



Effects of an Individual and Family Self-Management Program on Self-Management Behaviors and Hemoglobin A1C Level Among Older Adults with Uncontrolled Diabetes Mellitus:

A Randomized Controlled Trial*

ผลของโปรแกรมการส่งเสริมการจัดการตนเองของบุคคลและครอบครัวต่อพฤติกรรม
การจัดการตนเองและระดับน้ำตาลสะสมในเลือดในผู้สูงอายุเบาหวานที่ควบคุมไม่ได้:
การวิจัยเชิงทดลองแบบสุ่มชนิดมีกลุ่มควบคุม*

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Abstract

Uncontrolled diabetes mellitus in older adults requires effective self-management strategies involving both the patients and their families. This randomized controlled trial (RCT) aimed to examine the effects of the Individual and Family Self-Management Program (IFSMP) on self-management behaviors (SMB) and hemoglobin A1C levels (HbA1C) among older adults with uncontrolled diabetes mellitus. The participants were 52 older adults with uncontrolled diabetes mellitus attending San Na Meng Municipal Public Health Service Center and Ban Pa Kang Subdistrict Health Promoting Hospital in San Sai District, Chiang Mai Province (26 each in the experimental and control groups). The experimental group received the IFSMP for 4 weeks. The data were analyzed using descriptive statistics, independent t-tests, paired t-tests, chi-square, and McNemar tests.

The study results found that the mean self-management behavior scores of participants in the experimental group significantly increased after participating in the program ($M = 111.30$, $SD = 5.14$) compared to before participating in the program ($M = 81.26$, $SD = 8.27$, $t = -14.159$, $p < .001$) and compared to the control group ($M = 79.92$, $SD = 7.71$, $t = 17.37$, $p < .001$). The proportion of older adults who could control their HbA1C levels after participating in the program was significantly higher than before the program ($p < .001$) and compared to the control group ($p < .001$).

This study demonstrates the effectiveness of the IFSMP. Therefore, health professionals can apply this program to improve SMB in older adults with uncontrolled diabetes mellitus, thereby decreasing HbA1C levels.

Keywords: Hemoglobin A1C level; Individual and family self-management; Older adults; Self-management behaviors; Uncontrolled diabetes mellitus

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บทคัดย่อ

โรคเบาหวานที่ควบคุมไม่ได้ในผู้สูงอายุ จำเป็นต้องใช้กลยุทธ์การจัดการตนเองที่มีประสิทธิภาพร่วมกันระหว่างผู้ป่วยและครอบครัว การวิจัยเชิงทดลองแบบสุ่มชนิดมีกลุ่มควบคุมครั้งนี้ มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมการส่งเสริมการจัดการตนเองของบุคคลและครอบครัวต่อพฤติกรรมการจัดการตนเอง และระดับน้ำตาลสะสมในเลือดในผู้สูงอายุเบาหวานที่ควบคุมไม่ได้ กลุ่มตัวอย่างจำนวน 52 ราย คัดเลือกกลุ่มตัวอย่างด้วยการสุ่มอย่างง่าย จากผู้สูงอายุโรคเบาหวานที่มารับบริการที่ศูนย์บริการสาธารณสุขเทศบาลสันนาเม็ง และโรงพยาบาลส่งเสริมสุขภาพตำบลบ้านป่าแก อำเภอสันทราย จังหวัดเชียงใหม่ สุ่มเข้ากลุ่มทดลอง และกลุ่มควบคุมกลุ่มละ 26 ราย กลุ่มทดลองได้รับโปรแกรมการส่งเสริมการจัดการตนเองของบุคคลและครอบครัว ระยะเวลารวม 4 สัปดาห์ วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนา สถิติ independent t-tests, paired t-tests, chi-square test และ McNemar tests

ผลการศึกษาพบว่า ค่าเฉลี่ยคะแนนพฤติกรรมการจัดการตนเองของกลุ่มทดลอง ($M = 111.30$, $SD = 5.14$) สูงกว่าก่อนเข้าร่วมโปรแกรม ($M = 81.26$, $SD = 8.27$) อย่างมีนัยสำคัญทางสถิติ ($t = -14.159$, $p < .001$) และมีค่าคะแนนเฉลี่ยพฤติกรรมการจัดการตนเองสูงกว่ากลุ่มควบคุม ($M = 79.92$, $SD = 7.71$) อย่างมีนัยสำคัญทางสถิติ ($t = 17.37$, $p < .001$) สัดส่วนของจำนวนผู้สูงอายุที่ควบคุมระดับน้ำตาลสะสมในเลือดได้ตามเกณฑ์หลังเข้าร่วมโปรแกรมมากกว่าก่อนเข้าร่วมโปรแกรมอย่างมีนัยสำคัญทางสถิติ ($p < .001$) และมากกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ($p < .001$)

ผลการศึกษาแสดงถึงประสิทธิผลของโปรแกรมการส่งเสริมการจัดการตนเองของบุคคลและครอบครัว ดังนั้น บุคลากรทางด้านสุขภาพสามารถประยุกต์ใช้โปรแกรมนี้ในการส่งเสริมพฤติกรรมการจัดการตนเองในผู้สูงอายุโรคเบาหวานที่ควบคุมไม่ได้ ซึ่งจะช่วยลดระดับน้ำตาลสะสมในเลือดได้

คำสำคัญ: ระดับน้ำตาลสะสมในเลือด การจัดการตนเองของบุคคลและครอบครัว ผู้สูงอายุ พฤติกรรมการจัดการตนเอง โรคเบาหวานที่ควบคุมไม่ได้

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Background and significance

Uncontrolled diabetes mellitus poses a major public health challenge, causing complications like heart disease, stroke, retinopathy, neuropathy, and ulcers, which reduce the quality of life for older adults (Chentli et al., 2015). The Centers for Disease Control and Prevention (2024) estimates that 135.6 million older adults worldwide live with diabetes mellitus. Among older adults aged 65 years and older with diabetes, 42.3% have uncontrolled diabetes mellitus. In Thailand, the prevalence of uncontrolled diabetes mellitus among older adults varies across age groups: 25.2% of those aged 60-69 years, 26.4% of those aged 70-79 years, and 19.5% of those aged 80 years and over were unable to achieve adequate glycemic control (Aekplakorn, 2021).

Uncontrolled diabetes significantly increases the risk of complications, such as hypoglycemia, coronary heart disease, diabetic nephropathy, kidney disease, stroke, and amputation, which contribute to increased mortality rates. Globally, about 4.2 million deaths among older adults have been attributed to diabetes mellitus (Centers for Disease Control and Prevention, 2024). The mortality rate among older adults with uncontrolled diabetes rose from 23.36 per 100,000 in 2020 to 28.86 per 100,000 in 2021 (Ministry of Public Health, 2022). This upward trend highlights the growing public health concern regarding uncontrolled diabetes mellitus among older adults.

The HbA1C level measures glycated hemoglobin, which reflects an average blood glucose level over the past three months and is formed when glucose attaches to hemoglobin in red blood cells. It serves as a key indicator of long-term glycemic control (Public Health Laboratory Office, Laboratory of Bangkok Metropolis Administration, 2017). Based on current clinical practice guidelines, the recommended HbA1C target for older adults without chronic conditions and without functional dependency is 7%. Whether older adults have high or low blood sugar levels depends on various factors, as demonstrated in a study by Dorji et al. (2017). Dietary behavior, exercise, and medication adherence were statistically significantly associated with glycemic control levels. To achieve optimal diabetes management, older adults should prioritize a comprehensive approach that includes dietary control, regular medication adherence, consistent exercise or appropriate physical activity, and effective stress management. These combined efforts contribute to lowering blood sugar levels.

Self-management behaviors (SMB) refer to the actions practiced by older adults with uncontrolled diabetes mellitus to manage their condition (Sriyasak et al., 2021). Older adults often require assistance with activities of daily living from family members, who play a vital role in supporting SMB. This support can encompass diverse activities such as meal preparation, grocery shopping, shared mealtimes, accompaniment to medical appointments, medication management, encouragement of physical activity, and assistance in managing stress and anxiety. Moreover, family support fosters psychological well-being in older adults. Therefore, strong



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familial relationships and support are significant motivators for them to adopt SMB, which contributes to diabetes control and ultimately leads to improved glycemic control, as reflected in HbA1C levels.

Individual and Family Self-management (IFSM) is a process by which individuals and families utilize knowledge, beliefs, skills, self-regulation abilities, and social support networks to achieve desired health outcomes (Ryan & Sawin, 2009). The process dimension involves: 1) Knowledge and Beliefs 2) Self-Regulation Skills and Abilities, encompassing a six-step process; and 3) Social Facilitation, wherein family and social networks provide support and participate in the individual's SMB journey by offering information, resources, and emotional support.

The researcher developed a self-management promotion program for individuals and families based on IFSM theory to improve self-management behaviors and HbA1C levels in older adults with uncontrolled diabetes. This program consists of education, training, and skill development for both older adults and their families. The activities include three main components: 1) Enhancing Knowledge and Beliefs includes providing education on diabetes and self-care practices for blood sugar control, and promoting self-efficacy; 2) Training Self-Regulation Skills and Abilities involves goal setting, self-monitoring, reflective thinking, decision-making, planning and execution, self-assessment, and emotional management; and 3) Promoting the Use of Social Support aims to enhance confidence and enable family members to support the self-management of older adults. Families play a crucial role in providing informational, instrumental, and emotional support related to diet, medication adherence, exercise, stress management, and ongoing care.

The researcher expects that the IFSM program will improve self-management behaviors and reduce HbA1C levels in older adults with uncontrolled diabetes. Additionally, the program helps reduce the risk of complications related to uncontrolled diabetes in older adults.

Research objectives

To investigate the effects of the IFSMP on SMB and the proportion of older adults who can control their HbA1C levels among older adults with uncontrolled diabetes mellitus.

Conceptual framework

This research applied Ryan and Sawin's Individual and Family Self-Management Theory (2009) as the conceptual framework, focusing on the process dimension. The intervention consisted of three core components: enhancing knowledge and beliefs, promoting self-regulation skills and abilities, and utilizing social support. This process enhances positive outcome expectations and promotes goal congruence between older adults and their family members. With improved self-regulation skills and abilities, they are able to adopt and modify behaviors to improve diabetes management. Older adults and their families collaboratively analyze the causes of undesirable behaviors, establish shared goals, and develop strategies to



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align daily practices with these goals. They actively participate in planning and implementing behavioral changes, followed by regular self-monitoring and self-evaluation to compare actual behaviors with planned strategies. This ongoing process supports continuous adjustment and improvement in self-management.

As older adults and their families develop effective self-management skills, they are better able to regulate diabetes through appropriate dietary management, medication adherence, regular physical activity, stress management, and continuous care. Consistent engagement in these self-management behaviors over an eight-week period is expected to result in a reduction in HbA1C levels.

Methodology

This study was a double-blind, two-parallel-group RCT with a pretest, post-test, and follow-up research design.

Population and sample

The sample group comprised individuals aged 60 years and older with a diagnosis of type 2 diabetes for at least three months and a glycated HbA1C level above 7%. Participants were recruited from the San Na Meng Municipal Public Health Service Center and Ban Pa Kang Subdistrict Health Promoting Hospital in San Sai District, Chiang Mai Province.

Inclusion criteria were: 1) having a family member available and willing to participate in the study; 2) the ability to perform activities of daily living independently, as assessed using the Barthel Activities of Daily Living (ADL), Thai version, by the Department of Medical Services, Ministry of Public Health (2015) with a score of 12 points or higher; 3) having average intelligence and cognition as assessed using the Short Portable Mental Status Questionnaire (SPMSQ), Thai version, by the Chiang Mai Province Public Health Office (2018), with a score of 8 or higher; and 4) the ability of older person participants or their family members to join video calls via the LINE app.

The exclusion criteria included: 1) HbA1C levels less than 7% at baseline; 2) a self-management behavior score greater than 94; 3) conditions affecting HbA1C levels, such as thalassemia, significant blood loss within the past three months, or HIV infection; 4) treatments affecting HbA1C levels, such as hemodialysis; and 5) diabetes mellitus-related complications. A final criterion for discontinuing research participation was the inability of the older adults or their families to attend all scheduled activities.

A priori power analysis was conducted using G*Power version 3.1.9.7 to determine the required sample size. Based on a significance level of 0.05, a statistical power of 0.80, and a large effect size of 0.80 (Cohen, 1988), the required initial sample size was calculated to be 21 participants per group. To account for potential attrition, the researchers increased this by 20%, resulting in a final sample size of 26 participants per group.



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The researchers randomly selected two health centers in San Sai District and screened 52 interested older adults, who were then randomly assigned to the experimental (IFSMP) or control (usual care) group, with 26 participants in each group.

Research instruments

This study employed three types of research instruments: screening tools, intervention tools, and data collection tools. These are detailed below:

1. The screening tools used were: 1) Barthel Activities of Daily Living (ADL), Thai version, by the Department of Medical Services, Ministry of Public Health (2015); 2) the Short Portable Mental Status Questionnaire (SPMSQ), Thai version, by the Chiang Mai Province Public Health Office (2018); and 3) the Diabetes Mellitus Self-Management Behavior Questionnaire, by Sriyasak et al. (2021).

2. The intervention tools consisted of the IFSMP, based on Ryan and Sawin's (2009) theory, which aimed to improve self-management skills in older adults with uncontrolled diabetes. It had three components: 1) enhancing diabetes mellitus knowledge and self-efficacy; 2) improving self-regulation skills, including goal-setting, self-monitoring, reflection, decision-making, planning, implementation, self-evaluation, and emotional management; and 3) encouraging family involvement in self-management, including meal preparation, grocery shopping, shared mealtimes, medical accompaniment, medication management, physical activity encouragement, and stress management. The program was delivered in small groups over four weeks, with active participation in weeks 1–2, follow-up in week 3, and home visits in week 4. Sessions were weekly, except for two in week 2.

Program materials included: 1) a manual for implementing the self-management promotion program for individuals and families; 2) a manual for diabetes knowledge and behavioral management lesson plans for controlling blood glucose levels; 3) self-management lesson plans for individuals and families to control HbA1C levels; 4) a self-monitoring logbook; 5) video clips of older adults' experiences in managing diabetes mellitus; 6) a self-efficacy assessment form on self-regulation; and 7) simulated situations.

3. Data collection tools consisted of:

3.1) the Diabetes Self-Management Behavior Questionnaire (DSMBQ), by Sriyasak et al. (2021), with 40 items assessing five domains: 1) Eating, 2) Medication, 3) Exercise, 4) Stress, and 5) Continuous care management. Scores range from 40 to 120. This questionnaire is categorized into three levels as follows: scores from 40.00 to 66.99 indicate a low level of SMB; scores from 67.00 and 93.99 indicate a moderate level; and scores from 94.00 to 120.00 indicate a high level. It demonstrated strong content validity (CVI = 0.90), and test-retest reliability suggests an extremely high level of consistency (Pearson's correlation coefficient = 0.99).

3.2) HbA1C was measured using the Cobas Mira automated analyzer at the Maharaj Nakorn Chiang Mai Hospital laboratory, using high-performance liquid chromatography (HPLC). The analyzer is certified, regularly maintained every six months, and calibrated.



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Ethical considerations

This study was approved by the Ethics Review Committee, Faculty of Nursing, Chiang Mai University (No. 028/2567, Code: 2566-FULL023, Approval date: 22 February 2024) and registered as a randomized trial with the Thailand Clinical Trial Registry (TCTR20241201004). Participants were free to decline, stop, or withdraw at any time during the study. Once participants agreed to participate, they were requested to sign a consent form.

Data Collection

In this research, the researcher organized the program for all participants in the experimental group, with support from the research assistants (RA), data collectors, and data interpreters responsible for interpreting the SMB and HbA1C results.

As part of the double-blinding process, the researcher was unaware of which participants belonged to the control group or the experimental group (Figure 1):

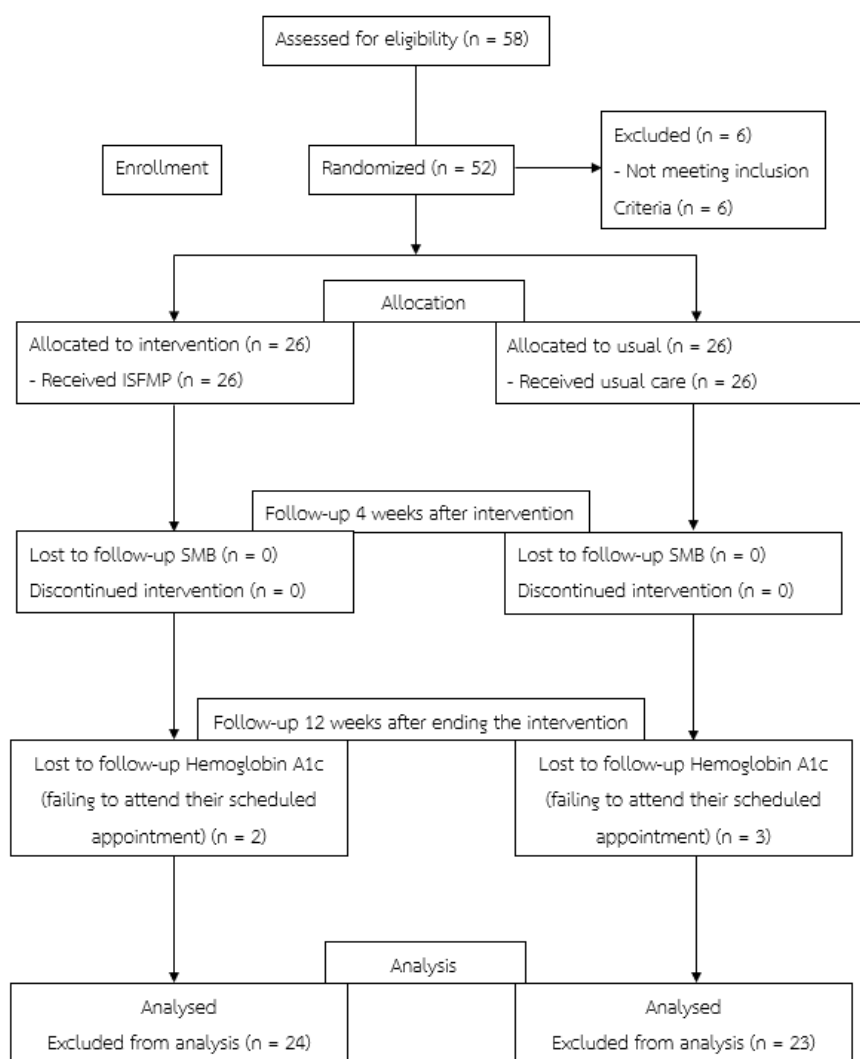


Figure 1: Consort flow diagram of participants and randomization throughout the study



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After obtaining permission to collect data, the RA screened participants for eligibility based on the criteria, assessed them using the DSMBQ, and measured HbA1C levels. The researcher then randomly assigned them into an experimental or a control group and scheduled appointments with both groups via mobile phone to participate in the program. To prevent contamination, the researcher scheduled participants at different times and locations. Furthermore, since the activities involved hands-on skill training that could not be effectively conveyed secondhand, participants were required to attend in person to receive the intervention.

The intervention for the experimental group was conducted across seven appointments, as follows:

Week 1 consisted of an activity to provide knowledge about diabetes mellitus and diabetes mellitus SMB, lasting one hour and 40 minutes, conducted in small groups of four to six families.

Week 2 included a two-day meeting, lasting two hours per day. On day 1, there was an activity to train self-regulation skills and promote self-efficacy awareness, goal setting, self-monitoring and reflection, and decision-making. On day 2, an activity was conducted to promote planning and implementation, self-evaluation, and emotional management. Additionally, families were provided with knowledge and training on their role in supporting self-management, including negotiation skills and strategies to encourage older individuals to practice self-management behaviors for diabetes mellitus. In the self-monitoring and reflection section, older adults were asked to record their SMB activities in a logbook for one week. The researcher reviewed the logbooks to identify any issues hindering goal achievement and then collaborated with the older adult and their family to address these challenges. After each activity, the researcher assessed self-efficacy perception and provided encouragement. These activities were conducted in small groups consisting of four to six families.

Week 3 had a self-management follow-up activity, in which the researcher contacted participants by phone using video call via the LINE app. Each follow-up session with an older adult and their family lasted 30 minutes.

Week 4 consisted of a one-hour home visit for each older adult based on the problems encountered.

Weeks 5-16 involved older adults and their families practicing SMB to control their HbA1C levels, independently.

The control group received the usual care according to the diabetes guidelines for the health promotion hospital at home during weeks 1-16.

Four weeks after the end of the program, the researcher scheduled appointments for both the control and experimental groups to complete the DSMBQ with the RA.

Twelve weeks after the end of the program, the researcher scheduled appointments for both the control and experimental groups to have their HbA1C levels measured by the RA.



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Data analysis

Data were analyzed using SPSS (Chiang Mai University copyright). Descriptive statistics summarized personal data. The chi-square test compared group differences, while a univariate t-test analyzed SMB mean scores before and after the intervention in the program group. An independent t-test compared SMB scores between experimental and control groups. The chi-square test assessed glycemic control proportions between groups, and the McNemar test evaluated glycemic control changes within the experimental group.

Results

This study initially included 52 participants, divided into an experimental group and a control group with 26 participants in each group. The participants remained engaged in the program until all the designated sessions were completed. However, a total of five participants were lost to follow-up. Specifically, two participants from the experimental group and three from the control group were lost during the second HbA1C measurement. The reasons included failure to attend scheduled appointments, the researchers' inability to contact them, and some participants relocating to a different healthcare facility.

Demographic characteristics of the participants

Most participants in both groups were female (65.40% control, 61.50% experimental), with an average age of 70.65 years (SD = 8.34) in the control group and 68.80 years (SD = 6.96) in the experimental group. The majority had a BMI ≥ 23 (69.20% control and experimental) and a primary education (69.20% control, 73.10% experimental), and relied on the older adults allowance for income (96.20% control, 88.50% experimental). The average diabetes mellitus duration was 5.27 years (SD = 3.94) in the control group and 8.27 years (SD = 6.08) in the experimental group. The majority of participants were taking 1–2 medications (61.5% in the control group and 69.2% in the experimental group), and all participants in both groups (100.0%) received family caregiving support. No significant differences were found between the groups.

Self-management behavior

The experimental group had a mean self-management behavior score of 81.26 points (SD = 8.27) before the intervention and a mean score of 111.30 points (SD = 5.14) after the intervention. A comparison of mean self-management behavior scores revealed a statistically significant increase from pre-intervention to post-intervention ($t = -14.159$, $p = 0.000$) (Table 1).

Table 1: Comparison of mean self-management behavior scores of the experimental group before and after the 4-week program

Self-management behavior assessment score	M	SD	t	p-value
Before the study	81.26	8.27	-14.159	0.000*
After completing the study	111.30	5.14		

* $p < 0.001$



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The control group had a mean self-management behavior score before the experiment of 79.69 points (SD = 7.81) while that of the experimental group was 81.26 points (SD = 8.27). After the experiment, the self-management behavior score for the control group was 79.92 points (SD = 7.71); for the experimental group, the score was 111.30 points (SD = 5.14). There were no significant differences when comparing the mean self-management behavior scores before the experiment between the control and experimental groups. After the experiment, however, the experimental group's score was significantly higher than that of the control group ($t = 17.37$, $p = 0.000$) (Table 2).

Table 2: Comparison of mean SMB of older adults with uncontrolled diabetes before and after the 4-week intervention in the control and experimental groups ($n = 26$)

Self-management behavior score	Control group ($n = 26$)			Experimental group ($n = 26$)			t	p-value
	Range	M	SD	Range	M	SD		
Before the study	63-92	79.69	7.81	63-92	81.26	8.27	7.377	0.248
After the study	64-93	79.92	7.71	96-119	111.30	5.14	17.37	0.000*

* $p < 0.001$, ES = 4.79

Hemoglobin A1C Level

All participants had HbA1C levels above the target ($>7\%$) before the experiment. Afterward, in the experimental group 18 reached the target, while six did not. The improvement in the experimental group was statistically significant ($p = 0.000$) (Table 3).

Table 3: Comparison of the proportion of older adults in the experimental group who achieved glycemic control (hemoglobin A1C) before and after the 12-week IFSMP ($n = 24$)

Hemoglobin A1C	Passed the criteria	Did not pass criteria	p-value
Before the study ($n = 24$)	0	24	0.000*
After the study ($n = 24$)	18	6	

* $p < 0.001$

Before the experiment, all participants had blood glucose levels exceeding the target. After 12 weeks, four in the control group and 18 in the experimental group achieved glycemic control. The experimental group showed a significantly higher improvement ($p = 0.000$) (Table 4).



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Table 4: Comparison of the proportion of older adults who achieved glycemic control (hemoglobin A1C) before and after the 12-week intervention in the control and experimental groups

Hemoglobin A1C		Control group (n = 23)	Experimental group (n = 24)	p-value
Before the study	Passed criteria	0	0	-
	Didn't pass criteria	23	24	-
After the study	Passed criteria	4	18	0.000*
	Didn't pass criteria	19	6	

*p < 0.001

Discussion

This research examined the effect of the IFSMP on SMB and blood glucose levels among older adults with uncontrolled diabetes mellitus.

These findings suggest that the IFSMP, based on Ryan and Sawin's Individual and Family Self-Management Theory (2009), effectively improved SMB. The program employed the process dimension as a conceptual framework, which included the following key processes.

The first process involved promoting knowledge and beliefs to review knowledge that the participants (older adults) had previously received, emphasizing and reviewing essential points so that they and their families had more accurate knowledge and beliefs about diabetes. Repeatedly reviewing knowledge on important points will help older adults and their families remember and be able to practice it (Ahmad et al., 2022). Families gain knowledge about diabetes mellitus that they may not have received before. When families know more about diabetes mellitus, they understand how to manage it and use the knowledge they gain to help older adults manage themselves better. As Jalilian et al.'s (2014) findings also demonstrate, when families know more about diabetes mellitus, they understand how to manage it and use the knowledge they gain to help older adults manage themselves better.

In addition, the researchers also promoted self-confidence in the patients by using videos of the experiences of older adults. Using role models who are also older adults will help increase confidence in acting, encouraging individuals to practice continuously until it becomes a habit, resulting in higher scores for SMB (Albikawi et al., 2015). In addition, after each activity, encouraged participants and their families to be more confident. Using encouraging words can help promote self-efficacy awareness in older adults and their families who are not satisfied with how they are managing themselves. By encouraging, praising past efforts, and showing progress in practicing SMB, the researcher helped older adults and their families feel value and



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confidence in their ability to manage themselves, resulting in better SMB.

The second process was related to teaching self-regulation skills and abilities and consisted of six topics: Goal setting helps older adults and their families have clear goals; it helps them plan and set directions for better diabetes mellitus control behaviors. This also helps increase confidence when achieving the set goals, resulting in higher scores for SMB as similarly demonstrated in a study by Naik et al. (2011).

Self-monitoring and reflection help both older adults and their families identify previous inappropriate SMB, leading to changes and more appropriate SMB in the future. This allows participants to practice appropriate behaviors consistently, leading to higher levels of SMB. When individuals and their families record their self-monitoring in a logbook, it helps them recognize past behaviors, such as whether they ate more than their body needed, exercised less than their set target, forgot to take their medication, or took it at the wrong time. This awareness leads to improved SMB and higher levels of SMB. Similarly, findings from Adu et al. (2020) suggest that structured self-monitoring and reflection (e.g., maintaining a logbook) promote sustained behavior change, thereby improving and increasing SMB levels.

Developing decision-making skills helps older adults and their families build on their abilities to make choices. Therefore, when they return home to situations that present obstacles to SMB, they have clearer guidelines and greater confidence in making sound and consistent decisions, resulting in improved SMB. Similarly, Fitzpatrick et al. (2016) found that improved decision-making capacity was associated with more consistent self-management in the face of everyday challenges.

Promoting planning and implementation enables older adults and their families to develop SMB plans aligned with their goals and individual needs. When participants adhere to these plans and observe progress, their confidence in SMB grows, leading to improved SMB. This finding aligns with Vos et al. (2019).

Promoting self-evaluation helps older adults and their families recognize their abilities and limitations in SMB, the recognition of which enables them to refine their SMB plans to better align with their capabilities. When older adults can confidently adhere to their plans, SMB increases. Similarly, Nejhaddadgar et al. (2019) reported that self-evaluation and reflection supported plan adjustment and improved self-management behaviors.

Promotion of emotion management occurs when events make SMB difficult. This process provides older adults and their families with strategies to manage such emotions. When older adults and their families manage these emotions together, it helps them practice SMB consistently, preventing lapses in self-care and leading to improved SMB. Similarly, Tefvik and Bektas (2009) found that emotion-management strategies helped individuals maintain self-care behaviors during challenging situations.



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The third process involved promoting the use of social support sources for SMB. When families have accurate knowledge about diabetes and understand their role in supporting SMB, such as preparing suitable meals, exercising together, reminding individuals to take medication on time, accompanying them to medical appointments, and providing emotional support, they are better able to offer assistance. Additionally, families can negotiate and provide support by reminding older adults if they consume too much food or neglect physical activity, which leads to improved SMB among the older adults. The researcher followed up with video calls for an additional seven days to monitor SMB, helping identify challenges faced by older adults and their families. The researcher then provided solutions and offered praise and encouragement to those practicing correct SMB, further boosting their adherence to healthy behaviors. Similarly, Nguyen Viet et al. (2020) reported that structured follow-up and supportive feedback strengthened adherence to self-management behaviors.

After seven days, the researcher visited each older adult's home to inquire about their challenges and daily activities. The visit provided insights into their environment and routines, highlighting positive and negative SMB. The researcher worked with participants and families to adjust inadequate SMB and promote strategies suited to each context. Older adults showed improved SMB capacity through consistent practice of effective strategies. Similarly, Kaveh et al. (2022) found that home-based support and context-tailored guidance improved self-management capacity and sustained behavioral practice.

Compared to usual care which often focuses on providing knowledge in large groups, where individuals have limited opportunities to exchange experiences, opinions, knowledge, and beliefs about diabetes mellitus, this program offers a more individualized approach. Usual care often lacks family involvement, comprehensive diabetes education, straightforward SMB processes, or tailored individual support. This personalized support may include a variety of care types, such as home visits or mobile phone follow-up. As a result, those who participated in the SMB promotion program had higher SMB scores than the group who received their usual care. Similarly, Wisarapun et al. (2020) reported that individualized, family-involved support led to better SMB outcomes than usual care.

Moreover, the research results showed that the proportion of older adults achieving glycemic control (HbA1C) after participating in the program was significantly higher compared to before the program ($p < .001$) and notably higher than in the usual care group ($p < .001$).

Older adults with uncontrolled diabetes mellitus showed low to moderate SMB, but the program led to significant improvements. It focused on five self-management areas: following a diabetes mellitus-appropriate diet, adhering to glucose-lowering medication, engaging in exercise, managing stress, and seeking ongoing care. Over 12 weeks of consistent practice, participants achieved a reduction in HbA1C levels below the standard criteria. In contrast, the usual care group had only four out of 23 individuals reach glycemic control. The higher number



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of individuals not achieving control in the usual care group may be due to limited support, as nurse interactions were brief and lacked personalized attention. Additionally, there was no encouragement of family involvement or training in SMB skills, which likely prevented improvements in SMB and contributed to continued elevated blood glucose levels. Similarly, Jiang et al. (2023) found that structured, skills-based interventions with ongoing support were associated with improved glycemic outcomes compared with usual care.

Limitations

The design of the IFSMP requires nurses with expertise in caring for diabetes patients, who can apply the Individual and Family Self-Management concept and provide guidance to help patients address health problems in a timely and appropriate manner. Therefore, this role may be more challenging for new graduates or general nurses who do not have specialized training.

Application of research findings

This study demonstrates the self-management program's effectiveness in increasing SMB and lowering HbA1C levels. Healthcare personnel can apply this program to improve SMB in older adults, reducing diabetes mellitus complications. Hospital executives should support nurses in obtaining specialized diabetes care training and establish guidelines for implementing the program to improve SMB and HbA1C outcomes for older adults.

Suggestion for further research

Future studies should incorporate ongoing HbA1c follow-up to evaluate whether glycemic improvements are sustained over time and to identify when additional support may be needed.

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