

THE EFFECT OF EDUCATIONAL MATERIAL AND MESSAGES ON QUALITY OF LIFE AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Type 2 Diabetes (T2DM) is a chronic illness that must be controlled to avoid complications that reduce quality of life. Proper education and psychological support via motivational messages may assist patients in effectively managing their illness and achieving an ideal QoL. The aim of this study was to examine the influence of providing instructional and motivational messages on the QoL of diabetes mellitus patients at Umbulharjo 1st Health Center Yogyakarta. Data were collected using a quasi-experimental-pre-post-test control group design. The control group received usual care from the pharmacist in health center, while the intervention group received educational and motivating messages from researcher on treatment. Patients' QoL was examined using EQ-5D-5L and EQ-VAS. Data were evaluated utilizing paired t-tests for QOL score of each group in pre- post-test and independent t-tests to compare QOL score of intervention and control group. The data collection process included 62 patients with T2DM (31 from the control group and 31 from the intervention group). The result showed that pretest QoL did not differ between control and intervention groups ($p=0.786$) and the post-test QoL was significantly different. The paired t-test revealed a significant change ($p<0.001$) in the intervention group's QoL between the pre-test and post-test periods, while the control group showed no significant difference ($p=0.138$). It was found that the provision of educational and motivational messages for patients with DMT2 had an impact on their QoL. The findings of this study can have a positive impact on pharmaceutical services in primary health facilities.

Keywords: Diabetes Mellitus, Education, Motivation, Quality of Life

INTRODUCTION

The prevalence of Diabetes Mellitus Type 2 or T2DM, a chronic illness, is rising globally, including in Indonesia. The International Diabetes Federation (IDF) reports that 10.5% of the global population

suffers from Diabetes Mellitus (DM). According to IDF data, Indonesia ranks fifth in diabetes prevalence among those aged 20 to 79. The country's diabetic population is expected to reach 28.6 million by 2050 (IDF, 2025). Meanwhile, according to data from

the 2023 Indonesian Health Survey, the incidence of DM in the Special Region of Yogyakarta was high compared to other provinces, namely 2.9%.

Besides from blood glucose control, the effectiveness of diabetic mellitus (DM) medication is also measured by the patient's quality of life. Previous research has shown that the quality of life among DM patients, as measured by the EQ-5D-5L questionnaire, remains inadequate. Certain domains, such as pain/discomfort and anxiety/depression, remain substantial difficulties for these individuals (Parik & Patel, 2019).

Type 2 DM (T2DM) requires effective and sustainable management to prevent complications that can reduce patients' quality of life (Parik, P & Patel V, 2019). The main challenge in managing T2DM is patients' lack of awareness regarding the condition and low motivation to undertake the necessary lifestyle adjustment, which affects patients' attitudes and quality of life (Sari N.P, 2020; Ulfa S and Muflihatin S, 2022; Majid et al., 2019).

Pocket books contain concise and easily accessible information. Therefore, these educational media can help T2DM patients understand how to manage their condition better (Hidayah & Sopiandi, 2019). On the other hand, motivational messages sent periodically via WhatsApp

can provide psychological support and motivate patients continuously. Several previous studies reported an increase in QOL of T2DM patients after receiving education in the form of printed leaflet media and motivational messages via short message service (SMS) (Nopitasari et al., 2018; Okafor et al., 2023).

According to the explanation, this study was achieved to figure out the impact of providing education through a pocket book and motivational messages for DM treatment on patients' QoL at Umbulharjo 1 Public Health Center in Yogyakarta.

METHODS

Study Design

The current study used the quasi-experimental control group pre-test post-test design. Data of the study was obtained in March to April 2024 from T2DM patients at Umbulharjo 1 Health Center in Yogyakarta. Umbulharjo 1 Health Center is a public health service that handles the most cases of diabetes in the city of Yogyakarta. A preliminary analysis found that from January to December 2023, the number of T2DM patients at Umbulharjo 1 Health Center reached 1,176 patients. As a primary health care center, Umbulharjo 1 Health Center is influential in the provision of education and assistance to patients with T2DM.

Sampling Technique and Data Source

Respondent sampling technique based on inclusion and exclusion criteria. The study's inclusion criteria comprised patients diagnosed with type 2 diabetes mellitus (T2DM), individuals receiving a minimum of one oral antidiabetic medication, and those proficient in reading and utilizing WhatsApp. The exclusion criteria included pregnant patients with T2DM, those who did not finish the study, and individuals who withdrew. Participants enrolled in the study will be categorized into two groups: a control group receiving standard care from the community health center pharmacist, and an intervention group receiving educational and motivational messages from the researcher. Data collection was founded on patient interview responses.

Sample Study

The data collection process included 62 patients with T2DM (31 from the control group and 31 from the intervention group).

Intervention

The study intervention was given by distributing a pocketbook on Diabetes Mellitus and sending motivational messages to the patients via WhatsApp every morning or evening for 7 days (Figures 1 and 2). Pre-test data collection was done after patients were recruited and signed the informed consent. Meanwhile, post-test data were gathered on the seventh day of intervention via phone calls. In this study, respondents received an intervention in the form of pocketbook distribution and motivational messages sent via WhatsApp. The pocketbook contains informative materials about diabetes including lifestyle and treatment to improve self-management, such as meal planning, physical activity, medication use, blood sugar control, prevention of complications, foot care, and general knowledge about diabetes mellitus.



Figure 1. Pocket book “Kenali dan Berdamai dengan Diabetes Mellitus” (Recognize and Make Peace with Diabetes Mellitus)

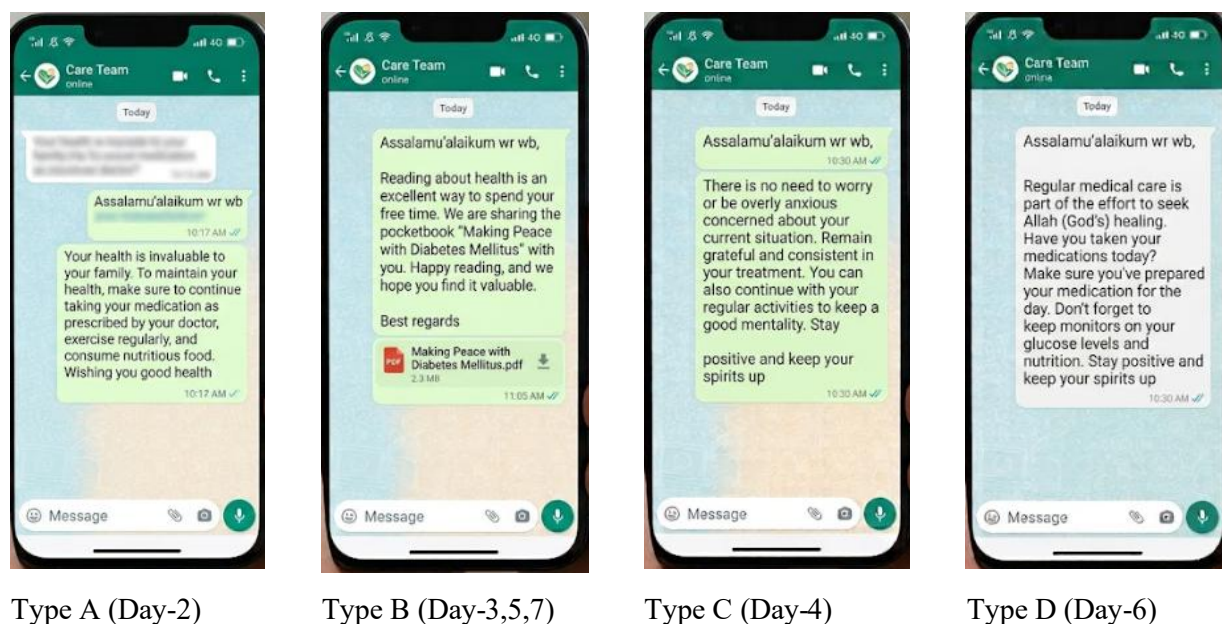


Figure 2. Motivational messages sent to diabetes mellitus patients

Quality of Life Instrument

Patients' QOL was assessed using the EQ-5D-5L (*European Quality of life-5 Dimensions-5 Level*) questionnaire which had been translated into Bahasa Indonesia officially published by EuroQOL Group. The questionnaire was validated and assessed for reliability prior to its application in this study. The validity test was performed to 30 elderly patients with diabetes mellitus from Janturan, Yogyakarta. The result of the validity test showed $r > 0.361$ and Cronbach alpha value of 0.693. The EQ-5D-5L questionnaire consists of two sections. The first section covers five dimensions of life quality measurement, which are mobility, self-care, daily activity, pain/discomfort and anxiety/depression. Each dimension is built on five levels: level 1-showing no problem at

all, level 2 showing a slight problem, level 3 showing a moderate problem, level 4 showing a severe problem, and level 5 showing an extremely severe problem. The second section of the questionnaire is VAS (*Visual Analog Scale*) which is usually used to determine patients' health status by assigning score to it, where 0 indicates that the patient possesses a very bad health condition and 100 suggests that the patient possesses a very good health condition (EUROQoL-Group, 2019). Patient interviews were conducted at the beginning, following acceptance of informed consent and before the intervention. The EQ-5D-5L questionnaire was used to assess patients' quality of life by utility and VAS scores. The utility score was calculated using the criteria established by Purba et al. (2017).

Data Analysis

The data were examined using univariate and bivariate analyses by SPSS. Univariate analysis was conducted to provide an overview of the demographic characteristics of the control and intervention groups. Normality test using Kolmogorov-Smirnov ($p > 0.05$). Bivariate analysis (independent sample t-test) was implemented to examine the mean QoL scores of two unpaired groups, control and intervention. A paired t-test was performed to evaluate the mean ranks of the control and intervention groups before and after testing. A non-significant difference is shown by a P-value > 0.05 , whereas a significant difference is indicated by $P < 0.05$.

Ethical Approval

This study has obtained ethical approval with number 012311304 by the Ethic Committee of Universitas Ahmad Dahlan.

RESULTS AND DISCUSSION

This research aimed at investigating the impact of providing educational instruction through a pocketbook and motivational messages via WhatsApp on the QoL of T2DM patients at the Umbul Harjo 1 Health Center in Yogyakarta. Seventy patients had fulfilled the inclusion criteria,

excluding 8 patients due to lost follow up. There were 62 patients recruited to participate in this study after signing an informed consent. These patients were then assigned into 2 groups. The control group ($n=31$) received usual care from the health center, while the intervention group ($n=31$) received education and motivational messages from us as the researchers.

The demographic characteristics of patients analyzed in this study included age, gender, education background, family history of DM, duration of DM and history of comorbidities. Table 1 presents the patient demographic analysis results.

Table 1. Demographic characteristics of participants

Characteristics	Frequency	
	Control n (%) N=31	Intervention n (%) N=31
Age		
40-59 years old	5 (16.1)	19 (61.3)
60-69 years old	24 (77.4)	10 (32.3)
≥ 70 years old	2 (6.5)	2 (6.5)
Gender		
Male	9 (29.0)	10 (32.3)
Female	22 (71.0)	21 (67.7)
Education		
SD (elementary)	13 (41.9)	13 (41.9)
SMP (junior)	13 (41.9)	11 (35.5)
SMA (secondary)	4 (12.9)	4 (12.9)
Higher Education	1 (3.2)	3 (9.7)
Family History of DM		
Yes	24 (77.4)	22 (71.0)
No	7 (22.6)	9 (29.0)
Duration of DM		
≤ 2 years	4 (12.9)	7 (22.6)
> 2 years	27 (87.1)	24 (77.4)
History of Comorbidities		
Hypertension	17 (54.8)	16 (51.6)
Dyslipidemia	1 (3.2)	0
Cardiovascular diseases	0	2 (3.2)
No comorbidities	13 (41.9)	13 (41.9)

According to Table 1, it is known that the participants of this research were dominated by patients aged 60-69 years (77.4% in the control group and 32.3% in the intervention group). In line with prior research by Milita et al. (2021), a wide range of T2DM sufferers are aged 60-64 years. The aging process after the age of 40 years can result in a higher increase in impaired glucose tolerance. This is due to anatomical, physiological and biochemical changes that occur in the body, which cause blood glucose levels to rise. As a result, the chance of developing T2DM increases with age, as the

higher the glucose levels in the body make a person more susceptible to this condition (Betteng, 2014).

The large percentage of T2DM patients at Umbulharjo 1 Health Center were female (71.0% in the control group and 67.7% in the intervention group). According to the study, greater than half the number of those with diabetes (59%) were female, this findings in line with Rita (2018). These findings prove a link between gender and T2DM ($p < 0.001$) (Rita Nova, 2018). Women are reported to have higher lipid profiles (blood fat) than men so the risk of women developing

diabetes is 3-7 times higher than men who have a risk of 2-3 times (Imelda S, 2029). Additionally, by Usman et al. (2020) found that women are at a higher risk of developing diabetes than men since they usually have an unhealthy lifestyle such as taking foods heavy in fat and glucose.

Regarding educational background, most respondents had elementary school education, 41.9% each in both the control and intervention groups. Earlier research by Milita et al. (2021) discovered a substantial connection (rather than OR - 0.403) between education level and the occurrence of T2DM in Indonesian older people. The education level affects a person's attitude towards health issues. Individuals with inadequate education are less aware of the symptoms associated with type 2 diabetes (Milita et al., 2021).

Furthermore, the number of respondents with family background of diabetes was larger than those who did not have one (74.4% in the control group while 77.1% in the intervention group). Family history of disease is one of the unchangeable associated risk factors for diabetes. A person's chance of getting DM is six times higher if they have a family background on the disease (Kusnadi et al., 2017). According to Etika and Monalisa, (2016), 21 (84.0%) respondents with a family background of

Diabetes also suffered from it, whereas as many as 16 (84.2%) respondents did not suffer from DM because they did not have a family background of diabetes.

Judging from the duration of diabetes, most respondents had experienced DM for more than 2 years (87.1% in the control group and 77.4% in the intervention group). The duration of diabetes mellitus can lead to issues that damage the patient's quality of life. This finding is corroborated by Sulistiani (2023) who found a link between duration of diabetes suffering and the level of QoL in T2DM individuals. Respondents who have had diabetes for more than three years have a lower quality of life than those who have had it for less than three years (Sulistiani I, 2023).

The most prevalent comorbidity reported by respondents was hypertension (54.8% in the control group and 51.6% in the intervention group). Previous research Fortuna et al. (2023) discovered that hypertension was a common comorbidity among individual with type 2 diabetes. Following the investigation, 46 (41%) of the 97 diabetes individuals surveyed had hypertension. Hyperglycemia increases the risk of hypertension by inhibiting the formation of endothelium and resisting sodium (Fortuna, et al., 2023). The report by Puspa Sari et al. (2019) implies that lack of physical activity and a long history of

diabetes are the leading causes of hypertension, with an 88.63% likelihood (Puspa Sari et al., 2019).

The respondents' quality of life was investigated through utilizing the EQ-5D-5L and VAS questionnaires. The analysis results of the EQ-5D-5L pre- and post-test questionnaires are showed in Table 2. Table 2 reveals that all type 2 DM patients in the control group (usual care) had difficulties in all five dimensions. The most problematic dimension was the pain/discomfort dimension. At the time of the pre-test, it was found that 25.8% respondents had slight pain/discomfort, 41.9% had moderate pain/discomfort, 12.9% had severe pain/discomfort, and 3.2% had extremely severe pain/discomfort. Meanwhile, the post-test result showed that 29.0% of respondents had slight pain/discomfort, 25.8% had moderate pain/discomfort, and 6.5% had extremely severe pain/discomfort. According to Kardela et al. (2022), Type 2 DM patients might feel pain/discomfort due to uncontrolled blood sugar levels might cause to neuropathy complications or peripheral nerve damage in the hands and feet. This condition causes diabetes patients to feel tingling, numbness and even severe pain (Kardela et al., 2022).

Most respondents reported a slight problem when doing usual activities. The

pre-test result showed that 58.1% of respondents experienced a slight problem doing usual activities. However, this number declined to 45.2% in the post-test. Equally, the amount of respondents who had a moderate problem doing usual activities decreased from 3.2% in the pretest to 0% in the post-test.

Table 3 presents the analysis result of patients' QoL in the intervention group, where a significant change on each dimension can be observed. However, dimensions 4 and 5 reported the most significant change among all dimensions. Almost half of the respondents (35.5%) described slight pain/discomfort, and 6.5% respondents had moderate pain/discomfort. Most of the respondents (41.9%) were moderately anxious/depressed.

Both control and intervention groups showed similarities in the most problematic dimensions, namely pain/discomfort and anxiety/depression. In line with research Saleh et al. (2015), diabetes patients have the most problems in the anxiety/depression dimension (74%) and pain/discomfort (73%) (Saleh et al., 2015). Another findings by Barua et al., (2021) showed that 80% diabetes patients reported anxiety/depression and 78% of them experienced pain and discomfort Study by Nila et al. (2022) indicated that type 2 diabetes patients might

feel anxious and depressed because of pain or discomfort related to lower metabolism and the number of drugs consumed by the patients. When someone feels anxious/depressed, the release of the hormone cortisol will increase and as a result

there will be an increase in glucose levels. In addition, a person with type 2 diabetes may naturally experience anxiety and depression after receiving a diagnosis since they believe that the condition necessitates ongoing care.

Table 2. Analysis result of patients' QoL in the control group on each EQ-5D-5L dimension

Dimension	Control Group									
	pre-test (n=31), n (%)					post-test (n=31), n (%)				
	1	2	3	4	5	1	2	3	4	5
Ability to walk	11 (35.5)	13 (41.9)	6 (19.4)	1 (3.2)	0	14 (45.2)	15 (48.4)	1 (3.2)	1 (3.2)	0
Self-care	11 (35.5)	18 (58.1)	2 (6.5)	0	0	13 (41.9)	17 (54.8)	1 (3.2)	0	0
Usual activity	12 (38.7)	18 (58.1)	1 (3.2)	0	0	17 (54.8)	14 (45.2)	0	0	0
Pain/discomfort	5 (16.1)	8 (25.8)	13 (41.9)	4 (12.9)	1 (3.2)	12 (38.7)	9 (29.0)	8 (25.8)	2 (6.5)	0
Anxiety/ depression	9 (29.0)	15 (48.4)	5 (16.1)	1 (3.2)	1 (3.2)	16 (51.6)	13 (41.9)	1 (3.2)	1 (3.2)	0

Abbreviation: 1: no problem ; 2: slight problem ; 3: moderate problem ; 4: severe problem ; 5: extremely severe problem

Table 3. Analysis result of patients' QoL in the intervention group on each EQ-5D-5L dimension

Dimensi	Intervention Group									
	pre-test (n=31), n (%)					post-test (n=31), n (%)				
	1	2	3	4	5	1	2	3	4	5
Ability to walk	12 (38.7)	13 (41.9)	6 (19.4)	0	0	24 (77.4)	7 (22.6)	0	0	0
Self-care	12 (38.7)	16 (51.6)	1 (3.2)	2 (6.5)	0	24 (77.4)	6 (19.4)	1 (3.2)	0	0
Usual activity	15 (48.4)	14 (45.2)	1 (3.2)	1 (3.2)	0	29 (93.5)	2 (6.5)	0	0	0
Pain/discomfort	7 (22.6)	14 (45.2)	7 (22.6)	2 (6.5)	1 (3.2)	18 (58.1)	11 (35.5)	2 (6.5)	0	0
Anxiety/ depression	10 (32.3)	15 (48.4)	6 (19.4)	0	0	18 (58.1)	13 (41.9)	0	0	0

Abbreviation: 1: no problem; 2: slight problem; 3: moderate problem; 4: severe problem; 5: extremely severe problem

Table 4. Result of the test on the difference in respondents' QoL using EQ-5D-5L index

Research Data Group	Control (n=31)		Intervention (n=31)	
	Pre-test	Post-test	Pre-test	Post-test
Mean±SD	0.71±0.12	0.75±0.14	0.72±0.10	0.87±0.08
The lowest EQ5D5L index value	0.504	0.489	0.525	0.716
The highest EQ5D5L index value	0.912	1.000	0.910	1.000
Mean difference (pre-post-test) in group	0.138 ^a (95% CI : -0.921 – 0.133)		<0.001 ^a (95% CI: -0.193 – -0.119)	
Mean difference (pre-post test) between groups	0.786 ^b (Pre-test) 95% CI: -0.064 to 0.049		<0.001 ^b (Post-test) 95% CI: -0.193 to -0.119	

Notes: ^aPaired t-test ^bIndependent t-test

Patients' QOL was assessed using the EQ-5D-5L questionnaire through the utility and VAS scores. The utility score was determined by figuring out index value based on the criteria set By Purba et al. (2017). An index score of 1 indicates a high QOL, which is defined as having no problems in any of the five dimensions. Patients have a higher quality of life when the number is close to 1. According to Table 4, the control group's lowest index score during the pre-test was 0.504, indicating issues in every dimension. The respondents reported pain/discomfort and anxiety/depression, as indicated by the highest index value of 0.912. In contrast, the post-test's lowest index, 0.489, indicated issues in each of the five aspects. The post-test's highest index, 1, suggested that the respondents had no issues in any of the five areas.

In the intervention group, the lowest index during the pretest was 0.525, indicating

that respondents found problems in each of the five dimensions. Meanwhile, the highest index, 0.910, was found in the usual activities dimension. The post-test showed the highest index of 1 and the lowest index of 0.716. According to the result, the index score increased from the pre-test to the post-test.

Statistical analysis of the respondents' pretest ranks revealed no significant difference in mean score ($p=0.786$) between the control and intervention groups in terms of quality of life. This indicated that respondents in the control and intervention groups had similar or identical quality of life on day one (pre-test). However, the statistical analysis of the post-test scores resulted in $p<0.001$, demonstrating a substantial difference in QOL throughout the groups.

There was no statistically significant variance in quality of life between the control group at pre-test or post-test ($p=0.786$). This finding suggested that the control group did

not experience an increase in quality of life. The intervention group reported a significant difference between pre-test and post-test scores ($p < 0.001$). This result implied that the intervention group improved their quality-of-life scores. As a result, it can be stated that sending educational and encouraging messages via WhatsApp to T2DM individuals had a substantial influence on enhancing their quality of life. This finding is

confirmed by Nopitasari et al. (2018), who found that type 2 diabetes individuals improved their QOL (2.19 ± 163.66) after receiving short messages as medication reminders and motivation.

Respondents' quality of life was also measured using (Visual Analog Scale). Table 5 contains the analysis result of VAS on respondents' quality of life.

Table 5. Analysis result of respondents' QoL based on VAS

Research Data Group	Control (n=31)		Intervention (n=31)	
	Pre-test	Post-test	Pre-test	Post-test
X $\pm$ SD	70.00 $\pm$ 12.91	73.06 $\pm$ 11.80	70.00 $\pm$ 12.38	83.87 $\pm$ 7.15
The lowest VAS score	45	55	50	60
The highest VAS score	90	85	90	95
Mean difference (pre-post-test) in group	0.140 ^a		<0.001 ^a	
Mean difference (pre-post test) between groups	0.960 ^b		<0.001 ^b	

Notes: ^aWilcoxon ^bMann-Whitney

The Mann-Whitney statistical analysis was performed to determine the distinction of VAS scores among two types of groups (control and treatment group). According to Table 5, there was no significant distinctions in VAS scores across groups on the pretest (p-value 0.960). However, a significant difference in VAS scores between groups was observed on the post-test (p-value <0.001).

Moreover, the Wilcoxon statistical analysis was done to examine the difference in VAS score reported by each group on the

pretest and post-test. The analysis results showed that the control group obtained a p value of 0.140, implying the presence was no meaningful change in respondents' quality of life between the pretest and post-test conditions. Meanwhile, the treatment group reported a p-value of $p < 0.001$, suggesting that there was a substantial difference between respondents' pretest and post-test scores on QOL. This finding indicated that T2DM patients improved their QOL significantly after receiving education and motivational messages for 7 days.

The VAS mean score reported by either the control or intervention group showed that respondents had a good quality of life on the pretest and post-test. This finding diverges from those of earlier studies Nila et al. (2022), which stated that VAS scores reported by type 2 diabetes patients were relatively low, ranging between 59.73 ± 20.07 . Other research Golicki et al. (2015) also found low VAS scores among type 2 diabetes patients in Poland, (68.2 for patients aged 32-44 years old and 50.2 for patients aged more than 65 years old). According to the research, this score continues to decline as the patient ages.

Quality of life is clinical outcomes of diabetes mellitus therapy (PERKENI, 2021). There are several features that can influence diabetes patients' quality of life are knowledge and attitudes/ behavior. In theory, according to Notoatmodjo (2012), behavioral changes occur through the process of increasing knowledge which then influences attitudes and eventually changes behavior.

According to Swaroop et al. (2016), pharmacist education can enhance patient understanding of the illness and its treatment, adjusting attitudes and practices. Similarly, research by Azizah (2024) found an increase in patients' knowledge score after receiving education through a pocket book, from 57.85 ± 15.12 on the pretest to 78.50 ± 8.30 on

the post-test with a p-value < 0.001 . Patients' increased knowledge of treatment will help to improve patients' quality of life since it raises their understanding of the importance of self-care and effective treatment. As a result, enhancing patient understanding about their treatment can lower the risk of complications (Zakiyah et al., 2023). Previous studies showed that lifestyle education could reduce complaints of neuropathic pain in T2DM Ghavami et al. (2014). In addition, motivational messages sent to type 2 diabetes patients periodically can support and help them remember the importance of their health, so that they become more concerned about their condition.

This study has various limitations, including the fact that the intervention was given during a seven-day period; thus, more research is needed to look into longer intervention periods. Furthermore, considering the study was conducted in primary care settings, additional research in hospital settings is required to fully assess the wellness of patients with diabetes mellitus, including both complicated and uncomplicated cases. The findings of this study show a beneficial impact on quality of life. This is expected to assist pharmaceutical services, particularly when it comes to giving education, counseling, and motivation to

diabetic patients, thereby helping them to reach their therapeutic goals.

CONCLUSIONS

This study revealed that education provided through a pocketbook as the media and motivational messages sent to patients WhatsApp had an effect on quality of life of type 2 diabetes mellitus patients at Umbulharjo 1 health center in Yogyakarta. Educational media such as pocketbooks and motivational messages are expected to be effective in improving pharmaceutical services in primary health services for chronic conditions such as Diabetes Mellitus.

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