1. Introduction

Chronic diseases are among the main causes of mortality and disability in the world today [1]. Decline in physical activity, increase in obesity and tobacco use, and increasingly aging populations have led to considerable growth rates in the prevalence of chronic diseases in societies [2]. Diabetes is one of the most common chronic metabolic diseases [3, 4]. According to reports by the World Health Organization (WHO), about 422 million individuals were affected by diabetes in 2014, with greater prevalence in low and moderate income countries. The global prevalence of diabetes is estimated to be 8.5% among adults aged above 18 years. It was the seventh leading cause of mortality in 2016 (1.6 million individuals died from consequences of diabetes) [5].

Diabetes may cause short-term complications, including as hypoglycemia and diabetic ketoacidosis, and long-term complications, including retinopathy, nephropathy, neuropathy, and cardiovascular disease [6]. It may also lead to disability and a multi-year decline in life expectancy [7, 8]. Therefore, daily blood glucose control, adherence to a dietary and pharmaceutical regimen, physical activity, and regular foot care are essential factors in disease management...
Teach-Back and Type 2 Diabetes

2. Materials and methods

2.1 Patients

This was a pretest/posttest clinical trial with a control group. The study included 74 patients with type 2 diabetes (T2D) from the Endocrinology and Metabolism Clinic of Gonabad University of Medical Sciences, Gonabad City, Iran in 2018. The samples were selected by convenience sampling and according to the inclusion and exclusion criteria. Inclusion criteria included:

- Over 18 years
- No mental illnesses
- Literate
- Not part of the health workforce
- No history of participation in diabetes education programs in the last six months
- Possibility of contacting their family members

The exclusion criterion was: developing physical problems that prevent self-care. The patients were allocated to the 2 groups, namely training (n = 37) and control (n = 37).

After obtaining permission from the Ethics Committee of Iran University of Medical Sciences, the relevant data were collected by referring the patients to the Diabetes Clinic of Gonabad City. Details of the project, research objectives, and confidentiality of personal information were explained to the study participants, and written informed consent was obtained from all participants.

2.2 Study design

In order to prevent leakage of information, the two groups (control and intervention) had been selected separately and in isolation from each other. The selection of subjects was performed at the beginning of the week. Training sessions were held during the same week in the diabetes clinic for individual subjects on a face-to-face basis. The teach-back method was implemented by a person-to-person training program that was carried out during 4 sessions of 30 to 45 min in addition to the usual departmental program. Also, at the end of each training session, the education manuals on diabetes were provided to the intervention group. The control group received the routine program including training by a doctor or nurse accompanied by departmental posters. One month later, the two groups were evaluated.

2.3 Data gathering

Clinical and demographic characteristics were recorded and a diabetes self-efficacy questionnaire (DMSES) was used to assess the level of patients’ self-management of their disease. Clinical and demographic characteristics included gender, age, marital status, occupational status, educational level, residence location, income, insurance and supplementary insurance status, household, individuals living with the patient, height, weight, body mass index, tobacco use, fasting blood glucose level at last laboratory test, history of diabetes, type of treatment, and history of training. The DMSES questionnaire used for assessing patients’ self-efficacy consisted of 19 questions scored on the 11-degree Likert scale, ranging from “I cannot definitely” with zero score to “I can definitely” with a score of 10. The patients scored themselves from zero to ten for each question to assess their performance and awareness in the context, with higher scores representing higher self-efficacy. The scores obtained represented the following degrees of self-efficacy:

1. 0-66: low self-efficacy
2. 66-130: medium self-efficacy
3. 130-190: high self-efficacy
The questions were classified into five categories, including:

- Nutrition and diet: questions number 4, 5, 9, 11, 12, 13, 14, 15, and 16 (nine questions)
- Physical activity: questions number 8 and 10 (two questions)
- Medication use: questions number 2, 18, and 19 (three questions)
- Measurement of blood sugar: questions number 1, 2, and 3 (three questions)
- Assessment of feet and referral to physician: questions number 7 and 17 (two questions)

The internal consistency coefficient (Cronbach’s alpha) was 0.83.

2.4 Data analysis

The collected data were analyzed by SPSS. Quantitative data were represented by mean and standard deviation. Frequency distribution tables and related diagrams (for qualitative data) were used to describe the results. The Kolmogorov-Smirnov test was used to assess normality of data. Paired sample t-test and independent t-test were applied to compare mean scores and normal data. Non-parametric Mann-Whitney U-test and Wilcoxon signed-rank test were used for analyzing non-normal data. The significance level was considered 0.05 for all tests.

3. Results

The data obtained suggested that the control and intervention group were homogeneous in terms of clinical and demographic information. The mean score for age was 47.08 years in the intervention group and 43.54 years in the control group, with a mean age of 45.31 years in both groups. The majority of subjects were married and homemakers, held a diploma or degree, and had a history of diabetes of longer than 2 years (Table 1).

According to independent t-test, mean ± SD scores for self-efficacy before training were 95.89 ± 10.77 in the intervention group and 95.54 ± 10.97 in the control group. There were no significant differences in self-efficacy before training between the 2 groups. However, the difference between the two groups was significant one month after training, with 148.51 ± 19.78 in the training group and 97.95 ± 15.72 in the control group (p < 0.001). This result was also confirmed by the paired sample t-test: the difference between scores before and after 1 month of training was significant in the intervention group, but not the control group (t = 13.94, p < 0.001) (Table 2).

According to independent t-test, mean scores for self-efficacy before training were not significantly different between the 2 groups. However, one month after training, the difference between the groups was significant; the mean scores were significantly higher in the intervention group (p < 0.001). According to the paired t-test, there was also a significant difference between the mean scores for self-efficacy before and after 1 month of training in the intervention group; they were significantly higher 1 month after training (p < 0.001). Meanwhile, there was no significant difference in the control group (Table 3).

4. Discussion

The results suggested that a one-month teach-back training significantly improved self-efficacy in the intervention group, while there was no significant difference between mean and SD scores in the control group before and after training. Inter-group comparisons revealed that the intervention group performed significantly better: mean and SD of self-efficacy were

| Table 1. Clinical and demographic information on type 2 diabetic patients in the intervention and control group |
|---------------------------------------------------------------|
| **Age (yr)** | Intervention | Control | Test results |
|----------------|--------------|---------|--------------|
| 20-39          | 11(29.8)     | 15(40.6)| t = 1.4      |
| 40-59          | 19(51.3)     | 17(45.9)| df = 72      |
| 60-70          | 5(13.9)      | 5(13.5)| p* = 0.16    |
| **Mean ± SD**  | 47.08 ± 10.39| 43.54 ± 11.20 |            |
| **Gender**     |              |         |              |
| Male           | 18(48.6)     | 18(48.6)| x² = 0       |
| Female         | 19(51.4)     | 19(51.4)| df = 1       |
| **p** = 1      |              |         | p** = 0.07   |
| **Marital status** |          |         |              |
| Married        | 30(81)       | 23(62.1)| x² = 3.2     |
| Single         | 7(19)        | 14(37.9)| df = 1       |
| **p** = 1      |              |         | p** = 0.07   |
| **Employment status** |        |         |              |
| Employed       | 3(8.2)       | 4(10.5)|             |
| Self-employment| 8(21.6)      | 9(24.3)|             |
| Retired        | 5(13.5)      | 3(8.2)|             |
| Homemaker      | 12(32.4)     | 11(29.7)|             |
| Unemployed     | 5(13.5)      | 7(18.9)|             |
| Worker         | 4(10.8)      | 3(8.1)|             |
| **Education**  |              |         | x² = 4.98    |
| Illiterate     | 6(16.2)      | 6(16.2)| df = 4      |
| Primary school | 9(24.4)      | 9(24.4)| p* = 0.28   |
| Secondary school| 8(21.6)    | 7(18.9)|             |
| Diploma        | 12(32.4)     | 7(18.9)|             |
| Undergraduate or higher degree | 2(5.4) | 8(21.6)|             |
| **History of diabetes** | | | X² = 0.45 |
| 6 months to 2 years| 6(16.3) | 8(21.7)| df = 2      |
| 2-4 years      | 13(35.1)     | 11(29.7)| p* = 0.79   |
| >4 years       | 18(48.6)     | 18(48.6)|             |
| **Mean ± SD**  | 2.32±0.74    | 2.27±0.80|              |

Legend: * Independent t-test, ** chi-square test, *** Fischer’s exact test
In the prevention or at least reduction of long-term complications and hospitalization. Teach-back is a specific training method aimed at improving patients’ perception, and it is applicable in the context of diabetes disease management. Increased knowledge enables the patient to achieve better self-care and may lead to informed decision-making related to the continuity of self-care and eventually a decline in physical and mental complications [36].

There are limitations to this study. The educational levels of the participants were heterogeneous which may have had an impact on the answers. Also, participants sometimes had difficulties attending training classes. In these cases, it was necessary to work more closely with them to solve this problem.

5. Conclusions

Health education and appropriate corrective and behavioral approaches are among the most effective ways of preventing and controlling diabetes. These strategies focus on raising awareness of medical needs to achieve optimal glycemic control and on reinforcing the motivation and skills of individuals to engage in the implementation of prescribed therapies and participate actively in self-care with the help of other family members. Considering the efficacy of the intervention to improve the lifestyle of people with type 2 diabetes, rehabilitation in the field of diabetes is feasible and an effective way to improve the status of people with diabetes. Training by the teach-back method has been shown to be a feasible and effective means of implementing self-efficacy and thus improving lifestyle changes for optimized disease management.
1. Rodriguez F, Blum MR, Falasirnu T, Hastings KG, Hu J, Cullen MR, Palaniappan LP. Diabetes-attributable mortality in the United States from 2003 to 2016 using a multiple-cause-of-death approach. Diabetes Res Clin Pract 2019. 148:169-178.

2. Forbes AW. The nursing contribution to chronic disease management: a discussion paper. Int J Nurs Stud 2009. 46(1):120-131.

3. Nathan DM, Buse JB, Davidson MB, Ferrannini E, Holman RR, Rewers M, Zinman B. Medical management of hyperglycaemia in type 2 diabetes mellitus: a consensus algorithm for the initiation and adjustment of therapy. Diabetologia 2009. 52(1):17.

4. Caughey GE, Roughhead EE, Vitry AI, McDermott RA, Shann S, Gilbert AL. Effects of a nursing intervention on improving self-efficacy and reducing cardiovascular risk factors in patients with cardiovascular diseases. J Hayat 2011. 17(1):45-54.

5. World Health Organization. Teaching back method in patient education. Strides in medical education 2016.

6. Brunner LS, Smeltzer SC, Bare BG, Hinkle JL, Cheever KH. Brunner and Suddarth’s textbook of medical-surgical nursing. Lippincott Williams and Wilkins, 2014.

7. Seclen SN, Rosas ME, Arias AJ, Huayta E, Medina CA. Self-efficacy in patients with type 2 diabetes: a randomized clinical trial. Int J Nurs Pract 2005. 11(4):177-184.

8. Khalkhali HR. The effect of counseling on health promotion behaviors in diabetic mothers referred to Motahhari Hospital of Urmia at 2016. J Urmia Nurs Midwif Facul 2016. 14(9):757-766.

9. McDowell J, Courtney M, Edwards H, Shortridge-Baggett LM. Validation of the Australian/English version of the diabetes management self-efficacy scale. Int J Nurs Pract 2005. 11(4):177-184.

10. Shakibzadeh E, Rashidian A, Larijani B, Shojaeezadeh D, Forouzanfar M, Karimi Shahanjari N. Perceived barriers and self-efficacy: Impact on self-care behaviors in adults with type 2 diabetes. J Hayat 2010. 15(4):69-78.

11. Fischer J, Koszewski W, Jones G, Stanek-Krogstrand K. The use of interview to assess dietetic internship preceptors needs and perceptions. J Am Diet Assoc 2006. 106(8):A48.

12. Bazzazian S, Besharat M, Ehsan BH, Rajab A. The moderating role of coping strategies in relationship between illness perception, quality of life and HbA1c in patients with type 1 diabetes. Iran J Endocrinol Metab 2010. 13(3):213-222.

13. Wu SF, Courtney M, Edwards H, Shortridge-Baggett LM, Chang PJ. Self-efficacy, outcome expectations and self-care behaviour in people with type 2 diabetes in Taiwan. J Clin Nurs 2007. 16(11c):250-257.

14. Keough L.A. Self-management of type 1 diabetes across adolescence: a dissertation. 2009.

15. Lauer-Walker M. Importance of illness beliefs and self-efficacy for patients with coronary heart disease. J Adv Nurs 2007. 60(2):187-198.

16. Bandura A. Adolescent development from an agentic perspective. In: Pajares F, Urdan T (eds.): Self-efficacy beliefs of adolescents (pp. 1-43). Greenwich, Connecticut, Information Age Publishing, 2006.

17. Naidu J, Wills J. Health promotion functions for practice. London, Toronto, second ed., 2005. p. 98-99.

18. Bentsen SB, Wentzel-Larsen T, Henriksen AH, Rokne B, Wahl AK. Self-efficacy as a predictor of improvement in health status and overall quality of life in pulmonary rehabilitation - an exploratory study. Patient Educ Couns 2010. 81(1):5-13.

19. Baljani E, Rahimi J, Amanpour E, Salimi S, Parkashjojo M. Effects of a nursing intervention on improving self-efficacy and reducing cardiovascular risk factors in patients with cardiovascular diseases. J Hayat 2011. 17(1):45-54.

20. Wilson FL, Baker LM, Nordstrom CK, Legwand C. Using the teach-back and Orem’s Self-Care Deficit Nursing theory to increase childhood immunization communication among low-income mothers. Issues Compr Pediatr Nurs 2008. 31(1):7-22.

21. Esquivel J, White M, Carroll M, Brinker E. Teach-back is an effective strategy for educating older heart failure patients. J Card Fail 2011. 17(8):S103.

22. Kripalani S, Bengtzen R, Henderson LE, Jacobson TA. Clinical research in low-literacy populations: using teach-back to assess comprehension of informed consent and privacy information. JBRB 2008. 30(2):13-19.

23. Dalir Z. Teach back method in patient education. Strides in Development of Medical Education 2017. 13:640-643.

24. Kornbueger C, Gibson C, Szadowski S, Malletta K, Klingbeil C. Using “teach-back” to promote a safe transition from hospital to home: an evidence-based approach to improving the discharge process. J Pediatr Nurs 2013. 28(3):282-291.

25. White M, Garbe C, Robinson R, Sohl A, Silverman J, Kiefer M, Lessler D, Krieger J. Peer Support for Achieving Independence in Diabetes (Peer-AID): design, methods and baseline characteristics of a randomized controlled trial of community health worker assisted diabetes self-management support. Contemp Clin Trials 2014. 38(2):361-369.

26. Rashidi K, Safavi M, Yavahy S, Farahani H. Effects of peer support on self-efficacy of patients with type II diabetes. Sci Hamadan Nurs Midwife Facul 2015. 3(50):15-26.

27. Lachini A, Amirsardari L, Mahmoudi Zaman M. Efficacy of education of self-efficacy on controlling HbA1c in the dDiabetes II. J Res Psychol Health 2014. 8(2):61-70.

28. Hejazi S, Peyman N, Tajfard M, Esmaeili H. The impact of education based on self-efficacy theory on health literacy, self-efficacy and self-care behaviors in patients with type 2 diabetes. Iran J Health Educ Health Prom 2017. 5(4):296-303.

29. Naghibi SA, Ashari M, Rostami F. Investigation the effect of education on self-care promotion in type 2 diabetic patients in Noor Health Centers in 2015. J Health Res Commun 2015. 1(2):22-28.

30. Masoodi R, Alhani F, Rabiei L, Majdinasab N, Moghaddasi J, Esmaeili S, Noorian C. The effect of family-centered empowerment model on quality of life and self-efficacy of multiple sclerosis patients family care givers. Iran J Nurs Res 2013. 7(27):32-43.

31. Mohsenikah M, Esmaii R, Tavakolizadeh J, Khavasi M, Jaras M, Delshad Nohgahi A. Effects of peer-education on quality of life in adults with type 2 diabetes. Q Horiz Med Sci 2018. 24(1):17-22.