Journal for Re Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 August; 6 (9s): 799-809

Self-Care Behavior, Self-Efficacy and Quality of Life of Patients with Type 2 Diabetes Mellitus with Symptoms of Peripheral Neuropathy

Laode Saltar[1], Junaiti Sahar[2], Etty Rekawati[3]

[1]Doctoral student of Faculty of Nursing, University of Indonesia, Indonesia, email:saltarlaode@yahoo.com

[2]Department of Community Health Nursing, Faculty of Nursing, University of Indonesia, Indonesia, email: junsr@ui.ac.id

[3]Department of Community Health Nursing, Faculty of Nursing, University of Indonesia, Indonesia, email: rekawati@ui.ac.id

Corresponding author: Laode Saltar, E-mail address: saltarlaode@yahoo.com

Received: 20- June -2023
Revised: 07- July -2023
Accepted: 01- August -2023

Abstract

Background: Diabetic Peripheral Neuropathy (DPN) has an impact on the physical, psychological, social, and spiritual aspects of diabetic patients. The resulting impact affects the discipline of people with diabetes in engaging in adequate self-care. The majority of patients with type 2 diabetes mellitus (T2DM) in Kendari City still show non-adherence to diabetes self-care. This study aimed to determine self-care behavior and its relationship with self-efficacy, quality of life, and glycemic control in T2DM patients with DPN symptoms.

Methods: This quantitative study was conducted with a cross-sectional approach, involving a sample of 118 T2DM patients with DPN symptoms. The consecutive sampling technique was used to collect samples from nine health centers in Kendari City. The chi-square test was used to analyze the relationship between characteristics, and Spearman's correlation test with 95% confidence interval was used to analyze the relationship between self-efficacy, quality of life, glycemic control, and self-care behavior.

Results: Most patients (59%) reported having poor self-care behavior (below the median), low self-efficacy (45%) and impaired quality of life (48%) with values below the mean while as many as 47.5% have HbA1c values above the median. Median value of self-care behavior was 62.47 (26-110). The mean self-efficacy and quality of life scores were 95.87±16.34, and 105.93±18.75, respectively, and the median HbA1c value was 9.5 (6.5-15.0). A positive correlation was found between self-efficacy (p=0.000; r=0.662), quality of life (p=0.003; r=0.270), and a negative correlation of glycemic control (HbA1c) (p=0.000; r=-0.732) with diabetes self-care behavior.

Conclusion: The self-care behaviors of T2DM patients with NPD symptoms were mostly poor. Self-efficacy, quality of life, and glycemic control were related to diabetes self-care behavior. Appropriate, easily accessible, and sustainable program support is needed from policymakers to improve self-care behavior and self-efficacy, which can improve glycemic control and the quality of life of T2DM patients with NPD symptoms. WC 300

Keywords: Type 2 diabetes mellitus, self-efficacy, diabetic peripheral neuropathy, self-care behavior

Introduction

The practice of self-care behavior for patients with Type 2 Diabetes Mellitus (T2DM) globally is still limited. Research at a rehabilitation center in Saudi Arabia found patients with DM rarely exercise and check their blood sugar [1]. In North India, a cross-sectional study of 385 patients with DM found 52% did not comply with exercise recommendations, 46.5% did not comply with scheduled medication and 29% did not comply with dietary recommendations[2]. The same results were also found in Indonesia. As much as 52.2% of T2DM patients' self-care behavior in the city of Bandung was reported in a low category[3]. Meanwhile, in West Sulawesi, it was reported that 62.86% were non-adherent to treatment and did not follow a healthy diet[4]. The findings are the same as in this study, where as much as 59% of the self-care behavior of patients with T2DM in Kendari City was in the poor category.

The presence of diabetic peripheral neuropathy (DPN) contributes to reducing T2DM patients' interest in self-care[5], as a result of the emerging impact. The impacts arising from the presence of DPN include pain, loss of sensation, falls, impaired walking, leg injuries, amputation, and death [6][7][8]. In addition, DPN reduces life expectancy and creates economic, social, and emotional burdens. These conditions have the effect of decreasing the quality of life of patients with T2DM who develop DPN. Self-care activities are expected to help patients with T2DM prevent or reduce the incidence of complications due to DM and maintain or improve their quality of life. The World Health Organization (WHO) defines the quality of life as an individual's perception of the life they live by the culture and values where the individual lives and compares their life with the goals, expectations, standards, and goals set by the individual[9].

Self-care behavior is daily behavior conducted by people with DM to manage their disease such as self-monitoring of blood glucose, diet, and physical activity[10]. Self-care behavior is an important component that must be adhered to by patients with DM in managing their disease[11]. Diabetes self-care behavior refers to seven diabetes self-care behaviors endorsed by the American Association of Diabetes Educators (AADE) and recommended in diabetes self-management education, including: 1) physical activity/exercise, 2) diet, 3) medication, 4) regular blood glucose monitoring routine, 5) prevention of complications (routine foot care, monitoring signs and symptoms of disease, and quitting smoking), 6) psychosocial adaptation, and 7) spiritual coping [12-16].

Low diabetes self-care behavior contributes to poor glycemic control[4][17]. One of the factors that influence glycemic control is self-efficacy[18][19]. Self-efficacy is defined by Bandura as a person's belief in their ability to perform an expected behavior[20]. The ability to follow a health plan to prevent a disease is influenced by the patient’s belief in their own self-efficacy. The stronger the perception of self-efficacy, the stronger the commitment within themselves[21]. Motivation is directly influenced by self-efficacy, which is closely related to diabetes self-care behavior[22]. Interventions to increase diabetes self-efficacy have been shown to improve self-care behavior in patients with DM[23].

Many studies have explored self-efficacy, self-care behavior, and quality of life for patients with T2DM. However, research on self-efficacy, quality of life, glycemic control, and self-care behavior in T2DM patients with DPN symptoms in Indonesia, especially in Kendari City, is still lacking and needs to be explored. This study aimed to identify self-care behavior and its relationship with demography, self-efficacy, glycemic control, and quality of life of T2DM patients with DPN in Kendari City. This research will be the basis for the development of interventions, especially to increase self-efficacy in self-care which affects improving glycemic control and quality of life for T2DM patients with DPN in Kendari City.

Methods

This study used a cross-sectional approach to enroll 118 patients with T2DM to know the relationship between individual characteristics, self-efficacy, quality of life, and glycemic control with diabetes self-care behavior. All respondents provided informed consent. The research was conducted in the work area of the Kendari City Public Health Center from April 10 to August 31, 2022. A total of 9 health centers were selected in this study based on the representation of the geographic location of the area with a sampling technique using consecutive sampling.

Determination of Sample Size and Sampling Techniques

All patients with T2DM who had visited the health centers during the last six months became the target population. Sample inclusion criteria were: patients with T2DM who have HbA1c values above 6.5%, and have at least 1 of 3 points of decreased foot sensation using the 10gr monofilament test. The study sample size was calculated using the formula with 95% confidence level (CI), marginal error (d) 0.05, and the number of samples obtained was 122 people. A total of 118 patients with T2DM were included in the study.

Ethics, approvals, and permissions

This research study received approval from the Research Ethics Committee of the Faculty of Nursing, University of Indonesia (FoN-UI), with the assigned reference number Ket-231/UN2.F12D1.2.1/PPM.00.02/2021. The materials provided to the participants, including interview guides, research information, and participant consent forms, were duly reviewed and approved by the Ethics Committee of the Faculty of Nursing, University of Indonesia (FIK-UI). Prior to participation in the study, informed consent was obtained from all participants, ensuring adherence to the ethical principles of respect for individuals, beneficence/non-maleficence, and justice. Throughout the research process, no ethical issues were identified. Instruments Questionnaires used in this study include:

1) Measuring self-care behavior used The Summary of Diabetes Self-Care Activities (SDSCA) instrument [14] and modified into 16 questions. The validity and reliability tests have been conducted, with a Cronbach's alpha value of 0.7.
2) For measuring self-efficacy, the researchers modified the Chinese version of the Diabetes Management Self-Efficacy Scale (C-DMSES) instrument [24] and The Iranian version of the Diabetes Empowerment Scale (IR-DES-28) instrument [25], into 28 question items. The validity and reliability tests have been conducted with Cronbach's alpha r = 0.965.
3) Measuring quality of life used the SF-36 questionnaire [26] in the Indonesian version, with the overall Cronbach alpha coefficient value of 0.883.
4) Glycemic control measurements used the results of the respondent's HbA1c examination for the last three months from the health laboratory in collaboration with the Public Health Centers in Kendari City.

Data analysis

Univariate analysis was used to describe the demographics and characteristics of the respondents, which are displayed in tables of relative frequencies and percentages, such as marital status, ethnicity, who they live with, age, gender, duration of diabetes, metabolic markers, goals to be achieved in self-care behavior, sources of information about the most preferred diabetes information, and desired diabetes education materials. Because one of the variables was not normally distributed, the bivariate analysis used the Spearman correlation test, to see the relationship between self-efficacy, quality of life and HbA1c values with self-care behavior in T2DM patients with DPN.

Results

Characteristics of Respondents

Respondents were mostly in the age range of 45-54 years with a total of 58 people (49.2%), while the majority are women as many as 91 people (77.1%). Based on the level of education, the majority of respondents were in the senior high school level group with as many as 55 people (46.6%), and the type of work was mostly as housewives with as many as 62 people (52.5%). Characteristics of respondents according to marital status indicated as many as 93 people (78.8%) have been married, while the duration of being diagnosed with T2DM was in the 1-5 years group with as many as 64 people (54.2%). For the characteristics of respondents based on ethnicity, the majority of respondents are in the Tolaki tribe with as many as 43 people (36.4%). The majority of HbA1c values were above the median value (>9.7%) with as many as 57 respondents (56.4%). Characteristics of respondents and metabolic values can be seen in more detail in Table 1.

Table 1. Characteristics of Respondents and Metabolic Markers (n=118).

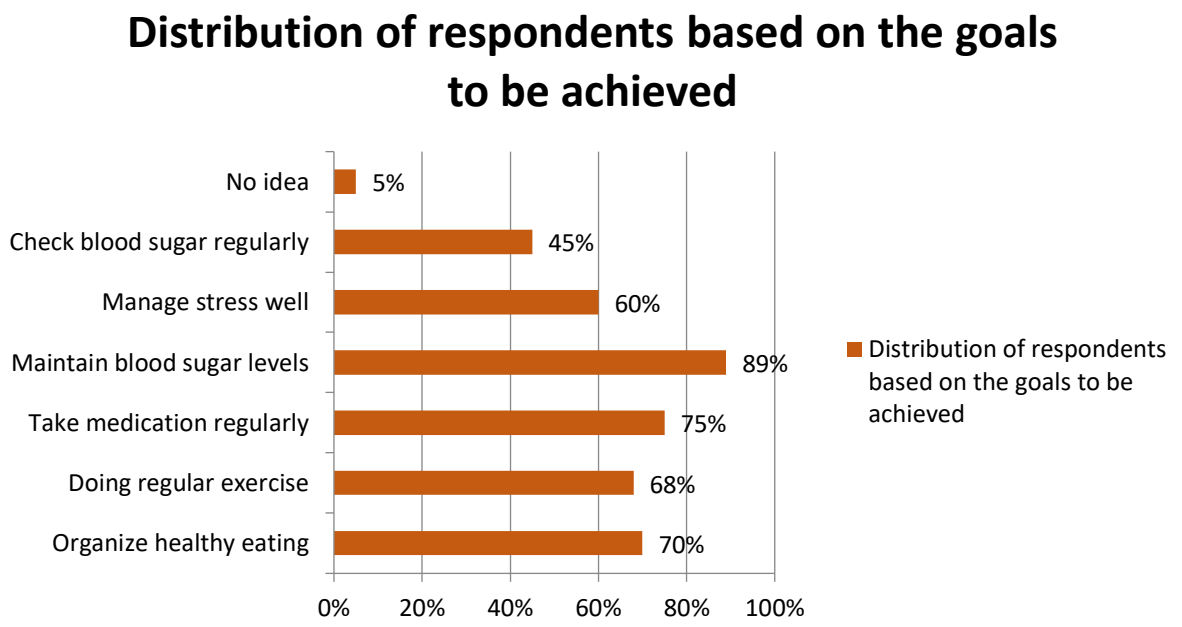
Characteristics of Respondents	n	Percentage (%)
Age		
a. 25 – 34	2	1.7
b. 35 – 44	4	3.4
c. 45 – 54	58	49.2

d. 55 – 64	46	39
e. 65 – 74	7	5.9
f. 75 – 84	1	0.8
Sex		
a. Man	27	22.9
b. Woman	91	77.1
Level of education		
a. Elementary school	10	8.5
b. Junior high school	24	20.3
c. Senior High School	55	46.6
d. Higher education	29	24.6
Job		
a. Civil Servant	27	22.9
b. Self-Employed	21	17.8
c. Employee	1	0.8
d. Housewife	62	52.5
e. Etc.	7	5.9
Marital status		
a. Married	93	78.8
b. Unmarried	2	1.7
c. Widow/widower	22	18.6
Duration of diabetes (years)		
a. 1 – 5	64	54.2
b. 6 – 10	42	35.6
c. 11 – 15	8	6.8
d. 16 – 20	4	3.4
Ethnicity		
a. Tolaki	43	36.4
b. Bugis	38	32.2
c. Muna	15	12.7
d. Buton	6	5.1
e. Toraja	3	2.5
f. Jawa	7	5.9
g. Etc.	6	5.1
The score of HbA1c		
a. < median; min-max (9.5; 6.5-15.0)	62	52.5
b. ≥ median; min-max (9.5; 6.5-15.0)	56	47.5
The score of random blood sugar (mg/dl)		
a. < median; min-max (296; 193-584)	60	51
b. ≥ median; min-max (296; 193-584)	58	49

Min-Max, minimum-maximum.

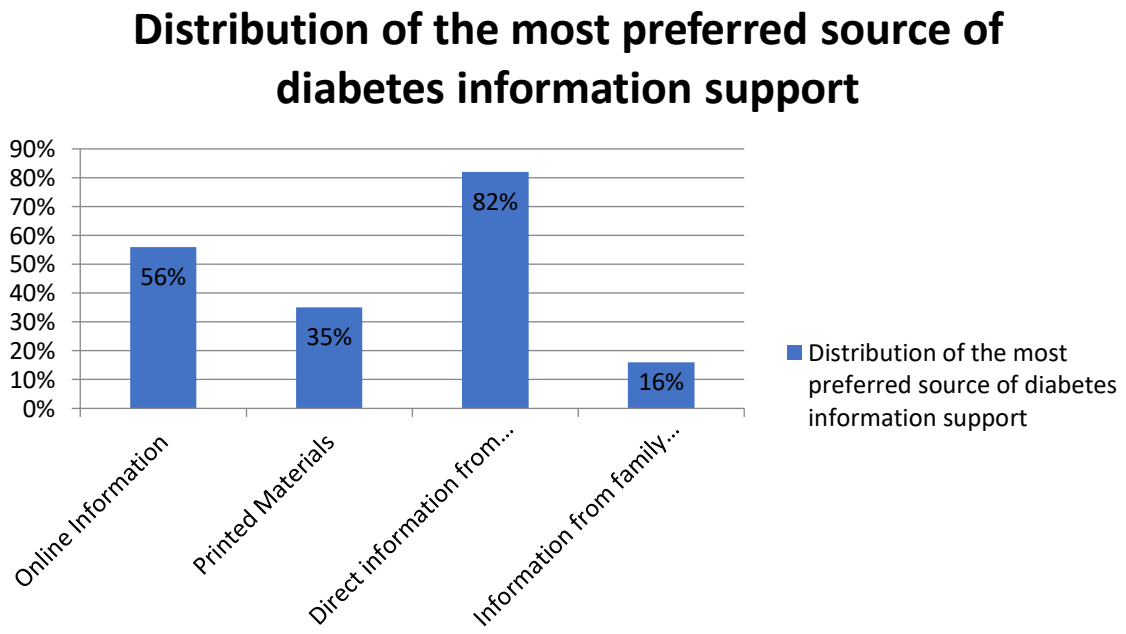
Goals to be achieved in diabetes self-care

The most preferred choice of goals to be achieved by respondents in diabetes self-care was to maintain blood sugar levels with n=105 (89%). Then followed by managing a healthy diet with n=83 (70%), doing regular exercise with n=80 (68%), taking the medication regularly with n=89 (75%), managing stress properly with n=71 (60%), checking sugar regular blood with n=53 (45%), while some said they do not know with n=6 (5%).



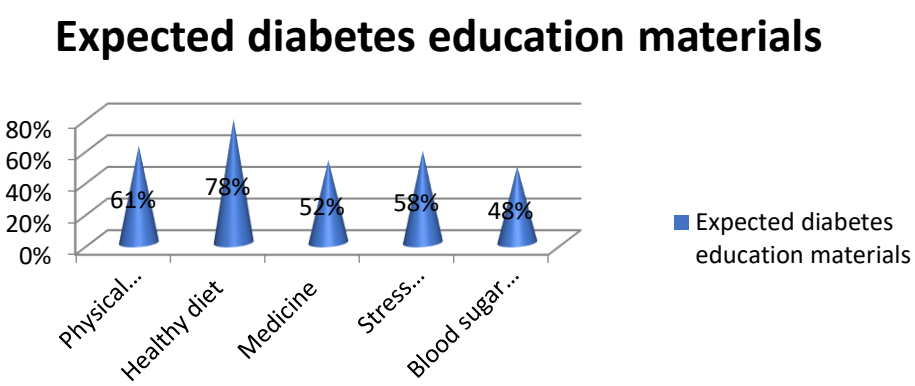
Media Information about DM

The most preferred media sources of information about DM by respondents were online information with n=66 (56%), printed books with n=41 (35%), direct information from doctors/nurses/other health workers with n=97 (82%), and information from friends/neighbors with n=19 (16%).



Educational Materials DM desired

When asked about the desired diabetes education material, the most common choices were material about a healthy diet by 78% (n=92), material about physical exercise by 61% (n=72), material about diabetes treatment by 52% (n=61), stress management by 58% (n=68), and blood sugar checks by 48% (n=57).



Univariate analysis

The majority of respondents' diabetes self-care behaviors were below the median value (50th percentile) of 70 people (59%). The median HbA1c value of the respondents was 9.5% and those who were above the median value were 56 people (47.5%) which can be seen in Table 2.

Table 2. Description of Respondents' Diabetes Self-Care Behavior and HbA1c

	Median (Minimum-Maximum)	<50th percentile		≥50th percentile	
		n	%	n	%
Diabetic self-care behavior	62.47 (26-110)	70	59	48	41
HbA1c value	9.5 (6.5-15.0)	62	52.5	56	47.5

Table 3 shows the average score of self-efficacy is 95.87 ± 16.34, while the average score of quality of life is 105.93 ± 18.75.

Table 3. Description of Respondents' Self-Efficacy and Quality of Life

	Mean (SD)	95% CI
Self-Efficacy	95.87 (16.34)	(92.89-98.85)
Quality of Life	105.93 (18.75)	(102.52-109.35)

CI, confidence interval; SD, standard deviation.

Bivariate Analysis

Characteristics of respondents with self-care behavior

Analysis of the relationship between respondents' characteristics and self-care behavior used the chi-square test as shown in Table 4. Self-care behavior was divided into two categories, namely less than the median (poor) and more than or equal to the median (good). The results of the analysis showed that gender, last education, and type of work had a significant relationship with self-care behavior with *p*-values of 0.000, 0.018, and 0.003, respectively. There was no significant relationship between age characteristics, marital status, or ethnicity with self-care behavior.

Table 4. Relationship between Respondent Characteristics and Self-Care Behavior in T2DM Patients with DPN Symptoms

Variable	Diabetic Self-Care Behavior	
	Pearson Chi-Square	*p*- value
Age	7.154	0.209
Gender	13.146	0.000*
Last education	10.081	0.018*
Job	16.202	0.003*
Marital status	4.193	0.381
Tribe	12.160	0.058

*$p<0.05$ considered significant.

Self-efficacy, quality of life, glycemic control (HbA1C) with self-care behavior. We tested the relationship using the Spearman correlation test because the self-care behavior variable was not normally distributed with 95% CI and α of 5%. The relationship test of self-care behavior with the variables of self-efficacy, quality of life, and HbA1c can be seen in Table 5. Based on these data, there was a positive correlation between self-care behavior and self-efficacy (r = 0.334, $p = 0.000$); quality of life (r = 0.300, $p = 0.001$), and a negative correlation with HbA1c values (r = -0.732, $p = 0.000$).

Table 5. Relationship between Self-efficacy, Quality of Life and HbA1c Values with Self-care Behavior in T2DM Patients with DPN Symptoms.

Variable	Diabetic self-care behavior	
	Spearmen Correlation	*p*- value
Self-efficacy	0.334	0.000*
Quality of life	0.300	0.001*
HbA1c value	-0.732	0.000*

*$p<0.05$ considered significant.

Discussion

The findings of this study indicate that the majority of T2DM patients' self-care behavior with DPN symptoms is in a poor category. These results match a study on 123 patients with diabetes at a rehabilitation center in Saudi Arabia where diabetic patients rarely do exercise and check blood sugar[1]. Likewise, a study at the Bandung City Health Center found that the majority of patients with T2DM (52.2%) had inadequate diabetes self-care behaviors[3]. However, in contrast, one study in urban China found diabetes self-care behaviors such as medication management, diet management, blood sugar checks, foot care, exercise management and prevention and treatment of hypo/hyperglycemia in patients with T2DM were mostly in the good category[13]. Complaints felt by patients with T2DM reduce the patient's enthusiasm and interest in engaging in physical activities, which is similar with the results of this research where the quality of life is related to self-care behavior in T2DM patients with DPN symptoms.

Low diabetes self-care behavior is influenced by two main factors, namely internal and external factors. Internal factors include knowledge of patients with DM [27], self-efficacy[28][29], and psychological conditions such as stress[30], depression[31], and spiritual conditions[32]. External factors include family and friend support, availability of health services, provider-client communication, lack of empathy for health care providers, social stigma, and the availability of an adequate environment for training[33][34]. The lack of family understanding of the DM disease makes individual patients receive less attention and support in diabetes self-care [34]. Other external factors are environmental factors such as the COVID-19 pandemic. The COVID-19 pandemic situation has limited patients in managing diabetes self-care as a result of social restrictions and the cessation of diabetes

patient service activities at the Integrated Development Posts of Non-Communicable Diseases (IDP-NCD). Social restrictions have an impact on stopping joint exercise activities for patients with diabetes every week, and limiting food stocks, thus changing the patient's habits. This is reinforced by another study [34], which found an impact on poor glycemic control as a result of diabetes management during the COVID-19 pandemic. The cessation of service activities at IDP-NCD has an impact on the stock of diabetes medication at the patient's home running out so that the patients stopped taking their scheduled medication. This finding is reinforced by a recent study [35], that found problems in diabetes patients' drug stocks during the COVID-19 pandemic.

This study identified a significant relationship between self-efficacy and self-care behavior. A study found that self-efficacy has an indirect effect on glycemic control through diabetes self-care [18]. Self-efficacy is a predictor of diabetes self-care behavior[28]. A similar study found a positive relationship between self-efficacy and diabetes self-care activities[36]. The higher the self-efficacy of patients with DM, the better their self-care behavior will be. The patients with DM who have strong self-efficacy will perform self-care activities that are considered challenging but are seen as capable of being overcome. Activity in self-care increased along with increased self-efficacy in patients with T2DM [23].

This study found a significant relationship between glycemic control and self-care behavior. The best glycemic control indicator is the glycosylated hemoglobin (HbA1c) value. These results are in line with a study, which concluded that poor glycemic control is closely related to poor self-care behavior [37]. A high HbA1c score is closely related to poor DM patient care behavior. The results of this study show consistency with the results of previous studies which showed that high self-care behavior scores were related to low HbA1c levels[38][39]. Disobedience to following a healthy diet, engaging in regular physical exercise, and taking the scheduled medication is the dominant behavior shown by the respondents of this study. This lack of adherence to a healthy lifestyle is predicted to be a factor associated with high HbA1c scores.

Another finding is that the quality of life of T2DM patients with DPN of 50% is below the median. The majority of respondents complained of leg pain, aches all over the body, numbness, and fatigue throughout the day. These results follow a similar study [40], which showed that the majority of patients with T2DM experienced severe peripheral neuropathy, with symptoms of pain, walking instability, and leg injuries which resulted in reduced quality of life. Quality of life decreases with age[41]. The results of this study showed that the majority of the duration of suffering from T2DM (54.2%) was in the range of 1-5 years. In an acute attack, DPN causes a stabbing pain that is felt, has a rapid onset, with complaints of intense burning pain and pain with nocturnal exacerbations, while the severity of symptoms is usually moderate to severe, and with decreased ankle reflexes[8].

Low quality of life is significantly related to the duration of diabetes and prolonged complications[41]. The intensity and duration of pain are closely related to the decreased quality of life of patients with DM [42]. The majority of respondents had HbA1c values > 9.7%, with as many as 57 respondents (56.4%). The results showed that low quality of life was significantly related to high HbA1c values. High glycosylated glycemic levels will cause nerve damage. Thus, the function of the nerves to send various important signals throughout the body becomes disrupted. Nerve damage can cause symptoms of mild numbness to pain in several parts of the body.

The results showed that education level had a significant relationship with diabetes self-care behavior. The T2DM patients with higher levels of education tended to have better self-care behaviors. The results of this study are in accordance with a previous study [43], which found that DM patients with a higher level of education were more obedient in following doctor's advice in medication and blood glucose examination, as well as physical exercise. However, a systematic review confirmed that there was no significant relationship between diabetes self-care behavior and education level[44]. Research showed that the education level mediates self-care behavior through knowledge of patients with T2DM. Someone with a higher level of education will find it easier to understand the information provided, whereas T2DM patients with a low level of education may have some limitations in understanding the information provided regarding DM management.

Study limitations

Inadequate sample size limits the generalizability of our results, and there were few data and a lack of exploration related to diabetes self-care management support in the context of family and community, which are also some of the limitations of this study.

Research implications

The findings of this study form the basis for developing strategies to improve diabetes self-care behavior according to the needs of patients with DM, through increasing self-efficacy, which has an impact on improving glycemic control and quality of life.

Conclusions

The management of Type 2 Diabetes Mellitus (T2DM) requires consistent adherence to various self-care behaviors, such as maintaining healthy eating habits. The act of utilizing self-management techniques for diabetes control behavior among patients with type 2 diabetes mellitus (T2DM) who experience diabetic peripheral neuropathy (DPN) symptoms remains low, resulting in poor glycemic control. This low self-care behavior is closely associated with reduced self-efficacy in patients with DM. Furthermore, the negative impact of poor glycemic control extends to a decline in the quality of life for individuals with T2DM and DPN symptoms. Therefore, it is imperative to implement proactive, targeted, and sustainable efforts aimed at enhancing the self-care behavior of patients with T2DM.

Acknowledgments

The authors would like to express their deepest gratitude to the Ministry of Education and Culture, Directorate of Higher Education of the Republic of Indonesia, for their generous grant funding that supported this research. Additionally, our sincere appreciation goes to all the patients with T2DM who participated in this study, providing invaluable insights into their diabetes self-care behavior. We are also grateful to the individual responsible for managing the chronic disease program at the Public Health Center in Kendari City, whose assistance greatly facilitated the collection of responses from the patients with diabetes.

References

1. Saad AMJ, Younes ZMH, Ahmed H, Brown JA, Al Owesie RM, Hassoun AAK. Self-efficacy, self-care and glycemic control in Saudi Arabian patients with type 2 diabetes mellitus: A cross-sectional survey. Diabetes Res Clin Pract [Internet]. 2018;137:28–36. Available from: https://doi.org/10.1016/j.diabres.2017.12.014
2. Basu S, Sharma N. Diabetes self-care in primary health facilities in India - challenges and the way forward. World J Diabetes. 2019;10(6):341–9.
3. Yamin A, Sari CWM. Relationship of Family Support Towards Self-Management and Quality of Life of Patients with Type 2 Diabetes Mellitus. J Keperawatan Padjadjaran. 2018;6(2):175–82.
4. Pamungkas RA, Hadijah S, Mayasari A, Nusdin N. Factors Associated With Poor Glycemic Control Among Type 2 Diabetes Mellitus in Indonesia. Belitung Nurs J. 2017;3(3):272–80.
5. Timar B, Timar R, Schiller A, Oancea C, Roman D, Vlad M, et al. Impact of neuropathy on the adherence to diabetes-related self-care activities: A cross-sectional study. Patient Prefer Adherence. 2016;10:1169–75.
6. Stino AM, Smith AG. Peripheral neuropathy in prediabetes and the metabolic syndrome. J Diabetes Investig. 2017;8(5):646–55.
7. Jember G, Melsew YA, Fisseha B, Sany K, Gelaw AY, Janakiraman B. Peripheral Sensory Neuropathy and associated factors among adult diabetes mellitus patients in Bahr Dar, Ethiopia. J Diabetes Metab Disord. 2017;16(1):1–8.
8. Hershey DS. Diabetic Peripheral Neuropathy: Evaluation and Management. J Nurse Pract [Internet]. 2016;13(3):199-204.e1. Available from: http://dx.doi.org/10.1016/j.nurpra.2016.08.034
9. Cai T, Verze P, Bjerklund Johansen TE. The Quality of Life Definition: Where Are We Going? Uro.

2021;1(1):14–22.
10. Luo X, Liu T, Yuan X, Ge S, Yang J, Li C, et al. Factors influencing self-management in Chinese adults with type 2 diabetes: A systematic review and meta-analysis. Int J Environ Res Public Health. 2015;12(9):11304–27.
11. Wong-Rieger D, Rieger FP. Health coaching in diabetes: empowering patients to self-manage. Can J diabetes [Internet]. 2013;37(1):41–4. Available from: http://dx.doi.org/10.1016/j.jcjd.2013.01.001
12. Eva JJ, Kassab YW, Neoh CF, Ming LC. Self-Care and Self-Management Among Adolescent T2DM Patients : A Review. 2018;9(October):1–7.
13. Huang M, Zhao R, Li S, Jiang X. Self-management behavior in patients with type 2 diabetes: A cross-sectional survey in western urban China. PLoS One. 2014;9(4).
14. Toobert DJ, Hampson SE, Glasgow RE. The Summary of Diabetes Self-Care. Diabetes Care. 2000;23(July):943–50.
15. Sridharan S, Chittem M, Muppavaram N. A review of literature on diabetes self-management: Scope for research and practice in India. J Soc Heal Diabetes. 2016;04(02):108–14.
16. Rutledge SA, Masalovich S, Blacher RJ, Saunders MM. Diabetes self-management education programs in nonmetropolitan counties - United States, 2016. MMWR Surveill Summ. 2017;66(10):1–6.
17. Mamo Y, Bekele F, Nigussie T, Zewudie A. Determinants of poor glycemic control among adult patients with type 2 diabetes mellitus in Jimma University Medical Center, Jimma zone, south west Ethiopia: A case control study. BMC Endocr Disord. 2019;19(1):1–11.
18. Lin K, Park C, Li M, Wang X, Li X, Li W, et al. Effects of depression, diabetes distress, diabetes self-efficacy, and diabetes self-management on glycemic control among Chinese population with type 2 diabetes mellitus. Diabetes Res Clin Pract [Internet]. 2017;131(38):179–86. Available from: http://dx.doi.org/10.1016/j.diabres.2017.03.013
19. Shao Y, Liang L, Shi L, Wan C, Yu S. The Effect of Social Support on Glycemic Control in Patients with Type 2 Diabetes Mellitus: The Mediating Roles of Self-Efficacy and Adherence. J Diabetes Res. 2017;2017.
20. Khuzaimah S, Sharoni A, Rahman HA, Minhat HS, Shariff-ghazali S, Hanafi M, et al. The effects of self-efficacy enhancing program on foot self-care behaviour of older adults with diabetes : A randomised controlled trial in elderly care facility , Peninsular Malaysia. 2018;1–24. Available from: http://dx.doi.org/10.1371/journal.pone.0192417
21. Bandura A. Self-Efficacy; The Exercise of Control [Internet]. W.H. Freeman and Company. New York: W.H. Freeman and Company; 1997. Available from: http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=9703260522&site=ehost-live
22. Mohebi S, Azadbakht L, Feizi A, Sharifirad G, Kargar M. Review the key role of self-efficacy in diabetes care. J Educ Health Promot. 2013;2(1):36.
23. Albikawi ZF, Petro-Nustas W, Abuadas M. The effect of diabetes self-efficacy enhancing intervention on diabetes self-care management behaviors among Jordanian type two diabetes patients. Am Int J Contemp Sci Res. 2015;2(4):34–48.
24. Vivienne Wu SF, Courtney M, Edwards H, McDowell J, Shortridge-Baggett LM, Chang PJ. Development and validation of the Chinese version of the Diabetes Management Self-efficacy Scale. Int J Nurs Stud. 2008;45(4):534–42.
25. Mahjouri MY, Arzaghi SM, Heshmat R, Khashayar P, Esfahani EN, Larijani B. Psychometric properties of the Iranian version of Diabetes Empowerment Scale (IR-DES-28). J Diabetes Metab Disord [Internet]. 2012;11(1):1–5. Available from: ???
26. Putri BD, Handayani NS, Ekayafita SZ, Lestari AD. The Indonesian Version of SF-36 Questionnaire: Validity and Reliability Testing in Indonesian Healthcare Workers Who Handle Infectious Diseases. Indian J Forensic Med Toxicol. 2021;15(2):2135–42.
27. Kassahun T, Gesesew H, Mwanri L, Eshetie T. Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: A cross-sectional survey. BMC Endocr Disord [Internet]. 2016;16(1):1–11. Available from: http://dx.doi.org/10.1186/s12902-016-0114-x

28. Kurnia AD, Amatayakul A, Karuncharernpanit S. Predictors of diabetes self-management among type 2 diabetics in Indonesia: Application theory of the health promotion model. Int J Nurs Sci [Internet]. 2017;4(3):260–5. Available from: http://dx.doi.org/10.1016/j.ijnss.2017.06.010
29. Masoompour M, Tirgari B, Ghazanfari Z. The relationship between health literacy, self-efficacy, and self-care behaviors in diabetic patients. Evid Based Care J. 2017;7(3):17–25.
30. Dehghan P, Pourmoradian S, Mahdavi AM, Sarmadi B, Mehralizadeh S. Relationship Between Perceived Stress and Dietary Intakes in Type 2 Diabetic Patients. Curr Top Nutraceuticals Res. 2016;14(3):199–206.
31. Darawad MW, Hammad S, Mosleh S, Samarkandi OA, Hamdan-Mansour A, Khalil AA, et al. Psychosocial correlates of diabetes self-management practices. Iran J Public Health. 2017;46(6):771–81.
32. Darvyri P, Christodoulakis S, Galanakis M, Avgoustidis AG, Thanopoulou A, Chrousos GP. On the Role of Spirituality and Religiosity in Type 2 Diabetes Mellitus Management—A Systematic Review. Psychology. 2018;09(04):728–44.
33. Byers D. Facilitators and Barriers to Type 2 Diabetes Self-Management Among Rural African American Adults. J Health Dispar Res Pract [Internet]. 2016;9(1):164–74. Available from: http://digitalscholarship.unlv.edu/jhdrp/
34. Blixen CE, Kanuch S, Perzynski AT, Thomas C, Dawson N V., Sajatovic M. Barriers to self-management of serious mental illness and diabetes. Am J Health Behav. 2016;40(2):194–204.
35. Banerjee M, Chakraborty S, Pal R. Diabetes self-management amid COVID-19 pandemic. Diabetes Metab Syndr Clin Res Rev [Internet]. 2020;14(4):351–4. Available from: https://doi.org/10.1016/j.dsx.2020.04.013
36. Kav S, Yilmaz AA, Bulut Y, Dogan N. Self-efficacy, depression and self-care activities of people with type 2 diabetes in Turkey. Collegian [Internet]. 2017;24(1):27–35. Available from: http://dx.doi.org/10.1016/j.colegn.2015.09.005
37. D'Souza MS, Karkada SN, Parahoo K, Venkatesaperumal R, Achora S, Cayaban ARR. Self-efficacy and self-care behaviours among adults with type 2 diabetes. Appl Nurs Res [Internet]. 2017;36:25–32. Available from: http://dx.doi.org/10.1016/j.apnr.2017.05.004
38. Pokhrel S, Shrestha S, Timilsina A, Sapkota M, Bhatt MP, Pardhe BD. Self-care adherence and barriers to good glycaemic control in nepalese type 2 diabetes mellitus patients: A hospital-based cross-sectional study. J Multidiscip Healthc. 2019;12:817–26.
39. Shayeghian Z, Aguilar-Vafaie ME, Besharat MA, Amiri P, Parvin M, Gillani KR, et al. Self-care activities and glycated haemoglobin in Iranian patients with type 2 diabetes: Can coping styles and social support have a buffering role? Psychol Heal. 2015;30(2):153–64.
40. Ghavami H, Radfar M, Soheily S, Shamsi SA, Khalkhali HR. Effect of lifestyle interventions on diabetic peripheral neuropathy in patients with type 2 diabetes, result of a randomized clinical trial. Agri Derg. 2018;30(4):165–70.
41. Nasralla Saleh MS, Alwahedi Z. Quality of Life Predictors and Glycemic Control among Type 2 Diabetic Patients Attending Primary Health Care Centers in Qatar. Prim Heal Care Open Access. 2016;6(2).
42. Geelen CC, Smeets RJEM, Schmitz S, van den Bergh JP, Goossens MEJB, Verbunt JA. Anxiety affects disability and quality of life in patients with painful diabetic neuropathy. Eur J Pain (United Kingdom). 2017;21(10):1632–41.
43. Chourdakis M, Kontogiannis V, Malachas K, Pliakas T. Self-Care Behaviors of Adults with Type 2 Diabetes Mellitus in Greece Self-Care Behaviors of Adults with Type 2 Diabetes Mellitus in Greece. 2014;(February).
44. Nelson LA, Ackerman MT, Greevy RA, Wallston KA, Mayberry LS. Beyond Race Disparities: Accounting for Socioeconomic Status in Diabetes Self-Care. Am J Prev Med [Internet]. 2019;57(1):111–6. Available from: https://doi.org/10.1016/j.amepre.2019.02.013