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# Effects of the Holistic Self-Care Program on Diabetes among Diabetic Mellitus Patients in a Rural Area of Sakaeo Province, Thailand

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**Abstract** Currently, the number of diabetes patients is increasing each year, and this may lead to complications if they do not engage in proper self-care behaviors. This research investigated the effects of a holistic self-care program on diabetes among patients with diabetes mellitus in a rural area of Sa Kaeo Province, Thailand. This research was a quasi-experimental study utilizing a two-group pretest-posttest design, which assessed outcomes before and after the intervention over three months. Participants were recruited from diabetes mellitus patients diagnosed by medical doctors and registered for treatment at the Khlong Kai Thuen Sub-district primary healthcare centers. These patients were over 35 years old and voluntarily participated in the program. The sample consisted of 70 participants, divided into intervention (n=35) and control (n=35) groups through simple random sampling based on participant identification numbers drawn by lottery. The control group received standard care and a self-care behavior booklet. In contrast, the intervention group engaged in a 12-week holistic self-care program, meeting bi-weekly for six sessions. Outcomes were measured using interview forms and blood glucose tests. The data were analyzed with descriptive statistics, paired t-tests, and independent t-tests. The findings indicated that after three months, the intervention group showed significantly reduced blood glucose levels and increased knowledge about diabetes and self-care behaviors compared to the control group ($p < 0.001$). Additionally, the intervention group demonstrated significantly reduced blood glucose levels and enhanced knowledge about diabetes and self-care behaviors compared with pre-intervention levels ($p < 0.001$). The holistic self-care program has proven effective in lowering blood glucose levels for diabetes mellitus patients. Healthcare providers can incorporate this program to change the behavior of diabetes patients, working alongside local administrative organizations to mitigate potential complications from chronic diseases.

**Keywords** Holistic Self-Care, Diabetes, Blood Glucose Levels, Self-Care Behaviors, Rural Area

# 1. Introduction

Diabetes is a chronic disease resulting from abnormalities in production or response to insulin hormone, leading to ineffective sugar utilization and high blood sugar levels [1]. Prolonged high blood sugar can cause organ dysfunction and failure, resulting in complications such as vision loss, chronic kidney failure, peripheral neuropathy, and difficult-to-heal wounds [2]. Therefore, preventing complications for diabetes patients can be achieved by effectively controlling blood sugar levels, regularly visiting a doctor, adhering to prescribed medications, reporting any unusual symptoms to the treating physician, avoiding self-medication, exercising regularly, refraining from alcohol consumption, not smoking, and undergoing annual health check-ups [3]. In addition, diabetes remains a leading cause of other non-communicable diseases (NCDs), such as heart disease, stroke, hypertension, and chronic kidney failure [4].

In 2021, it was reported that 537 million people worldwide had been diagnosed with diabetes. This figure is expected to increase to 643 million by 2030. Additionally, diabetes has been linked to 6.7 million deaths globally [5]. Specifically, Thailand has experienced a significant increase in diabetes mellitus cases, with 300,000 new diagnoses each year and 3.3 million people currently registered in the healthcare system. In 2020, there were 16,388 diabetes-related deaths, corresponding to a mortality rate of 25.1 per 100,000 individuals [6]. In Sa Kaeo Province, diabetes cases have been steadily rising, with the number of patients increasing from 26,627 in 2021 to 27,959 in 2022, reaching 29,322 in 2023. This reflects a continuous upward trend in diabetes cases over the past three years. Additionally, in 2023, it was reported that 35.7% of diabetes patients could reasonably control their blood sugar levels [7]. In the Khlong Hat District, Sa Kaeo Province, diabetic patients rose from 1,821 cases in 2021 to 1,992 cases in 2022 and 2,107 cases in 2023, reflecting an upward trend over the past three years [7].

Furthermore, the medical records from the Health Promotion Hospital in Khlong Kai Thuen Sub-district showed 190 diabetic patients diagnosed in 2023, with 30.5% successfully maintaining reasonable blood sugar control [8]. Consequently, patients' inability to manage their blood sugar levels may increase disease severity and complications [9]. Notably, self-care behaviors in diabetes patients are crucial and must be encouraged to equip them with the necessary knowledge and enable them to modify their self-care practices effectively [10]. This approach enhanced blood sugar control, reduced the risk of diabetes-related complications, and helped individuals lead fulfilling lives [11]. Notably, the study aimed to examine the effects of a holistic self-care program on diabetes management among patients with diabetes mellitus in a rural area of Sa Kaeo Province, Thailand.

According to the data from this situation, it is clear that diabetes patients struggle to maintain adequate blood sugar control, leading to elevated levels [12]. Furthermore, complications such as diabetic retinopathy, diabetic kidney disease, and diabetic ulcers have been noted among these patients. These problems arise from the patients' improper self-care behaviors [13]. The researcher created a comprehensive self-care program for managing diabetes by incorporating the principles of holistic health care, which includes four key aspects: physical, mental, social, and intellectual. According to the World Health Organization (WHO), holistic health care is an approach that takes into account the physical, mental, emotional, social, and spiritual well-being of individuals [14], [15].

This research was developed for a 12-week self-care program with six sessions held every two weeks. Based on previous literature reviews, many studies have concentrated on enhancing physical and mental well-being [16], [17]. However, this study sets itself apart by including social and spiritual health and the traditional focus on holistic health care. Moreover, this study incorporates community involvement, with village health volunteers (VHVs) tasked with recording and monitoring each patient's overall well-being at their homes [18]. The holistic self-care program will enhance participants' blood glucose control. Additionally, it will deepen their understanding of diabetes management, leading to sustained behavioral changes that support long-term health.

# 2. Materials and Methods

### 2.1. Research Design

This study was quasi-experimental research using a two-group pretest-posttest design to compare blood glucose levels, knowledge about diabetes, and self-care behaviors before and after three months of the intervention program. The intervention group engaged in a 12-week holistic self-care program, attending sessions every two weeks for six meetings. In contrast, the control group received standard care and a self-care behavior booklet. Both groups were evaluated twice before the experiment and after three months between January and April 2024.

### 2.2. Population and Sample

The study population comprised 190 diagnosed diabetes patients from the Health Promotion Hospital in Khlong Kai Thuen Sub-district [8]. Participants were recruited from those receiving treatment at primary healthcare centers. The G*Power software was used to determine the sample size based on an effect size of 0.88 [19], an alpha value of 0.05, a power of 0.95, and an allocation ratio (N2/N1) of 1. This calculation indicated a required sample size of 35 per group for 70 participants. The participants were chosen using simple random sampling; each was given a number between 1 and 190, and a lottery draw was conducted without replacement. If a participant did not meet the inclusion criteria, another random draw was performed until the sample size of 70 was reached. The final sample was randomly divided into two groups of 35 participants each.

Inclusion Criteria: Participants were diabetic patients aged 35 years or older, diagnosed by a physician, and receiving treatment at the chronic disease clinic of the Health Promotion Hospital in Khlong Kai Thuen Sub-district. They voluntarily agreed to participate in the program and provided written consent. Exclusion Criteria: Patients who were bedridden and unable to perform activities independently or those with conditions such as coronary artery disease, osteoarthritis, or osteoporosis that prevented participation in program activities were excluded.

### 2.3. Intervention Details

The holistic self-care program on diabetes among patients with diabetes mellitus was developed based on the concept of holistic health care from WHO [14], [15]. The World Health Organization's (WHO) concept of holistic care addresses a person's physical, mental, social, and spiritual well-being. This holistic approach can be used to develop an effective self-care program for patients with diabetes mellitus by ensuring comprehensive care that empowers individuals to manage their condition, ultimately leading to improved health outcomes and quality of life [20].

Pre-experimental duration: Before the experiment, participants were selected from diabetic patients attending the chronic disease clinic at the primary healthcare center. They were screened based on the inclusion criteria, and those who qualified were invited to participate. Additionally, before the experiment, the researcher facilitated collaboration by organizing a meeting with the Village Health Volunteers (VHVs) [21]. The purpose of this meeting was to clarify each VHV's responsibilities, which included tracking blood sugar levels, educating patients on self-care practices, promoting involvement in physical activities, and providing emotional and social support within the home setting. VHVs conducted weekly home visits to monitor patients' self-care activities, such as food intake, exercise, Somporn Kantharadussadee Triumchaisri (SKT) meditation, medication adherence, and participation in community events. VHVs documented different data types during these visits in the patients' self-care behavior journals. Each VHV was responsible for supervising five participants.

Experimental duration: Throughout the trial, participants participated in a 12-week holistic self-care program, attending bi-weekly sessions for six sessions (one hour/time) at the Health Promotion Hospital in Khlong Kai Thuen Sub-district. The study outcomes measured included blood glucose levels, diabetes knowledge, and self-care behaviors, assessed at the start (Week 1) and at the end of the three-month intervention (Week 12). The details of the intervention are described as follows:

Session 1: Preparing and baseline measurement: This session was conducted as the orientation activity to explain the guidelines for participating in the program, provide program details, and schedule activity dates using a slide presentation. Initially, the samples were evaluated through baseline assessment, interviews, and blood sugar tests. Participants received a self-care behavior booklet along with a daily self-care behavior record book. Afterward, the researcher inquired about the participant's medical history and individual diabetes treatment. The participants were then assigned to self-analyze the pros and cons of their self-care behaviors related to diabetes. They were also encouraged to set goals for maintaining appropriate self-care behaviors, aiming for better health outcomes. They wrote their responses on post-it notes, then posted them at the front of the room and separated them into Pro, Con, and Goal categories.

Session 2: Physical health activity: First, the researcher organized activities using lecture techniques to provide information about diabetes, its natural complications, dietary guidelines, and exchange foods for diabetic patients, as well as the correct medication regimen for the participants. This was supplemented with presentation slides to enhance the lecture. Afterward, the researchers educated patients on diabetes-friendly diets, meal planning, and portion control to stabilize blood sugar levels. They emphasized the importance of fiber-rich foods and low glycemic index. Moreover, the researcher demonstrated simple daily exercise routines and allowed participants to practice with a buddy system in small groups. Patients were also taught how to correctly take prescribed medications, including insulin, monitor blood sugar levels at home, and understand the results. Follow-up on behavior was conducted through the participants' daily self-care record books.

Session 3: Mental health activity: First, the researcher educated patients on how stress can affect blood sugar levels and offered relaxation techniques like mindfulness, deep breathing, and meditation. Then, the researcher explained the meaning and origin of the SKT meditation technique, how to practice it, and its benefits for diabetes patients. This was done through group activities, including a lecture and an interactive question-and-answer session. Afterward, practical training of SKT meditation was conducted, consisting of 10 basic poses of SKT. Using the buddy system, the researcher guided participants to practice each pose for 3 minutes in pairs. Relaxing music was played during the session to promote relaxation, relieve stress, and ease anxiety. Behavior follow-up was carried out using the participants' daily self-care record books.

Session 4: Social health activity: The researcher established support groups where patients can connect with others managing diabetes. Sharing experiences and advice can help them feel less isolated and more motivated. Additionally, the researcher encourages the involvement of family members in the self-care process. Family members can help patients stay on track with dietary plans, exercise routines, and medication schedules. Finally, the researcher conducted group activities to organize healthy food cooking classes for diabetes. These classes foster social interaction and mutual support among participants, making it fun and informative to learn how to select and cook appropriate food for diabetes. Behavior follow-up was conducted by using the participants' daily self-care record books.

Session 5: Spiritual health activity: The researcher organized an activity to share and learn about successful and unsuccessful self-care behaviors among the participants. During the session, advice and motivational reinforcement were provided, and a successful role model who had effectively managed their blood sugar levels through proper self-care was introduced. This aimed to inspire participants to recognize the importance of self-care and adopt appropriate behaviors for better health outcomes. Additionally, the researcher offered opportunities for patients to explore their values, beliefs, and sense of purpose. Help them see how managing diabetes aligns with their personal goals and aspirations.

Session 6: Feedback and evaluation activity: The post-test measurement was assessed at week 12 through an interview form and a blood glucose test. Afterward, the researcher organized group discussions to allow participants to share their experiences, challenges, and successes during the program. These group discussions can foster peer support and provide a collective understanding of the program's impact. We also provided participants with a summary of the overall program results, highlighting how their feedback has contributed to program improvements. This will help patients feel valued and invested in future participation.

The control group received standard treatment and a self-care behavior booklet. The booklet covered food intake, exercise, SKT mindfulness meditation, medication adherence, and participation in community events. At the beginning and end of the three months, the control group underwent the same assessments as the intervention group. These assessments included an interview and a blood glucose test.

### 2.4. Instruments of the Study

The research instruments utilized in this study were developed based on a comprehensive literature review [14], [15]. The physician performed the blood sugar tests and documented them in the medical records. The study tool is segmented into four parts, comprising:

Part 1: The general interview form: The researcher was created to measure general characteristics. The tool consisted of eight questions in both open-ended and closed-ended formats, including gender, age, education level, occupation, duration of illness, medication used, complications, and family history of diabetes.

Part 2: The blood sugar record form: The researcher developed to record blood sugar levels. This form is designed to systematically document and monitor blood glucose levels using the Fasting Blood Sugar (FBS) method. The study measured the blood glucose level at baseline and again after three months. A fasting blood sugar level of 126 mg/dL (7.0 mmol/L) or higher on two separate tests confirms a diagnosis of diabetes mellitus.

Part 3: The diabetes knowledge interview form: The researcher was created based on a review of relevant literature [22], consisting of 15 multiple-choice questions. Each question has four choices, with 1 point awarded for a correct answer and 0 point for an incorrect answer. The scores for knowledge about diabetes ranged from 0 to 15. The knowledge scores were divided into three levels using Bloom's taxonomy as follows [23]: 0–8 points indicate a low level of knowledge, 9–11 points indicate a moderate level, and 12–15 points indicate a high level.

Part 4: The self-care behavior assessment form: Developed by the researcher from the review literature [24], it includes three areas: dietary behavior, medical adherence, and personal hygiene. The form consisted of 15 questions using a Likert scale with three response options: regular practice (more than 3 times per week), occasional practice (2-3 times per week), and infrequent practice (0-1 time per week), scored as 3, 2, and 1 point, respectively. The self-care behavior scores ranged from 15 to 45 scores. The scoring criteria were divided into three levels by the best criteria as [25]: an average score of 1.00–1.66 indicates a low level, an average score of 1.67–2.33 indicates a moderate level and an average score of 2.34–3.00 indicates a high level.

### 2.5. Validity and Reliability

Three experts, including medical doctors, public health experts, and geriatric nursing experts, evaluated the tool's validity using the Index of Item-Objective Congruence (IOC). The IOC values ranged from 0.86 to 1.00. The reliability of the diabetes knowledge interview form was assessed using the Kuder-Richardson 21 (KR-21) method, which yielded a value of 0.90. Additionally, Cronbach's alpha coefficient for the self-care behavior assessment form was found to be 0.95 through a tryout involving 30 diabetic patients, similar to the study sample but not included in the study.

### 2.6. Data Collection

The researcher secured approval from local health authorities to carry out the study. Following this, participants were recruited from chronic disease clinics based on inclusion criteria and provided with consent forms to sign. The researcher implemented a 12-week holistic self-care program, with participants attending bi-weekly sessions for six sessions. The control group received standard care along with a self-care behavior booklet. Both groups were evaluated at two points: once before the intervention and after three months.

### 2.7. Ethical Consideration

The human research component of this study was approved by the Research Ethics Committee on Human Research at Valaya Alongkorn Rajabhat University under the Royal Patronage. The project was assigned the identification numbers REC No. 0085/2023 and COA No. 0001/2024, and it received certification on January 5, 2024. The study was carried out following the Declaration of Helsinki.

### 2.8. Data Analysis

Data analysis was conducted using SPSS version 29.0.1, with a significance level set at 0.05. Descriptive statistics included minimum and maximum values, frequency, percentage, mean, and standard deviation (SD). The Kolmogorov–Smirnov Test was used to determine if the dependent variables were normally distributed. Results showed that blood glucose levels (p-value=0.211), diabetes knowledge (p-value=0.231), and self-care behaviors (p-value=0.263) followed a normal distribution. The Chi-square test was used to compare baseline variables between groups, provided that no more than 20% of expected frequencies are less than 5. If any variables failed to meet this criterion, Fisher's exact test was employed instead. The Paired t-test measured within-group mean differences, while the independent t-test compared mean differences between groups at baseline and post-intervention.

## 3. Results

### 3.1. Baseline Characteristics Variables

Table 1 demonstrated that the baseline variables were similar between the intervention and control groups, suggesting that the baseline characteristics were comparable across both groups ($p > 0.05$). The baseline parameter results showed that the majority of the samples were female (60.0%) and aged 60 years and older (61.4%), with an average age of 62.5 years (SD = 9.3). Most had graduated from lower secondary school (80.0%) and worked as agriculturists (78.6%). In terms of health characteristics, most individuals were diagnosed with diabetes for less than five years (47.1%), with an average duration of 7.2 years (SD = 4.8). The majority did not have complications from diabetes (80.0%), and 55.7% had a family history of diabetes. Regarding diabetes drug use, they were taking Glipizide (71.4%), Metformin (80.0%), Pioglitazone (2.9%), Insulin injection (20.0%), and regular Insulin injection (7.1%).

### 3.2. Level of Knowledge and Self-Care Behavior

In Table 2, it is shown that initially, 65.7% of participants in the intervention group had a low level of knowledge about diabetes. After the intervention, this percentage changed to 71.4% of participants having a high level of expertise. In contrast, most participants in the control group reported low knowledge levels both before and after the intervention (82.9 % vs. 77.1%). Furthermore, 82.9% of participants in the intervention group had moderate self-care behavior before the intervention. After the intervention, this percentage changed to 71.4% of participants having a high level of self-care behavior. On the other hand, most participants in the control group reported moderate self-care behavior both before and after the intervention (74.3% vs. 65.7%).

### 3.3. Effects of the Program Between Groups and Within the Group

Table 3 reveals that before the intervention, there were no significant differences in the mean change in blood glucose level, knowledge about diabetes, and self-care behaviors ($p > 0.05$). Afterward, the mean change in all dependent variables was assessed between the groups after intervention at three months. The findings indicated a significant decrease in blood glucose levels and increased knowledge about diabetes and self-care behaviors in the intervention group compared to the control group after intervention ($p < 0.001$). After comparing the parameters in the intervention group before and after the intervention, it was determined that there were statistically significant decreases in blood glucose levels and increased knowledge about diabetes and self-care behaviors ($p < 0.001$). For the control group, the measured mean scores before and after the intervention showed no statistically significant differences in any of the outcomes ($p < 0.05$).

**Table 1.** The baseline characteristics variables of the intervention and control groups (n=70)

| Variables | Total n (%) | Intervention Group n (%) | Control Group n (%) | p-value |
|---|---|---|---|---|
| Gender | | | | |
| Female | 42 (60.0) | 24 (68.6) | 18 (51.4) | 0.143[a] |
| Male | 28 (40.0) | 11 (31.4) | 17 (48.6) | |
| Age (Years) | | | | |
| < 60 | 27 (38.6) | 12 (34.3) | 15 (42.9) | 0.461[a] |
| ≥ 60 | 43 (61.4) | 23 (65.7) | 20 (57.1) | |
| Educational Level | | | | |
| Lower Secondary School | 56 (80.0) | 27 (77.1) | 29 (82.9) | 0.550[a] |
| Secondary School or Higher | 14 (20.0) | 8 (22.9) | 6 (17.1) | |
| Occupational | | | | |
| Agriculturist | 55 (78.6) | 24 (68.6) | 31 (88.6) | 0.078[b] |
| Merchant | 15 (21.4) | 11 (31.4) | 4 (11.4) | |
| Duration of Illness | | | | |
| ≤ 5 years | 33 (47.1) | 15 (42.9) | 18 (51.4) | 0.439[a] |
| 6-10 years | 25 (35.7) | 12 (34.3) | 13 (37.1) | |
| > 10 years | 12 (17.1) | 8 (22.9) | 4 (11.4) | |
| Complications | | | | |
| Yes | 14 (20.0) | 4 (11.4) | 10 (28.6) | 0.073[a] |
| No | 56 (80.0) | 31 (88.6) | 25 (71.4) | |
| Family History of Diabetes | | | | |
| Yes | 39 (55.7) | 24 (68.6) | 15 (42.9) | 0.053[a] |
| No | 31 (44.3) | 11 (31.4) | 20 (57.1) | |

Observation: [a]Chi-square test, [b]Fisher's exact test, Significant difference $p< 0.05$

**Table 2.** Level of knowledge and self-care behavior among diabetes patients before and after the intervention program (n=70)

| Variables | Time | Level | Intervention Group n (%) | Control Group n (%) |
|---|---|---|---|---|
| Knowledge about diabetes | Before | Low | 23 (65.7) | 29 (82.9) |
| | | Moderate | 3 (8.6) | 5 (14.3) |
| | | High | 9 (25.7) | 1 (2.9) |
| | After | Low | 5 (14.3) | 27 (77.1) |
| | | Moderate | 5 (14.3) | 7 (20.0) |
| | | High | 25 (71.4) | 1 (2.9) |
| Self-care behaviors | Before | Low | 0 (0.0) | 0 (0.0) |
| | | Moderate | 29 (82.9) | 26 (74.3) |
| | | High | 6 (17.1) | 9 (25.7) |
| | After | Low | 0 (0.0) | 0 (0.0) |
| | | Moderate | 10 (28.6) | 23 (65.7) |
| | | High | 25 (71.4) | 5 (14.3) |

**Table 3.** Comparison of the mean scores of outcome variables between groups and within groups (n=70)

| Variables | Before (Mean ± SD.) | After (Mean ± SD.) | p-value (a) |
|---|---|---|---|
| Blood glucose levels (mg/dL) | | | |
| Intervention group | 153.89 ± 31.61 | 128.69 ± 9.51 | <0.001* |
| Control group | 146.17 ± 19.84 | 144.60 ± 20.65 | 0.160 |
| p-value (b) | 0.226 | <0.001* | |
| Knowledge about diabetes | | | |
| Intervention group | 6.69 ± 4.76 | 12.25 ± 3.70 | <0.001* |
| Control group | 5.97 ± 2.73 | 6.40 ± 2.87 | 0.169 |
| p-value (b) | 0.444 | <0.001* | |
| Self-care behaviors | | | |
| Intervention group | 32.17 ± 2.86 | 40.08 ± 6.34 | <0.001* |
| Control group | 31.57 ± 3.45 | 30.69 ± 8.28 | 0.423 |
| p-value (b) | 0.431 | <0.001* | |

**Observation:** Paired t-tests were used to assess the data within each group (p-value (a)), and independent t-tests were used between groups (p-value (b)). * Statistically significant at p<0.05

# 4. Discussion

The findings of this study revealed that a holistic self-care program for diabetes effectively reduced blood glucose levels and improved knowledge about diabetes and self-care behaviors among patients with diabetes mellitus in a rural area of Sa Kaeo Province, Thailand. The research results can be discussed as follows:

After participating in the holistic self-care program, patients experienced significant reductions in their blood glucose levels. This suggests that the program was effective in helping participants manage their blood glucose levels. This finding is consistent with Ekakkatachit [26], which implemented knowledge development programs to control diabetes behaviors. The experiment indicated that fasting blood sugar (FBS) levels were significantly lower afterward. Furthermore, the results align with Ranjbar et al. [27], who suggested that the experimental group, following an educational intervention focused on self-management behaviors for type 2 diabetes patients, exhibited a decrease in fasting blood sugar levels compared to the control group. Similarly, Anjali et al. [28] indicated that at the three-month follow-up, there was a significant reduction in blood glucose levels in the intervention group compared to the control group. Additionally, these findings support Ji et al. [29], who noted that simulation education and case management for glycemic control in type 2 diabetes could effectively lower blood glucose levels in the experimental group compared to the control group. Likewise, Nooseisai et al. [11] found significant changes in blood glucose levels after participants joined the diabetes self-management education program. This can be described as follows: Firstly, a holistic self-care program for diabetes addresses multiple aspects of health, including physical, mental, social, and spiritual well-being: 1) Physical health: Encouraging regular exercise, healthy eating, and proper medication use can directly impact blood glucose levels. 2) Mental health: SKT meditation helps reduce stress, which can otherwise lead to increased blood sugar levels [30]. 3) Social health: Social support through group activities or peer support helps patients remain motivated and adhere to their treatment plans, positively influencing blood glucose control. 4) Spiritual health: Educating patients about diabetes, its complications, and self-management empowers them to make informed decisions about their lifestyle, diet, and medication, contributing to improved blood glucose levels [14], [15]. Secondly, education is a cornerstone of a holistic self-care program. By increasing participants' understanding of diabetes management—such as the role of diet, exercise, and medication in controlling blood sugar levels—patients are better equipped to take proactive steps in managing their condition, enabling them to regulate their blood glucose levels more effectively, resulting in lower blood glucose level readings [31].

Participants' knowledge about diabetes improved significantly after the intervention. The education component of the holistic self-care program ensured that patients better understood the causes, treatment, and complications of diabetes. This finding is consistent with Puangmalee and Chupanit [32], who studied an integrated self-care program for 12 weeks. They found increasingly significant differences in knowledge scores between the intervention and control groups. Moreover, it was consistent with Adam et al. [33], whose study on the impact of diabetes self-management education on knowledge of diabetes mellitus found that significant differences in knowledge score changes were observed from baseline education and after three months. Shiferaw et al. [19] showed that the interventions significantly increased participants' knowledge of type 2 diabetes. Similar to Chawla et al. [12], it was indicated that there was a significant increase in knowledge compared to the control group. This finding explained that a well-rounded education component was embedded in the holistic self-care program, focusing on teaching patients about the importance of blood sugar monitoring, the impact of diet and physical activity, and the prevention of complications [34]. This increase in knowledge is critical because better-informed patients are more likely to take an active role in managing their health [35]. This increase in knowledge can be linked to the educational sessions provided during the program. The knowledge gained empowered patients to make informed decisions, such as adhering to medication, adjusting dietary habits, and performing regular physical activities, key elements of successful diabetes management [36]. Notably, the increase in knowledge is directly linked to better self-care behaviors. Patients who understand their disease are more likely to adopt effective self-care strategies, which, in turn, contribute to better management of blood glucose levels.

Participants demonstrated significant improvements in self-care behaviors, such as regular blood glucose monitoring, adherence to medication, proper diet, SKT meditation, and exercise routines. The result was similar to the study of Lalun and Wirunphan [37], who studied a self-management program among diabetic patients. It was found that after receiving the program, the experimental group had a statistically significant better mean of self-management behavior than the control group. Moreover, Romero-Castillo [38] demonstrated significant differences in diabetes self-care between groups three months after the educational program, similar to Khani Jeihooni et al. [39], the intervention group showed improved mean scores in self-care management compared to the control group and the study by Khiyali et al. [35] showed a significant increase in self-care behavior in the intervention group compared to the control group after two months of educational intervention. It can be explained that the holistic self-care program significantly emphasizes empowering patients to manage their condition through self-care practices [40]. By promoting regular exercise, a balanced diet, stress management with SKT meditation, and proper medication use, patients became more proactive in their diabetes management [41]. Additionally, the program helped patients develop the mental and emotional resilience needed to maintain these behaviors over time. These findings are crucial as they indicate a long-term benefit where patients can sustain their health outcomes and minimize diabetes-related complications [42].

To summarize, the holistic self-care program implemented in a rural area of Sa Kaeo Province demonstrated substantial positive effects on blood glucose levels, diabetes knowledge, and self-care behaviors. By addressing multiple aspects of health and encouraging patients to take an active role in managing their diabetes, the program proved to be an effective intervention in this community. The findings underscore the importance of a comprehensive approach to diabetes management that extends beyond medication to include education and lifestyle changes. However, this study has several limitations: 1) The study was conducted in a rural area, which may limit the applicability of the findings to other regions, particularly urban areas or regions with different healthcare infrastructure and cultural practices. 2) The study's relatively small sample size limits the generalizability of the findings. A larger sample could provide more robust results and increase the study's external validity. 3) The intervention was conducted over three months, which may not be sufficient to observe the long-term effects on diabetes management. More extended follow-up periods are needed to assess the sustainability of the outcomes.

# 5. Conclusions

The study suggests that a holistic self-care program for diabetes can effectively reduce blood glucose levels by enhancing knowledge about diabetes and self-care behaviors based on a holistic care approach recommended by the WHO for patients with diabetes mellitus. Healthcare providers in rural areas should incorporate holistic self-care programs into standard diabetes management at health centers. This program can complement regular medical care and improve overall patient outcomes. Additionally, it should expand to include patients not currently registered in the program, providing education on self-care practices that focus on the four key aspects of health: physical, mental, social, and spiritual. Furthermore, it's essential to collaborate with local health authorities and community leaders to implement the program widely. Encouraging community participation can increase access to care and reduce complications. Recommendation for the next study: Future research should go beyond the three-month intervention period to evaluate the long-term sustainability of the comprehensive self-care program. Additionally, future studies should design a comprehensive self-care program using mobile health apps, allowing participants to carry out the program in their own homes. Furthermore, future studies could investigate the role of family members and caregivers in supporting patients' self-care practices. This exploration could provide insights into how a support system impacts patient outcomes and adherence to the program.

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## Conflict of Interest

The authors declare no conflict of interest.

## Authors Contribution

Conceptualization: WC, PT, CP; Data collection: WC, PT, SP, NN, SP, OB; Formal analysis: WC, PT, SM; Investigation: WC, SP, NN, SP, OB; Methodology: all authors; Project administration: WC, PT; Resources: CP, SP, NN; Supervision: NP, CP; Validation: PT, NK; Visualization: PT; Writing–original draft: PT, SM; Writing–review & editing: PT, SM; Corresponding authors: PT. All authors read and approved the final manuscript.

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