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REVIEW: THE ROLE OF LIFESTYLE IN THE QUALITY OF LIFE OF TYPE 2 DIABETES MELLITUS PATIENTS

Alfiranty Yunita[1], **Alfia Aretzy**[2]

[1]Pharmacy Study Program, Universitas Sembilan Belas November Kolaka, Kolaka 93561, Indonesia
[2]Food Studies Program, Faculty of Agricultural Technology, IPB University, Bogor 16680, Indonesia

alfira@usn.ac.id

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ABSTRACT
Diabetes is a chronic disease that has increased growing from year to year in the number of sufferers from year to year. It is associated with changes in lifestyle in modern times that can affect the quality of life of the patients. The quality of life itself refers to the value assigned during a lifetime that changes with decreased functional, perceptual, and social value and can be affected by disease and treatment. The assessment of the quality of life, especially for patients with type 2 diabetes mellitus, aims to restore not only physical function in terms of mobility but also perceptions of health. This research aims to determine the role of lifestyle in improving the quality of life of type 2 diabetes mellitus patients. The non-experimental study is based on a review of various articles on the quality of life of people with type 2 diabetes mellitus published in various national journals from 2016 to 2022. The results of this study showed that exercising, consuming a balanced, nutritious diet, and monthly health check-ups greatly contribute to the improvement of the quality of life. The quality of life can also be measured using the EQ-5D-5L instrument which cover five domains mobility (the ability to move or walk), self-care, usual activities, pain or discomfort, and anxiety or depression and five domain levels. This article concludes that a good lifestyle can improve the quality of life of type 2 diabetes mellitus patients.

Keywords: Diabetes mellitus; Quality of life; Lifestyle; Type 2 diabetes mellitus

1. INTRODUCTION

Diabetes mellitus (DM) is a non-communicable disease whose development progresses slowly over a long period of time. It is characterized by increased blood sugar levels and impaired carbohydrate, lipid, and protein metabolism as a result of insulin function insufficiency (DepKes RI, 2005; Permenkes RI, 2015).The International Diabetes Federation (IDF) estimated that 463 million people aged 20–79 years in the world would suffer from DM in 2019, the equivalent of a prevalence rate of 9.3% of the total world population. Indonesia is ranked 7th out of 10 countries with the largest populations suffering from DM, with 10.7 million people living with the disease, which has contributed greatly to the prevalence of DM in Southeast Asia (Kemenkes RI, 2020).

Each individual has his/her own thoughts and tastes. The particulary in each individual's mindset influences his/her behavior in choosing something in life. Two individuals may share some similarities, but they are not the same. This leads to the diversity in the quality of life among different individuals. The World Health Organization (WHO) revealed that a person's quality of life depends on his/her perception because each individual has a different perspective on culture, goals, expectations, and living standards (WHO, 1998).

In modern times, young and old people alike increasingly pursue good quality of life, considering the rise in health problems, due to low social economy, low education, poor lifestyle, and poor food intake. One disease that is closely related to quality of life is diabetes mellitus. According to (Umam et al., 2020),one must have control over his/her quality of life. Patients of

DM constantly have needs, especially for sugar. This excessive consumption of sugar in diabetes mellitus sufferers can cause abnormal blood glucose levels (Umam et al., 2020).

Diabetes mellitus is generally defined as a disease caused by an increase in a person's consumption of sugar. It is a metabolic disorder associated with distribution (Umam et al., 2020). The increase in blood sugar levels in DM sufferers is caused by ineffective use of insulin. Of the various types of DM, type 2 DM is the most common. The American Diabetes Association (2018) reported, that type 2 DM contributed 90% of the data and has the highest relevance all types of diabetes. Research (Adikusuma et al., 2016; Teli, 2017; Putu et al., 2019; Dewi et al., 2019; Handayani et al., 2022; Nurliza et al., 2022) has demonstrated that lifestyle is important for patients. DM patients who have good quality of life will find it easier to avoid the wort risks. That being the case, this study seeks to review matters related to the quality of life of patients with type 2 diabetes mellitus using the cross-sectional method. It aims to provide readers with the knowledge of the right quality of life for people with DM.

Research reviews regarding type 2 diabetes mellitus have been carried out before, but there are differences in terms of improving the quality of life of type 2 diabetes mellitus patients. As in research conducted (Serena et al., 2023) patients who have good family support will have a comfortable feeling that can increase their motivation to obey on the management of type 2 diabetes mellitus and ultimately quality of life they increase. According to (Fitriani and Sanghati, 2021) shows that lifestyle interventions can effectively prevent the risk of developing type 2 DM in people with pre-diabetes.

2. METHODS

The present study investigated the quality of life of type 2 DM sufferers in Indonesia using a non-experimental method. Article searches in this research were achieved using Google Scholar with keywords "Diabetes mellitus; Quality of life; Lifestyle; Type 2 diabetes mellitus". It was selected based on the suitability of the title to the topic of this study. Furthermore, data were extracted from 13 articles selected and published in national journals from 2016 to 2022. Information regarding the articles' authors, titles, years of publication, objectives, methods, times of study, criteria, number of patients involved, patient characteristics, instruments used, and conclusions was retrieved. The flow of selection of articles in this study is shown in **Figure 1**.

3. RESULTS AND DISCUSSION

Age, occupation, and gender are groups that are used as measuring tools in determining the Diabetes Quality of Life Clinical Trial Questionnaire (DQLCTQ) instrument. Women are more affected by type 2 diabetes mellitus. They are 3-7 times more at risk of developing DM than men as the levels of fat in their blood is higher than that of men. The increase in sugar intolerance in the elderly makes them more susceptible to type 2 DM (Nurhaliza et al., 2022). In collecting quality of life data, physical examinations such as blood pressure checks and examinations of other anthropogenic markers useful for measuring nutritional status, and limited daily activities were performed. From psychological examinations, it was found that patients with DM tend to lack a zest for life and have no desire to live a better life. Around the age of 67, men are at higher risk of suffering from type 2 DM compared to women (Faswita, 2019). However, other research contrarily reveals that men exhibit better quality of life in terms of physical fiction, energy, mental health, and frequency of symptoms (Handayani et al., 2022). Umam et al., (2020) stated that people above 50 are at risk of developing DM because of a decreased immune state. Their leading a poor lifestyle and rarely going out for sports during their youth exacerbate their risk of developing the disease. Megawati et al., (2019) found that there is no relationship between gender and quality of life. While they face the risk of developing DM, men and women alike still have the ability to manage diabetes. Activities such as work can affect the physical state, and the consumption of high-calorie foods and a lack of exercise can cause obesity. Someone who suffers

from a disease has a fairly high emotional level compared to healthy people. This also have a role in encouraging patient's quality of life.

Adikusuma et al., (2016), discovered that patients who received monotherapy had higher quality of life than patients who received combination therapy. However, both groups of patients were in similar states of physical functioning they fell to exhaustion easily and, felt a low level of energy even though they had accepted their health condition. There was no significant difference between combination therapy and monotherapy patients on mental health. This can be attributed to the fact that all patients had accepted their health condition. They did not feel the burden of having to lead a different lifestyle. With regard to satisfaction, a significant difference was found between monotherapy and combination patients. They felt a higher degree of control over their treatment, and they wished to continue with oral antidiabetic monotherapy. However, both groups of patients had reduced quality of life due to the side effects of the drugs that they took. Meanwhile, Teli (2017) found that diabetes mellitus patients experienced a decline in physical function, mental function, pain, general health, roles, and responsibilities. They also experienced a shift in their roles. According to Nurhaliza et al., (2022), patients who received combination therapy could not fully control their lifestyle and eating patterns. In the case of housewives who dealt with various kinds of routines, physical activities could trigger stress, which ultimately affected their blood glucose levels. Moreover, the majority of the activities were carried out at home, which could lead to obesity, one of the triggering factors for type 2 diabetes mellitus.

Putu et al., (2019) in their research found that the quality of life of Prolanis (Chronic Disease Management Program) participants in psychological as well as social, environmental, and physical aspects was relatively high. Prolanis participants made regular visits to health facilities once a month. Information related to diabetes and diet management was provided to increase the participants' knowledge about diabetes and to minimize complications. In another work, (Dewi et al., (2019) used the EQ-5D-5L instrument to measure the quality of life in five domains, namely, mobility (the ability to move or walk), self-care, usual activities, pain or discomfort, and anxiety or depression. Socioeconomic and appetite changes will result in changes in eating patterns that tend to move away from the concept of nutritious food, which will have an impact on health. Smoking has been significantly linked to an increased risk of type 2 diabetes mellitus. Exercise will convert glucose into energy. It causes insulin to increase, which subsequently causes the level of sugar in the blood to decrease. Diabetics must undergo specific diet or eating arrangements, control their blood sugar, and exercise to improve their quality of life. (Hamida et al., (2019) also used the EQ-5D-5L instrument to describe health. Ratnasari et al., (2020) stated that diabetes mellitus has an impact on psychological conditions related to emotional burden, the pressure to maintain health, illness-related stress, and social relationships. To improve the quality of life, patients with diabetes mellitus should take drugs regularly and lead a healthy lifestyle. The results of the literature review of 13 articles obtained in this study can be seen in **Table 1** which contain resources, research title, location (city), total patients, length of research, variables results and conclusion, and reference.

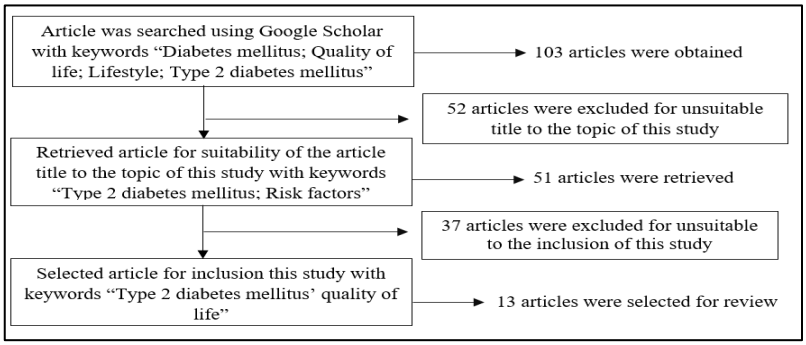

Figure 1. Scheme of the review process

Table 1. Articles review

No	Resources	Research title	Location (City)	Total patients	Length of research	Variables	Results and Conclusion	Reference
1	Jurnal Ners LENTERA	The Development of a Self-Empowerment and Quality of Life Improvement for Model for Patients with Type 2 Diabetes Mellitus	Bendo Public Health Center, Pare, Kediri, 2014	42 patients	1 month	Independent variable: Personal Factor and Self-Instructional Training Dependent variable: Self-empowerment, quality of life	1. The patient's personal factors (age, gender, education, length of suffering from DM, perceived benefits, and perceived barrier) significantly affect self-empowerment and quality of life 2. Self-empowerment has a significant influence on the quality of life of DM patients 3. Self-Instructional Training can improve self-empowerment and quality of life for type 2 DM patients	(Nuari, 2016)
2	Jurnal Ilmiah Ibnu Sina	Measurement of the Quality of Life of Type 2 Diabetes Mellitus Patients Receiving Oral Anti-Diabetic in Medication in RS PKU Muhammadiyah Bantul Yogyakarta	RS PKU Muhammadiyah Bantul Yogyakarta, 2016	56 patients	3 months	Independent variable: Patient's Characteristics (age, gender, education, job, long suffering, drug therapy) Dependent variable: Quality of life of diabetes mellitus type 2 patient	1. There were significant differences in patient quality of life (DQLCTQ) between the monotherapy and combination therapy groups in the domains of personal satisfaction and treatment satisfaction. 2. Based on the Time Trade Off (TTO) questionnaire, there was no significant difference between the monotherapy and combination therapy groups	(Adikusuma et al., 2016)
3	Jurnal Info Kesehatan	The Quality of Life of Type 2 Diabetes Mellitus Patients at the Public Health Center of Kupang City	Health centers in Kupang City, East Nusa Tenggara	65 patients	3 months	Independent variable: Long suffering from DM, gender, age, complications of DM, regularity of taking medication and regularity of checking blood sugar Dependent Variable: Quality of life of DM patient that defined as a DM patient's perspective on function, and role in life while suffering from DM	1. There is a decrease in the quality of life of type 2 DM patients in all aspects of health, including physical function, social functioning, mental health, general health, pain, role changes due to physical problems, role changes due to emotional problems with a value of < 80 2. There is no relationship between age, regularity of taking medication, regularity of checking blood sugar with quality of life of DM patients.	(Teli, 2017)

No	Resources	Research title	Location (City)	Total patients	Length of research	Variables	Results and Conclusion	Reference
							3. There is a significant relationship between sex, complications, and duration of suffering from DM with the life causality of DM type 2 patients with p-value = 0.000.	
4	Jurnal Persatuan Perawat Nasional Indonesia	The Quality of Life of Prolanis Participants with Type 2 Diabetes Mellitus in Yogyakarta	Depok Health Center, Sleman, Yogyakarta, 2019	85 patients	2 months	Independent variable: Characteristics of the patient (last education, employment status, marital status, income, length of time with diabetes, length of time following prolanis, concomitant diseases) Dependent variable: Quality of life of participants with type 2 diabetes mellitus	1. The quality of life of Prolanis participants at Puskesmas Depok Sleman Yogyakarta is good. 2. Based on demographic characteristics, good quality of life is found in the late adult age group (≥60 years), male, last junior high school education, not working, married status, earning 2 million-4 million, long time with diabetes for <5 years, following Prolanis ≥ 6 months, and not having comorbidities	(Putu et al., 2019)
5	Jurnal Oline Keperawatan Indonesia	A Description of The Quality of Life of Type 2 Diabetes Mellitus Patients At RSUD. dr. R.M. Djoelham of Binjai City In 2019	RSUD.dr.R.M. Djoelham of Binjai City, North Sumatera, 2019	24 Patients	1 month	Independent variable: Characteristics of the patient (age, gender, educational program, physical health category, physiological health category, social relationships) Dependent variable: Quality of life of people with type 2 diabetes mellitus	1. According to the characteristics of respondents, the majority are in the age group of 38-40 years as many as 8 people (33.3%), male gender as many as 13 people (54.2%), with elementary education level of as many as 9 people (37.5%) 2. The picture of the quality of life of people with type 2 Diabetes mellitus in terms of the physical health of the majority is disturbed by 54.2%, the psychological health of the majority is disturbed by 62.5%, and the majority of social relationships are disturbed by 66.6%	(Faswita, 2019)
6	Jurnal Permata Indonesia	The Quality of Life of People with Type 2	Mercusuar Pharmacy of Kaliworo,	73 patients	2 months	Independent variable: Patient characteristics such as age, sex, education,	1. Characteristics of type 2 diabetes mellitus patients aged > 45 years (80.8%), female (69.9%), married	(Dewi et al., 2019)

No	Resources	Research title	Location (City)	Total patients	Length of research	Variables	Results and Conclusion	Reference
		Diabetes Mellitus at Mercusuar Pharmacy of Kaliwiro, Wonosobo	Wonosobo, Central Java			occupation, income, marital status, family support, diet, BMI category, current blood sugar levels, exercise, insurance, medications used, type of therapy, complications, length of DM, family history, smoking history, and alcohol history, family support, and medication adherence. Dependent variable: Quality of life of type 2 DM patients	2. (83.6%), and poorly educated (75.3%). 3. The results of measuring the quality of life of type 2 diabetes mellitus patients obtained a utility value of 0.85±0.15 and a VAS (Visual Analog Scale) value of 84.38±8.163. The anxiety domain is the domain reported to have many problems in type 2 diabetes mellitus patients by 54.8%.	
7	Majalah Farmaseutik	Measurement of The Quality of Life among Prolanis in Primary Healthcare Centers using the EQ-5D-5L Instrument	Public Health Center of Pali City, Central Sulawesi and Public Health Center of Kab. West Aceh Regency, Nangroe Aceh Darussalam	200 patients	3 months	Independent variable: Factors characteristic of the patient that affect the patient's quality of life scores (gender, age, education level, employment status, income, assets owned, having other diseases, family history of illness, length of suffering, and length of control) Dependent variable: Quality of life of diabetes mellitus and hypertension patients expressed in utility value	1. The pain/discomfort domain is the domain where most reported problems occur in DM and hypertension patients. 2. There are significant differences in utility values based on age characteristics, family history of disease, length of disease, and frequency of control in hypertensive patients. 3. In DM patients only on the characteristics of having comorbidities that have significant differences in utility value	(Hamida et al., 2019)
8	Jurnal Ilmiah Medicamento	An Assessment of The Quality of Life of Type 2 Diabetes Mellitus	Ari Canti Hospital, Bali	100 patients	6 months	Independent variable: Quality of life of type 2 diabetes mellitus outpatients with quality of life	1. The average respondent feels that his quality of life is moderate and feels that his health condition is moderate.	(Megawati et al., 2019)

No	Resources	Research title	Location (City)	Total patients	Length of research	Variables	Results and Conclusion	Reference
		Inpatients in Ari Canti Hospital in 2018				questionnaire from WHOQOL BREF Dependent variable: Demographic data including name, gender, age, last education, previous occupation, marital status and length of visit	2. Judging from the dimensions of physical health, psychological dimensions, dimensions of social relationships, and environmental dimensions, the average respondent with DM who does outpatient treatment at Ari Canti General Hospital has a moderate quality of life.	
9	Jurnal Promotif Preventif	The Quality of Life of Diabetes Mellitus Patients and Its Determinants in Gorontalo District	Pulubala Public Health Center, Limboto Public Health Center, Dungaliyo Public Health Center, Tabongo Public Health Center, and Batudaa Public Health Center, Gorontalo, North Sulawesi	313 patients	2 months	Independent variable: Age, education level, employment status, economic status, and length of suffering) Dependent variable: Quality of life of people with diabetes mellitus and its determinants	1. The proportion of respondents with a high quality of life was 44.7%. 2. There is a relationship between education level, employment status, economic status, and length of suffering with the quality of life of diabetes mellitus patients 3. There is no relationship between age and quality of life of diabetes mellitus patients	(Adhayani et al., 2020)
10	Jurnal Sains Farmasi & Klinis	A Clinical Outcome Analysis Based on the Quality of Life and Direct Medical Costs of Patients With Type 2 Diabetes Mellitus	RSUD Panembahan Senopati Bantul, Yogyakarta, 2020	200 patients	1 month	Independent variable: Quality of life and direct medical costs of type 2 diabetes mellitus patients Dependent variable: Clinical outcomes of type 2 diabetes mellitus patients	1. A total of 129 out of 200 patients showed uncontrolled clinical outcomes with an average good quality of life score with direct medical costs incurred of Rp 489.005 2. There are differences in clinical outcomes based on patient quality of life in the domains of physical functioning, personal satisfaction, treatment satisfaction, frequency of disease symptoms, and based on direct medical costs	(Ratnasari et al., 2020)

No	Resources	Research title	Location (City)	Total patients	Length of research	Variables	Results and Conclusion	Reference
							3. Patients with controlled clinical outcomes show better quality of life with lower medical costs	
11	Jurnal Kesehatan Kusuma Husada	An Overview of The Quality of Life of Patients with Diabetes Mellitus at Wanaraja Public Health Center	Wanaraja Public Health Center, Garut Regency, West Java, 2020	91 patients	1 month	Independent variable: Age, gender, level of education, socioeconomic status, length of suffering, complications Dependent variable: Quality of life of patients with diabetes mellitus	1. The quality of life of diabetes mellitus patients is mostly in the moderate category. 2. Quality of life based on physical domain, psychological domain, social relationship domain, and environmental domain is in the moderate category	(Umam et al., 2020)
12	Jurnal Ilmiah Farmasi Farmasyifa	An Evaluation of The Quality of Life of Type 2 Diabetes Mellitus Patients Taking an Oral Antidiabetic at RSUD Harapan and Do'a, Bengkulu City	RSUD Harapan and Do'a Bengkulu City	98 patients	-	Independent variable: Oral antidiabetic therapy and patient characteristics (age, gender, education, occupation, long suffering from the disease) Dependent variable: Quality of Life of Type 2 Diabetes Mellitus Patients	1. There is no influence between respondents' characteristic factors on quality of life. 2. There was no difference in quality of life in patients with metformin, sulfonylureas, and acarbose therapy. 3. There is no difference in quality of life between patients with single ADO therapy and patients with combination ADO therapy.	(Handayani et al., 2022)
13	Jurnal Syifa Sciences and Clinical Research (JSSCR)	Measuring the Quality of Life of Patients with Type 2 Diabetes Mellitus Using the *Diabetes Quality of Life Clinical Trial Questionnaire* (DQLCTQ) Instrument	Siantan Tengah Public Health Center, Pontianak City, West Kalimantan	30 patients	2 months	Independent variable: Characteristics of the patient (gender, age, education, occupation, marital status) Dependent variable: Quality of Life of Type 2 Diabetes Mellitus Patients	1. The results of quality-of-life measurement in patients with type 2 diabetes tests at the Siantan Tengah Health Center were in the low category of 58.69% and the high category of 41.31% 2. The group of patients who received a single antidiabetic drug had a quality of life score above the average value	(Nurhaliza et al., 2022)

4. CONCLUSION

This article concludes that a good lifestyle can improve the quality of life of type 2 diabetes mellitus patients. Exercising, consuming a balanced, nutritious diet, and having monthly health check-ups greatly contribute to the improvement of the quality of life. By exercising, people with type 2 diabetes mellitus can convert glucose in the body into energy. The quality of life must be measured using appropriate methods. For instance, it can be measured using the EQ-5D-5L instrument. This instrument measures the quality of life in five domains mobility (the ability to move or walk), self-care, usual activities, pain or discomfort, and anxiety or depression and five domain levels.

5. CONFLICT OF INTEREST

All authors declare no conflict of interest.

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