

Review

A Systematic Review: Family Support Integrated To Diabetes Self-Management among Glycemic Uncontrolled Type II DM Patients

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Abstract:

Background: Diabetes mellitus is dramatically increasing in the wide world. The managing of diabetes care emphasized the self-management education and support into patients' care and family care.

Objective: to review and synthesizes the effectiveness of DSME strategies involving family as a key person to provide social support for diabetes mellitus self-management of glycemic uncontrolled patients

Method: Three databases through PubMed, CINAHL, and Scopus were reviewed to assess the relevant articles. The following search terms: "type 2 diabetes," "self-management," "family support," and "glycemic uncontrolled." We summarized details of family support on self-management among glycemic uncontrolled patients for 14 existing studies.

Results: A total of 22 intervention studies were identified. Those studies have a heterogeneous of the education strategies, support perceived, follow-ups strategies and outcomes among type 2 DM. Family integration on diabetes self-management education (DSME) has a positive impact on several outcomes including, self-care behaviors, psychological outcomes, self-efficacy and clinical outcomes

Conclusions: This systematic review found robust data related to the integration of family support on diabetes self-management among glycemic uncontrolled patients. Consequently, the improvement in outcomes was identified.

Implications: The findings suggest model of family engagement is better and needed for sustaining the diabetes care in the long-term care

KEYWORDS: Diabetes self-management; Family support; Glycemic uncontrolled; Type 2 DM; Systematic review.

1. Introduction

Prevalence of diabetes mellitus (DM) is steadily increasing in the world. World Health Organization (WHO) (2014)⁽¹⁾ estimated that 422 million people have been diagnosed with DM globally. In the Asian region, the prevalence of diabetes mellitus could be estimated to be 300 million people in 2025⁽²⁾. From those numbers, only 14.3% meet the target goals of the HbA1c level ⁽³⁾. A higher level of HbA1c more than 8% is considered as a poor glycemic control ⁽⁴⁾

Glycemic uncontrolled type 2 DM associated with serious multiple long-term complications, including constricted of blood vessels, nephropathy and retinopathy, neuropathy, peripheral, and problems of the cardiovascular system ⁽⁵⁾. Several factors were linked with glycemic uncontrolled type 2 diabetes mellitus, including unhealthy eating habits, physical inactivity, non-adherence to medication, lack of regular home glucose monitoring⁽²⁾.

Managing of diabetes mellitus is a cornerstone to prevent the long-term complication and improve the quality of life among the population ⁽⁶⁾. American Diabetes Association suggested the diabetes self-management education (DSME) method as a potential foundation for diabetes care. The managing of care is relatively complex among diabetes patients because they have to visit a medical doctor regularly; adhere to medication taken for controlling the blood glucose and prevents complication; take part in self-care behaviors including, self-monitoring blood glucose, dietary control and physical activity ⁽³⁾. However, adjusted to these activities always be accompanied by some daily demands on diabetic care and patients' barriers including frustration emotional distress and unbalancing of life commitment ⁽⁷⁾

Lack of knowledge, low-level of self-efficacy and lack of social support in particular from a family member are challenging in DM self-management ⁽⁸⁾. A family member is a key person in biologically, legally and emotionally to support and care for patients with diabetes ⁽⁹⁾. Most of the diabetes management is conducted within their families and social environment. Thus, assessing of the

family member is the fundamental part since the family has contributed to successfully of diabetes management.

Family members are always required to share the role of diabetes care. Family can also provide some forms of support such as instrumental support for making an appointment with health care provider or helping for insulin injection and emotional support when patients faced the psychological problem during long-term self-care^(9, 10). Guidelines on diabetes care emphasized the self-management education with support in patients' care and families care in which significantly enhance the diabetes self-management. Therefore, an individual education program for patients with diabetes mellitus could limit its impact on the patient since the family has roles in diabetes management.

Diabetes self-management education with family approaches to diabetes management can emphasize the context of the family's roles, as well as education, patients and family needs on diabetes care and promote of diabetes self-management. However, not many review studies explore how family support integration enhances the diabetes self-management among type 2 DM. Thereby, this review will review the appropriate intervention and explore how the family support integration approach can influence the diabetes self-management education (DSME) among patients with type 2 DM.

2. Objective

The study aimed to review and synthesizes the effectiveness of DSME strategies involving the family member as a key person to offer social support for diabetes mellitus self-management of glycemic uncontrolled patients.

3. Methods

This review described the effectiveness of family involvement in diabetes self-management among glycemic uncontrolled patients. We used the PRISMA statement of all stages of the review

3.1 Eligibility Criteria

The PICO (Participant-Intervention-Comparison-Outcomes) formats based on Joanna Briggs Institute (JBI), (2014)⁽¹¹⁾ to create the criteria inclusion for reviewing the articles. In originally studies among uncontrolled type 2 DM with any treatment strategies such as by using the didactic method, participatory learning, Internet-based method for intervention and usual care were included in this review. Specific reasons for excluding the article are an inappropriate subject (diabetes medication or treatment), research design (a single design, descriptive design, qualitative research) or no control group, not an academic journal, and intervention journal without family involvement. Studies focused on diabetes prevention or target population gestational is also excluded.

HbA1c was a primary outcome that reflected the glycemic controlled the last 3 months. Secondary outcomes were self-care behaviors (Diet, physical activity, blood glucose monitoring, foot infection, and medication adherence), physiological outcomes, self-efficacy and social support and clinical outcomes (HbA1c/Blood glucose level, Blood pressure, BMI status, and lipid profile).

3.2 Search strategy

The search strategy used to find the relevant articles, including “type 2 diabetes,” “self-management,” “family support,” and “Glycemic uncontrolled.” Available title and abstract of articles were reviewed by systematically searching to gain the relevant of DSME with family support program term.

3.3 Study selection

Databases accessed through PubMed, CINAHL, and Scopus in this study. We searched and identified the relevant articles published from 2008 through 2016. After removing the articles duplication, the proper articles of relevant abstracts were also retrieved.

3.4 Synthesis of Results

The results of this review described narratively. The describing of the results explained about 1) diabetes self-management education (DSME) program, 2) how to integrate the family support into DSME program, and the effectiveness of the program on health outcomes.

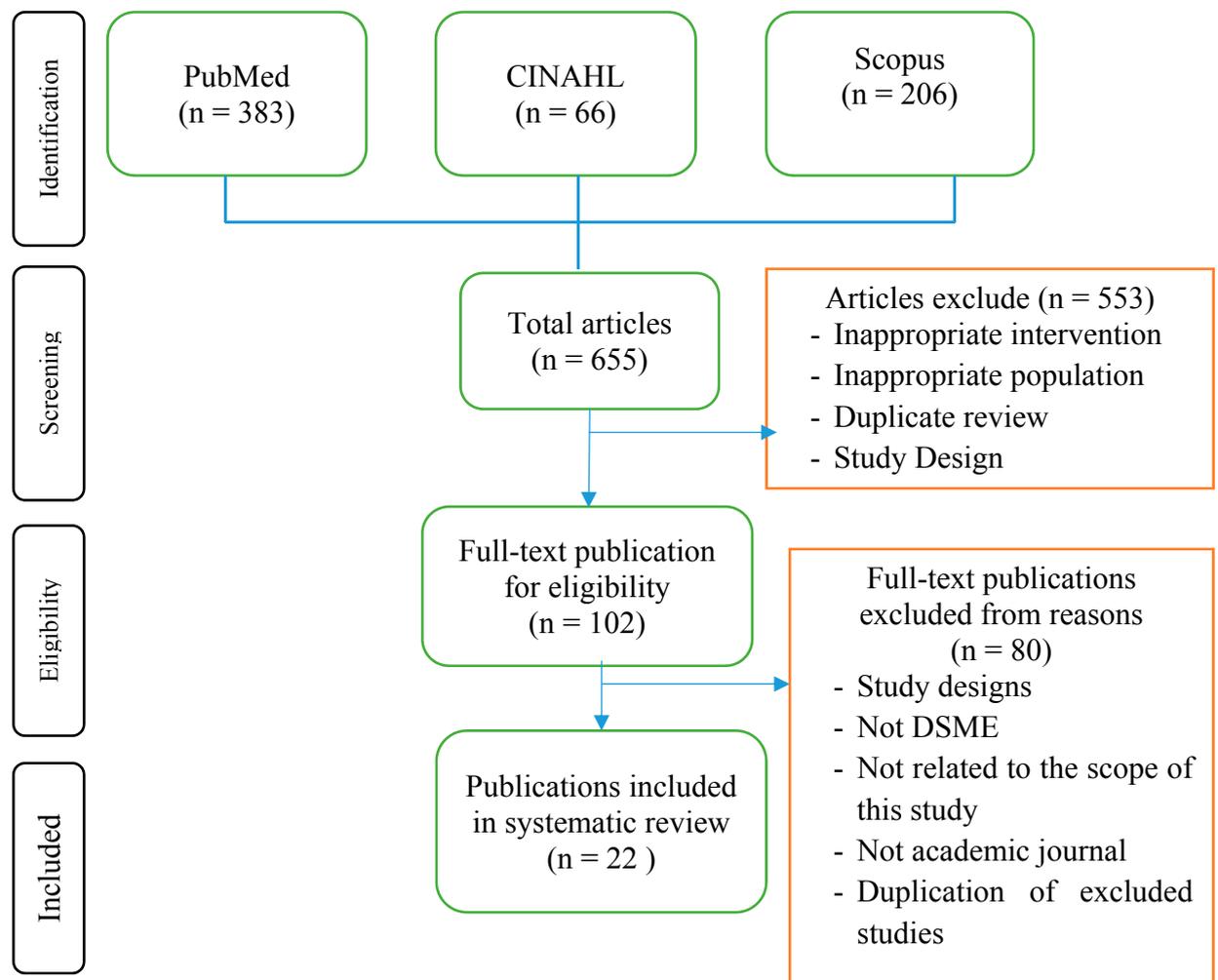


Figure 1. Summary of evidence search and selection

4. Results

Twenty-two recently experimental studies were conducted to explain a diabetes self-management education (DSME) with family support program on diabetes self-management among glycemic uncontrolled patients. Most of these studies are randomized controlled trials (RCT) ⁽¹²⁻³²⁾ and three studies were conducted by the quasi-experimental study ^(13, 33, 34). From those fourteen studies, thirteen studies were conducted in Western countries ^(12-14, 16-19, 22-27, 29-34), whereas only one study was undertaken in Asian countries ⁽²¹⁾

4.1 Diabetes Mellitus Self-Management Education (DSME)

We found that DSME based individual program was conducted into 40.9% of the studies ^(12, 13, 16, 20, 23, 25, 29, 30, 32) and 59.1% of the studies offered the DSME in a combination of individual and group education ^(12, 14, 15, 17, 20, 21, 27, 31, 32, 34). In general, The individual or group-based program provided the intervention of several strategies, including personalized counseling, feedback regarding goal-setting and problem-solving, support for self-care practice from family members, and the follow-up session.

4.1.1 Strategy of Diabetes Self-Management Education

In general, self-management education is divided into three approaches including didactic (offering the learning material throughout educational sessions and following by discussion), participatory learning (encouraging active patients' involvement in the learning process, a discussion session, goal setting, negotiation, and problem solving), and mix (combination of didactic and participatory learning).

Of the 22 existing studies, 16 studies presented group based education or individualized counseling on several strategies such as set the, action planning, problem solving and follow-up strategies ^(14-16, 18, 19, 21-24, 27, 29, 31-34). To improve the knowledge and communication skill, one study the offered a DVD-based training program⁽¹⁷⁾. In addition, other study used a Bluetooth technology to access the

health condition and to communicate with family practice teams ⁽¹²⁾. Aikens' study expanded DVD-based training program to influence the communication skill ⁽³⁵⁾. Another study presented the cooking class to demonstrate the health food ⁽²⁰⁾. A study offered diabetes telemonitoring calls by using the mHealth + CarePartner (CP) to improve diabetes self-management and supporting their blood glucose monitoring ⁽²⁶⁾.

4.1.2 Education Materials

The material of this review varied across from the studies. A bluetooth technology was incorporated to deliver the diabetes information ⁽¹²⁾. Four studies used food model, picture, illustration, foot picture ^(14, 18, 20, 24). Diabetes handout/booklet (diet, exercise, medication, eye, and foot self-care) been used to spread the knowledge ^(15, 16, 19, 21, 30, 32, 36). In addition, four studies^(13, 14, 20, 34) used video and DVD to show the successfully of self-care behaviors practice among diabetes patients. Another study used a mobile health (mHealth) to monitor the behaviors and update the diabetes information ⁽²⁶⁾

4.1.3 Follow-up Strategies

Follow-up strategies are essential components in diabetes care to sustain the self-care management behaviors. This review verified that five studies follow-up the program by using a face-to-face follow-up ^(12, 15, 17, 22-24, 33). Three studies were noticed to follow-up the program by using the telephone method ^(13, 14, 25, 26, 32). Mix of telephone and face-to-face follow-up strategies ^(18-20, 29) and two studies did not mention about the follow-up process for evaluating the program ^(16, 21)

4.2 Integration of family support in the DSME program

In recently, DSME program is incorporated into primary care unit or community. Regardless of this setting, the effectiveness of communication and supporting skill on diabetes care is required to influence the self-management behaviors and promote the effectiveness of a coping with day to day care ⁽³⁷⁾. In this review, family involvement in the program across studies. From 22 existing studies, 13 studies involved patient and family members as a unit intervention and required family member to attend the education class or meeting ^(14, 15, 19-22, 24, 26, 27, 29, 31-34), 8 studies focused on patients ^(12, 13, 16-18, 23, 30, 32). However, sometimes they asked the family members as a part of support system in the education session, such as support in solving stress when feelings of denial, the presence of discordant conditions, and retirement.

In Karen's study ⁽¹⁹⁾, family members were needed to assist and support patients in the self-management by facilitating them to influence skills including strategies planning, goal setting, and problem-solving. Effective feedback on the negative perception of diabetes by exchanging the health information, reducing the care resistance and building self-efficacy is emphasized by family members.

In other studies, the author stated that patients received an interactive voice response (IVR) calls to monitor the barriers of self-management, medical check-up seeking and connecting with family members as a caregiver. The role of the family in this session to record patient's improvement, as well as problem during implemented the program and support for self-management behaviors ^(13, 35).

A study was conducted by using a social cognitive theory focused on the social environment change especially family member to influence the self-efficacy, diabetes self-management and to solve barriers. Family members demonstrated against exercise and shared the healthy meal.

Families emphasized the cultural belief and values in terms of dietary change, physical activity and monitoring blood glucose in order to meet with needs. Family supportive and relationship are associated with diabetes self-management ⁽¹⁴⁾

While a study offered the communication skill using the speakerphone among couples to support and solve the problem of behavior changed ⁽³⁸⁾. This program focused on couples communication skill such as homework and discussion tasks, goal setting and problem-solving. The effectiveness of collaborative chronic care approaches is a fundamental method to achieve goals and tailor intervention in glycemic uncontrolled type 2 DM.

In Ananda's study⁽²⁶⁾ stated that participants received mHealth +CarePartner (CP) program to monitor the self-management behavior among diabetes patients. On another side, family members also received the email updates on the patient's diabetes and guidance of supporting their self-management. This program is effective to improve the glycemic control and patient-family relationship.

Regarding the emotionally supportive behaviors, seven studies address the psychosocial problem such as feelings of denial, the presence of discordant conditions, and retirement that might occur among diabetes patients ^(14, 19, 22, 23, 35, 39).

The effectiveness of family support integration in DSME program has been shown in cost-effective related to reduce the risk of complication ⁽¹³⁾. DSME is also reported to improve HbA1c level by as much as 1% among glycemic uncontrolled patients. ^(12, 15, 18, 19, 21, 22, 24, 32, 33). In addition, several outcomes have a positive effect on psychosocial ⁽³⁵⁾, self-efficacy ^(14, 24), dietary and physical behavior aspects ⁽¹⁹⁾, perceived support ⁽¹⁵⁾, knowledge⁽³²⁾, medication adherence and quality of life ⁽³²⁾ . The

improvement in several outcomes has clearly confirmed the importance of family involvement in diabetes self-management education.

4.3 Effectiveness of family support integration on diabetes Outcomes

DSME with family support has a significant effect on varieties outcomes of existing studies in this review. The outcome will be classified into five outcomes, including self-care behaviors (Diet, physical activity, blood glucose monitoring, foot infection, and medication adherence), physiological outcomes, self-efficacy and social support and clinical outcomes (HbA1c/Blood glucose level, Blood pressure, BMI status, and lipid profile), as follows

4.3.1 Self-care behavior outcomes

Based on the inclusion criteria of the database search, 14 intervention articles examined the impact of DSME with family support on self-care behaviors. There is strong evidence reported that following good self-care behaviors, including diet, physical activity, blood glucose monitoring, foot inspections, and medication adherence have a significantly improve the clinical outcomes and prevent long-term complications⁽⁴⁰⁾. Two studies have a positive impact on healthy dietary intake ^(27, 31) after receiving the DSME with family support involvement. Other study showed an appropriate in selecting healthy food and food exchange ⁽²⁰⁾, while five studies focused on exercise behavior outcomes of diabetes ^(13, 21, 27, 31, 34). Both of those studies showed the high level of family support integration on DSM program.

In addition, when the correlation between support perceived with blood glucose monitoring was examined, four studies have been found. Those studies confirmed that higher level of support is significantly influencing the blood glucose monitoring at home ^(13, 14, 17, 20, 24, 34). For medication taking behavior, seven studies

demonstrated that regularly medication adherence was conducted under the family support ^(14, 15, 18-21). Furthermore, this review confirmed that the increasing of self-awareness on foot inspections is correlated to foot ulcer prevention^(13, 34).

In opposite of the previous study, four studies showed not significantly on medication adherence under the family support ^(12, 20, 22, 23). It could be correlated with low family participation ⁽²⁰⁾, understanding of patient and family member roles, and patients' adoption on medication adherence in the long-term period ⁽²²⁾. Those opposing results indicate that study limitation had minimized the resulting effect.

4.3.2 Psychological outcomes

As an approach to explore the psychological problem in managing self-care behaviors, barriers related to psychosocial were reviewed in this review. Emotional distress associated with poor diabetes self-care and glycemic control which impacted to emotional responses, including feeling discouraged of diabetes treatment, worrying of long-term complications, and incorrectly defining the concrete of goals for diabetes cared ⁽⁴¹⁾. From those existing studies, twelve studies addressed the psychological status as the intermediate outcomes, which reported that higher level of family support has a positive impact on reducing depressive symptoms ^(13, 15, 22, 26) and positive emotional control ⁽¹⁶⁾, psychosocial well-being ^(19, 31, 34), quality of life^(26, 32) and diabetes related to distress and reducing barriers ⁽¹⁷⁾. As the results, less depression has positive impacts on self-care behavior and certain clinical outcomes

4.3.3 Self-Efficacy

A concept of self-efficacy was generated in the context of cognitive behavior modification among patients with chronic

conditions. Five review studies explained that patients who have higher perceived support are significantly better self-efficacy^(12, 14, 16, 20, 24). One study received the one-on-one tailored education session and bi-weekly follow-up to influence the self-efficacy on performing self-management⁽³²⁾. Consequently, this self-efficacy will improve on self-management practice.

4.3.4 Social Support Perceived

Support is a fundamental approach to sustaining self-care behaviors among diabetes patients. Six experimental studies described the impact on family support integration on social support perceived.^(12, 13, 15, 22, 23, 36) While one study explained the positive impact of on the quality of the relationship between patients and family member in managing the diabetes self-management behaviors⁽²⁶⁾. For this reason, social support was effective for improving the diabetes self-care behavior.

4.3.5 Clinical Outcomes

Twenty-two articles were reviewed that examined the effect of DSME with family support on clinical outcomes. Ten review studies showed the improvement on HbA1c^(12, 15, 18, 20-22, 24, 30-32) after succeeding the diabetes self-management. Five studies focused on the dietary modification support to improve blood pressure level^(12, 20, 21, 26, 29). In addition, the relationship between perceives support and lifestyle modification also improved body mass index^(12, 33) and lipid profile^(21, 29, 32). These studies showed the high level of family support in sustaining self-care behaviors. Another study also reported that patients in the experimental group that received the one-on-one peer support with DSME program had positive impact on improving blood pressure, LDL level and BMI index than comparison group⁽³²⁾

In opposing to the previous study, two studies confirmed that no significantly change in systolic blood pressure, triglycerides and BMI ⁽²⁵⁾. It could be linked to the low level of peer support group in the long term period. Other studies also showed no significant on HbA1c level ^(29, 32, 34)

5. Discussion

We conducted the systematic review of 22 existing studies related to diabetes self-management education (DSME) with family support from 2008 to 2016. The results confirmed that impact upon family integration on several health outcomes of type 2 DM. Many studies are strong of study design such as randomized controlled trials

The diabetes self-management education based family intervention is often generated by individual and group education. This strategy offered in a combination of didactic teaching and interactive or participatory learning approach. Some studies conducted the diabetes self-management education with mix teaching methods by involving the family members into a collaborative approach ^(12, 14, 15, 17, 20, 21). The combination of didactic with other methods such as goal setting, action plan and problem solving has a positive impact on health outcomes and improve health behaviors ^(13, 17-21, 23).

This literature review also found that the integration and involvement of family members into collaborative approach was verifying widely across studies. Many studies incorporated the details of family members into program activities such as providing the emotional support regarding problem-solving and helping patients to solve the emotional distress or provide informational and roles to facilitate, accommodate, remind motivate and partner with behavior change and do tasks. Some studies in this literature review found that family members were included in an intervention program. However, lack of information about how family members provide the support in diabetes self-management behaviors,

interaction in the program and what family outcomes should be addressed from intervention. Only a few study described the role of the family member in the participatory learning. In addition, some studies unconsidered about the key person in that family that has a responsibility to provide caring for the diabetic patients. In order to effectively to engage family members in the intervention, the clearer understanding of the theoretical basis of involving family members is needed to serve the patients during performing the self-care behaviors.

The duration of the intervention and follow-up is measured by using the length of the intervening period from the pre-test until completing the program. The length of the program is divided in the short-term (less than six months), medium (six months to 12 months), and long-term (more than 12 months). Studies conducted in the short term duration of several strategies, including weekly telephone follow-up, face to face follow-up, negotiating, and discussing to design the goals and action plan, and modify the goals and action plan were more effective to improve the health outcomes (12, 13, 15, 17-20, 23). On other hands, long-term studies were increasingly emotional discouraged. Higher of perceived self-efficacy associated with the feeling of empowerment ⁽⁴²⁾

Follow-up is an essential component in diabetes self-management among patients with chronic conditions. Generally, follow-ups are categorized into four strategies, including assisting computer-based, phone call, short message service (mail), and home visits. In this literature review, follow-up strategies are used to assess the patient's experience of the program, identify the barrier and use a problem-solving approach to address barriers revise the action plan to meet the goals, and reinforce any successful performance dietary and exercise self-management. Combination of telephone and face to face follow-up is very effective to monitor the patients' achievement and significantly improves the health outcomes by increasing knowledge and self-efficacy to carry out self-management behaviors ^(14, 18)

A study that assessed the outcomes found there is a significantly on

clinical outcomes such as HbA1c, blood pressure, lipid profile and BMI status have been improved after implementing the program. Three studies mentioned that no significant change of HbA1c level in the short intervening period ^(17, 20, 23). Other issues in the self-care that is often faced with diabetes patients are to maintain the behavior after the end of the intervention period. However, the engaging of a family member could help the patients strengthen self-care interventions in the longer intervention period ^(43, 44).

6. Strength & Limitation

Although in this review, we reviewed many studies involving the family member in diabetes self-management with randomized control trial (RCT) design. However, some limitations are still found in this review. Heterogeneous methods, strategies, populations settings, and outcomes make it difficult to compare the effect size of each study. Even though we created this systematic review by hand tracking, there may be some studies related to family support for diabetes self-management unidentified.

7. Conclusion

Developing diabetes intervention in family support is an integral part of sustaining the self-care behavior and improve the health outcomes. Various studies showed the heterogeneity of the teaching strategies, follow-up, material, instruments, and outcomes. Further study needs to provide details of diabetes self-management education in the intervention and compare the health outcomes of and without family involvement. In addition, the role of family participation should be assessed in diabetes self-management interventions and how the family involvement can affect outcomes.

References	Design	Component of DSME	Integration of family support in DSME	Follow-up	Education materials	Outcomes
Wild (2016) ⁽¹²⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - Providing the Bluetooth technology for transmitting readings for patients and family - Advice on lifestyle modification, on lag time for effects of lifestyle and medication change on glucose and blood pressure - Providing information when and how to contact family practice team via research nurses. - Support 	<ul style="list-style-type: none"> - Family as an informational support to link with health care provider 	<ul style="list-style-type: none"> - Week 6 Face to face follow - Last follow up in ninth month 	Bluetooth technology	<ul style="list-style-type: none"> - Significant of HbA1c, systolic blood pressure, diastolic blood pressure - No significant of weight, treatment pattern, adherence to medication, or quality of life
Garcia (2015) ⁽²⁵⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - The participants received the DSME including, diabetes overview, eating with diabetes, physical activity, managing emotions etc. - Participants received glucose meter to test the blood glucose 3 times per day for six months - Participants were assisted to access the resources needs - Assisting in setting goals and problem-solving 	<ul style="list-style-type: none"> - Families were encouraged to attend the education session at home - The program consisted of eight one-on-one tailored education session such as self-management behaviors - Families were assisted to access the resources needs such as accessible clinic 	<ul style="list-style-type: none"> - Participants received eight biweekly follow-up session via phone to assist with problem solving and motivation 	<ul style="list-style-type: none"> - Handout at each session - Glucose meter for self-monitoring 	<ul style="list-style-type: none"> - Decreasing HbA1c and improvement of knowledge, self-efficacy, quality of life and LDL cholesterol - There were no significant changes in systolic blood pressure, triglycerides, or BMI
Aikens (2015) ⁽¹³⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - Monitor patients barriers of self-management - Provided the diabetes self-management by using messages - Helping the medical seeking - Generate the guidance of self-management - Training of DVD-based training in communicating effectively 	<ul style="list-style-type: none"> - Family members have roles on medical help seeking, emotional support when patients faced the problem 	<ul style="list-style-type: none"> - Follow-up: telephone touchtone keypad and heard messages every week 	<ul style="list-style-type: none"> - DVD - Mail message 	<ul style="list-style-type: none"> - Significant of medication adherence, physical functioning, depressive symptoms, and diabetes-related distress - Significant of SMBG performance, checking feet.

		<ul style="list-style-type: none"> - Questions and feedback messages - Support 				
Tang (2015) ⁽³²⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - 3-month diabetes self-management education program consisted of 12 weekly 90-minute group sessions, a personalized diabetes complications risk profile, one on one support activities, face to face meeting, self-management goal, develop an action plan and follow-up - Ongoing diabetes self-management support (DSMS) consisted 12 months ongoing DSMS such as emotional and behavioral support in weekly group session, follow-up telephone contact - During follow-up, the researcher addressed self-management challenges, evaluate the action plan, problem-solving and develop the future action plan and set the goals 	<ul style="list-style-type: none"> - Peer leader provided the emotional and behavioral support 	<ul style="list-style-type: none"> - This study was conducted 12 months - Face to face follow-up and telephone follow-up at 3 months and 12 months 	<ul style="list-style-type: none"> - Not mention 	<ul style="list-style-type: none"> - Not improve in HbA1c at 3 months and 15 months - Peer support had significantly lower LDL, systolic blood pressure, diastolic blood pressure, body mass index compared DSME-alone group
Hu (2014) ⁽¹⁴⁾	Quasi-experimental	<ul style="list-style-type: none"> - Providing information related to diabetes exercises and diet - Helped to create eating health, monitoring blood glucose and medication taking - Facilitated to problem-solving, action plan and discussion with family member about DSM 	<ul style="list-style-type: none"> - Family member was invited to the program and focused on family centeredness - Roles of family on decision-making, problem-solving and emotional support - Building family support which was focused on cultural value 	<ul style="list-style-type: none"> - One month follow-up by telephone call 	<ul style="list-style-type: none"> - Picture illustration - Flipchart and games - Video tapes - Visual aids 	<ul style="list-style-type: none"> - Significant of blood pressure, diabetes self- efficacy diabetes knowledge, and physical and mental components of health-related quality of life - Significant of intake of healthy foods and performance of blood sugar tests and foot inspections and lower BMI - No significant changes in levels of physical activity

Ananda et al. (2014) ⁽²⁶⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - This program is mHealth +CarePartner (CP) programs - Participants received the weekly automated diabetes telemonitoring calls to include self-management guidance 	<ul style="list-style-type: none"> - The care partners such as family member received the email updates on the patient's diabetes and guidance on supporting their self-management 	<ul style="list-style-type: none"> - Follow-ups were conducted at month 6 and month 12 to assess the outcomes 	<ul style="list-style-type: none"> - Mobile health (mHealth) telemonitoring 	<ul style="list-style-type: none"> - Improvement of glycemic control and diabetes distress - Significant of diabetes self-management behaviors, health-related quality of life, systolic blood pressure, and relationship quality
Hamidrez a (2014) ⁽¹⁵⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - Assessing the education needs and divided the family member to small groups based on their education needs - 45–60 minutes of educational session about the importance of medication adherence and family support behavior - Teaching about 30-45 minutes and 15 minutes for answering the questions and exchanging of views between family members - Support 	<ul style="list-style-type: none"> - Involving family in Education session and exchanging of view between family member - Family as key person has roles on home blood glucose testing, health behavior such as medication taking 	<ul style="list-style-type: none"> - This study was conducted within three months follow-up 	<ul style="list-style-type: none"> - Not mention 	<ul style="list-style-type: none"> - Significant decreased of A1c - Significant of perceived support - Significant different of medication adherence and cognitive status
William et al. (2014) ⁽³⁴⁾	A quasi-experiment	<ul style="list-style-type: none"> - Inviting the participants to identify the their own needs - Enhanced the participants' engaging by showing the videotaped stories of typical problems - Providing the information by using the culturally appropriate material - Helping participants to set the goals and supporting them for self-care 	<ul style="list-style-type: none"> - Families were invited to encourage shared learning and enhance the ability to support and to know how to be helpful - Families also have as key person to affirm the successful behaviors 	<ul style="list-style-type: none"> - This study was conducted within 2 years follow-up - The outcomes were assessed at 3 months, six months, and 12 months post- 	<ul style="list-style-type: none"> - Videotaped 	<ul style="list-style-type: none"> - At 3 months follow-up has an improvement on psychological and behavioral outcomes - Increasing the knowledge of self-management and personal care skill (exercise and foot care) - Decreasing A1c but not significant

				baseline		
Fall (2013) (16)	Randomized control trial (RCT)	<ul style="list-style-type: none"> - Reflection of personal threat to diabetes care - Providing mastery perception of diabetes - Briefly consultation related to positive-emotional group & negative emotional group 	Not mention	Not mention	Not mention	<ul style="list-style-type: none"> - Significant of adherence, perceive diabetes, positive emotion control and greater treatment acceptance
Robling et al. (2012) (17)	Cluster randomized controlled trial	<ul style="list-style-type: none"> - Promotes shared agenda setting and guiding communication style - Discrete strategies and skill drawn on interview practice - Role played interactions modeled on routine consultations - Education by using didactic and interactive strategies - Practice intervention strategies and skills - Consultations online and to receive feedback 	<ul style="list-style-type: none"> - Family as a facilitator on goal setting, communication, and health-seeking 	<ul style="list-style-type: none"> - Two weeks review of intervention program 	<ul style="list-style-type: none"> - Physical tools (3T: TimeToTalk) 	<ul style="list-style-type: none"> - No significant on HbA1c - More capable of training staff - No significant skill of practitioner - Reduced problem with treatment barriers - Improve treatment adherence - Greater excitement about clinic visits - Improve continuity of care
Sinclair (2013) (18)	Randomized control trial (RCT)	<ul style="list-style-type: none"> - Providing education related to diabetes complication - Encouraged to self-management practice - Building on culturally relevant knowledge and skill related to self-care behaviors - Providing the communication skill - Action plan on controlling on controlling blood glucose and A1c - Discussing of challenges on diabetes self-management - Group training by peer educator and facilitator - Storytelling of effectiveness self-management behaviors - Providing support 	<ul style="list-style-type: none"> - Involving family to provide the emotional support and goal setting, problem-solving and health-seeking 	<ul style="list-style-type: none"> - 20-40 minutes of survey completion by face to face - Post test after 3 months follow-up program 	<ul style="list-style-type: none"> - Images of local foods and physical activity - Individual metaphors - Electronic supplementary materials - Handbook 	<ul style="list-style-type: none"> - Significant on A1c - Significant on knowledge - Significant on self-management behaviors
Toobert	Randomized	<ul style="list-style-type: none"> - The Viva Bien program including weekly 	<ul style="list-style-type: none"> - Families were involved 	<ul style="list-style-type: none"> - This study 	<ul style="list-style-type: none"> - Not mention 	

<p>(2010) ⁽²⁷⁾ Tobert-Deborah (2011) ⁽²⁸⁾</p>	<p>control trial (RCT) Randomized control trial (RCT)</p>	<p>meeting and encouraged participants, practice stress management technique, engage in 30 minutes of daily physical activity, stop smoking, and problem solving-based support group</p> <ul style="list-style-type: none"> - Cultural adaptation program including, the adaptation gathering and focus group, preliminary adaptation design focusing on modified the program, preliminary adaptation test 	<p>to family night where family can join in the social support group portion of the meeting, hear a Viva Bien activities</p> <ul style="list-style-type: none"> - Families also could join to celebrate the participants' achievement, asked question and answer of those activities 	<p>was conducted at 12 months</p> <ul style="list-style-type: none"> - Twice weekly follow-up during six months period - Assessing the outcomes improvement at 6 months and 12 months 		<ul style="list-style-type: none"> - The program was significantly improved of psychosocial and behavioral outcomes (fat intake, stress management, physical activity, social environmental support) at six months - Decreasing the A1c level and health diseases risk factors
<p>Rosal (2011) ⁽²⁴⁾</p>	<p>Randomized control trial (RCT)</p>	<ul style="list-style-type: none"> - Addressing of literacy needs and modeling and experiential teaching methods - Cultural tailoring by using an educational soap opera to introduce self-management information and model attitudinal change - Reinforce information taught, emphasis on making traditional food healthier - Increasing the walking steps by using a step counter - Brief personalized counseling, goal setting and problem-solving 	<ul style="list-style-type: none"> - Families were invited to attend the home-based support, group meals - Family were also invited to discuss the way how to implement the recipes at home and acceptability of family at home 	<ul style="list-style-type: none"> - Follow-ups were done at 4 months and 12 months for evaluating the outcomes achievement 	<ul style="list-style-type: none"> - Food bingo, and Soap opera - A color-coded graph - Glucose meter and simple logs for tracking the glucose value 	<ul style="list-style-type: none"> - Significant change in HbA1c at 4 months follow-up but not change at 12 months follow-ups - Significant of self-efficacy, blood glucose monitoring, and diet
<p>Karen (2011) ⁽¹⁹⁾</p>	<p>Randomized control trial (RCT)</p>	<ul style="list-style-type: none"> - 16 hours of training in motivational interviewing - 15-minute follow-up telephone call - Individually tailored to participants' needs and attempted (clarify negative perception, personalized action plan, mobilized family 	<ul style="list-style-type: none"> - Involving family member on emotional support and problem solving 	<ul style="list-style-type: none"> - 10-15 minutes follow-up by telephone call - 6 months 	<p>Not mention</p>	<ul style="list-style-type: none"> - Significant on A1C levels - Improve beliefs about diabetes, psychological well-being, diet, exercise, and family support.

		support) - Building self-efficacy, problem-solving, and goal setting/action		follow-up		
Kang (2010) ⁽²⁰⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - Three brief individual education session at 1, 3 and 5 months related to diabetes, eating habits, physical activity, and foot care - 2-day long group education session at 2 and 4 months related to demonstrating of cooking, exercise, and foot care - Diabetes sharing groups - A monthly 25-30 minutes telephone discussion 	<ul style="list-style-type: none"> - Emphasizing family participation on goal setting, gaining the knowledge and improve the skill 	<ul style="list-style-type: none"> - Monthly follow-up by telephone - 6 months follow-up 	<ul style="list-style-type: none"> - Family life assessment checklist - Diabetes hangout - Food models - Cooking books - Exercise video and DVD - Oral medication pictures & power point - Foot massage pictures 	<ul style="list-style-type: none"> - Significant on family supportive behaviors - Significant on patients' knowledge and attitude - Not significant A1c, lipid profile - Not significant on self-care behaviors
Tai (2010) ⁽³³⁾	Quasi-experimental	<ul style="list-style-type: none"> - Meeting of the family education diabetes series program. The meeting is begun by checking the blood sugar, weight and foot inspections - Discussion on meal's ingredients, portion size, and healthy weight maintained - Planning and design a priority of activities based on participants' interest - Informal sharing information and support 	<ul style="list-style-type: none"> - Family members were invited to attend the family education diabetes series program, - Involved in the data collection but not enrolled as participants 	<ul style="list-style-type: none"> - Assessing the improvements were conducted within 3-month and six month time period 	<ul style="list-style-type: none"> - Not mention 	<ul style="list-style-type: none"> - The data show significant in weight, blood pressure, and HbA1c level.
Kluding (2010) ⁽²¹⁾	Quasi-experimental	<ul style="list-style-type: none"> - 3 to 4 days per week exercise session included stretching exercise to warm up and cool down with a 20-second hold and deep breathing - Weekly nutrition session included decreasing fat intake, increasing consumption of fruits, vegetables, and 	<ul style="list-style-type: none"> - Family member and other supportive were included in the education session especially in family support day and graduation ceremony 	<ul style="list-style-type: none"> - Not mention 	<ul style="list-style-type: none"> - Food label - Informational material - Cardiovascular training equipment 	<ul style="list-style-type: none"> - Significant on A1c and pain - Significant on self efficacy

		<ul style="list-style-type: none"> - whole grain - Education session related to setting goals, monitoring ABCs of diabetes, healthy feet, family support day, stress management, preventing depression and building healthy relationship - Family support 				
García-Huidobro (2011) ⁽²²⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - Interdisciplinary family meetings or home visits - Received a recipe book for diabetes and during family meetings, they received a framed family picture. - Individual counseling session and one counseling session (Learn about strategy of caring) - Multifamily group sessions (trained in motivational interviewing and family counseling and clinicians that guided multifamily groups) 	<ul style="list-style-type: none"> - Emphasizing family involvement on family meeting to discuss the psychosocial problem and health behavior strategies 	<ul style="list-style-type: none"> - Face to face follow-up - 12 months follow-ups 	<ul style="list-style-type: none"> - Recipe book - Framed family picture 	<ul style="list-style-type: none"> - Significant on HbA1c and reduce of depressive symptoms - No significant changes in family functioning style, health behaviors, medication adherence and knowledge of diabetes
Tiffany (2009) ⁽²⁹⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - The intervention was consisted of two intervention groups such as minimal intervention, a telephone-based intervention and an intensive intervention consisting of education and follow-up service - Minimal intervention included the 6 months remaining of preventive health screening (HbA1c, primary care, and specialty visit) - Intensive intervention was conducted 6 weeks such as guidelines and practical information, self-management education, home-based assessment and education, field experience, skill reinforcement and 	<ul style="list-style-type: none"> - Families were involved to provide additional diabetes education - The CHW monitored participant and family behaviors, reinforce adherence to diabetes treatment 	<ul style="list-style-type: none"> - 6-12 months follow-up for preventive screening - 3-4 months for information mailing - Every year for visiting clinic - 1-3 year for 	<ul style="list-style-type: none"> - Not mention 	<ul style="list-style-type: none"> - Increasing HDL level and decreasing diastolic blood pressure - No significant HbA1c

		maintenance and quality control		home visiting		
Vincent (2008) ⁽²³⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - 2-hour group sessions, didactic: cooking demonstrations, and group support sessions. - Culturally tailored: low- fat modifications, discussing of home remedies, and appropriate exercise strategies: walking and dance - To bring a family member as a support person 	<ul style="list-style-type: none"> - Family as support system on emotional support and performing self-management behaviors 	<ul style="list-style-type: none"> - 8 weeks follow-ups 	Not mention	<ul style="list-style-type: none"> - Significant on weight and BMI - Improve frequency of self-glucose monitoring and physical activity - No significant on diet, foot care, or medications, knowledge, self-efficacy, blood glucose, and HbA1C
Utz (2008) ⁽³⁰⁾	Randomized control trial (RCT)	<ul style="list-style-type: none"> - Culturally relevant group DSME intervention was consisted of eight 2-hours education session over 8 weeks period, incorporated the activities and problem solving in each group session - DSME was delivered by emphasizing the supportive atmosphere, storytelling related to diabetes care, diabetes education material, lesson, an approach emphasizing respect and empowerment - Individual DSME session: week 1 is setting goal; week 4 is reviewing the progress, problem solving, offering additional information; and week 8; final review, discussion about the self-management achievement and plan for future self-care 	<ul style="list-style-type: none"> - Families were invited to selected group session to gain the diabetes information and peer support - Families had an opportunity to watch the video regarding to family communication on diabetes care - Discussion and share experience related to diabetes care - Families also were invited in cooking demonstrating activities and how to cook healthy meals 	<ul style="list-style-type: none"> - Follow-up progress in week 4 - Final follow-up in week 8 	<ul style="list-style-type: none"> - Colorful 1-page Handout - Brochure - Cook book, exercise videotape, pedometer and foot care kit 	<ul style="list-style-type: none"> - DSME improved the self-care activities, A1c level, and goal attainment

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