Meta-Analysis the Effect of Family-Based Intervention in Increasing Quality of Life in Diabetes Mellitus Patients

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ABSTRACT

Background: An increase in type 2 diabetes and related risk factors, which include increased rates of obesity, an unhealthy diet, and a lack of physical activity. One category of intervention to prevent diabetes in adults that has developed rapidly in recent years is family-based intervention. The family is also the party that helps each member in maintaining health, such as meeting the needs of eating, drinking, bathing, resting, recreation, sports, and others. This study aims to estimate the magnitude of the effect of family-based intervention on improving the quality of life of patients with diabetes mellitus.

Subjects and Method: This was a systematic review and meta-analysis conducted using PRISMA flow diagrams. Search articles through journal databases including: PubMed, Science Direct, Google Schoolar and SpingerLink by selecting articles published in 2010-2020. The PICOs of this study are, Population: diabetes mellitus patients, Intervention: family-based intervention, Comparison: not family-based intervention, Outcome: quality of life. The keywords used are "family-based intervention" OR "family-based program" OR "family-based treatment" OR "family-based" OR "home-based intervention" OR "household-based intervention" AND "quality of life" AND "diabetes mellitus" AND RCT OR "randomized controlled trial" OR "cluster-randomized controlled trial. The inclusion criteria were full paper articles with Randomized Controlled Trial (RCT) research methods, the measure of the relationship used was Mean SD, the intervention given was family-based intervention, the research subjects were patients with diabetes mellitus. Eligible articles were analyzed using the Revman 5.3 application.

Results: A meta-analysis of 10 articles showed the results of Family-Based Intervention (SMD 0.23; 95% CI= -0.08 to 0.53; p=0.140).

Conclusion: Family-Based Intervention has an effect on improving the quality of life of patients with diabetes mellitus.

Keywords: family-based intervention, quality of life, diabetes mellitus, Meta-Analysis

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BACKGROUND

Diabetes is a chronic disease that occurs when the pancreas is no longer able to make insulin, or when the body cannot properly use the insulin, it produces (International Diabetes Federation 2019).

The increasing prevalence of diabetes worldwide is driven by a complex interaction of socioeconomic, demographic, en-

vironmental and genetic factors. The sustained increase is largely due to an increase in type 2 diabetes and related risk factors, which include increased rates of obesity, unhealthy diets, and lack of physical activity (International Diabetes Federation, 2019).

The number of people with diabetes increased from 108 million in 1980 to 442 million in 2014. The prevalence has been increasing faster in low- and middle-income countries than in high-income countries. Between 2000 and 2016, there was a 5% increase in premature death from diabetes. In 2019, an estimated 1.5 million deaths were caused directly by diabetes (WHO, 2021).

Countries in the Arab-North African and Western Pacific regions rank first and second with the highest prevalence of diabetes in the population aged 20-79 years among 7 regions in the world, namely 12.2% and 11.4%, respectively. The Southeast Asia region, where Indonesia is located, ranks 3rd with a prevalence of 11.3%. IDF also projects the number of people with diabetes in the population aged 20-79 years in several countries in the world which has identified 10 countries with the highest number of sufferers. China, India and the United States are in the top 3 with the number of sufferers 116.4 million, 77 million, and 31 million. Indonesia is ranked 7th among 10 countries with the highest number of sufferers, which is 10.7 million (Ministry of Health of the Republic of Indonesia, 2020).

The countries with the highest number of adult diabetics in 2019 were China, India and the United States and are expected to remain so until 2030 (IDF, 2019).

The popularity of fast food among adults and children increases the incidence of obesity. The habit of eating low-fiber foods with a high glucose index is also asso-

ciated with risk factors for type 2 diabetes (Liu et al., 2000).

According to WHO (2004) Quality of life is an individual's perception of his life in terms of the cultural context, behavior and value system in which they live and relates to living standards, expectations, pleasures, and individual assessments of their position in life. According to WHO, the measurement of quality of life includes physical health, psychological health, level of freedom, social relationships, and relationships with their environment. Quality of life is the subjective perception of the individual on the physical, psychological, social, and environmental conditions in his daily life (Urifah, 2012).

One category of intervention to prevent diabetes in adults that has developed rapidly in recent years is family-based intervention. The role of the family is very important in the maintenance and care of health. The family is the first to provide help if one of its members has a health problem. The family is also the party that helps each member in maintaining health, such as meeting the needs of eating, drinking, bathing, resting, recreation, sports, and others (Rahayu et al., 2014).

Quality of life is needed for individuals suffering from Diabetes Mellitus in the treatment process, so that individuals pay more attention to how to improve their quality of life in order to achieve a better physical condition and reduce the severity of the disease. Regular physical activity can contribute to lowering the risk of type 2 diabetes by 30–50% (Bassuk & Manson, 2005). Type 2 DM patients are advised to maintain daily physical activity by walking, which is an effective self-management strategy. For type 2 DM patients who have difficulty walking due to joint problems, other forms of physical activity that can be done

are cycling or swimming (Wu & Parhofer, 2014).

To improve adherence to care or treatment carried out by DM patients so that it has an impact on improving their quality of life, namely by involving the family (Yakub, 2020).

The results of research from Baig et al. (2015) family intervention in improving the quality of life of diabetes for adults stated that family support had an effect on increasing physical activity so that the positive effect of involving the family was very influential in improving the quality of life of patients with diabetes mellitus.

Based on this background, comprehensive research is needed from various primary studies on the effect of family-based intervention on improving the quality of life of patients with diabetes mellitus. The data obtained will be analyzed using a systematic review and meta-analysis by synthesizing the results of the studies carried out to reduce bias

SUBJECTS AND METHOD

1. Study Design
This study uses a systematic review and meta-analysis study design. Using the PRISMA flow chart guidelines. Article searches were carried out using journal databases including: PubMed, Science Direct, Google Scholar and SpingerLink articles in the vulnerable years 2011-2021 with the keywords "family-based intervention" OR "family-based program" OR "family-based treatment" OR " family-based" OR "home-based intervention" OR "household based intervention" AND "quality of life" AND "diabetes mellitus" AND RCT OR "randomized controlled trial" OR "cluster-randomized controlled trial.

2. Inclusion Criteria
This study has inclusion criteria, including: Full paper article with a Randomized Con-trolled Trial (RCT) study design, articles published in Indonesian and English, the measure of the relationship used with Mean SD, The intervention given is family-based intervention. The research subjects quality of life of patients with type 2 diabetes mellitus were given intervention and the intervention provided was family based (care or medication, healthy diet, physical activity, education or a combination thereof).

3. Exclusion Criteria
This study has exclusion criteria, including: articles published in this study are articles that have been meta-analyzed, articles do not use English and Indonesian, are not RCT designs, articles do not include Mean SD and articles with non-intervention interventions family based.

4. Operational Definition of Variables
The formulation of the research problem was carried out by considering the eligibility criteria defined using the PICO, namely, Population: Diabetes mellitus patients, Intervention: family-based intervention, Comparison: no family-based intervention Outcome: quality of life

Family Based Intervention is a family-based intervention or lifestyle intervention that involves structured strategies to change diet and physical activity by involving the family in reducing or overcoming the care or treatment of diabetes mellitus in adults (Matrook et al., 2018).

Quality of Life is a level that describes the advantages of an individual that can be judged from their lives. The individual's superiority is usually seen from his life goals, personal control, interpersonal relationships, personal development, intellectual and material conditions (Handini, 2011).

5. Instruments
The instrument in this study used a family-based intervention (family-based program), laboratory examination of blood sugar checks for diabetes mellitus patients and a

questionnaire to assess the quality of life of diabetes mellitus patients who were given family-based interventions
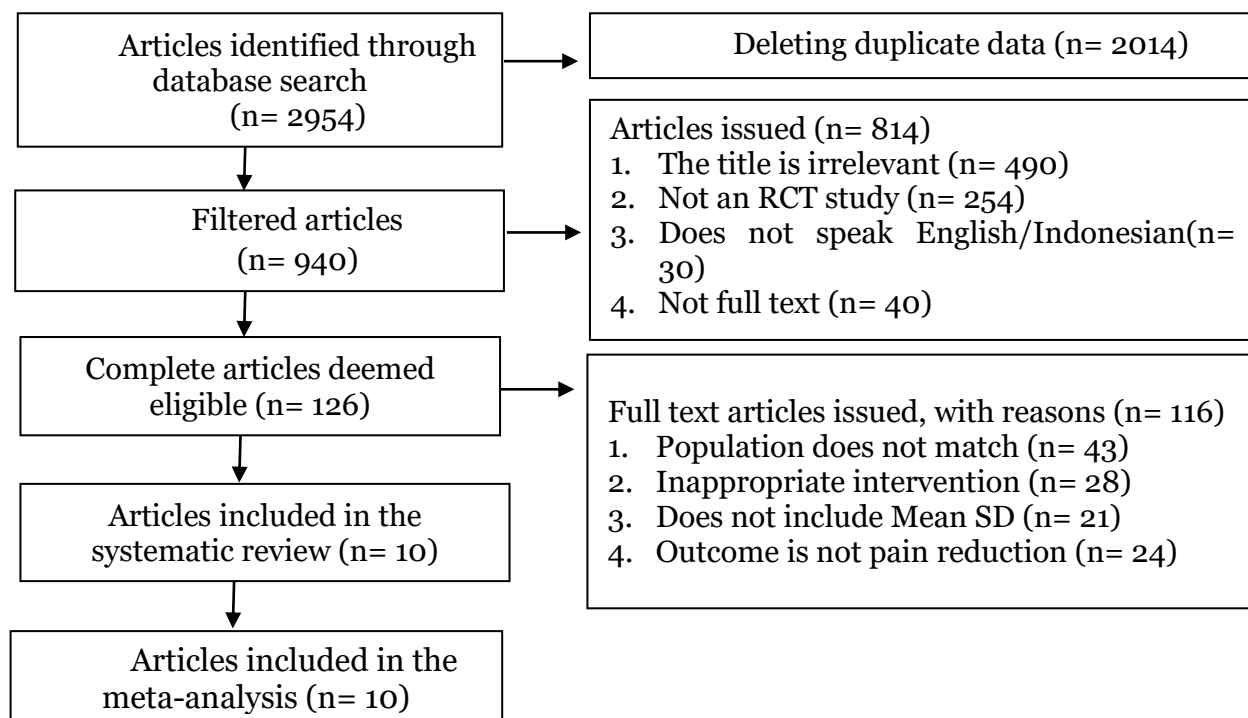
6. Data Analysis

Data analysis in this study used the Review Manager application (RevMan 5.3). Data were analyzed based on variations between studies by determining the use of random effects analysis models. In this study, I^2 was used to quantify the dispersion. The results of data analysis are in the form of the effect size value of the heterogeneity of the study which later the results of the data that have been analyzed are interpreted in the form of forest plots and funnel plots.

RESULTS

Research from the primary study related to the effect of family-based intervention on the quality of life of patients with diabetes mellitus contained 10 articles with a total sample of 1414 participants, 809 participants for the intervention and 605 participants as a comparison. Articles were ob-

tained from 3 continents, namely, 4 studies from the Asian continent, 4 studies from the Americas and 2 studies from the European continent. Each study had a sample of less than 100 participants. The outcome for some articles is that there is an increase in the quality of life of diabetes mellitus patients, a decrease after being given a family-based intervention.

The search for articles was carried out using a database based on the PRISMA flow diagram, which can be seen in Figure 1. The study quality assessment was carried out qualitatively and quantitatively. Assessment of research quality using the Critical Appraisal Skills Program (CASP) can be seen in Table 1. Each of the 11 questions was answered with the answer choices: Yes, No and Unclear. After assessing the quality of the study, 10 articles that were included in the quantitative synthesis process of the meta-analysis were analyzed using RevMan 5.3.

Articles identified through database search (n= 2954) → Deleting duplicate data (n= 2014)

Filtered articles (n= 940) → Articles issued (n= 814)
1. The title is irrelevant (n= 490)
2. Not an RCT study (n= 254)
3. Does not speak English/Indonesian(n= 30)
4. Not full text (n= 40)

Complete articles deemed eligible (n= 126) → Full text articles issued, with reasons (n= 116)
1. Population does not match (n= 43)
2. Inappropriate intervention (n= 28)
3. Does not include Mean SD (n= 21)
4. Outcome is not pain reduction (n= 24)

Articles included in the systematic review (n= 10)

Articles included in the meta-analysis (n= 10)

Figure 1. PRISMA Flow Diagram

Table 1. Research Quality Assessment of the Effect of Family-Based Intervention on Quality of Life of Diabetes Mellitus Patients
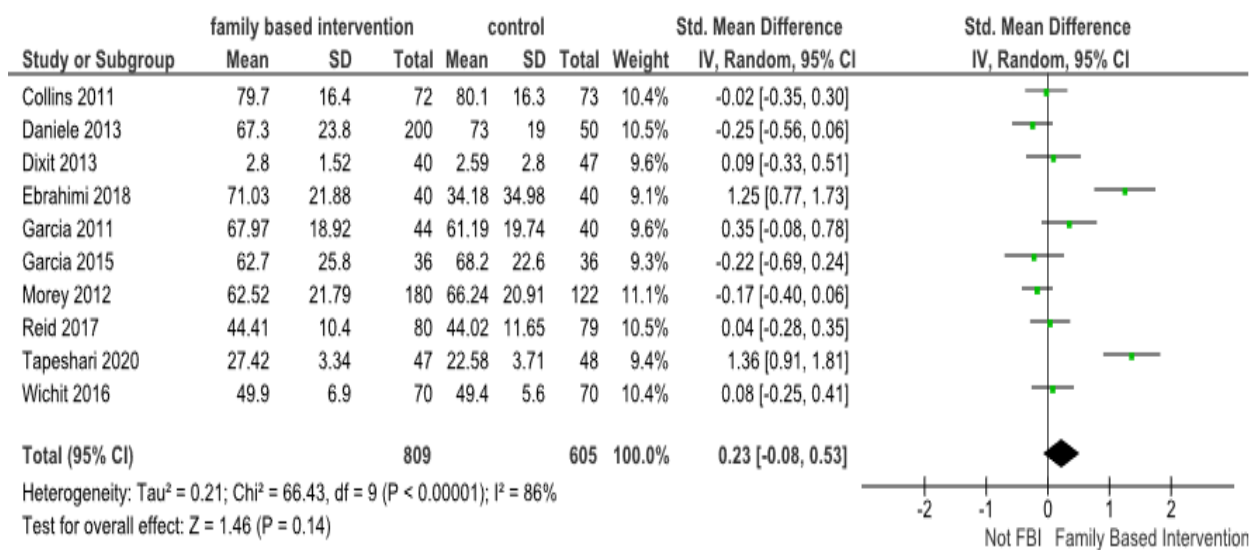
| No	Question	Ebrahimi et al., (2018) Score	Garcia et al., (2015) Score	Garcia et al., (2011) Score	Collins et al., (2011) Score	Wichit et al., (2016) Score
1.	Does the experiment clearly address the clinical problem?	1	1	1	1	1
2.	Was the intervention given to the patient randomized?	1	1	1	1	1
3.	Are patients, health workers, and researchers blinded?	1	1	1	1	1
4.	Were the study groups similar at the start of the study?	1	1	1	1	1
5.	Outside of the intervention under study, were the study groups treated equally?	1	1	1	0	1
6.	Were all patients included in the study properly accounted for in the conclusions? were all patients analyzed according to the randomized study groups?	1	1	1	1	1
7.	Is the effect of the intervention large enough?	1	1	1	1	1
8.	How precise is the estimation of the effect of the intervention?	1	1	1	1	1
9.	Are the results applicable to the context of practice or local populations?	1	1	1	1	1
10.	Are all other clinically important results considered in this article?	1	1	0	1	0
11.	Do the benefits provided by the intervention outweigh the disadvantages and costs?	1	1	1	1	1
Total		12	12	11	11	11

Note: 1= Yes, 0= No

Table 1. Research Quality Assessment of the Effect of Family-Based Intervention on Quality of Life of Diabetes Mellitus Patients (Continued)

No	Question	Morey et al., (2012) Score	Reid et al., (2017) Score	Tapeshari et al., (2020) Score	Daniele et al., (2013) Score	Dixit et al., (2013) Score
1.	Does the experiment clearly address the clinical problem?	1	1	1	1	1
2.	Was the intervention given to the patient randomized?	1	1	1	1	1
3.	Are patients, health workers, and researchers blinded?	1	1	1	1	1
4.	Were the study groups similar at the start of the study?	1	1	1	1	1
5.	Outside of the intervention under study, were the study groups treated equally?	0	1	1	1	1
6.	Were all patients included in the study properly accounted for in the conclusions? were all patients analyzed according to the randomized study groups?	1	1	1	1	1
7.	Is the effect of the intervention large enough?	1	0	1	1	1
8.	How precise is the estimation of the effect of the intervention?	1	1	1	1	1
9.	Are the results applicable to the context of practice or local populations?	1	1	1	1	1
10.	Are all other clinically important results considered in this article?	0	1	0	1	1
11.	Do the benefits provided by the intervention outweigh the costs and disadvantages?	1	1	1	1	1
	Total	11	11	11	12	12

Note: 1= Yes, 0= No

Study or Subgroup	family based intervention Mean	SD	Total	control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Collins 2011	79.7	16.4	72	80.1	16.3	73	10.4%	-0.02 [-0.35, 0.30]
Daniele 2013	67.3	23.8	200	73	19	50	10.5%	-0.25 [-0.56, 0.06]
Dixit 2013	2.8	1.52	40	2.59	2.8	47	9.6%	0.09 [-0.33, 0.51]
Ebrahimi 2018	71.03	21.88	40	34.18	34.98	40	9.1%	1.25 [0.77, 1.73]
Garcia 2011	67.97	18.92	44	61.19	19.74	40	9.6%	0.35 [-0.08, 0.78]
Garcia 2015	62.7	25.8	36	68.2	22.6	36	9.3%	-0.22 [-0.69, 0.24]
Morey 2012	62.52	21.79	180	66.24	20.91	122	11.1%	-0.17 [-0.40, 0.06]
Reid 2017	44.41	10.4	80	44.02	11.65	79	10.5%	0.04 [-0.28, 0.35]
Tapeshari 2020	27.42	3.34	47	22.58	3.71	48	9.4%	1.36 [0.91, 1.81]
Wichit 2016	49.9	6.9	70	49.4	5.6	70	10.4%	0.08 [-0.25, 0.41]
Total (95% CI)			809			605	100.0%	0.23 [-0.08, 0.53]

Heterogeneity: Tau² = 0.21; Chi² = 66.43, df = 9 (P < 0.00001); I² = 86%
Test for overall effect: Z = 1.46 (P = 0.14)

Figure 2. Forest plot of Family-Based Intervention on quality of life of diabetic patients
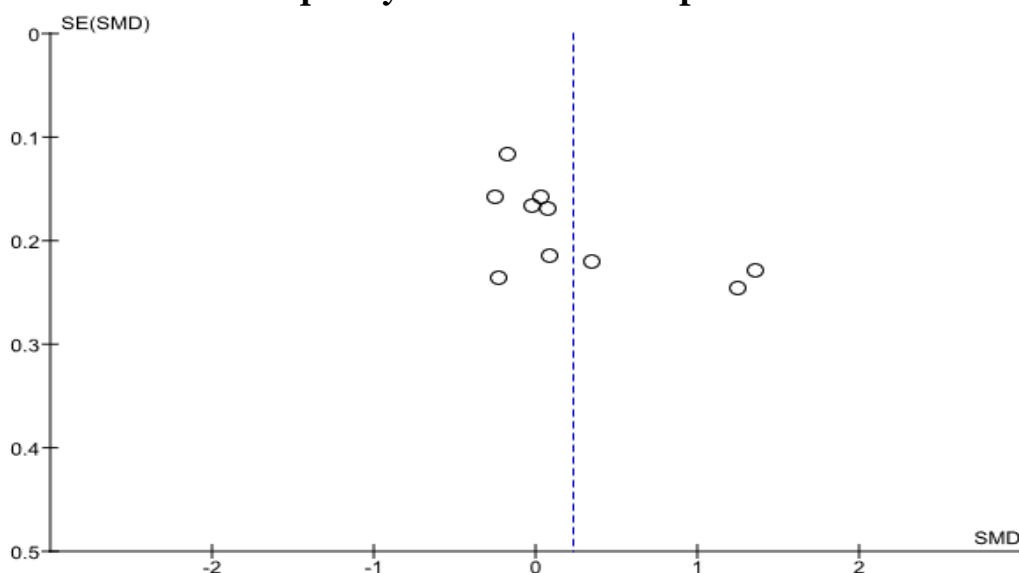
Figure 3. Funnel plot of family-based intervention on the quality of life of patients with diabetes mellitus

a. **Forest plot family-based intervention on the quality of life of patients with diabetes mellitus**

Interpretation of the results of the meta-analysis process can be seen through the forest plot. Figure 2 shows as many as 10 articles on family-based interventions that can improve the quality of life of diabetes mellitus patients compared to other interventions or not given interventions. Meanwhile, there was high heterogeneity between experiments (I2=86%; p<0.001). Thus, the Random Effect Model (REM) was used to analyze the data in the forest plot. The results of the analysis of the family-based intervention were found to have 0.23 times the effect on improving quality of life compared to other interventions or no intervention, and statistically insignificant (SMD= 0.23; 95%CI= -0.08 to 0.53; p=0.140).

b. Funnel Plot family-based intervention on the quality of life of patients with diabetes mellitus

A funnel plot is a plot that represents the approximate size of the effect of each study on its estimated accuracy, which is usually the standard error. Figure 3 funnel plot of family-based intervention on improving the quality of life of patients with diabetes mellitus, shows that there is an underestimate of publication bias which is indicated by the asymmetry of the right and left plots. Where on the right plot there are 3 plots and the left plot there are 7 plots

DISCUSSION

This study is a systematic study and meta-analysis with the theme of the effect of family-based intervention on improving the quality of life of patients with diabetes mellitus. The independent variable analyzed was family-based intervention, while the dependent variable studied was improving the quality of life of patients with diabetes mellitus. The results of the primary study conducted by a systematic review and meta-analysis showed an epidemiological study design with a larger sample, different demographic characteristics in both developed and developing countries, thus providing the basis for concluding that family-based intervention has an effect on improving the quality of life of patients with diabetes mellitus.

In this systematic review, there are ten studies from around the world from 2011-2020. This study analyzes articles using the Standardized Mean Difference (SMD) relationship measure. The results of the systematic study and meta-analysis are presented in the form of forest plots and funnel plots. A forest plot is a diagram that shows information from each of the studies studied in the meta-analysis and estimates of the overall results (Murti, 2018). The forest plot also shows visually the magnitude of variation (heterogeneity) between study results. The funnel plot shows the relationship between the effect size of the study and the sample size or standard error of the effect size of the various studies studied (Murti, 2018). The possibility of publication bias in the funnel plot can be seen from the asymmetry in the number of left and right studies.

Diabetes mellitus is one of the most common metabolic diseases caused by complex factors and causes heterogeneous complications throughout the life course. Over the past 40 years, it is worrying that diabetes mellitus has caused an unprecedented global pandemic. Improving the quality of life of patients with type 2 diabetes mellitus can improve mental health and physical activity in older adults (Kang et al., 2021).

One category of intervention to prevent diabetes mellitus that has developed rapidly in recent years is family-based intervention. Educational management interventions and family care are the main approaches to achieve quality control of type 2 diabetes mellitus patients. The family, as one of the most significant and influential social units, can help and hinder health, besides that the family can encourage patients to make behavioral changes that focus on diet, care and physical activity behavior (Thirsk & Schick-Makaroff, 2021).

The results of this meta-analysis study found effect of family-based intervention on improving the quality of life of patients with diabetes mellitus. Family-based interventions improve the quality of life of diabetes mellitus patients by 0.23 times and have an effect on improving quality of life compared to other interventions or no intervention, and statistically not significant (SMD 0.23; 95% CI= -0.08 to 0.53 ; p=0.140).

However, Anggraeni et al. (2018) conducted family-based interventions to

increase knowledge, and skills in self-care. The results showed that there was a significant effect of family-based intervention on the quality of life of patients with diabetes mellitus at dr. Soebandi hospital, Jember.

Yuliana (2021) stated that family-based interventions showed statistically significant changes in the quality of life of patients with diabetes mellitus. Yuliana (2021) also said that family support in the process of treating diabetes patients (family based) can improve patient self-care, self-efficacy, knowledge and diabetes management.

Anggraini et al. (2021) mentions several factors that cause poor quality of life of diabetic patients, namely not maintaining a diet, taking medication less regularly, rarely checking blood sugar levels, not doing foot care and not doing physical activity, it will have a negative impact on the quality of life of DM patients.

One appropriate intervention is a family-based intervention that can be started by optimizing family functions to help patients with T2DM to adapt and comply with self-care measures through four dimensions, empathic (emotional), encouragement (reward), facilitative (instrumental) and participatory (participation) (McEwen et al., 2017).

According to Kien et al. (2021), there are several factors that cause the quality of life of patients with diabetes mellitus to be insignificant, including demographics, lifestyle, and clinical. Educational counseling programs will help people to understand their health and treatment status, thereby increasing medication adherence and positive attitudes towards diabetes. In addition, it is important to provide interventions to limit diabetes complications, medical side effects, and offer psychological support during treatment. Doing physical exercise also plays an important role in reducing the

risk of impaired quality of life. Although there are many interventions that aim to control diabetes, based on observations the results obtained are difficult to maintain over time. Therefore, it is necessary to continue to create high-quality interventions based on sound theory, not only to treat the current disease but also to help prevent various complications of the disease that may arise (Gorina et al., 2018).

In general, family-based interventions appear to be effective in improving the quality of life of patients with type 2 diabetes mellitus. To manage diabetes successfully, patients must learn about their disease to be able to make daily decisions independently. In addition to being effective, this decision must take into account various personal physiological and psychosocial factors. Intervention strategies that enable patients to make decisions about goals, therapeutic options and self-care behaviors and assume responsibility for daily diabetes care are effective in helping patients care for themselves (Aro et al., 2017).

Med, Science Direct, Google Scholar and SpingerLink

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