

## Cognitive Behavioral Therapy: A Quasi-Experimental Study of Self Care Activity with Type 2 Diabetes Mellitus Patients

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### ABSTRACT

Individuals diagnosed with diabetes mellitus require a multi-faceted approach to treatment. Key aspects of self-care for these patients include maintaining a proper diet, engaging in regular physical activity, adhering to prescribed medications, consistently monitoring blood glucose levels, caring for the legs, and managing smoking habits. Among the therapeutic interventions used in nursing, Cognitive Behavioral Therapy (CBT) is noteworthy. The purpose of this study was to examine the impact of CBT on self-care behaviors in patients with Type 2 diabetes mellitus. Utilizing a quasi-experimental design, this study implemented a pre and post-test control group methodology. A total of 32 participants were selected based on specific criteria and probability sampling methods were employed to determine the sample. Data was gathered using the Summary of Self-Care Diabetic Activity questionnaire. Findings from the study indicate that CBT significantly enhanced dietary compliance ( $p$ -value = 0.02), increased physical activity ( $p$ -value = 0.001), and improved independent blood glucose monitoring ( $p$ -value = 0.003). Additionally, CBT enhanced adherence to medication ( $p$ -value = 0.004), leg care ( $p$ -value = 0.004), and reduced smoking behaviors ( $p$ -value = 0.021). CBT effective in enhancing various self-care activities among diabetic patients by fostering changes in mindset and encouraging positive behavioral shifts

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## 1. INTRODUCTION

Patients with diabetes mellitus require comprehensive care. This care is necessary to prevent hyperglycemia due to defects in insulin function or inadequate insulin activity (Alberti et al., 2007). An estimation from the International Diabetes Federation (IDF), there are as many as 81 million people suffering from Diabetes Mellitus (DM) in the Southeast Asia region. This percentage is expected to increase from 7.0% in 2010 to 8.4% in 2030 among ages 20-79 years (World Health Organization, 2005). In Indonesia, projections by the World Health Organization (WHO) indicate a significant increase in the prevalence of diabetes mellitus (DM), with the number of patients expected to rise from 8.4 million in 2000 to approximately 21.3 million by 2030. Similarly, the International Diabetes Federation (IDF) forecasts an increase from 7.0 million in 2009 to 12.0 million by 2030. Although there are discrepancies in the prevalence figures between WHO and IDF estimates, both reports consistently predict a two- to threefold increase in the number of DM patients by 2030.

According to the 2021 Health Profile of East Java Province, Diabetes Mellitus (DM) is recorded as the second most common non-communicable disease with the highest number of hospitalizations, following hypertension, according to the Health Department (Dinkes Provinsi Jawa Timur, 2021). Data from the same year's Health Department indicates that about 2.6% of the population in East Java aged over 15 years suffers from DM, with health services covering 93.3% of the total DM patients in the region. In Jember Regency, which has the second lowest life expectancy in East Java at 63.22 years and a population of 2,362,179 people, it is estimated that there are between 33,779 and 34,724 diabetes mellitus patients.

Long-term complications arising from Diabetes Mellitus (DM), including both microvascular and macrovascular issues, necessitate specialized management and self-care by DM patients. This self-care constitutes an ongoing effort by individuals to independently enhance and maintain their health throughout their lives. For type 2 DM patients, these self-care activities are crucial for maintaining blood glucose stability and preventing sudden fluctuations. Cognitive Behavioral Therapy is one therapeutic method that can be employed in this context. Effective self-management is essential for the comprehensive treatment of chronic diseases. Efficient DM management is achieved when individuals possess the knowledge and skills to autonomously regulate their condition (Jauhari, 2016). Through CBT, patients are encouraged to alter negative thoughts that can affect their attitudes, intentions, and behaviors, thereby promoting better engagement in self-care activities for diabetes mellitus.

## 2. METHODS

### 2.1 Research design

This study employs a quasi-experimental design with a two-group pre-posttest design. The researcher aims to reveal causal relationships by involving two groups of subjects. The subject groups are observed before the intervention is conducted and then observed again after the intervention.

Subject	Pre-test	Intervention	Post-test
K-A	O	I	O1-A
K-B	O	-	O1-B
	Time 1	Time 2	Time 3

Description :

- K-A : Subjects (Type-2 Diabetes Mellitus patients) intervention group
- K-B : Subjects (Type-2 Diabetes Mellitus patients) control group
- O : Measurement of self-care activities in diabetes mellitus patients before the implementation of Cognitive Behavioral Therapy.
- I : Cognitive Behavioral Therapy intervention
- O1 (A+B) : Measurement of self-care activities in diabetes mellitus patients after the intervention of Cognitive Behavioral Therapy (treatment and control groups).

## 2.2 Setting and Sample/Participants

The population in this study comprises all Type 2 Diabetes Mellitus patients treated at the Rambipuji Public Health Center in Jember district, totaling 78 respondents. The sample includes a subset of these patients who meet the inclusion criteria: ability to communicate verbally, willingness to participate in Cognitive Behavioral Therapy (for the treatment group), physically healthy (stable) at the time of therapy, and coherent communication. Exclusion criteria include patients with Diabetes Mellitus who are deaf. The sampling technique used is probability sampling, specifically simple random sampling, which involves selecting samples from the population according to the research objectives.

## 2.3 Intervention (Applicable to Experimental Studies)

In this quasi-experimental study, two groups are involved, with 16 respondents in the treatment group and 16 respondents in the control group, totaling 32 participants. The treatment group received CBT (Cognitive Behavioral Therapy) intervention, a form of therapy that changes the patients' negative thinking patterns, conducted by the caregiver with an integration of thoughts, behavior, and emotions over 5 sessions, each lasting 30-45 minutes.

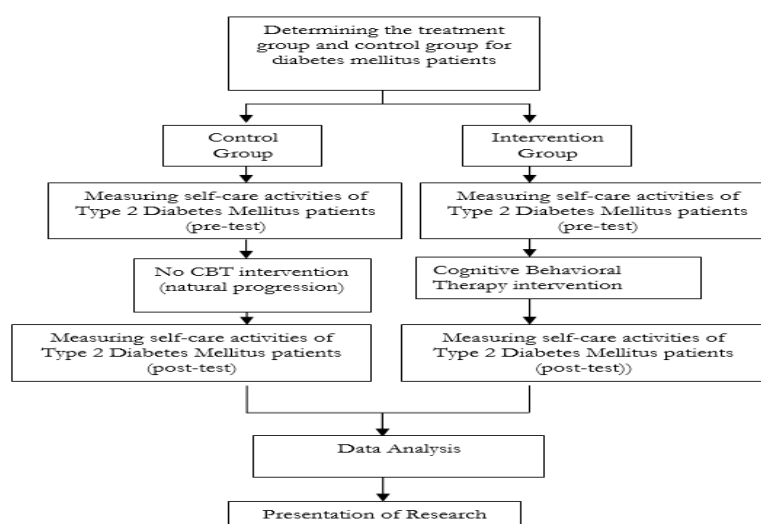


Figure 1. Research steps

## 2.4 Measurement and Data Collection

The data collection tool used in this study is a questionnaire sheet (attached). The questionnaire used to measure self-care activity variables is based on the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire (Toobert et al., 2000), which has been modified and tested for validity and reliability. The questionnaire includes questions about dietary behavior, physical activity, blood sugar testing, medication use, foot care, and smoking behavior. The types of questions include favorable and unfavorable items, and one open-ended question for the smoking behavior indicator. Responses for each favorable question are scored based on the number of days in a week, from 0 to 7, while the unfavorable questions have inverse values.

## 2.5 Data analysis

Descriptive analysis involves processing data by depicting and summarizing it scientifically in table form. The data presented include frequencies and proportions. Frequency tables consist of columns that contain the frequency and percentage for each category. Data analysis is performed using the t-test statistical test with a significance level of  $p\text{-value} \leq 0.05$ , which means that if the statistical test result ( $p$ ) shows this value, there is a significant difference between the control group and the treatment group.

## 2.6 Ethical considerations

Consent forms are provided to respondents who meet the inclusion criteria and agree to participate in the study. The consent form includes the title of the research and its benefits. If a respondent refuses to participate, the researcher must not coerce them and must respect the rights of the respondents. The principle of anonymity is applied to maintain confidentiality; the names of the respondents are not included on the questionnaire sheets but are replaced with specific codes. The confidentiality of the information provided by the respondents is guaranteed by the researcher, who ensures that what has been answered and written by respondents remains confidential. This study has received an ethical clearance certificate from the Health Research Committee of the Faculty of Dental Medicine at the University of Jember.

## 3. RESULTS

**Table 1. Characteristics of Respondents**

Characteristics of Respondents	Control Group (N: 16)		Intervention Group (N: 16)	
	F	%	F	%
<b>Age of Respondents</b>				
a. Over 60 Years	7	43,8%	8	50%
b.				
c. Between 50-60 Years	5	31,2%	4	25%
d. Under 50 Years	4	25%	4	25%
<b>Duration of Diabetes Mellitus</b>				
a. Over 10 Years	8	50%	6	37,5%
b. Between 5-10 Years	4	25%	5	31,2%

c. Under 5 Years	4	25%	5	31,2%
<b>Gender</b>				
a. Male	10	62,5%	9	56,2%
b. Female	6	37,5%	7	43,8%
<b>Ethnic group</b>				
a. Javanese ethnicity	6	37,5%	7	43,3%
b. Madurese ethnicity	10	62,5%	9	56,2%
<b>Type of job</b>				
a. Unemployed	2	12,5%	3	18,8%
b. Private sector	2	12,5%	3	18,8%
c. Civil servant	1	6,2%	1	6,2%
d. Retired	2	12,5%	0	0%
e. Farmer	7	43,8%	7	43,8%
f. Merchant	2	12,5%	2	12,5%
<b>Education level</b>				
a. Not attending school	2	12,5%	4	25%
b. Elementary school	6	37,5%	5	31,2%
c. Junior high school	3	18,8%	2	12,5%
d. Senior high school	2	12,5%	3	18,8%
e. Diploma	2	12,5%	1	6,2%
f. Bachelor's degree	1	6,2%	1	6,2%
<b>Types of medication used</b>				
a. Taking oral medication	15	93,8%	16	100%
b. Using insulin treatment	1	6,2%	0	0%
<b>Ownership of blood glucose testing equipment</b>				
a. Has a testing device	3	18,3%	2	12,5%
b. Does not have a testing device	13	81,3%	14	87,5%
<b>The psychological condition of the respondents.</b>				
a. Frequent anger	5	31,2%	4	25%
b. Not often angry	11	68,8%	12	75%
c. Frequent feelings of irritation	7	43,8%	6	37,5%
d. Not often feeling irritated	9	56,2%	10	62,5%

Based on the table above, it is found that the majority of respondents are over 60 years old, have had the disease for more than 10 years, are male, of Madurese ethnicity, Muslims, work as farmers, have an elementary school education, use oral medication, do not have blood sugar testing equipment, and have stable emotional conditions. The results of the analysis of the impact of Cognitive Behavioral Therapy (CBT) on self-care activities of patients with diabetes mellitus are presented in Table 2.

**Table 2. The Effect of Cognitive Behavioral Therapy on Self Care Activity**

<i>Cognitive Behavioral Therapy</i>	Group	Control		Intervention		<i>P-value</i>
		Mean	SD	Mean	SD	
The influence of Cognitive Behavioral Therapy on dietary compliance	Before	29,31	13,64	31,19	13,13	0,695
	After	29,50	12,13	43,50	10,8	0,02
The effect of Cognitive Behavioral Therapy	Before	32,38	12,73	32,06	13,97	0,948

on physical activity	After	32,94	11,61	45,50	7,54	0,001
The impact of Cognitive Behavioral Therapy on blood glucose monitoring adherence	Before	36,88	7,85	37,56	8,48	0,813
	After	36,06	7,21	43,81	6,32	0,003
The impact of Cognitive Behavioral Therapy on medication adherence.	Before	44,06	10,48	44,69	14,11	0,888
	After	44,25	9,90	54,50	8,36	0,004
The impact of Cognitive Behavioral Therapy on foot care compliance	Before	37,75	11,82	38,25	11,55	0,905
	After	37,94	11,13	48,40	7,70	0,004
The impact of Cognitive Behavioral Therapy on smoking avoidance behavior	Before	6	5,97	6,12	5,04	0,949
	After	6,25	6,06	2,31	2,30	0,021

The impact of Cognitive Behavioral Therapy on diet compliance, physical activity, blood sugar testing behavior, medication adherence, foot care, and smoking avoidance in patients with diabetes mellitus demonstrate a significant increase in diet compliance in the treatment group compared to the control group without treatment.

#### 4. DISCUSSION

This study aims to analyze the impact of Cognitive Behavioral Therapy on dietary compliance, physical activity, blood sugar monitoring, medication use, foot care, and smoking avoidance behavior in patients with type 2 diabetes mellitus. Cognitive Behavioral Therapy significantly enhances dietary compliance behavior in patients with diabetes mellitus. Respondents exhibited inadequate regulation concerning the quantity and type of food consumed. The amount of food ingested by diabetes patients must be tailored to individual needs. In this group, respondents tend to overlook the quantity and type of food consumed daily to maintain health. Elucidates that the dietary principles for diabetes patients are similar to dietary recommendations for the general population, namely, consuming a balanced diet tailored to the caloric and nutritional needs of each individual. It is crucial for diabetes patients to adhere to specific meal times, types, and quantities of food, especially for those taking glucose-lowering medication or insulin (Gajati & Kusumaningrum, 2020).

Cognitive Behavioral Therapy in patients with diabetes mellitus is a therapeutic approach that combines cognitive and behavioral aspects. This approach teaches diabetes mellitus patients to recognize that certain negative thought patterns can lead individuals to misinterpret situations and elicit negative emotions or feelings. Misguided thoughts and emotions can ultimately influence an individual's behavior, necessitating therapy (Rosenvald, Oei & Schmidt, 2007). Through Cognitive Behavioral Therapy, patients with diabetes mellitus will develop an attitude or mindset that is appropriate and ready to adhere to diabetes dietary regulations. With this positive attitude, patients will foster positive intentions towards dietary compliance necessary for maintaining health. According to the Theory Of Planned Behavior, an individual who believes that displaying dietary compliance will lead to positive outcomes will have a positive attitude towards dietary compliance, and vice versa (Ajzen, 2005). Cognitive Behavioral Therapy can influence individuals to form such attitudes. A positive attitude towards dietary compliance can shape intentions in an individual, which will be reflected in healthy dietary compliance behavior. Intentions are determined by the extent to which diabetes patients hold positive attitudes towards dietary compliance behavior. These

intentions represent a desire, deliberate decision, or a pre-planned behavior. Thus, when an individual harbors positive intentions, they will exhibit positive behavior towards dietary compliance (Ajzen, 2005).

Cognitive Behavioral Therapy has a significant impact on increasing physical activity in patients with diabetes mellitus. The physical activities performed are irregular and do not conform to the type recommended by healthcare professionals, nor is there monitoring of pulse rates during physical exercise. Such physical activity is essential for diabetes mellitus patients to enhance insulin sensitivity and reduce blood glucose levels. Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. Regular physical activity is considered a crucial component of a healthy lifestyle. Physical activity directly improves the muscles' sensitivity to insulin, thus facilitating the storage of glucose in muscles rather than allowing its increase in the bloodstream (Dyah et al., 2019).

Positive attitude towards physical activity influences the intentions of patients with diabetes mellitus. Intentions reflect the extent of belief and effort an individual is willing to apply in attempting an action. It indicates how likely a person is to decide to perform or not perform a task. This decision is influenced by the individual's positive attitude towards the intended behavior, as well as the support they receive from significant others in their life if they choose to engage in that behavior. Intentions are manifestations of a desire, deliberateness, or planning to act. For example, a positive attitude towards physical activity can influence behavioral formation. Behavior is determined by corresponding intentions and responses to behavior within perceived behavioral control. Between intentions and behavior, a moderating effect is expected, where good intentions will result in positive behavior only if there is strong behavioral control (Ajzen, 2005). However, it is important to remember that intentions are not actual actions; while physical activity behavior is the actual execution of that action. Cognitive Behavioral Therapy can enhance self-management and improve diabetes care management, thereby also changing lifestyle in patients with type 2 diabetes mellitus (Welschen, 2008). Cognitive Behavioral Therapy is a clinically effective intervention for diabetes self-management and blood sugar control in patients with type-2 diabetes. Thus, physical activity is necessary for patients with diabetes mellitus to increase insulin sensitivity and reduce blood sugar levels. To achieve this, the regularity and type of physical activity that must be performed by patients with diabetes mellitus are essential. Nursing modality therapy through cognitive-behavioral therapy has been proven to enhance physical activity in patients with diabetes mellitus (Safren et al., 2014).

Cognitive Behavioral Therapy (CBT) significantly enhances the behavior of blood glucose monitoring in patients with diabetes mellitus. This is associated with the ownership of blood glucose testing devices. A majority of respondents do not own blood glucose testing devices. The availability of medical devices and health facilities are enabling factors that influence an individual's health behaviors (Glanz, 2008). This therapy can be administered to patients to help address psychological issues and improve self-care behaviors. Cognitive Behavioral Therapy is a psychological treatment method that focuses on the relationship between an individual's thoughts, feelings, and actions. CBT aims to educate, train, and reinforce positive behaviors. Through CBT, individuals are assisted in recognizing thought and emotional patterns that influence their behavior (Somer, 2027). Cognitive Behavioral Therapy transforms negative thoughts about blood glucose monitoring into positive ones. Patients

with diabetes mellitus who possess positive thoughts will also have a positive attitude towards blood glucose monitoring. Attitude can influence intention. According to the Theory of Planned Behavior, an individual will only perform self-care based on their intentions or desires if they have control over their behavior (Ajzen, 2005). When possessing positive intentions towards blood glucose monitoring, patients will also exhibit positive behavior.

Complications such as acute and severe hypoglycemia or hyperglycemia pose life-threatening risks, potentially leading to organ failure, brain damage, coma, and in extremely severe cases, death. Persistently high blood sugar levels can cause progressive damage to various body organs, including the kidneys, eyes, heart, blood vessels, and nerves. Therefore, regular blood glucose monitoring is essential for patients with diabetes mellitus. One nursing modality therapy that can enhance self-care in diabetes mellitus patients regarding blood glucose monitoring is Cognitive Behavioral Therapy. This therapy has been proven to improve blood glucose monitoring in patients with diabetes mellitus.

Cognitive Behavioral Therapy has a significant effect on improving medication adherence among patients with diabetes mellitus. This increased in medication regularity is linked to enhanced patient adherence to their daily diabetes medication regimen. Prior to intervention, respondents exhibited irregular medication intake, which posed a risk of complications arising. Inappropriate diabetes medication use can lead to hypoglycemia or hyperglycemia (Smeltzer et al., 2010). Non-adherence to medication results in uncontrolled blood sugar levels, leading to complications such as diabetic neuropathy, diabetic nephropathy, cerebrovascular accidents (stroke), optic nerve damage, and diabetic ulcers ultimately affecting the quality of life of diabetes mellitus patients (Listyorini, 2023). Cognitive Behavioral Therapy (CBT) assists patients in recognizing and correcting specific cognitive distortions that contribute to the negative and distressing emotions. Deviant thought patterns can impact emotional well-being and behavior, and CBT helps clients develop positive behavior towards regular medication use. This is supported by research from Safren et al., (2014), which indicates that Cognitive Behavioral Therapy is an effective intervention for blood sugar control. It is clinically beneficial for diabetes self-management and can facilitate independent blood sugar regulation (Safren et al., 2014)

Cognitive Behavioral Therapy (CBT) has a significant impact on improving foot care practices among patients with diabetes mellitus. Proper foot care plays a crucial role in preventing complications in these population. Data indicates that respondents who implemented effective foot care, demonstrating less risk of foot complications. Adequate foot care practices contribute to early prevention of diabetes-related foot complications. This directly supports the improvement of life expectancy for diabetes sufferers. The level of adherence to adequate foot care habits among respondents has been recorded at a significant percentage (Lengga et al., 2023). Brunner (2002) states that 50-75% of lower extremity amputations occur in patients with diabetes mellitus. A significant proportion, approximately 50%, of these amputation cases are estimated to be preventable if patients receive education about preventive foot care measures and apply daily. Preventive foot care includes washing the feet properly, drying them carefully, and providing treatment with specific oils or lotions; it is crucial to ensure that the spaces between the toes remain dry. Additionally, daily foot inspections are necessary to check for signs of redness, blisters, fissures, calluses, or ulcerations (Smeltzer et al., 2010). Selecting appropriate and comfortable footwear for patients with diabetes mellitus as a strategy to avoid rough skin conditions and prevent the



occurrence of ulcers (Jauhari, 2016). This is in line with the research findings by Ariyanti (2012), which shows the selection and use of proper footwear can reduce the risk of developing diabetic ulcers by 0.28 times. This underscores the importance of adequate footwear selection in the clinical management of diabetes (Ariyanti, 2012).

Foot care for diabetes patients is necessary to prevent complications such as diabetic ulcers, which require a prolonged healing process and, in severe cases, may lead to amputation. To avoid these outcomes, proper foot care is essential. Cognitive Behavioral Therapy (CBT) as a nursing modality therapy has been proven to enhance foot care in patients with diabetes mellitus. This approach helps patients adopt and maintain behaviors crucial for preventing foot complications, thereby improving their overall health outcomes.

Cognitive Behavioral Therapy (CBT) has a significant effect in reducing smoking behavior among patients with diabetes mellitus. Cognitive Behavioral Therapy for diabetes mellitus patients is a therapeutic approach that integrates cognitive and behavioral aspects. This method guides patients with diabetes mellitus to recognize that negative thought patterns can lead to misinterpretations of situations, which then trigger negative emotions or feelings. These errors in thinking and emotions ultimately impact an individual's behavior, making this therapy considered necessary (Rosensvald, Oei & Schmidt, 2007).

The prevalence of smoking in Indonesia is increasing, particularly among children and adolescents. From 2007 to 2018, the prevalence of the population consuming both smoked and chewed tobacco has risen, especially among those aged 10-14 years (an increase of 0.7%) and those aged 15-19 years (an increase of 1.4%). The 2020 Indonesian Tobacco Atlas report shows that the highest percentage of Indonesians start smoking at ages 15-19 (52.1%), followed by ages 10-14 (23.1%). This indicates that many Indonesian youth begin smoking as early as elementary and middle school. Additionally, there are even children aged 5-9 who have started smoking (2.5%) (Atlas tembakau, 2020). Besides the high tobacco use, Indonesia is also a major tobacco producer. Cigarette production in Indonesia increased from 2011 to 2018, reaching 332.38 billion sticks. This figure exceeds the target set in the 2015-2020 Tobacco Product Production Roadmap (260 billion sticks) (Listyorini, 2023). A study by Kumboyono (2011) revealed that smokers often hold the belief that smoking does not cause death but only leads to several diseases such as heart disease, impotence, pregnancy complications, and fetal issues, which are commonly listed on cigarette packages. This view potentially influences their smoking habits, thus lowering their motivation to quit. The perception of the risk of disease from smoking is a factor that affects the motivation to quit. If the perceived risk of disease is low, it can hinder the motivation to stop smoking. Nainggolan (2004) adds that the motivation to quit smoking is often triggered by awareness of the dangers of smoking, supported by a strong desire and motivation to quit. Among individuals who have successfully stopped smoking, another inhibiting factor comes from peers who smoke (Kumboyono, 2011). Findings from this research state results similar to a study conducted by Heikkinen, et al. (2010) in Finland, which showed that the majority of smokers believe that smoking does not endanger or threaten life. Consequently, these smokers are convinced that smoking does not negatively impact their lives or the lives of others around them. Just like in that study, respondents in this study also tend to consider that smoking is no more dangerous than other disease causes (Heikkinen et al., 2010).

Challenges encountered in this study primarily involved elderly respondents who exhibited diminished auditory and visual functions, along with an inability to read and write.

This necessitated the researchers' assistance in writing on the patients' worksheets, as the respondents could not write themselves. Additional challenges included losing contact with respondents in the control group due to the lengthy interval (one month) between the pre-test and post-test, leading to participant dropouts. Furthermore, difficulties in adhering to initially agreed-upon visit schedules occurred, often due to respondents forgetting or being occupied with work, necessitating frequent rescheduling of visits. In the implementation of Cognitive Behavioral Therapy, the facilitation of the therapeutic process was aided by the fact that most respondents were proficient in Indonesian and maintained a relatively stable emotional state.

The findings of this study can serve as evidence-based guidance for developing other Cognitive Behavioral Therapy (CBT) techniques for clients experiencing negative thoughts and behaviors related to various health issues. The application of CBT in managing type 2 diabetes patients, particularly in aspects of self-care, can be adopted as a preventive strategy to avoid the emergence of long-term complications associated with type 2 diabetes. This initiative can involve nurses and healthcare professionals at community health centers performing therapy for patients. Additionally, psychiatric nurses or nurses who are experts in CBT can act as therapy consultants or specialist nurses at these centers.

## 5. CONCLUSION

Cognitive Behavioral Therapy has a significant impact on enhancing adherence to dietary regimens, physical activity, blood sugar monitoring, medication usage, and foot care, as well as reducing smoking habits among patients with type 2 diabetes mellitus. This is achieved through the transformation of negative thoughts and behaviors related to diabetic diets into more positive ones.

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