



Predictors of Diabetes Self-Management Behaviors among Patients with Type 2 Diabetes Mellitus in Aceh, Indonesia

Riski Amalia¹  , Nani Safuni¹ , Aulia Akmal² , Anda Kamal¹ , Asrizal³ ,
Sri Agustina⁴ , Fiona Desi Amelia⁵ , Tri Nur Handayani⁶ 

¹ Department of Medical and Surgical Nursing, Faculty of Nursing, Universitas Syiah Kuala, Banda Aceh, Aceh, Indonesia

² Nursing Academy of Kesdam Iskandar Muda, Banda Aceh, Aceh, Indonesia.

³ Department of Medical-Surgical Nursing, Faculty of Nursing, Universitas Sumatera Utara, Medan, Indonesia

⁴ Department of Pediatric Nursing, Faculty of Nursing, Universitas Syiah Kuala, Banda Aceh, Aceh, Indonesia

⁵ Department of Nutritional Sciences, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, Aceh, Indonesia

⁶ Dr. Zainoel Abidin Regional Public Hospital, Banda Aceh, Aceh, Indonesia

 Corresponding author: riskiamalia@usk.ac.id

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ABSTRACT

Patients managing Type 2 Diabetes Mellitus (T2DM) themselves are still key to reducing morbidity, mortality, and complications. T2DM blood sugar regulation is affected by several internal and environmental factors. This research aims to investigate the extent of factors related to self-management techniques in T2DM patients in Aceh Province, Indonesia. This study employed a cross-sectional predictive correlational design and was conducted in a subdistrict of Banda Aceh. This research sample has used the G*Power program, which indicated that there were 118 T2DM patients. This study utilized a purposive sampling technique. The Diabetes Self-Management Questionnaire (DSMQ), the Diabetes Mellitus Self-Efficacy Scale (DMSES), and the RAND Health Support Questionnaire (RAND SF-36). IBM SPSS Statistics 27 was used to perform the study's multiple linear regression analysis. The findings of this study showed that greater participation in the T2DM management education program was significantly associated with improved self-management behaviors ($\beta = 0.326$, $p < 0.0001$). In contrast, lower levels of family support ($\beta = -0.184$, $p = 0.030$) and self-efficacy ($\beta = -0.172$, $p = 0.048$) were negatively associated with T2DM self-management. The findings of this study showed that greater participation in the T2DM management education program was significantly associated with improved self-management behaviors ($\beta = 0.326$, $p < 0.0001$). In contrast, lower levels of family support ($\beta = -0.184$, $p = 0.030$) and self-efficacy ($\beta = -0.172$, $p = 0.048$) were negatively associated with T2DM self-management behaviors. For this research, a continuous T2DM self-management education program for families and counselor nurses is recommended.

Keyword: Family Support, Self-Efficacy, Self-Management, T2DM



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1. Introduction

The health of the world's population is still at risk due to Type 2 Diabetes Mellitus (T2DM). In every country, the number of people with T2DM has been rising annually. About 90% of all occurrences of diabetes

are type 2 diabetes, making it the most prevalent kind. T2DM, which was formerly more prevalent in older adults, is now rising among children, adolescents, and younger adults as a result of obesity, sedentary lifestyles, and poor diets. These factors are linked to physical activity and diet and are linked to urbanization and development (International Diabetes Federation, 2025). According to the International Diabetes Federation, there will be 700.2 million people with T2DM globally by 2045, up from 463 million in 2019 (Saeedi et al., 2019). According to the International Diabetes Federation (2021), the prevalence of diabetes patients increased from 6.2% in 2019 to 2021, with the United States, China, India, and Pakistan having the highest rates. According to the International Diabetes Federation (IDF), Indonesia had approximately 20.4 million people living with diabetes in 2024, ranking fifth worldwide. This number is projected to increase to 28.6 million by 2050 (International Diabetes Federation, 2025).

Annually, millions die to T2DM, with complications adversely impacting health, well-being, and financial stability. Patients with T2DM experience mortality due to coronary heart disease, and the incidence of chronic kidney failure continues to rise (Pavkov & Miyamoto, 2023). A high Body Mass Index (BMI) combined with hypertension and hyperlipidemia, as well as the prevalence of microvascular complications associated with T2DM, such as peripheral neuropathy, albuminuria, and chronic kidney disease (17.2%), are characteristics of T2DM patients in Indonesia; more than 70% of individuals with T2DM take metformin and sulfonylureas, and macrovascular consequences include heart failure (26.2%) and coronary artery disease (Soeatmadji et al., 2023). Appropriate self-management behavior can prevent and lessen complications of T2DM.

The self-management behavior of T2DM patients is still relatively low in Indonesia, especially in Aceh province, which is linked to the rising rates of morbidity, mortality, and complications that occur annually and are more closely associated with the factors that influence T2DM patients' self-management behavior in blood glucose control. Challenges in self-management behavior for T2DM are highly varied, including factors related to T2DM patients with low health literacy, cultural beliefs, mental health issues, and difficulties in lifestyle changes; social pressures such as financial limitations, family support problems, and lack of social support; and system-level barriers including inadequate access to resources, insufficient diabetes education, and insensitivity of healthcare providers (Desse et al., 2024; Mahlare et al., 2023; Whittemore et al., 2019; Yimer et al., 2025).

T2DM remains a major health problem with harmful consequences for the people of Aceh. High morbidity and mortality occur annually due to complications caused by T2DM in Aceh. The phenomenon of T2DM in Aceh is caused not by many factors but rather by a combination of several factors, especially T2DM self-management behavior and demographic factors. Previous studies in Indonesia have primarily examined diabetes self-management using descriptive approaches. However, limited evidence is available regarding the relative contributions of education, family support, and self-efficacy using multivariate predictive modeling, particularly in Aceh. Furthermore, Aceh Province has distinctive cultural and social characteristics, as the majority of its population is Muslim and community behaviors are strongly influenced by local traditions and social norms. In addition, Aceh differs from other regions in Indonesia in terms of its geography, culture, social structures, and healthcare system. Therefore, this study aims to identify the predictors of diabetes self-management behaviors among patients with T2DM in Aceh, Indonesia.

2. Methods

This study employed a cross-sectional predictive correlational design. The Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) was followed by this study design. This study was conducted at a subdistrict in Banda Aceh municipality, i.e., Baiturrahman. This study's sample search and direct distribution of questionnaires to T2DM patients as outpatients in the Baiturrahman subdistrict took place between December 2022 and May 2023. This study used a purposive sampling technique, with inclusion criteria including age over 19 years and T2DM duration of less than 15 years, whereas exclusion criteria included T2DM patients with macro and microvascular problems and diminished consciousness. To improve data dependability and eliminate sample bias, researchers relied on patient medical record reports demonstrating compliance with the inclusion criteria. This study's sample size is based on the G*Power application, with an effect size f^2 of 0.15, an α error probability of 0.05, a power value ($1-\beta$ error prob): 0.8, and 10 total predictors. The sample size was 118 T2DM patients.

The instrument in this study used demographic data on respondents' characteristics related to T2DM self-management behavior at a subdistrict in Banda Aceh municipality, i.e., Baiturrahman, such as age, marital status, last level of education, occupation, duration of T2DM, Body Mass Index (BMI), and whether they had ever attended T2DM education. The Diabetes Self-Management Questionnaire (DSMQ), a self-report

questionnaire to evaluate the level of self-management of DM disease, was used to assess T2DM self-management, with glucose management, diet control, physical activity, and services studied as subvariables. The MCCS Group's Diabetes Mellitus Self-Efficacy Scale (DMSES) was used to assess self-efficacy. The RAND Health Support Questionnaire was used to evaluate family support.

The Diabetes Self-Management Questionnaire (DSMQ) demonstrated good reliability, with a Cronbach's α of 0.84, and has been reported as a valid instrument (Schmitt et al., 2013). The Diabetes Management Self-Efficacy Scale (DMSES) also showed strong reliability, with a Cronbach's α of 0.89, and good validity, as evidenced by a Pearson's correlation coefficient of -0.46 ($p < 0.0001$) when compared with the Diabetes Problem Areas Scale, confirming its criterion validity (Sturt et al., 2010). Additionally, the RAND Health Support Questionnaire, particularly the RAND SF-36, demonstrated high reliability with Cronbach's α values ranging from 0.81 to 0.95 and adequate construct validity, indicated by a Pearson's r value greater than 0.1548 (Ramadhanty et al., 2019).

The study's multiple linear regression analysis was carried out utilizing the IBM SPSS Statistics 27 computerized statistical analysis application. This study used multiple linear regression analysis to examine the relationship between self-management and demographic data (age, gender, marital status, highest education, occupation, duration of type 2 diabetes, BMI, height, and attendance at T2DM education), family support, and self-efficacy in T2DM patients. The method contains an explanation of how the research was conducted. This study was conducted in accordance with the ethical principles outlined in the World Medical Association's Code of Ethics (Declaration of Helsinki). Ethical approval was obtained from the Research Ethics Committee of the Faculty of Nursing, Universitas Syiah Kuala (Research Code: 111060181022; Approval Date: November 8, 2022). All participants provided written informed consent prior to participation.

3. Results

Table 1 presents the study's findings, which included a total of 118 research samples with a mean age of 57.82 (SD = 8.912). The majority of responders were female (74.8%), and 78.0% were married. The majority (72.9%) of respondents had a secondary education. Respondents were mostly self-employed (43.2%), had a maximum T2DM duration of 1–5 years (94.1%), had a mean BMI of 22 (range: 17–40), and half participated in T2DM management education (50%). The self-management behavior range was 31 (minimum value 17; maximum value 48), the self-efficacy range was 30.69 (SD=4.624), and the family support range was 28 (minimum value 26; maximum value 54).

Table 1 The distribution of characteristics among T2DM respondents by T2DM Self-Management behaviors (N=118).

Respondents Characteristics		f	%	Range (Min-Max)	Mean± SD
Age					57.82±8.912
Gender	Male	30	25.4		
	Female	88	74.6		
Marital status	Single	12	10.2		
	Married	92	78.0		
	Widow/widower	14	11.9		
Highest level of education	Not school	1	0.8		
	Primary education	15	12.7		
	Secondary education	86	72.9		
	Higher education	16	13.6		
Occupation	Unemployed	13	11.0		
	Farmer or laborer	7	5.9		
	Housewife	44	37.3		
	Self-employed	51	43.2		
	Civil servant	3	2.5		
Duration of Suffering from T2DM	<1 year	7	5.9		
	1-5 years	111	94.1		

Table 1 Continued

Respondents Characteristics		f	%	Range (Min-Max)	Mean± SD
>5 year		0	0		
Body Mass Index (BMI)				22 (17-40)	
Participated in the T2DM Management Education Program	Yes	59	50.0		
	Never	59	50.0		
Self-management behavior				31 (17-48)	
Self-efficacy					30.69 (4.624)
Family support				28 (26-54)	

3.2. Bivariate Selection

Table 2 shows the results of a significant relationship between T2DM self-management behaviors and the variables of self-efficacy (p value < 0.005), family support (p value < 0.022), and participation in the T2DM management education program (p value < 0.009). However, this study did not show a significant relationship between the variables of age (p value < 0.233), BMI (p value < 0.471), marital status (p value < 0.701), highest level of education (p value < 0.727), occupation (p value < 0.626), duration of suffering from T2DM (p value < 0.626), and gender (p value < 0.320).

Table 2 Analysis of the relation between age, Body Mass Index (BMI), self-efficacy, family support, marital status, highest level of education, occupation, duration of suffering from T2DM, gender, participated in the T2DM management education program, and T2DM self-management behaviors (N = 118)

Variables	p-value
Age ^a	0.233
Body Mass Index (BMI) ^a	0.471
Self-efficacy ^a	0.005
Family support ^a	0.022
Marital status ^b	0.701
Highest level of education ^b	0.727
Occupation ^b	0.626
Duration of Suffering from T2DM ^b	0.626
Gender ^c	0.320
Participated in the T2DM Management Education Program ^c	0.009

a: pearson; b: ANOVA; c: Independent-T test; Dependent variable: self-management

3.3. Multivariate Modeling

Table 3 shows that the second model is consistent with the multiple linear regression analysis. The independent variables included in the regression are self-efficacy, family support, and participation in the T2DM management education program. The table model summary shows that the coefficient of determination (R square) is 0.205, which means it can explain 20.5% of the variation in the dependent variable, T2DM self-management. In other words, these three variables (self-efficacy, family support, and participation in the T2DM management education program) can explain 20.5% of T2DM self-management behaviors. Although the model explains 20.5% of the variance, this suggests that diabetes self-management behavior may also be influenced by other unmeasured psychosocial and system-level factors. T2DM self-management behaviors = 39.141 + 3.549 Participated in the T2DM Management Education Program - 0.203 self-efficacy, - 0.149 family support.

The formula shows that for every 1-point increase in participation in the T2DM management education program, self-management behavior will increase by 3.549 after controlling for self-efficacy and family support. T2DM self-management behaviors with lower self-efficacy will decrease by 0.203 points after controlling for participation in the T2DM management education program and family support. For every 1-point decrease in family support, self-management behaviors will decrease by 0.149 points after controlling for participation in the T2DM management education program and self-efficacy. The predictive factors in this study indicate that the most influential variable on T2DM self-management behavior is participation in the T2DM management education program (B=0.326). Results from the study demonstrate that high engagement

in the T2DM education program significantly predicts better self-management behavior ($\beta = 0.326$, $p < 0.0001$). In contrast, limited family support ($\beta = -0.184$, $p = 0.030$) and reduced self-efficacy ($\beta = -0.172$, $p = 0.048$) negatively influence self-management among individuals with T2DM.

Table 3 Multiple linear regression model for predictive factors affecting T2DM self- management behaviors (N=118)

Model/ Variable	R Square (R ²)	Unstandardized Coefficients B	Standardized Coefficients β	p-value
1 (Constant)	0.206	37.978		0.000
- Age		0.019	0.031	0.714
- Participated in the T2DM Management Education Program		3.501	0.322	0.000
- Self-efficacy		-0.200	-0.169	0.053
- Family support		-0.148	-0.183	0.031
2 (Constant)	0.205	39.141		0.000
- Participated in the T2DM Management Education Program		3.549	0.326	0.000
- Self-efficacy		-0.203	-0.172	0.048
- Family support		-0.149	-0.184	0.030

a: Dependent Variable: T2DM self-management behaviors

4. Discussion

The findings of this study indicate that age is not significantly associated with self-management behaviors among individuals with T2DM. This aligns with prior research demonstrating that age does not meaningfully predict T2DM self-management (Fatharani et al., 2024; Sudyasih et al., 2021). Recent evidence further suggests that internal and psychological factors, such as self-efficacy, diabetes related knowledge, and motivation—exert a stronger influence on self-management than age (Fadli et al., 2023; Khavere et al., 2025; Mekonnen & Hussien, 2021; Oo et al., 2023). Similarly, this study found no substantial association between BMI and self-management behaviors in T2DM patients. Existing literature supports this conclusion, noting that BMI is a weak predictor of self-management, as behavioral and contextual factors—including diet, physical activity, health literacy, and social support play a more decisive role (Afshari et al., 2021; Almomani & Al-Tawalbeh, 2022; Malini et al., 2025). Although BMI has been linked to metabolic syndrome in T2DM populations (Alsaidan et al., 2024), metabolic syndrome itself shows minimal correlation with self management behaviors. The results also demonstrate that educational attainment is not a strong determinant of T2DM self-management. Instead, diabetes-specific knowledge, health literacy, and self efficacy emerge as more influential predictors of effective self care, independent of formal education level (Diontama et al., 2025; Khatoon et al., 2025; Nadatien et al., 2024). While patient education remains essential for improving self-care practices, adherence to diet, physical activity, and follow up recommendations continues to be challenging across educational backgrounds (Eroglu & Sabuncu, 2021; Syaharuddin et al., 2025). Finally, the study found that duration of illness is not substantially correlated with T2DM self management behaviors, consistent with evidence showing that length of diagnosis does not predict overall self management once psychosocial factors are considered (Azami et al., 2021).

The greatest influence on the final model of multiple linear regression variables on T2DM patient self-management is the one with the highest beta coefficient: attending T2DM education. This study discovered an association between patients who attend T2DM education and T2DM self-management behavior. (Ojo et al., 2023). According to the findings of a systematic review conducted by Bekele et al. (2021) approximately 85% of studies found that Diabetes Self-Management Education (DSME) is effective in lowering HbA1c among T2DM patients. To avoid complications, diabetic patients should be educated about the importance of T2DM self-management in controlling their blood glucose levels, with a focus on lifestyle management, such as diet control and physical exercise. Diabetes education not only improves knowledge and skills, but also changes patient behavior, increases motivation to comply with therapy recommendations, improves quality of life,

builds partnerships in the treatment process, prepares patients for self-care, increases cardiovascular risk factors awareness, and improves psychological adaptive coping (Świątoniowska et al., 2019). Self-management education for regulating blood glucose levels is required in T2DM patients in order to reduce problems.

The third component examined in this study is family support. More frequent engagement in diabetic self-management behaviors was substantially associated with higher levels of family support and self-efficacy (Hiefner et al., 2024). Family support, according to Gavin et al. (2011) is a complex system that can be influenced by the patient's relationship with their family members, as well as the family's capacity and motivation to support or direct T2DM self-management behaviors. Patoding et al. (2024) discovered a relationship between family support in four dimensions: emotional, instrumental, informational, and appreciative, and self-management behavior in T2DM patients. Family support improves healthy eating habits and types, increases cognitive support, self-efficacy, psychological well-being, and blood glucose control. Nurhayati et al. (2023) reported that knowledge, the ability to undertake activities, family support, and self-efficacy all influence T2DM self-management. Family support improves self-management behavior in T2DM patients by completely mediating family function; it also partially mediates the relationship between self-management behavior and family self-efficacy (Tang et al., 2023; Zhu et al., 2024). Family support is the most essential aspect for T2DM patients from Asian cultural backgrounds when considering alternative therapy choices for T2DM treatment and care (Lee et al., 2024). Nonetheless, the findings of Fajariyah et al. (2023) suggest that there is no correlation between familial support and the quality of life of individuals suffering from diabetic ulcers. However, excessive and overly protective family support can lead to a decline in the self-management behavioral abilities of T2DM patients due to excessive dependence, psychological impact, and unhealthy family dynamics, which can hinder the patient's autonomy and ability to solve their problems independently (Mayberry & Osborn, 2014; Rose et al., 2022).

The study found an association between T2DM patients' self-management techniques and their level of self-efficacy. Self-efficacy refers to people with T2DM's confidence and ability to improve their diabetic self-management practices by overcoming problems and barriers, as well as their drive and perseverance to control blood glucose levels. Self-efficacy is one of the most essential variables in modifying the behavior of T2DM patients. D'Souza et al. (2017) discovered that poor blood glucose control in adult T2DM patients is connected with low self-efficacy and self-care behavior. T2DM patients' self-efficacy can motivate them to practice successful self-management. Wang et al. (2023) discovered that self-efficacy was substantially allied with self-management behavior in patients without T2DM stress but not with self-management behavior in patients with T2DM stress. Nurses should design and conduct nursing interventions for T2DM patients with low self-efficacy, including health education and consultation. Low self-efficacy is a significant predictor of poor self-management in patients with T2DM because a lack of confidence in one's ability to perform necessary self-care tasks leads to lower adherence to treatment plans, poor blood sugar control, and a reduced quality of life (Al-Khawaldeh et al., 2012).

5. Research Limitations

This study has several limitations, including the use of a cross-sectional design and a sample restricted to the Aceh region, which may limit the generalizability of the findings.

6. Conclusion

Internal and external factors have a substantial impact on self-management behaviors in T2DM patients. The study's findings revealed a relationship between T2DM patients' self-management practices, self-efficacy aspects, family support, and participation in T2DM education. The most influential factor in T2DM self-management behavior was participation in T2DM education. The study concluded that in order to improve T2DM patients' self-management behaviors, a continuous T2DM self-management education program including families and counselor nurses is essential.

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References

Afshari, S., Kalhor, N., Vahedian, M., Shajari, R., Sharifimoghadam, S., & Tabarraei, R. (2021). Evaluation of the relationship between different factors of self-management and control of diabetes in diabetic patients

- group. *Journal of Preventive Epidemiology*, 6(1), e18–e18. <https://doi.org/10.34172/jpe.2021.18>
- Al-Khawaldeh, O. A., Al-Hassan, M. A., & Froelicher, E. S. (2012). Self-efficacy, self-management, and glycemic control in adults with type 2 diabetes mellitus. *Journal of Diabetes and Its Complications*, 26(1), 10–16. <https://doi.org/10.1016/j.jdiacomp.2011.11.002>
- Almomani, M. H., & Al-Tawalbeh, S. (2022). Glycemic Control and Its Relationship with Diabetes Self-Care Behaviors Among Patients with Type 2 Diabetes in Northern Jordan: A Cross-Sectional Study. *Patient Preference and Adherence*, 16. <https://doi.org/10.2147/PPA.S343214>
- Alsaidan, A. A., Thirunavukkarasu, A., Alhassan, H. H., Bin Ahmed, I. A., Alnasiri, A. S., Alhirsan, W. M., Alazmi, N. N. M., Alkhalf, A. K., Alderbas, J. M., & Alkhaldi, M. A. (2024). Evaluation of Self-Management Behaviors and Its Correlation with the Metabolic Syndrome among the Type 2 Diabetes Mellitus Patients of Northern Saudi Arabia. *Journal of Clinical Medicine*, 13(1). <https://doi.org/10.3390/jcm13010118>
- Bekele, B. B., Negash, S., Bogale, B., Tesfaye, M., Getachew, D., Weldekidan, F., & Balcha, B. (2021). Effect of diabetes self-management education (DSME) on glycated hemoglobin (HbA1c) level among patients with T2DM: Systematic review and meta-analysis of randomized controlled trials. In *Diabetes and Metabolic Syndrome: Clinical Research and Reviews* (Vol. 15, Number 1, pp. 177–185). Elsevier Ltd. <https://doi.org/10.1016/j.dsx.2020.12.030>
- Desse, T. A., Namara, K. M., & Manias, E. (2024). Patient-Perceived Challenges to Type 2 Diabetes Self-Management in Sub-Saharan Africa: A Qualitative Exploratory Study. *Science of Diabetes Self-Management and Care*, 50(6), 456–468. <https://doi.org/10.1177/26350106241279809>
- Diontama, M. A., Larasati, T., Jausal, A. N., & Lisiswanti, R. (2025). Effect of Disease Acceptance on Glycemic Control in Type 2 Diabetes Mellitus Patients: A Systematic Review. *Journal Medical Informatics Technology*. <https://doi.org/10.37034/medinftech.v3i1.98>
- D'Souza, M. S., Karkada, S. N., Parahoo, K., Venkatesaperumal, R., Achora, S., & Cayaban, A. R. R. (2017). Self-efficacy and self-care behaviours among adults with type 2 diabetes. *Applied Nursing Research*, 36. <https://doi.org/10.1016/j.apnr.2017.05.004>
- Fadli, Nursalam, Uly, N., Iskandar, R., Amir, H., & Ahmad, A. S. (2023). Factors Associated with Self-Management Behaviour among Type 2 Diabetes Mellitus Patients. *Gaceta Medica de Caracas*, 131(2), 287–292. <https://doi.org/10.47307/GMC.2023.131.2.4>
- Fajariyah, N., Niriyah Sekani, & Simanjuntak Grace Esther Meylita. (2023). The Relationship Between Family Support and Quality of Life in Diabetic Ulcer Patients at Wocare Clinic Bogor. *Caring: Indonesian Journal of Nursing Science*, 5(2), 108–112. <https://doi.org/10.32734/ijns.v5i2.14345>
- Fatharani, L. F., Anggraheny, H. D., & Putro, W. G. (2024). Diabetic Self-Management and Correlated Factors: A Cross-Sectional Study. *South East Asia Nursing Research*, 6(1), 1. <https://doi.org/10.26714/seanr.6.1.2024.1-6>
- Gavin, J. R., Freeman, J. S., Shubbrook, J. H., & Lavernia, F. (2011). Type 2 diabetes mellitus: practical approaches for primary care physicians. In *The Journal of the American Osteopathic Association* (Vol. 111, Number 5 Suppl 4).
- Hiefner, A. R., Raman, S., & Woods, S. B. (2024). Family Support and Type 2 Diabetes Self-management Behaviors in Underserved Latino/a/x Patients. *Annals of Behavioral Medicine*, 58(7), 477–487. <https://doi.org/10.1093/abm/kaae023>
- International Diabetes Federation. (2021). *IDF Diabetes Atlas* (10th ed.). www.diabetesatlas.org
- International Diabetes Federation. (2025). *IDF Diabetes Atlas* (11th ed.). International Diabetes Federation. www.diabetesatlas.org
- Khatoon, S., Miraj, M. A., Mansoor, V. B., Alam, Q. U. A., Kazmi, S. K. S., Rasheed, F., Mannan, A., & Aqeel, M. (2025). Different Barriers, Different Needs: A Qualitative Study on How Educational Level Shapes Barriers to Type 2 Diabetes Self-Management in Urban Pakistan. *Cureus*. <https://doi.org/10.7759/cureus.95477>
- Khavere, S., Hadjicostantinou, M., Miksza, J., Hagan, J., Salisu-Olatunji, S., Naderpour, S., Hassen, S. N., Karimi, Z., & Gillies, C. L. (2025). Effectiveness of self-management interventions on Type 2 diabetes among young adults (18–45 years): A systematic review and meta-analysis. In *Diabetic Medicine* (Vol. 42, Number 10). John Wiley and Sons Inc. <https://doi.org/10.1111/dme.70127>
- Lee, E.-J., Qin, S., Baig, A. A., Lee, J. D., & Corrigan, P. W. (2024). Family-Centered Decision-Making About Type 2 Diabetes Mellitus Among Koreans. In G. Ciciurkaite & R. L. Brown (Eds.), *Disability and the Changing Contexts of Family and Personal Relationships* (Vol. 15, pp. 161–183). Emerald Publishing

- Limited. <https://doi.org/10.1108/S1479-354720240000015011>
- Mahlare, S. S., Rasweswe, M. M., & Ramavhoya, T. I. (2023). Self-management challenges of adults with type 2 diabetes mellitus in Ekurhuleni district primary health care facilities amid COVID-19 lockdown. *African Journal of Primary Health Care and Family Medicine*, 16(1). <https://doi.org/10.4102/PHCFM.V16I1.4202>
- Malini, H., Kardila, I. Y., & Alhofaian, A. (2025). The relationship among self-care, glycemic control, and quality of life in Indonesian patients with type 2 diabetes mellitus: An exploratory structural equation modeling study. *Belitung Nursing Journal*, 11(5). <https://doi.org/10.33546/bnj.3882>
- Mayberry, L. S., & Osborn, C. Y. (2014). Family involvement is helpful and harmful to patients' self-care and glycemic control. *Patient Education and Counseling*, 97(3). <https://doi.org/10.1016/j.pec.2014.09.011>
- Mekonnen, Y., & Hussien, N. (2021). Self-care related knowledge, attitude, and practice and associated factors among patients with type 2 diabetes in JMC, Ethiopia. *Diabetes, Metabolic Syndrome and Obesity*, 14, 535–546. <https://doi.org/10.2147/DMSO.S296112>
- Nadatien, I., Puspita, U. N., Kartini, Y., Setiyowati, E., & Hidayah, N. (2024). Does Education Influence Self Care Management in Diabetes Mellitus Patients? : Systematic Review. *Journal of Applied Nursing and Health*, 6(1). <https://doi.org/10.55018/janh.v6i1.181>
- Nurhayati, C., Nur Hidayanti, Ninik Ambar Sari, & Sri Anik Rustini. (2023). Analysis of factors affecting self-management in Type 2 Diabetes Mellitus. *Nurse and Health: Jurnal Keperawatan*, 12(1). <https://doi.org/10.36720/nhjk.v12i1.416>
- Ojo, I., Ojo, E., & Olubiyi, S. (2023). Diabetes self-management education: Benefits and challenges. In *Journal of Integrative Nursing* (Vol. 5, Number 2, pp. 93–101). Wolters Kluwer Medknow Publications. https://doi.org/10.4103/jin.jin_105_22
- Oo, A. N., Lininger, J., & Leelacharas, S. (2023). Associated Factors Related to Self-Management Behaviors among People with Type 2 Diabetes in Myanmar. *Makara Journal of Health Research*, 27(3), 154–159. <https://doi.org/10.7454/msk.v27i3.1459>
- Patoding, S., Fadli, F., & Hartono, H. (2024). Analisis Dukungan Keluarga dengan Self-Management Diabetes pada Penderita Diabetes Melitus Tipe II Analysis of Family Support with Diabetes Self-Management in Type II Diabetes Mellitus Patients. 3(2), 34–41.
- Pavkov, M. E., & Miyamoto, Y. (2023). IDF Atlas Reports: Diabetes and Kidney Disease. www.diabetesatlas.org
- Ramadhanty, Z., Yarsa, K. Y., & Probandari, A. (2019). Construct Validity and Reliability of Indonesian Version of RAND SF-36 Quality of Life Questionnaire in Breast Cancer Patients. *Indonesian Journal of Cancer*, 13(2), 55. <https://doi.org/10.33371/ijoc.v13i2.621>
- Rose, L., Taylor, E. P., Di Folco, S., Dupin, M., Mithen, H., & Wen, Z. (2022). Family dynamics in kinship care. *Child and Family Social Work*. <https://doi.org/10.1111/cfs.12912>
- Saeedi, P., Petersohn, I., Salpea, P., Malanda, B., Karuranga, S., Unwin, N., Colagiuri, S., Guariguata, L., Motala, A. A., Ogurtsova, K., Shaw, J. E., Bright, D., & Williams, R. (2019). Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Research and Clinical Practice*, 157. <https://doi.org/10.1016/j.diabres.2019.107843>
- Schmitt, A., Gahr, A., Hermanns, N., Kulzer, B., Huber, J., & Haak, T. (2013). The Diabetes Self-Management Questionnaire (DSMQ): Development and evaluation of an instrument to assess diabetes self-care activities associated with glycaemic control. *Health and Quality of Life Outcomes*, 11(1). <https://doi.org/10.1186/1477-7525-11-138>
- Soeatmadji, D. W., Rosandi, R., Saraswati, M. R., Sibarani, R. P., & Tarigan, W. O. (2023). Original Article Clinicodemographic Profile and Outcomes of Type 2 Diabetes Mellitus in the Indonesian Cohort of Discover: A 3-Year Prospective Cohort Study. *Journal of the ASEAN Federation of Endocrine Societies*, 68–74. <https://doi.org/https://doi.org/10.15605/jafes.038.01.10>
- Sturt, J., Hearnshaw, H., & Wakelin, M. (2010). Validity and reliability of the DMSES UK: A measure of self-efficacy for type 2 diabetes self-management. *Primary Health Care Research and Development*, 11(4), 374–381. <https://doi.org/10.1017/S1463423610000101>
- Sudyasih, T., Lutfi, :, & Asnindari, N. (2021). Hubungan Usia dengan Self-Care Pada Pasien Diabetes Mellitus Tipe-2. In *Jurnal Ilmiah Keperawatan* (Vol. 9, Number 1).
- Świątoniowska, N., Sarzyńska, K., Szymańska-Chabowska, A., & Jankowska-Polańska, B. (2019). The role of education in type 2 diabetes treatment. In *Diabetes Research and Clinical Practice* (Vol. 151).

<https://doi.org/10.1016/j.diabres.2019.04.004>

- Tang, R., Luo, D., Li, B., Wang, J., & Li, M. (2023). The Role of Family Support in Diabetes Self-Management among Rural Adult Patients. *Journal of Clinical Nursing*, 32(19–20). <https://doi.org/10.1111/jocn.16786>
- Wang, R. H., Chen, S. Y., Lee, C. M., Lu, C. H., & Hsu, H. C. (2023). Resilience, self-efficacy and diabetes distress on self-management behaviours in patients newly diagnosed with type 2 diabetes: A moderated mediation analysis. *Journal of Advanced Nursing*, 79(1). <https://doi.org/10.1111/jan.15483>
- Whittemore, R., Vilar-Compte, M., De La Cerda, S., Marron, D., Conover, R., Delvy, R., Lozano-Marrufo, A., & Pérez-Escamilla, R. (2019). Challenges to diabetes self-management for adults with type 2 diabetes in low-resource settings in Mexico City: A qualitative descriptive study. *International Journal for Equity in Health*, 18(1). <https://doi.org/10.1186/s12939-019-1035-x>
- Yimer, Y. S., Ahmed, A. A., Addissie, A., Kidane, E. G., Reja, A., & Abdela, A. A. (2025). Patients and healthcare providers needs and challenges in diabetes self-management and support in Ethiopian primary healthcare context. *BMC Health Services Research*, 25(1). <https://doi.org/10.1186/s12913-025-12953-w>
- Zhu, L., Pan, Z., Shen, F., Shen, Y., & Zhang, W. (2024). Effects of family support system on the self-management behaviour of patients with T2DM: a multi-centre cross-sectional study in community settings. *Family Practice*, 41(2), 114–122. <https://doi.org/10.1093/fampra/cmae010>