

Original article

The Effectiveness of Family-Based Intervention for Improving Glycemic Control in Patient with Diabetes Melitus Type 2

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Abstract

Diabetes Mellitus is a chronic disease that requires sustain support to maintain specific self-care. Support from family becomes the most essential part due to their role as an informal caregiver. This study aimed to determine the effective method of family-based intervention improving glycemic control among DM type II patient. This systematic review based on 4 search engines (Google Scholar, ScienceDirect, Pubmed, and Proquest) included a clinical trial in recent 5 years, published in English, and free full-text access. Keywords used in this study were a family-based intervention in diabetes. Two reviewers independently assessed studies for eligibility and determined study quality by JADAD score. This critical appraisal tool consisted of 3 criterias including randomization, blinding, and withdrawal to describe rigour of the RCT method. Quasi-experiment and single-arm prospective study were excluded. As a result described in a PRISMA flowchart, there were 4 final articles discovered. Model of intervention s was more likely similar with variance in follow up time and intensity of education class. This evidence proved significant improvement of glycemic control measured by HbA1C. Diabetes self-management education empowers the family member to provide better assistance in diabetes care.

Keywords: diabetes, family-based intervention, glycemic control**Corresponding author:** Gede Budi Widiarta; pandegedebudiwidiarta@gmail.com

Background

Diabetes mellitus (DM) type II is a chronic high volume disease in both developed and developing countries so that it becomes the current global burden issue (Al-Lawati, 2017). The International Diabetes Federation (2017) maps the proportion of the prevalence of type II DM in the world by regional regions in the 2017-2045 range of 35% in North America and the Caribbean; 72% in the Middle East and North Africa; 16% in Europe; 62% in Central and South America; 56% in Africa; 84% in Southeast Asia; and 15% in the Western Pacific region. One significant upward trend is in Southeast Asia. Indonesia as a country in Southeast Asia ranks sixth in the world with the largest incidence of type II DM. This phenomenon makes the World Health Organization (2016) launch DM type II into four priority diseases in global non-communicable diseases (NCDs). In an effort to realize the target of DM type II control, interventions are needed that can increase empowerment and support for patients through Diabetes Self Management Educatuion (DSME) and Diabetes Self Management Support (DSMS)(Duker et al., 2015).

Education and support become decisive in diabetes management as chronic disease. Bruisholz et al (2014) published a restrospective study declared DSME improved quality of care and clinical outcome measured by diabetes bundle measure. Diabetes budle in this research consisted of pumonary problame, miocard infarction, healt failure, renal disease and Charlson

comorbidity indeks. Program of DSME was implimeted at primary care setting involving diabetes educator (registered nurse or dietitian) following WHO curriculum 10 hours in 12 month. The result show after DSME program patients have improved clinical otcome better than the baseline. Recently, Center for Disease Control and Prevention (2018) discovered the power of DSMES. Program DSMES evolution of education integrated with support implemented by interdiscipline team, provided sharing information and enggagement, inherented personal therapy. In those recommendation, DSMES compared as pill regimen and had a higher psychosocial benefit and no side effect rather than metformin (ADA Standard of Medical Care. Diabetes Care, 2017 in CDC, 2018).

In fact, realization of DSMES and DSMS are challenging. The barrier of this program is the limitation of the health care provider. It is imposible to monitor patient 24 hours patient at home. Patient with diabetes needs longterm care and support to findout personal health care plan that fits to their daily life(Adu et al., 2019). In perspective of developmental stages, range of age patient of diabetes already build of family as basis of society(Miller & DiMatteo, 2013). Family has role in maintain health status and support the other member who suffer in illness(Pamungkas et al., 2017). However, only a view study described the strategy to explore the technical approach of the effective DSMES in diabetes management.

Method

This study was conducted based on 8 steps systematic reviews and metaanalysis(Lindsay S. Uman, 2011). Formulation of the reviews question using Cohrane's PICO acronym stands for population , intervention, comparison, and outcome. Population in this research was determine as adult patient > 18 years diagnosed diabetes mellitus type II. Family based intervention was defined as the involement of family member during the treatment process. The outcome was glycemic controll manifested in HbA1C or other blood glucose laboratorium value and diabetes knowledge related outcome. PICO method later become the approach of keyword formulation "diabetes or T2DM and family

based intervention and blood glucose controll or HbA1C or blood glucose". Inclusion criterias in this study only involed article publish in recent 5 years and clinical studies at least with controll group. Review article, study protocol, and other observational studies were excluded. Searching strategy was using keyword 'diabetes or DM type 2; family support or family intervention, and glycemic control'. PRISMA flowchart of the result decribed at figure 1. Data extraction and data pooling done by at least 2 author. Study appraisal scoring based on clinical study JADAD Score(Berger et al., 2010). Appraisal result and the final dataextraction summarized at table 1 and 2.

Results and Discussion

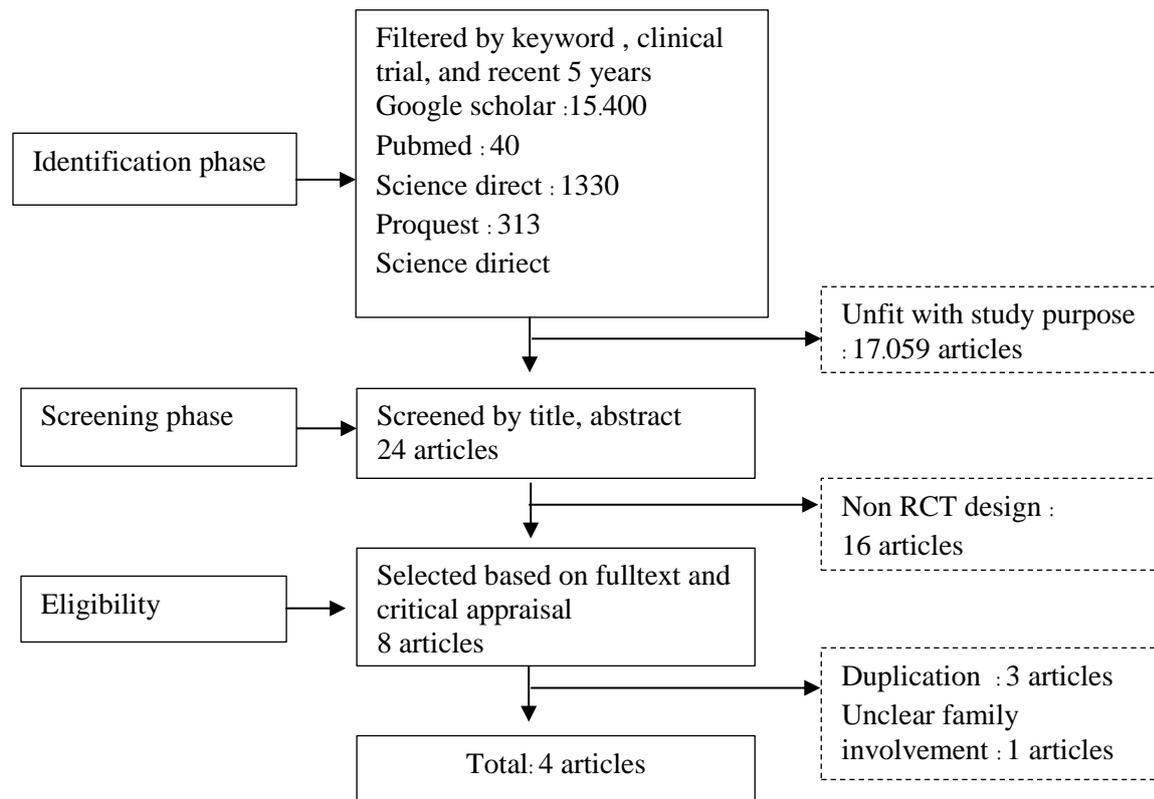


Fig 1 Result of online searching in PRISAMA flowchart

Table 1 Evidence Appraisal Based on JADAD Score

JADAD Score Qualification	Randomization		Blinding		Withdrawal < 20%
	Randomization	Method of Randomization	Blinding	Method of Blinding	
Witchit et al (2017)	+	+	-	-	+
Withidpanyawong et al (2018)	+	-	-	-	-
Gomes et al (2017)	+	+	-	-	-
Maslakpak et al (2017)	+	+	-	-	+

*(+): yes, well described, no, unavallable

Table 2 Summary of final articles

Author/ Research Site	Title	Sample/ participants	Method/ Family involvement	Intervention	Outcome	Result
Witchit et al (2017) Thailand	Randomised Controlled Trial of family oriented self management program to improve self efficacy, glycemic control and quality of life among Thai individuals with Type 2 diabetes	Total participant 140 DM type 2 patients divided into controll and interventional group	RCT This program involved spouse, child, grand child, and sibling of the patients and act as informal care giver, > 18 years old and lived at the same house.	Family-oriented self-management intervention based in self efficacy theory. Its applied on 3 workbook in education class; group discussion involed family and peer; home visit and telephone follow up. Total time of intervention 13 weeks.	-Diabetes Knowledge (DKQ) -Self-management (SDSCA) -Perceived Therapeutic (PTES) -Quality of life (SF-12) -Controll glycemic (HbA1C) -Self-efficacy (DSMES)	Diabetes self-efficacy, self-management, and quality of life improved at intervention group.
Withidpanyawong et al (2019) Thailand	Family based Intervention by Pharmacist for Type 2 Diabetes : A Randomized Controlled Trial	Intervention and controll group contain 98 participant DM type 2 patients at least or oleder than 30 years old.	RCT This program involved adult family member or spouse living together who included in educational package. Family member encougared to do active support.	Family member and patient received 40-50 minutes private class and pharmacist conseling up to 3 month. Phone call follow up also suplemented at 1 and 2 month.	-HbA1C -lipid profile, blood pressure, BMI -diabetes knowledge, family support, therapy adherence, self-management, sel-care.	HbA1C reduced significantly at intervention group. Having family care giver as female spouse was declared as significant helpfull family involment in DSMES.

Table 2 Summary of final articles (cont.)

Author/ Research Site	Title	Sample/ participants	Method/ Family involvement	Intervention	Outcome	Result
Gomes et al (2017) Brazil	Contribution of family social support to the Metabolic control of people with Diabetes Mellitus : A Randomized Controlled Trial	Intervention group consist of 108 participants wether controll group 112 participants	Family involed in group diabetes education and follow up around 12 month	DSMES program in group up to 10 people. The programs were about 4 topics based on social cognintive theory instrument. This intervention goal was to increase interest and education of family member in order to give assitant for the patient. Telephone follow up also inserted.	-HbA1C -Blood pressure -Lipid profile -Ureum -Creatinin	Blood pressure and HbA1C reduced greater at intervention group.
Maslakpak et al (2017) Urmania, Iran	Effects of Face-to-Face and Telephone-Based Family-Oriented Education on Self-Care Behavior and Patient Outcomes in Type 2 Diabetes: A Randomized Controlled Trial	This study compared 3 group intervention consisted of face to face family based intervention, family intervention throug telephone, and usual care. Each group included 30 adult DM type 2 patients.	Family who lived together with patient involen in DSMES through face to face meeting or telephone based education.	Face to face family based intervention twice a week in three months. Telephone based intervention 2 times a weerk in three months.	-self-care (SDSCA) -HbA1C, lipid profile	Face to face family based intervention befcial in improving diabetes selfcare. Telephone based intervention also had potential effect.

On the result of the four articles showed that family based intervention in DSMES is feasible to be applied. All study conducted at least 30 sample of patients and their family who lived together. Model of implementation was rigour, structured by the curriculum, using media and followed with telephone supplementation. Range of

intensity were twice a week in 2-3 months. According the critical appraisal result none of the evidence conducted blinding but more than half studies mentioned explicitly the randomization method. Overall, those articles could give a big picture to conduct family based intervention in DSMES.

Several outcome as Predictor of Glycemic Control

The family based interventions in this study mostly using educational approach to improve glycemic index. HbA1C was measured as the gold standard of glycemic control. The other biomarker related metabolic status also documented such as lipid profile (LDL, HDL, TG, and Total Cholesterol), plasma blood glucose, BMI, ureum, creatinin and blood pressure. The indicator of diabetes knowledge attribute measured in this study were Diabetes knowledge DKQ, Diabetes self-efficacy DMSES and Perceived Therapeutic Efficacy Scale (PTES). Outcome related selfcare adherence measured by SDSCA questioner and Morisky questioner related medication. Psychosocial indicators were assessed family support and quality of life.

According the evidence review, there are several outcomes have been studied. Glycemic index was determined as the main outcome measured by HbA1C. Other objective outcome involved such as lipid profile, blood pressure, body mass index, ureum, and creatinin. Attribute of other outcome to evaluate knowledge based intervention mentioned Diabetes Knowledge (DKQ), Self-management (SDSCA), Perceived Therapeutic (PTES), Quality of life (SF-12), Self-efficacy (DSMES), self adherence, and family support.

Based on the ADA recommendation HbA1C has been declared as strong predictor of diabetes. Cut of point 6,5% of

HbA1C is sensitive for diagnosis diabetes with strong correlation fasting plasma glucose (FPG 7.0 mmol/L) (Sherwani et al., 2016). HbA1C also provides a reliable measurement of chronic hyperglycemia and correlated with long-term diabetes complication. Recently, HbA1C even use as predictor of pre diabetes in children and adult. Clinical study Vijayakumar et al(2017)(2017) involving 2,095 children without diabetes ages 10-19 years monitored through age 39. Using ROC analysis, this study reveal that HbA1C, FPG, and 2hPG are sensitive and specific identify prediabetes in children and adult.

Diabetes knowledge related outcome more likely improve attitude and behaviour in self management. As chronic disease, support and education in diabetes targeted to improve self management and adherence. WHO (2003) in Hsu, Lin, Shu, Yang, & Ko(2013) defined the construct of adherence “...the extent to which a person's behaviour – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider”. Tobert et al (2000) purposed SDSCA as a brief, valid, and specific questionnaire measuring diabetes self management. However in recent study, Schmitt *et al*(2016) compared DSMQ and SDSCA among 430 diabetes patient. DSMQ statistically has stronger correlation with HbA1C rather than SDSCA.

The Effective DSMES for family

Based on the evidence, there are two theory mentioned that used as the frame of the family based intervention for diabetes management. The self efficacy theory developed by Bandura consist of 4 constructs : physiological information, verbal persuasiob, vicarious experience, and performance accomplishment. This intervention characterized by promotion of the model of succes inspired the others. Self efficacy focused intervention has been studied in 16 articles which is effective improving metabolic control and othe psychosocial predictors of diabetes management. The second one is social cognitive theory also developed by Bandura. This theory emphazied behaviour improvement influenced by social needs and support (emosional, instrumental, and information). Source of the support may comes from peer (friends, collages, and relatives) and family such as spouse, children, grandchildren.

In this study, characteristic of the patient and family member were more likely similar. The patient were adult with range of age minimal 35-40 years old, moderate glycemic control with fasting plasma blood glucose more than 140mg/dL and HbA1C 6-7% without andvace macro or micro vascular complication. Family involment may influenced by marital status while most participant were married. In Asia countries like Thailand culturally family have obligation to take care unhealthy family member by take role as informal care giver. Their role reflected on provide assitance of

Conclusion

Diabetes as a chronic diseaase needs a sustained and long term treatment. Family support is essensial resourse that can help patient maintain their glycemic controll. Improving knowledge of the family member is challenging regarding role of the family, cultral consideration, and level of education

meal preparation and health monitoring status. This study mention that female has higher health awareness as patient or family member. Family member involment more likely related to spouse whether elderly patients were taken care by their daughter or son.

There are variation of implementation family based intervention in this study with overall program was 3-9 months. All evidenced used telephone as the approach of conselling session, follow up, and reminder. The duration of phone call was vary, the range about 15- 30 minutes or one study mention the average toke 8 minutes. The conversation was about interview patient and family doubt feeling, motivational enhancement, selfcare adherence checking and problem based solution regarding spesific diabetes management. Most evidence in this study used structured education system as the aproach. One study in Thailand the clinical practice guildeline for diabetes divided into 3 workbook consists of general diabetes knowledge; diabetes diets; physical activity and foot care. Educational program in Brazil used tool called Diabetes Conversation Map consisted of 4 Maps: *How the body and diabetes work; Healthy eating and physical activity; medication treatment and blood glucose monitoring; reaching goals with insulin*. The face to face meeting approach used structure content includeing details information of diabetes diet and physical activity. The other focused on medication using conseling method involving patient and family.

or health literation. This study recommended telephone call as potential approach of healthcare assitance improving quality of care in chronic illness. Telephone is the most parctical and feasible in Asia or Thailand context due it merits the diabetes population who more likely baby boomer. Baby boomer

prefer use telephone to give feedback and communicate their family uncertain feeling in daily diabetes selfcare routine. It may help better decision making and health outcome.

An innovative strategy of interactive distance learning tools for family assistance is an urgent need to be developed in future research.

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