

## **Review: Self-management Support Program on Dietary Behaviors in Patients with Type 2 Diabetes Mellitus**

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**Background:** Dietary behaviors are the cornerstone in diabetes management. Diabetes self-management support program in which patients play an active role to determine their health care is an important strategy to improve dietary behaviors in type 2 diabetes mellitus (T2DM) patients. Its elements which contribute to the successfulness of the program need to be identified.

**Purpose:** To review and identify the elements of self-management support program to improve dietary behaviors in T2DM patients.

**Method:** An integrative review was conducted. Relevant studies published in English language during last 10-year, measured dietary behaviors in T2DM patients, and retrieved from CINAHL and PubMed were included.

**Results:** 13 experimental studies and 3 meta-analysis studies were reviewed. Goal setting and action planning combined with other strategies (brief counseling and problem solving) seemed more effective to improve dietary behaviors. Either trained lay people or clinicians could lead the program although clinician-led programs were common. Contents and materials of the education vary across the studies. The effects on dietary behaviors could be detected in short term duration of program (<6 months). Continuing follow-up was essential element which face-to-face follow-up as the most common strategy. The utilization of technology such as telephone-call and internet based follow-up might provide more benefits for patients.

**Conclusion:** Diabetes self-management support program is effective to improve dietary behaviors in T2DM patients. Further research is needed to test the effectiveness of goal setting strategy and technology utilization for follow-up strategy such telephone call in Indonesian T2DM population.

**Keywords:** self-management, dietary behaviors, type 2 diabetes mellitus

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## **Background**

Globally, diabetes mellitus (DM) is becoming a health problem. In 2000, 8.4 million Indonesian people suffered DM. This number will increase up to 21.3 million in 2030 (Wild, Roglic, Green, Sicree, & King, 2004). Approximately 90–95 % of those with DM are type 2 diabetes mellitus (T2DM) (ADA, 2009a).

Dietary management is the cornerstone management in most cases of T2DM (Williams & Pickup, 2004) to prevent complications and improve the health status (Wing et al., 2001). However, most of diabetic patients showed difficulty to self-manage their dietary behaviors (Lin, Anderson, Hagerty, & Lee, 2008; Nagelkerk, Reick, & Meengs, 2005; Nelson, Reiber, & Boyko, 2002). Moreover, both patients and health care professionals recognize dietary management as the most difficult management in T2DM (Grodner, Long, & Walkingshaw, 2007) despite the patient's recognition of the needs to manage their dietary behaviors (Garcia et al., 2007). Thus, the patients' active role to determine their health status as manifested with self-management becomes imperative.

Self-management refers to the individual's ability to manage the symptoms, treatments, physical and psychological consequences, and life style changes inherent in living with a chronic condition resulting in ability to monitor one's condition and to affect the cognitive, behavioral, and emotional responses necessary to maintain a satisfactory quality of life (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002). Self-management support program is the method of care in which the patients participate and engage actively in their daily treatment care (Kanfer & Gaelick-Buys, 1991). This method becomes necessary in diabetic patients since the traditional methods which placed the patients in a passive role are no longer sufficient to capture the complexity of the treatments and the nature of the disease which require not only health care experts, but also patients' active role in the treatments (Anderson & Funnel, 2005; Bodenheimer, Lorig, Holman, & Grumbach, 2002).

## **Objective**

Present study aimed to review the diabetes self-management support program on dietary behaviors in patients with Type 2 DM. The elements of diabetes self-management support program were identified and discussed. Recommendations for nursing practice to improve patients' dietary behaviors through diabetes self-management method were provided.

## **Methods**

CINAHL and PubMed databases were used to find the existing studies about diabetes self-management support program to improve dietary behaviors in patients with type 2 diabetes. The keywords such as self-management, dietary behaviors, and type 2 diabetes were used to search the data. The studies which published in English during last 10 years and measured dietary behaviors regardless of the clinical or laboratory outcomes in patients with type 2 diabetes were included.

## **Results**

Thirteen published experimental studies and three meta-analysis studies were reviewed to determine existing studies about the intervention to improve self-management of dietary behaviors in T2DM patients. Three of thirteen intervention studies were considered as the additional report from previous studies (Clark & Hampson, 2001; DeWalt et al., 2009; Galsow & Toobert, 2000) since they reported the same intervention or program. Thereby, they are considered as a complementary report from the remaining ten intervention studies.

Six of 10 intervention studies (60%) were randomized controlled trial (RCT) (Clark, Hampson, Avery, & Simpson, 2004; Glasgow, Boles, McKay, Feil, & Barrera, 2003; Glasgow et al., 2006; Kim & Oh, 2003; Polonosky et al., 2003; Song & Kim, 2003) and 40% were quasi experimental (Albarran, 2006; Baestiaens et al., 2009; Tang et al., 2005; Wallace et al., 2009). From those three meta-analysis studies, one meta-analysis study focused on modification of fat, fruit, and vegetable intake (Ammermann et al., 2002) and two meta-analysis studies described the effectiveness of diabetes self-management education intervention (Fan & Sidani, 2009; Norris et al., 2001). Two meta-analysis studies (Ammerman et al.; Norris et al.) did not incorporate any study included in this review. In addition, meta-analysis study from Fan and Sidani did not mention the entire original articles they reviewed, thereby the present reviewed studies that may also included in Fan and Sidani's work were unable to be identified.

Most of the studies were conducted in Western countries, only two of ten were conducted in Asia (Korea) (Kim & Oh, 2003; Song & Kim, 2003). Generally, they were conducted in individual-based (50%), followed by group-based and combination-based program (30% and 20% respectively). The outcomes of the programs, commonly, could be classified into clinical outcomes and behavioral change outcomes. Clinical outcomes entail

the laboratory result including lipid profile, body mass index (BMI), waist circumference; whereas the behavioral change outcomes comprised achievement of goal setting and action planning, macronutrients (carbohydrate, fat) intake, and fruits and vegetables consumptions.

### *Target Population*

Target population for diabetes self-management support program was T2DM patients. Patients' age ranged from 21-93 years old, being diagnosed with T2DM for at least 4 years, have level of HbA1c ranged from 4.2 to 16.8%, BMI ranged from 12.9 to 73.4, and waist circumference ranged from 79 cm to 115 cm. None of the studies included the patients who had complications that cause them unable to perform self-management activities.

### *Settings*

The interventions to improve patients' self-management were conducted in various settings and locations: primary care, hospital outpatient departments (OPD), diabetes centers, general practitioner clinics, other health service centers, community setting, and patient's home. The most common setting was in the OPD. The setting might be more than one and combine several setting, such as primary care unit and patient's home.

### *Teaching Methods*

The teaching methods of interventions were classified into five: deductive (facilitators provide learning material through educational session and might be followed by discussion); practice required skills (e.g. practice in arranging meal plan); brief counseling (brief and short duration of individual consultation regarding the selected behavioral); goal setting and action planning (patients generated the goal and action plan with the assistance of the facilitators); and problem solving (identified problems related to dietary behaviors management and explored the possible way to overcome the problems that suitable with patients condition).

Most of studies combined several methods in their self-management program. Only one study used brief counseling alone (Kim & Oh, 2003). Three studies employed combinations of brief counseling, goal setting and action planning, and problem solving (Glasgow et al., 2003, 2006; Wallace et al., 2009) and two studies combined deductive, goal setting and action planning, and problem solving (Bastiaens et al., 2009; Tang et al., 2005). Other studies combined those methods either deductive with problem solving (Albarran et al.,

2006; Polonosky, 2003), deductive with skill practice (Song & Kim, 2003), or goal setting with problem solving (Clark et al., 2004). These situations capture the lack of similarity of the interventions methods which also were revealed by the meta-analysis study (Ammerman et al., 2002; Norris et al., 2001).

The study that only used a single method reported significant improvement of dietary behaviors across the time within 12 week (Kim & Oh, 2003). The studies using combinations of three methods provided various effects on clinical outcomes (BMI reduction and waist circumference) (Bastiaens et al., 2009; Glasgow et al., 2006), but seemed to provide similar positive effect on behavioral change (Bastiaens et al., 2009; Glasgow et al., 2003, 2006; Tang et al., 2005; Wallace et al., 2009). The similar effects were also reported from the intervention that used combinations of two intervention methods. The result showed that the effect on behavioral change seems not to differ between program that encompassed single or multiple intervention method. However, the study from Kim and Oh did not measure clinical outcomes as measured by other studies that, even though they reported various significant effects on clinical outcomes, provide any benefit for patients.

Indeed, Fan and Sidani (2009) measured the effect size for the self-management program based on the teaching methods. They classified teaching methods on three categories: didactic (conveying information and limited discussion or interaction between providers and participants), interactive (encouraging active participant involvement in the learning process, discussion session, goal setting negotiation, and problem solving), and mixed (combination between didactic and interactive). Based on their work, interactive method provided largest effect size compared with didactic and mixed on self-management behaviors including diet (0.54, 0.47, and 0.29 respectively); whereas mixed method provided a larger effect size (0.69) than interactive and didactic (0.54 and 0.16 respectively) on clinical outcomes. Combined with the 10 intervention studies, it seems that the intervention which combines several intervention methods may be of more benefit for patients on the clinical outcome and provide the same impact as intervention with single method on behavioral change. However, it should be noted that to effectively self-manage, especially in dietary behaviors, people need adequate knowledge (Savoca & Miller, 2001). The fact that many studies reported the lack of dietary knowledge (Clark & Hampson, 2001; Nagelkerk et al., 2005; Sanpaung, 2000 as cited in Wattana et al., 2007) should be considered as the reason to include the providing information session (didactic method) prior the discussion, goal setting, and/or problem solving.

### *Facilitators*

Either trained non-clinicians, clinicians (nurses, physicians, and dieticians), or multidiscipline team were reported in selected studies even though most of interventions were led by clinicians (60%), followed by multidiscipline team (30%), and trained non-clinician (10%), although one study did not clearly explain the facilitator (Albarran et al., 2006). Albarran et al. reported that the facilitator in their study received a series of training to lead the intervention. Yet no major discrepancy outcomes are noted from reviewed study which used different facilitators. It seems that most of the studies still placed the clinicians as the person best able and responsible to deliver such program or intervention to the patients. It is important to note that as the lay-led program (Wallace et al., 2009) accounted for only 1 of the 10 studies, it may be an overestimate to judge that trained-lay-led program results better behavioral changes than clinician-led program, particularly, because dietary behaviors are recognized as difficult lifestyle management in T2DM patients and need the expertise (Grodner et al., 2007).

### *Contents and Materials of Educational Session*

The contents of educational session varied across the studies. Most of the studies not only focus on dietary behaviors in patients with T2DM, but also their educational contents combining with other topics related to diabetes such as physical activity, self-monitoring blood glucose, and drugs therapy. With respect to dietary behaviors, the contents of education include basic information on healthy food, goal setting and action planning related to dietary behaviors, healthy dietary pattern or meal planning, and strategies to healthy eating.

Various support materials were used in existing studies. It could be a written material such as guideline, newsletter, or handbook; intervention record such as the copy of goal setting and action plan; practice equipments such as glucometer; and others material such as CD-Rom. Most of the intervention will provide guideline or handbook material such as dietary guideline, exercise guideline, and other guideline related to living with diabetes. However, some of them are unclear about the material that they used in their intervention study (Polonosky et al., 2003).

### *Duration of Interventions*

Duration of the intervention is measured as the length of period of intervention conducted, from the baseline assessment until the completion of the program, not the completion of the post-test data. The duration of intervention could be derived into three categories: short-term (less than 6 months or 24 weeks), medium (6 months until 12 months or 24-48 weeks), and long-term (than 12 months or more than 48 weeks). From total 10 studies, 5 studies were conducted in short term duration, 4 studies were conducted in medium duration, and only 1-study was conducted in long-term duration.

The short-term duration studies that measured the clinical outcomes (BMI and HDL level) found the significant effect after follow-up at 12 weeks (Song & Kim, 2003), and still significant at follow-up in 12 and 18 week after the completion of the program (Baestiaens et al., 2009) even though study from Glasgow et al. (2006) failed to detect decrease body weight, HDL, LDL, and total cholesterol within 2 months of their program. However, all of those five studies in short term duration reported dietary behavioral change varied from the achievement of goal setting and action planning, daily fat reduction, and self-report dietary behaviors. Baestiaens et al. revealed that even though the tools that they used in their study (food frequency questionnaire) were unable to detect the small and actual behavioral change, their participants performed real dietary behavioral change as reported during the follow-up. The medium and long-term duration of study also revealed varieties in their result similar with studies in short-term duration. It indicates that for dietary behavioral change, the positive and significant effect can be seen in short-duration and vary across time. Conversely, for clinical outcomes, the result may depend on the time during follow-up rather than the duration of the program itself. It may be because the body metabolism needs time to show certain effects of the behavioral change (decrease HDL, LDL, etc), thereby being undetectable in a short period of follow-up.

Fan and Sidani (2009) measured the effects size of intervention based on the duration within 6 months. They classified into three time durations: less than 8 weeks, 8-24 weeks, and more than 24 weeks. With regard to the self-management behaviors outcome, the largest effect size showed in the duration for more than 24 weeks followed by less than 8 weeks and 8-24 weeks (0.38, 0.32, and 0.22 respectively). It can be seen that either in the short-term or in the long-term duration, the effects size range from small to medium effect size. Even though the largest effect size can be seen in the intervention with longer duration, another meta-analysis study in patients with T2DM revealed that the positive effects of self-

management support program on self-reported dietary habits was demonstrated in studies with short-term duration (< 6 months) (Norris et al., 2001).

### *Follow-up Strategies*

Strategies for follow-up of the interventions differ among studies. Commonly, it is categorized into four follow-up strategies: assisted computer, telephone call, home visit, and in person visit to the selected place according to setting delivery. The entire studies used in person visit as their follow-up strategy. However, the follow-up strategy could be more than one. Combinations by using computer assisted, telephone call, and in person visit were used by two studies of Glasgow et al. (2003, 2006). Four studies used telephone calls and in person visit (Clark et al., 2004; Polonosky et al., 2003; Song & Kim, 2003; Wallace et al., 2009). Only one study used telephone calls alone (Kim & Oh, 2003) and three studies used in-person visit alone (Albarran et al., 2006; Bastiaens et al., 2009; Tang et al., 2005).

Meta-analysis study from Fan and Sidani (2009) supported the effectiveness of strategy involving interactions between healthcare providers and participants. Even though face-to-face follow-up strategy was favorable to facilitate the follow-up, telephone call and computer assisted can also be used. With regard to the effect of follow-up strategies on self-management behaviors, Fan and Sidani further found that phone-call had the highest effect size (0.95) compared with face-to-face and web-based strategy.

## **Discussion**

Present study reviewed published studies which aimed to review and identify the elements of diabetes self-management support program that contribute to its effectiveness on dietary behaviors in T2DM patients. The review showed that diabetes self-management support program is effective to improve patients' dietary behaviors. To date, only small number of studies have been conducted in Asian countries, perhaps due to the lack of published study from Asia. Another consideration might be because in Asia or even in the West, health care providers may not support the self-management approach in which patients play active role in treating their condition, but rather health care providers may prefer the traditional approach of treatment in which patients only play a passive role (Donnelly & Anderson, 1990).

From the review, the most common teaching method to improve self-management of dietary behaviors is goal setting and action planning. This strategy can be used solely or with

combination with other methods. To date, the effect of this intervention method is mostly seen on behavioral change rather than clinical outcome. Goal setting assists patients to working toward healthier behaviors and involves patients agreeing on a general self-management goal. Action plans are concrete and specific activities that patients agree to do to help reach their goal (Bodenheimer & Handley, 2009). Specific goal setting and action planning can leads people to achieve higher performance than no goal, general, or unspecific goal (Bodenheimer et al., 2007).

In person follow-up visits, which entails face-to-face contact, is still favorable in the reviewed study even though some of them combined with telephone contact. The face-to-face follow-up during in person visit may provide benefit for both patients and facilitator since they can communicate easily and foster the successfulness of the program (Ellis et al., 2004). However, by the growing of communication technology, the utilization of telephone contact, computer, and internet for follow-up strategy should not be disregarded. Telephone follow-up can be alternative approach to conventional clinic follow-up and it can be carried out without apparent detriment of the patient (Sardell et al., 2000), convenient, simple, and less costly (Fan & Sidani, 2009). Clark (2008) suggested telephone contact as one of follow-up strategy in self-management program in patients with diabetes beside of face-to-face approach. Its benefits are not only seen in diabetic patients, but also for asthmatic patients and other chronic disease that needs long time follow-up (Pinnock et al., 2003; Wasson et al., 1992).

## **Conclusions**

In conclusion, the review from the 10 studies which test the effectiveness of self-management program on dietary behaviors in patients with type 2 diabetes mellitus found that even though the population, setting, intervention mode and method, facilitators, content of education, materials, duration, and follow-up strategies are varies across the study, the self-management program provide benefit in improving patients' dietary behaviors. Although the outcome may be small dietary behavioral change, it is considered important for diabetic patients.

The major concern as a result of the review entails the intervention methods and follow-up strategy. Goal setting and action planning strategy is recommended as one of effective strategies in dietary intervention that concern behavioral change. Even though in-person visit is the most common follow-up strategy, the health care providers should not

ignore the possibility to use technology in the follow-up such as the utilization of telephone, computer, and internet base follow-up strategy.

## Recommendations

Dealing with diabetes mellitus, health care providers should consider the importance of patients' engagement in determining their health care. The patients are the ones who are responsible for their own day-to-day care to manage symptom, treatment, physical and psychological consequences, and life style changes including dietary behaviors. Self-management approach is recommended to be implemented in caring patients with T2DM. Effective teaching method is needed. Goal setting and action planning in which patients generate own goal and plan to achieve better dietary behaviors should be considered as an effective method. Furthermore, patients should receive adequate follow-up, either using face-to-face as the most common follow-up strategy or telephone call based on patients' condition and supported facilities.

Further researches are needed in this field especially in Indonesia and Asia. The effectiveness of telephone call as one of follow-up strategy should be tested with regard to the patients' health status and the cost effectiveness. Another study should be conducted to test the feasibility of such intervention in the real setting such as primary care and OPD based on physician, nurses, and other related professional perspective which can further support the possibility to integrate such intervention as the standard care.

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