Self-Management Education Program for Reduce Blood Glucose Type 2 Diabetes Mellitus: A Systematic Review

Achmad Ali Basri, Ester Radandima, Niswa Salamung, Nessy Anggun Primasari, Ferry Efendi
Faculty of Nursing, Universitas Airlangga
perawatinisiat@gmail.com

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Abstract: Background: Type 2 DM prevalence continues to increase each year. The high number of sufferers of type 2 DM is correlated with changes in lifestyle that is unhealthy in effect conferring on the community. It’s need for managed care comprehensive and self-management program. This study aims to identify the influence of self-management education program in reduce blood sugar of type 2 DM. Methods: Data retrieved from ProQuest, Scopus, CINAHL, EBSCO, and PubMed. Search articles using keywords self-management, self-care, education, glycemic control and diabetes mellitus. The selection of articles using the following criteria: (1) Randomized Controlled Trial (RCT); (2) Published between the years 2010-2017; (3) Article using english language; (4) Focuses on self-management education and diabetes mellitus. Result: As much as 3,036 articles found, then performed a selection of articles and obtained 15 scientific articles that match the criteria specified reply. On the process of the analysis of the articles found four forms of methods used in self-management education program, namely self-management education-based individuals, families, groups and technology. Conclusions: Self-management education program significantly influential in reduce blood sugar levels of type 2 DM client. Most potential methods that can be used in self-management education program are technology-based.

1 BACKGROUND

Diabetes mellitus (DM) type 2 is one of the largest chronic health problems worldwide (Oliopoulus, 2011). The prevalence of type 2 diabetes has increased annually (Wichit et al., 2016). The high number of people with type 2 diabetes is associated with unhealthy lifestyle changes in the community, thus affecting the uncontrolled blood glucose levels. It is necessary to have comprehensive and continuous self-care management (Murray et al., 2017).

It is estimated that from 90% (382 million) in 2013 the world population is experiencing type 2 diabetes. The estimate has increased to 9% (592 million) people with type 2 diabetes by 2035 (Murray et al., 2017). Riset Kesehatan Dasar (RISKESDAS) in 2013 the number of DM patients in Indonesia has increased from 2007 to 2013 by 1.1% to 2.1% of the total population of Indonesia (Ministry of Health, 2014).
Uncontrolled blood glucose levels are a major cause of complications and increased mortality due to DM (Fisher et al., 2011). It is predicted that the incidence of complications (microvascular and macrovascular) continues to increase. The higher incidence of complications affects the clinical and economic burden for diabetics, so long-term treatment models are particularly appropriate in treating cases of diabetes mellitus (Oliopoulus, 2011).

Diabetes self-management education is an ongoing program that combines the knowledge, skills, and abilities needed for individual self-care with diabetes mellitus, as well as activities that assist a person in applying and maintaining the behavior needed to manage himself thoroughly and continuously, so that this program can prevent the onset and development of DM complications, so that type 2 DM patients are expected to perform self-care regularly and independently every day (Murray et al., 2017; Surucu, 2017).

Self-management education programs can be provided in a variety of methods. The most important part of the core component should not be abandoned. There are seven core components according to the American Association of Diabetes Educators (AADE) that must be present in any self-
management education program (1) self-monitoring of blood glucose; (2) medication adherence; (3) healthy food; (4) physical activity; (5) reduce risk factors; (6) positive coping / psychological stress control; and (7) problem solving (Yeary et al., 2017).

Several scientific articles on self-management education program in reducing the blood glucose level of published DM type 2 clients. The methods used in self-management education programs also vary, one of which is self-management education based on individuals, families, groups and technology. Therefore, a systematic review is needed to identify the effectiveness of the self-management education program in reducing the blood glucose level of type 2 DM patients. Therefore, a systematic review is needed to identify the effectiveness of the self-management education program in reducing the blood glucose level of type 2 DM patients. The study in this systematic review is interested in examining the "How does the influence of self-management education program on blood sugar decrease of diabetes mellitus type 2?"

2 METHODS

This research uses systematic review design, with research question "How is the influence of self-management education program to decrease blood sugar of diabetes mellitus type 2 patient?" Data obtained from ProQuest, Scopus, EBSCO, CINAHL, Pubmed and Science Direct database. Literature review are conducted using self-management, self-care, education, glycemic control and diabetes mellitus keywords. The selection of articles is determined by the following inclusion criteria: (1) the article uses a Randomized Controlled Trial (RCT) design; (2) articles published between to 2010-2017; (3) articles published in English; (4) articles focusing on self-management and diabetes mellitus; (5) articles on nursing. Exclusion criteria used are: (1) scientific articles that discuss education in general is not about self-management; (2) the sample used is not a DM type 2 client.

3 RESULT

Study Design

As many as 3,036 articles were found, the results came from four databases: 952 articles in ProQuest, 608 articles in Scopus, 652 articles on EBSCO CINAHL, 360 articles in Pudmed and 464 articles in Science Direct. The result of article selection according to the inclusion criteria of 15 articles, then given the serial number and done article analysis to facilitate the review process. There are four methods used in self-management education programs: self-management education based on individual, family, group, and technology. All research articles are prepared using Randomized Controlled Trial (RCT) research design.
Characteristics of Participant

In this systematic review of the 15 studies is about all populations were DM type 2 clients, the number of samples varied between 56-483 DM type 2 clients. The age of respondents taken in the study was ≥18 years. The research was conducted in various parts of the world including Asia, Middle East, Europe, Australia, and America.

Methods of Self-management Education Program

In this systematic review of 15 articles reviewed there are four methods used in the Self-Management Education Program based on individuals, families, groups, and technology. Most of the methods used on the basis of technology are 8 articles (Iljaž et al., 2017) (Kerfoot et al., 2017) (Shelagh, Russell and Kenneth, 2010) (Or and Tao, 2016) (Murray et al., 2017) (Oliopoulos, 2011) (Williams et al., 2012). Self-management education program with individual-based methods of 3 articles (Yeary et al., 2017) (Scavini et al., 2013) (Surucu, 2017). The self-management education program using the family-based method is 3 (Fiallo-scharer et al., 2017) (Yeary et al., 2017) (Wichit et al., 2016) and self-management education program with group-based method 1 article (Hill-briggs et al., no date)

In the self-management education program using time-based method used during the intervention is 3 months, with follow-up activities at 6 months and 9 months. The advantage of this method is significant in lowering HbA1c with P = 0.002 (P < 0.05). In addition, other positive effects of this method are able to improve treatment compliance, improve knowledge, improve problem solving, and improve self-care activities of DM type 2 clients. Statistically all these advantages can be proven significantly with the value of P on all components P < 0.05. However, there are also some disadvantages of this method that require greater costs in the training process and it is more difficult to match the right time among respondents in forming a group (Hill-briggs et al., no date).

In the family-based self-management education program, from the three articles obtained, the time spent in the intervention process is 2-9 months, with a follow up of 6-12 months. The advantages of this method is the support of the family during the intervention process that has an impact on the increasing self-efficacy and self-care management of DM type 2 clients. However at the HbA1c value, the three articles show a statistically not so significant decline. In the intervention group between pretest and posttest there was a significant decrease in HbA1c value of P < 0.05. When compared to posttest HbA1c values between intervention groups and
control group posttest, no significant decrease occurred, with \( P > 0.05 \).

In individual-based self-management education programs, the three articles obtained during the intervention period are 6-12 months. No follow up during the research process. The advantage of this method is that the time in the implementation of the intervention is more flexible and the education can focus more on each respondent. In addition, it can improve self-agency (\( P = 0.093, P < 0.05 \)) and self-care activities (\( P = 0.018, P < 0.05 \)) DM type 2 clients (Scavini et al., 2013; Surucu, 2017; Yeary et al., 2017).

In addition to the advantages there are also disadvantages of this individual-based method of the three articles obtained all the research showed statistically significant results in lowering blood sugar DM Type 2 clients. The quantitative value of HbA1 in the intervention group (pre-test and post-test) there was a decrease, but statistically between the intervention group and the control group there was no significant decrease in HbA1c with \( P > 0.05 \).

In the self-management education program using technology-based methods, the time spent during the intervention of the 8 articles obtained was mostly 2-3 months, with follow-up activities at 6, 9, and 12 months. The advantage of this method is that of the 8 articles obtained most (6 articles) are statistically significant in lowering HbA1c levels (\( P < 0.05 \)), 2 articles indicate significant values in the pretest and post-test intervention groups only. As comparison of post-test value with control group HbA1c value did not show significant value \( P > 0.05 \). Another advantage of this method is that the method is effective in improving self-efficacy, improving quality of life, controlling systolic blood pressure and improving self-care activities of DM type 2 clients, clients with long distances can still be reached, time efficiency, monitoring process of respondents easier to monitor, and more cost-efficient. The disadvantage of this study is that respondents who are unable to operate the technology of the intervention implementation process will be more difficult and in remote areas, with minimal network signals, this method will be difficult to implement (Greenwood et al., 2017; Fisher et al., 2011).
Table 1. Description and Paper Analyze

<table>
<thead>
<tr>
<th>No</th>
<th>Name, Country, and Years</th>
<th>Design (2 groups)</th>
<th>Number of Sampel</th>
<th>Duration (Months)</th>
<th>Follow Up (Bulan)</th>
<th>Research’s Subject and Intervention method</th>
<th>Research’s Subject and Control’s group</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Greenwood et al., 2017). Slovenia</td>
<td>RCT</td>
<td>120</td>
<td>2</td>
<td>6 12</td>
<td>Individual Daily care + e-Diabetes application (Telemonitoring and Web-based interventions) containing diabetes self-management</td>
<td>Individual Daily care</td>
<td>Statistically significant can decreasing HbA1c Power 80% (P = 0.005, β = -0.384) (P &lt;0.05)</td>
</tr>
<tr>
<td>2</td>
<td>Rosanna Fiallo-Scharer et al. USA 2017</td>
<td>RCT</td>
<td>214</td>
<td>9</td>
<td>12</td>
<td>Individual + family Daily care + Family-centered self-management education with approach ACE (Achieving, Connecting resources, Empowering families)</td>
<td>Individual Daily care</td>
<td>Significantly controlling blood sugar HbA1c (P &lt;0.05)</td>
</tr>
<tr>
<td>3</td>
<td>Karen Hye-cheon Kim Yeary et al. USA 2017</td>
<td>RCT</td>
<td>240</td>
<td>2</td>
<td>6 12</td>
<td>Individual + family Family model + diabetes self-management education</td>
<td>Individual Standard diabetes self-management education</td>
<td>Significant results improve blood sugar control Power 80% Moderate magnitude at 0.5 P &lt;0.05 Approximately 0.5% change in HbA1c, Standard deviation 1.5%</td>
</tr>
<tr>
<td>4</td>
<td>Nutchanath Wichit et al. Thailand 2016</td>
<td>RCT</td>
<td>140</td>
<td>3</td>
<td>-</td>
<td>Individual + family Daily care + Family-oriented self-management program (health education classes, group discussions, home visits)</td>
<td>Individual Daily care</td>
<td>Statistically significant in improving Diabetes Self-efficacy (P &lt;0.05); and improve Self-management (P &lt;0.05); However it is also not significant in lowering HbA1c (P = 0.2) (P&gt; 0.05) And it does not improve Quality of life (P = 0.2) (P&gt; 0.05)</td>
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<tr>
<td>5</td>
<td>Lawrence Fisher et al. USA 2012</td>
<td>RCT</td>
<td>483</td>
<td>12</td>
<td>-</td>
<td>Individual Daily care + Intent-to-treat (ITT) and per-protocol (PP) self-management education</td>
<td>Individual Daily care</td>
<td>The quantitative value of HbA1 in the intervention group (pretest-post-test) was decreased, but statistically when compared between the intervention group and the control group there was no significant decrease in HbA1c with P&gt; 0.05</td>
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<tr>
<td></td>
<td>Authors</td>
<td>Location</td>
<td>Study Type</td>
<td>Sample Size</td>
<td>Follow-up</td>
<td>Interventions</td>
<td>Outcomes</td>
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<td>6</td>
<td>Charlene C. Quinn et al. 2011 Maryland</td>
<td>RCT (2 groups)</td>
<td>163</td>
<td>3</td>
<td>6 9 12</td>
<td>Individual Daily care + Mobile and web-based self-management patient coaching system and provider decision support</td>
<td>Individual Daily care Statistically significant in decreasing nilai HbA1c with difference value 1.9% -0.7% = 1.2%, P = 0.001 (P &lt;0.05)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Marina scavini Italy 2011</td>
<td>RCT (2 groups)</td>
<td>100</td>
<td>12</td>
<td>-</td>
<td>Individual Kegiatan sehari-hari + intensive SMBG management</td>
<td>Individual Daily care The quantitative value of HbA1 in the intervention group (pretest-post-test) was decreased, but statistically between the intervention group and the control group there was no significant decrease in HbA1c with P&gt; 0.05.</td>
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<tr>
<td>8</td>
<td>B. Price Kerfoot Boston, MA 2017</td>
<td>RCT (2 groups)</td>
<td>456</td>
<td>6</td>
<td>12</td>
<td>Groups Daily care + Online team-based game delivering diabetes self-management education (DSME) via e-mail or mobile application (app) + Booklet on Civics</td>
<td>Groups Daily care + Online team-based game on Civics + Booklet-based diabetes self-management education Statistically significant in reducing HbA1c with values (-8 mmol / mol [95% CI-10 to -7] and -5 mmol / mol [95% CI -7 to -3], P = 0.048) (P &lt;0.05 )</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Felicia Hill-Briggs et al. USA 2011</td>
<td>RCT (2 groups)</td>
<td>56</td>
<td>3</td>
<td>6 9</td>
<td>Groups Daily care + Problem-Solving-Based Diabetes Self-Management Training</td>
<td>Individual Daily care Statistically significant lower HbA1c value with difference value -0.72% - -0.57, P = 0.02 (P &lt;0.05) Statistically significant also can improve medication adherence with value β = -0.13%, P = 0.04 (P &lt;0.05) as well as on knowledge P &lt;0.05 (P &lt;0.05); problem-solving P = 0.01 (P &lt;0.05); and self-management behaviors P = 0.04 (P &lt;0.05)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Shelgh A. Mulvaney et al. Tannesee 2010</td>
<td>RCT (2 groups)</td>
<td>72</td>
<td>3</td>
<td>-</td>
<td>Individual Daily care + Interned-based self-management</td>
<td>Individual Daily care The quantitative value of HbA1 in the intervention group (pretest-post-test) was decreased, but statistically between the intervention group and the control group there was no significant decrease in HbA1c with d = -0.28, P = 0.27 (P&gt; 0.05)</td>
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<tr>
<td>No</td>
<td>Author(s)</td>
<td>Country</td>
<td>Study Design</td>
<td>Participants</td>
<td>Intervention</td>
<td>Outcome Measures</td>
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<tr>
<td>11</td>
<td>Calvin Or &amp; Da Tao</td>
<td>China</td>
<td>RCT (2 groups)</td>
<td>63</td>
<td>3</td>
<td>-</td>
<td>Individual Daily care + <em>A patient-centered, tablet computer-based self-monitoring system</em></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Hamdiye Arda Surucu et al.</td>
<td>Turki</td>
<td>RCT (2 groups)</td>
<td>139</td>
<td>6</td>
<td>-</td>
<td>Individual Daily care + <em>Diabetes self-management education based on Self-Care Deficit Nursing Theory (SCDNT)</em></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Elizabeth Murray et al.</td>
<td>UK</td>
<td>RCT (2 groups)</td>
<td>374</td>
<td>3</td>
<td>12</td>
<td>Individual Daily care + <em>Web-based self-management programme</em></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Elizabeth A. Walker et al.</td>
<td>USA</td>
<td>RCT (2 groups)</td>
<td>526</td>
<td>2</td>
<td>12</td>
<td>Individual Daily care + <em>Telephonic-based self-management education</em> (HE diberikan melalui telepon, minimal 6 kali dalam satu bulan)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Emily D Williams et al.</td>
<td>Australia</td>
<td>RCT (2 groups)</td>
<td>120</td>
<td>6</td>
<td>-</td>
<td>Individual Daily care + <em>Interactive telephone-delivered management intervention (TLC (Telephone-Linked Care) Diabetes program</em></td>
<td></td>
</tr>
</tbody>
</table>

The quantitative value of HbA1 in the intervention group (prettest-post-test) was decreased, but statistically between the intervention group and the control group there was no significant decrease in HbA1c with P > 0.05 Statistically significant in lowering systolic blood pressure with p value = 0.043 (P <0.05)

Statistically significant in lowering HbA1c level with mean difference value -0.24%; 95% CI -0.44 to -0.049; P = 0.014 (P <0.05)

Statistically significant in decreasing HbA1c value (the difference in HbA1c was 0.40% (95% CI 0.10-0.70, P = 0.009) (P <0.05) but may improve treatment adherence P = 0.005 (P <0.05)

Statistically significant in decreasing HbA1c with difference value 8.7% -7.9% = 0.8%, P = 0.002 (P <0.05); But it can improve the quality of life (Mental) with difference value 48.7% -51.7% = 3%, P = 0.007 (P <0.05)
4 DISCUSSION

In the results of this systematic review analysis, showed that self-management education significantly influence in lowering blood sugar DM type 2 clients. Of the 4 methods used in the 15 articles that have been analyzed. The method of self-management education based on technology is the most potential method in lowering blood sugar DM type 2 clients. This is because, the number of technology-based method adoption is the most widely, amounted to 8 articles. In addition, the quality of measurement using statistical analysis of the results of this method is very significant when compared with other methods with the value of P is mostly P <0.05. The results of comparison between pre-test and post-test in the intervention group all showed significant results with P <0.05. Similar results also occurred in the comparison between control group post-test and post-test of the intervention group, all statistical results showed a value of P <0.05, meaning that the intervention-based self-management education program was statistically significant in reducing the blood sugar value of DM type 2 clients According to several studies that have been reviewed using technology-based methods, in addition to the output obtained in the form of a decrease in HbA1c value, other advantages derived from this method are technology-based methods are also effective in improving self-efficacy, improving quality of life, controlling systolic blood pressure and improve self-care activities DM type 2 clients, clients with long distances can still be within range, time efficiency, monitoring process of respondents more easily monitored, and more cost-efficient.

The use of this technology-based method should be adjusted to the location or area of the respondent related to the availability of telecommunication networks and the ability of the respondents in operating a technology or electronic goods.

In the use of methods other than technology-based self-management based education, individuals, families and, the group obtained results that are not as good as the use of technology-based methods. In addition, there are some drawbacks obtained from the use of methods other than technology that is the time of the nurses in the research process longer, the distance between respondents sometimes far so that takes a lot of time, the cost of printing equipment and materials are expensive, the collection time of respondents in the form of groups that hard to equate and more difficult to monitor intervention programs over the long term.

Nursing Implication for Practice

Research that has been analyzed in this systematic review is the implementation of self-management education program in lowering blood sugar DM type 2 clients. The results obtained that the self-management education program using a technology-based method is the most effective method in lowering blood sugar DM Type 2 clients Based on the results of this study, it can be used as an alternative choice by nurses, especially Community Health Nursing in determining the most effective method used in the process of health education in the community. Currently, developments in the world of technology is growing, so a nurse should be more professional in developing nursing science that is adjusted with the times. The existence of assistance from the technology side, it is expected that one of nurse's duties as an educator, especially in promotive and preventive activities (primary, secondary, and tertiary), can run more effectively and produce maximum output. So the morbidity and mortality rates caused by type 2 diabetes mellitus can be decreased.

5 CONCLUSION

Self-management education program significantly influences in lowering blood sugar level of type 2 DM client. The most effective method used in self-management education program is technology based. It is hoped that technology-based self-management education programs can be used by nurses in the application of health education to DM type 2 clients in the wider community and can be applied to other chronic diseases, so that morbidity and mortality can be reduced.

REFERENCE


