The Effect of Exercise Consultation Program on Exercise Behavioural Change and Self-efficacy in Patients with Type 2 Diabetes

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Abstract—The objective of this study was to determine the effect of exercise consultation program on exercise behavioural change and self efficacy to regulate exercise in patients with type 2 diabetes (T2DM). This quasi-experimental, comparison group pre-test/post-test design purposively included sixty one patients with T2DM, 31 patients received the exercise consultation and 30 patients received routine health care. After receiving exercise consultation program, 74.2 % of the experimental group and 33 % of the control group had behaviour changed from the contemplating or preparation stage to action stage. There was significantly different exercise behaviour change in the experimental group (Fisher’s exact test = 000, p <.005). Their self-efficacy significantly increased in the experimental group (p < .05), but no change in the control group. In conclusion, the exercise consultation program could improve the exercise behavioural change, self-efficacy to regulate exercise patients of T2DM.

Keywords—physical exercise; transtheoretical model; type 2 diabetes

I. INTRODUCTION

Physical exercise is one of the crucial strategies to manage patient with type 2 diabetes mellitus (T2DM) [1], [2] but changing physical exercise behaviour is difficult for people with T2DM [3]. Study reported [4] that 73% of people with T2DM living in Medan, North Sumatera, Indonesia did not participate in diabetes exercise. To encourage people with T2DM to participate in diabetes exercise is a major challenge for nurse community health care centre.

The interventions for physical exercise in people with T2DM have often been based on the Transtheoretical Model (TTM) in western countries, for example exercise consultation. Previous studies showed the exercise consultation intervention based on TTM in the short-term and long-term have demonstrated effective to promote exercise behaviour in people with T2DM comparing with standard exercise information [5], [6], [7]. Those exercise consultation for patients of T2DM has been formulated on the basis of physical activity counselling based on the TTM and cognitive behavioural approach to promote physical exercise [8], [9].

This has never been used in Indonesia. This is the first study that used the exercise consultation based on TTM approach to promote physical exercise with Gymnastic Diabetes in Indonesia. With regard to raising the number of patients T2DM in Indonesia [10] especially in Medan [4], North Sumatra province, and the supported literature of TTM, researchers are interested in enhancing physical exercise behaviour of patients with T2DM through exercise consultation, and a focus on Gymnastic Diabetes to promote exercise behaviour in people T2DM. Therefore, this study plans to examine the effect of exercise consultation programs on exercise behaviour change, self-efficacy to regulate exercise in people with T2DM. The result of this study will provide knowledge and guidelines for improving exercise behaviour, self efficacy towards taking up regular exercise in people with T2DM at the Community Health Centre, in Medan, Indonesia.

II. MATERIAL AND METHODS

A. Design and Sample

A total of 66 subjects of patients T2DM who met the inclusion criteria were recruited for this study. Participants of age between 40 to 59 years, blood glucose level indication ranging of 140 to 250 mg/dl as per physical check-up at Rantang’s Community Health Center, participants were in the contemplation or preparation stage of exercise behavior change (e.g., they did not meeting current physical exercise guidelines, but intended to become more active); whereas the exclusion criteria for not selecting the subjects were diabetics with severe cardiovascular problems, and diabetics with serious complications of diabetes (e.g. going blind, marked neuropathy, osteoporosis, or impending renal failure). The subjects were divided into two groups; the experimental group and the control group, each group consisting of 33 subjects. Five subjects dropped out from the study, two from the experimental group and three from control group due to personal reason. Subsequently, only 61 subjects completed the intervention program, 31 were from the experimental group

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and 30 were from the control group. Following the initial procedure, participants from the control group were receiving routine health care, while participants from the experimental group were given exercise consultation program in addition to their routine health care, and after 9 weeks of this intervention program, second data collections were conducted by the research assistant.

The Exercise Stage of Change Questionnaires developed by Marcus et al., (1992) [11] was used to measure exercise behavioral change. Reliability of the stage of exercise behavioral change has reflected the kappa index reliability of .78 [12]. Five progressive stages of behavioral change were identified: Pre-contemplation stage groups together those who have no intention to exercise in the next 6 months, while contemplation stage includes those who intend to exercise in the near future. And preparation stage groups those who are doing some physical exercise, but not on regular basis to be put under regular physical exercise group, whereas action stage considers only those who are physically active on regular basis, but have been doing less than 6 months. However, those who have been regularly exercising for longer than 6 month are grouped in maintenance stage.

Self-efficacy towards regular exercise was assessed by deploying five items drawn from the Exercise Self-Efficacy Questionnaire (ESQ) developed by Marcus et al., (1992) [11]. For each item, respondents indicated their level of confidence of carrying out certain behaviors with numerical rating from '0' (not applicable) to '10' (very confident). Internal consistency was 0.82 and test retest of 0.90 [12]. The total scores for self-efficacy towards exercise varies from 0 to 50 of which the higher score implies a higher level of self-efficacy towards regular exercise.

B. Intervention: Exercise Consultation

The exercise consultation program involved one-to-one discussion following published guideline [8], [13] based on TTM [14] and has been adopted for use in this study with certain modifications to meet the goals of motivating and enhancing confidence to change. Subjects were able to take the important first step of making sure of having plans for a programmed exercise, while the consulting practices have focused on promoting increase in physical exercise, as for example, Indonesia’s Gymnastic Diabetes. The exercise consultative session adhered to the following strategies: Part 1: Starting with discussion or assessing the subject’s current physical exercise activity, followed by identifying the benefits the subject hopes to obtain from physical exercise, the social support, and the mental barriers to exercise the subject needs to overcome, then moving on to have the subject making commitment to exercise. Finally, to summarize at the end of each exercise consultation, the discussions and solutions to any foreseeable problems likely to be encountered by the subject. The logic of problem solving is 1) To discuss/ explore the benefits of becoming more active in doing physical exercise, 2) To give clear advice how to begin a gymnastic diabetes program, 3) To make recommendation to people with type 2 diabetes for physical exercise which includes frequency, duration, and intensity of physical exercise. Part 2, Making demonstration of gymnastic diabetes procedures stage by stage with the help of booklet/leaflet and VCD, the booklet/leaflet referred to is “Indonesia’s Gymnastic Diabetes 5 series” developed by Indonesian Diabetes Association [15], whose contents cover essential information about the postures and steps of Gymnastic Diabetes movements. Guidelines for doing Gymnastic Diabetes for type 2 diabetes would be to start with warm-up (5 to 10 minutes), to be followed by core movement (20 minutes) and final cool-down (5 to 10 minutes). Patients with T2DM should do this Gymnastic Diabetes exercise regularly making gradual progress. While the VCD referred to is also “Indonesia’s Gymnastic Diabetes 5 series” and is also developed by Indonesian Diabetes Association [15].

C. Analysis

SPSS program version.15 was used for data analysis. The differences of mean score of self-efficacy to regulate exercise both before and after intervention of subjects within the same group were analysed using dependent t-test, while independent t-test was used to analysed differences of means values between the two groups. For exercise behavioural change, participants were classified under two categories. Participants achieving moderate and regular physical exercise at three times a week with duration of at least 30 minutes each session were re-classified as 'Changed' or 'Action Stage' at the follow-up sessions. On the other hand, participants failing to do moderate and regular physical exercise were re-classified as 'No-change' or 'Pre-action Stage'. Difference on exercise behavioural change between experimental group and control group was tested using Fisher’s Exact Test at the confidence level Alpha 0.05.

D. Ethical Approval

The Ethic Review Committee for Research Involving Human Research Subject, Boromarajonani College of Nursing Nopparat Vajira, Bangkok, Thailand approved the study and written informed consent was obtained from all participants.

III. RESULTS

The objective of this quasi-experimental study is to determine what effect an exercise consultation program would have on patients of type 2 diabetes with regard to exercise behavioural change and self-efficacy towards taking up regular exercise. Mean age of the subjects were 54.45 years (SD= 5.29) for the experimental group and 54.46 years (SD= 4.42) for the control groups. Majority of the subjects in both groups were of female gender. Blood glucose levels of subjects in the experimental and control group were 207.52 (SD=27.68) and 207.70 (SD=15.31) respectively. Prior to the intervention program the majority of the subjects in the experimental group and control group were in the preparation stage of change (67.7% and 60 %), respectively.

Table 1 showed that of the two categories of changes, 'Change to Action' and 'No Change', 23 out of 31 subjects in the experimental group has progressed to 'Action' stage representing 74.2%, after attending the exercise consultation
program. While only 1 out of 30 subjects or a mere 3, 3% from the control group made it to ‘Action’ stage. Further analysis using Fishers’ Exact Test revealed a significant difference of success rate of behavioral change between the experimental and control groups (Fishers’ Exact Test = .000, p < .05).

<table>
<thead>
<tr>
<th>Type of Exercise Behavioural Change</th>
<th>Experimental Group (n=31)%</th>
<th>Control Group (n=30)%</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change to ‘Action’ stage</td>
<td>23 (74.2)</td>
<td>1 (3.3)</td>
<td>.000</td>
</tr>
<tr>
<td>No Change</td>
<td>8(25.8)</td>
<td>29(96.7)</td>
<td></td>
</tr>
</tbody>
</table>

TABLE II. COMPARISON OF MEAN SCORE OF SELF-EFFICACY TOWARDS TAKING UP REGULAR EXERCISE IN SUBJECTS BETWEEN THE TWO GROUPS USING INDEPENDENT T-TEST

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group (n=31)%</th>
<th>Control Group (n=30)%</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy Pre-intervention Post-intervention</td>
<td>23.94(5.72)</td>
<td>25.10(5.75)</td>
<td>-792</td>
<td>.431</td>
</tr>
<tr>
<td></td>
<td>38.13(5.29)</td>
<td>25.27(6.74)</td>
<td>8.305</td>
<td>.000</td>
</tr>
</tbody>
</table>

At the baseline no significantly different means score of self-efficacy between two groups. Table II has shown that mean scores of self-efficacy towards taking up regular exercise, post-intervention of exercise consultation program, among subjects of the experimental group and those of the control group were 38.13 (SD = 5.29), and 25.27 (SD = 6.74) respectively, these results showed higher self-efficacy for those participated in the exercise consultation program over those who did not participate. The result of independent t-test has also shown significant difference in self-efficacy towards taking up regular exercise among subjects in the experimental group compared to those in the control group (t= 8.305, p < .05).

IV. DISCUSSION

This study has been undertaken with the primary aim of assessing the effects of conducting exercise consultation program to influence exercise behavioural changes and self-efficacy towards taking up exercise among patients of T2DM, by comparing two groups - one designated as the experimental group receiving exercise consultation program and the other designated as the control group receiving mere routine health care.

As for the control group, the findings showed no significant changes in exercise behaviour and self-efficacy towards taking up regular exercise between data recorded at baseline and throughout the 9-weeks of follow-up, while subjects in the experimental group had significantly changed their exercise behaviours by progressing from contemplation to ‘Action’ stage. These findings have supported the hypothesis, whereby the patients’ exercise behaviours might have been influenced by the exercise consultation program to progress to ‘Action’ stage, which was considered a significant change. The finding of this study is consistent with findings of previous studies [6],[7] which had also found that subjects exhibited significant progress in their exercise behavioural changes over a 6 month exercise consultation program, much more so than those who were not involved in the program. Moreover, the findings of this study have added to the previous study’s belief that adult patients of type 2 diabetes could be motivated to improve their exercise behaviour over a relatively shorter period than one though it would take . However, this study has also limited its scope of further explanation regarding the maintenance stages of exercise behaviours.

The exercise consultation might motivate subjects to become more physically active and increase self-efficacy and awareness of the benefits of physical exercise, thereby lowering mental barriers to exercise. Limited motivation and exercise knowledge could be barriers to taking up regular exercise among adults of T2DM [16]. Therefore, the exercise consultation should aim to support and motivate patients taking up exercise, as well as helping patients to recognize their unhealthy behaviours. Enhancing patient’s motivation and educating patients about the benefit of exercise are the most successful strategies of engaging patients to attain increased level of exercise [17]. High levels of physical exercise have correlation with patients progressing their stage of change [17], and it would be good if they could maintain their exercise behaviour changes [5], [6]. It is clear that exercise consultation program increases the participants’ self-efficacy to exercise regularly. Self-efficacy is an important factor of progressing individuals from the lower stages to upper stages through behavioural changes [18], [19] like the instance of individuals moving from the contemplation or preparation stages to the ‘Action’ stage. Individuals in the contemplation or preparation stages may struggle to change due to lack of exercise knowledge [18] and lack of self-confidence in his or her ability to change. Individuals are able to move to the next stage of change whenever they are comfortable with the selected exercise plan which they feel it can work and is practical to follow. Therefore, for individuals in contemplation or preparation stages their self-efficacies need to be enhanced. Previous study [20] found that individuals with higher self-efficacies had shown more confidence in maintaining their physical activity program. In addition, self-efficacy has proven to be the strongest predictor for maintaining regular exercise behaviour amongst adults of type 2 diabetes [21]. Considering routine health care as provided by different caregivers, the differences in self-efficacy to regulate exercise and increased behavioural changes were significant which might be due to the relationship between health care provider and patients themselves. Health care provider might have an important role of improving patient’s self-efficacy and behavioural changes. Good relationships and familiarity between personal health care giver and patient are needed to implement interventions.
based on the TTM approach [5]. Close contact between researcher and participants during the intervention and continuous feedback are also an important issue in determining the success of this intervention. Appropriate interventions at the patient’s different stages of change, together with adequate support like frequent contact to monitor and motivate behavioural changes in patients of T2DM are keys to success of changing their exercise behaviours.

In this study, changes in exercise behaviours were higher in preparation than in action stage of subjects in the contemplation stage. This may have some limitations that some factors were not measured in this study. Individual physical environment that may be the barrier in attending gymnastic diabetes program and may influence the results was not measured such as distance between home and community health centre. In addition, Emotions and mood may affect differences in diabetes control but it is not measured in this study. Other possible limitations related to variables were not measured including A1C, lipid, blood pressure, and quality of life as well as small sample size. For the future research, the exercise consultation program should be studied with longer follow-up period to measure these objectives and to evaluate the maintenance of physical exercise behavior change in a large sample size of patients of T2DM under different setting in Indonesia.

V. CONCLUSION

Exercise consultation program is a simple approach to counselling, tailored to the patient's current attitude, confidence, and motivation, to positively promote physical exercise. Exercise consultation program could improve the exercise behavioural change, self-efficacy to regulate exercise patients of T2DM. This program is a feasible to encourage sedentary people with type 2 diabetes to perform physical exercise. Health care providers consider using this program for life style modification to be better diabetes control and prevent diabetes complication.

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