula, Garam, Lemak pada Remaja di Kota Padang. J Kesehat. 2022;10(1):22–30.
8. Priambudi DA, Farapti F. Hubungan Tingkat Literasi Gizi pada Status Gizi Siswa SMA (Studi pada Siswa/i SMAN 1 Kota Tangerang). Media Gizi Kesmas. 2023;12(2):1029–35.
9. Ernawati U. Hubungan Pengetahuan Diet dengan Kadar Gula Darah Pasien Diabetes Melitus Tipe 2 di Klinik Mutiara Delima. J Ilm Kedokt dan Kesehat. 2025;4(1):292–304.
10. Adhania F, Hasneli N Y, Damanik SRH. Literasi Kesehatan dengan Pemantauan Glukosa Darah Mandiri Penderita Diabetes Mellitus Tipe 2. Surya Med J Ilm Ilmu Keperawatan dan Ilmu Kesehat Masy. 2024;19(3):199–207.
11. Puspita Sari P, Zainal S, Arna Abrar E. Efektivitas Health Education Tentang Diet Dalam Meningkatkan Pengetahuan Pasien Diabetes Melitus Tipe 2 Di Puskesmas Pampang Kota Makassar. JIMPK J Ilm Mhs Penelit Keperawatan. 2025;5(3):26–31.
12. Zendrato VN, Harahap HS, Silalahi NW, Panjaitan SS, Susilo RP. Konsumsi Indeks Glikemik Tinggi pada Kejadian Penyakit Diabetes Melitus Tipe 2. J Kesehat Masy Mulawarman [Internet]. 2025;7:1. Available from: https://e-journals.unmul.ac.id/index.php/MJPH/article/view/16225
13. Agung AL, Susanti E, Wahyuningrum DR, Cahyono J. Analisis perbedaan indeks glikemik dan beban glikemik pada berbagai jenis minuman kekinian: Peningkatan risiko metabolik. J SAGO Gizi dan Kesehat. 2025;6(64):69–78.
14. Wari AT, Muhlishoh A, Nurzihan NC. Indeks Glikemik dan Beban Glikemik Makanan Kaitannya dengan adar LDL dan RLPP Pasien Diabetes Mellitus Tipe-2. J Nutr Collage. 2023;12(1):61–9.
15. Arfania M. Analisis Faktor Risiko Kepatuhan Minum Obat Pasien Diabetes Mellitus Di Rumah Sakit Karawang. J Buana Farma. 2021;1:1.
16. Huang L, Liu C, Chen F, Kuo C, Pitrone P. Aging Affects Insulin Resistance, Insulin Secretion, and Glucose Effectiveness in Subjects with Normal Blood Glucose and Body Weight. MDPI. 2023;1–13.
17. Kautzky willer A, Pacini G. Sex and Gender Differences in Risk, Pathophysiology and Complications of Type 2 Diabetes Mellitus. Endocr Rev. 2016;37:278–316.
18. Italia N, Lestari A. Menopause & Upaya-upaya Menghadapi Menopause. 2021.
19. Setiyawati D, Wahab I, Safitri YB. Kadar glukosa darah pada wanita menopause: Studi di Puskesmas Muara Dua, Kota Lhokseumawe. J SAGO Gizi dan Kesehat. 2025;6(2):452–6.
20. PERKENI. Pedoman Pengelolaan Dan Pencegahan Diabetes Melitus Tipe 2 Di Indonesia 2024 Perkumpulan Endokrinologi Indonesia. 2024. 1–126 p.
21. Wittert G, Grossmann M. Obesity, type 2 diabetes, and testosterone in ageing men. Natl Libr Med. 2022;1233–42.
22. Nurvitasari RI, Primadani M, Fitriani AN. Faktor Demografis dan Geografis dalam Kejadian Diabetes Melitus di Puskesmas Imogiri II. J Penelit Inov. 2025;5(1):381–8.
23. Suswani A, Amaliah R, Nirmawati. Karakteristik Demografi Berdasarkan Kejadian Diabetes Melitus di Wilayah Kerja BLUD UPT Puskesmas Ponre Kab. Bulukumba. J Mitra Sehat. 2025;15(4):1225–32.
24. Wati DS, Sugiyo D, Haris F. The Risk Level of Type 2 Diabetes Mellitus in University Students: A Descriptive Study. J Ilm Kesehat. 2025;18(2):165–76.
25. Anshori AH. Hubungan Status Pekerjaan Dengan Kadar Gula Darah pada Penderita Diabetes Melitus Tipe 2 Di Wilayah Kerja Puskesmas Patrang. 2022.
26. Pratiwi WN, Firmanda GI, Sunarno RD, Sujatmiko, Pratama YG. Aktivitas Fisik Penting dalam Manajemen Kadar Gula Darah Lansia dengan Diabetes Mellitus. J Keperawatan Widya Gantari Indones. 2025;9(2):146–55.
27. Trihandayani Y, Oktovian T, Seftiyani, Niyatujahro N, Andini ST, Ghani MF. Pengaruh Latihan Fisik terhadap Penurunan Kadar Gula Darah pada Pasien Diabetes Melitus Tipe 2. J Siti Rufaidah. 2025;3(1):1–11.
28. Awaliyah T, Rosdaniati, Haqoiroh. Hubungan Tingkat Kepatuhan Pasien pada Penggunaan Obat Antidiabetes terhadap Kadar Glukosa Darah di Puskesmas X Indramayu. J Ris Ilmu Kesehat Umum. 2024;2(3):180–201.
29. Renaldia FS, Sauriasaria R, Riyadinab W, Maulida IB. Fenomena Pengaruh Terapi Farmakologi Terhadap Kepatuhan Berobat dalam Perspektif Pasien Diabetes Melitus Tipe 2. J Pharm Sci Pract. 2021;8(2):69–77.
30. Febrianti D, Zakia R, Rahayu P. Hubungan Pola Makan dan Aktivitas Fisik Dengan Peningkatan Kadar Gula Darah pada Penderita Diabetes Melitus Tipe II di Puskesmas Sukatani. J Kesehat Tambusai. 2025;6(1):4107–16.
31. Nur SA, Dafriani P. Hubungan Perilaku Pengendalian Diabetesmellitus dengan Kadar Gula Darah Pasien Diabetesmellitus di Poliklinik Penyakit Dalamrumah Sakit Umum Mayjend H.A Thalib Kabupaten Kerinci Tahun 2018. J Kesehat Saintika Meditory. 2018;2(2):52–61.
32. Rahmania P, Lufiana F. Persentase Visceral Fat Berhubungan Dengan Kejadian Diabetes Melitus Tipe 2 di Rumah Sakit Umum Haji Medan. J Pandu Husada. 2024;5(4):36–42.
33. Rahim A. Faktor-Faktor Gaya Hidup Yang Mempengaruhi Terjadinya Diabetes Melitus. JONS J Nurs. 2024;1(2):9–12.
34. Murtiningsih MK, Pandelaki K, Sedli BP. Gaya Hidup sebagai Faktor Risiko Diabetes Melitus Tipe 2. J Unsrat. 2021;9(28):328–33.
35. Nurgajayanti C, Susilawati TN, Wiboworini B. Durasi Menderita DM Memengaruhi Kontrol Glikemik Jangka Panjang Yang Diukur Melalui HbA1c Pada Pasien Diabetes Melitus Tipe 2. Media Penelit dan Pengemb Kesehat. 2024;34(3):563–70.
36. Nugroho SL, Anggorotomo W, Rafie R. Lama Menderita dan Kontrol Glikemik Berhubungan Dengan Penurunan Fungsi Kognitif Pada Pasien Diabetes Melitus Tipe 2. JKM (Jurnal Kebidanan Malahayati). 2021;7(3):495–501.
37. Aska AA Al, Wardhan MK. Duration Of Diabetes, Glycemic Control, And Risk Of Neuropathy Among Diabetes Population In Indonesia. Innov Heal Soc. 2025;5(2):79–88.

 https://doi.org/10.46389/rjd-2026-2218

38. Rosyidah NN, Cahyono EA. Diabetes Melitus Tipe 2; Artikel Review. Publ Ilm Has Kegiat Penelit Dalam Bid Kesehat. 2025;3(1):44–63.
39. Astutisari DAEC, Darmini AA. Y, Wulandari IAP. Hubungan Pola Makan dan Aktivitas Fisik dengan Kadar Gula Darah pada Pasien Diabetes Melitus Tipe 2 di Puskesmas Manggis I. J Ris Kesehat Nas. 2022;6(2):79–87.
40. Nursanti B, Wibiksana A, Astrianti K. Hubungan Tingkat Kepatuhan Penggunaan Obat Antidiabetes Oral pada Pasien DM Tipe 2 Terhadap Penurunan Kadar Gula Darah di Poliklinik Rawat Jalan Rs Mulia Pajajaran Bogor. Pharmamedica J. 2023;8(1):74–84.
41. Seçkiner S, İnce-palamutoğlu M, Baş D, İdiz C, Baş M. The relationship of the nutritional literacy level of individuals with diabetes on nutrition, quality of life, and metabolic control. BMC Public Health. 2026;26(279):2–17.
42. Ozdemir SC, Cakmak VS, Sert H, Demirci T. Effect of Perceived Food Literacy on Eating Behavior Pattern, Glycemic Parameters, and Lipid Profile in Patients with Type 2 Diabetes: Structural Equation Modeling Tip 2 Diyabetli Hastalarda Algılanan Gıda Okuryazarlığının Yeme Davranış Modeli, Glisem. Turkish J Diabetes Obes. 2025;(Cc):70–80.
43. Jafari A, Zadehahmad Z, Armanmehr V, Talebi M, Tehrani H. The evaluation of the role of diabetes health literacy and health locus of control on quality of life among type 2 diabetes using the Path analysis. Sci Rep [Internet]. 2023;1–11. Available from: https://doi.org/10.1038/s41598-023-32348-3
44. Karkhah MR, Arasteh M, Takasi P. Nutritional knowledge and related factors among patients with dia- betes mellitus: A systematic review. J Nurs Reports Clin Pract. 2025;3(1):69–77.
45. Lestari RR, Zurrahmi, Permadi W, Rahayu NS, Diana S. Hubungan Pengetahuan Gizi Dengan Kadar Gula Darah Penderita Diabetes Mellitus Tipe II Di Poli Dewasa Wilayah Kerja UPT BLUD Puskesmas Salo. 2022.
46. Alshahrani AM, Batais MA, Mujammami MH, Alrasheed AA, Almigbal TH, Aljulifi MZ, et al. Assessment of food labeling knowledge and associated reading barriers among patients with diabetes. J Fam Med Prim Care. 2023;12(9):264–9.
47. Haeriah, Dewi ADA, Mahfida SL, Puspita SNA, UmmaH AN, Nurwidyasari G. Hubungan Literasi Label Makanan Kemasan Dengan Food Skill Pasien Diabetes Mellitus Di Sleman. Bunda Edu-Midwifery J. 2025;8(2):671–81.
48. Afifah M. Hubungan Asupan Karbohidrat dengan Kadar Glukosa Darah pada Penderita Diabetes Melitus Tipe 2 Di Wilayah Kerja Puskesmas UPT Mandah. Universitas Islam Negeri Sultan Syarif Kasim Riau; 2026.
49. Aguatina D, Alfianti U, Utami K. Literasi Kesehatan terhadap Penerapan Pola Makan 3J Pasien Diabetes Melitus. Malahayati Nurs J. 2025;7(4):1709–19.
50. Strydom H, Muchiri J, Delport E, White Z. Adherence to Personalised Nutrition Education Based on Glycemic and Food Insulin Index Principles and Their Association with Blood Glucose Control in Individuals with Type 2 Diabetes Mellitus. Int J Environ Res Public Health. 2025;22(925):1–14.
51. Chen X, Min H, Sun X. Dietary Management Tools Improve the Dietary Skills of Patients with T2DM in Communities. Nutrients. 2022;14(4453):1–14.
52. Lu X, Xie Q, Pan X, Zhang R, Zhang X, Peng G, et al. Type 2 diabetes mellitus in adults: pathogenesis, prevention and therapy. Signal Transduct Target Ther. 2024;(August):1–25.
53. Ramadhani FA, Murakhofah H, Roesardhyati R. Hubungan Pola Makan dengan Ketidakstabilan Kadar Glukosa Darah pada Pasien Diabetes Mellitus di Wilayah Puskesmas Janti Kota Malang. J Artif Intell Digit Bus. 2025;4(4):7103–12.
54. Dianti P, Hariyantika, Putri AN. Hubungan Pola Makan Dengan Kejadian Diabetes Melitus Tipe 2 di Rumah Sakit Efarina Etaham Berastagi Tahun 2025. J Minfo Polgan. 2025;14(2):2741–8.
55. Aprianie W, Hidayati L, Sulam M, Yitu MB. Skrining dan Penyuluhan Pelaksanaan Diet Kadar Gula Darah pada Lansia Sebagai Upaya Mencegah Diabetes Mellitus. J Abdi Masy Cendekia. 2025;3(1):1–7.
56. Park IR, Chung YG, Won KC, Park IR, Chung YG, Won KC. Overcoming β-Cell Dysfunction in Type 2 Diabetes Mellitus: CD36 Inhibition and Antioxidant System. Diabetes Metab J. 2025;49:1–12.
57. Fiana MVN, Ismonah, Hartoyo M. Hubungan Self Acceptance dan Kepatuhan Diet dengan Kadar Glukosa Darah Penyandang Diabetes Melitus Tipe 2. J Persat Perawat Nas Indones. 2025;10:2.