

ORIGINAL ARTICLE

Comparison of the Effect of Education Using Team-based Learning Method and Lecture Method on Controlling Diabetes in the Elderly: A Quasi-Experimental Study

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ABSTRACT

Background: Patient education is considered as an essential part of diabetes control. This research is conducted to compare the effect of education using team-based learning (TBL) method and lecture method on blood pressure (BP), serum levels of fasting blood sugar (FBS), glycosylated hemoglobin (HbA1c), and Body mass index (BMI) in the elderly with diabetes.

Methods: This quasi-experimental study was conducted on 61 elderly patients with type 2 diabetes in diabetes clinics in Rafsanjan, during October 2018 to January 2019. Patients were selected using simple random sampling. They were divided into two groups of TBL and lecture-based learning. For each group, educational content was presented through 2-hour sessions held once a week for 1 months. FBS, HbA1c, BMI, and BP were measured at baseline and 3 months after the intervention. Data were analyzed through SPSS 21, using Chi-square test, independent t-test, and paired t-test; A P-value<0.05 was considered as significant.

Results: After the intervention, the TBL group had a significant decrease in systolic and diastolic BP compared to the lecture group (P<0.001). Before and 3 months after the intervention in the TBL group, there was a significant decrease between the means of FBS (P=0.01), HbA1c (P<0.001), and systolic and diastolic BP (P<0.001), but in the lecture group, only the systolic BP showed a significant decrease (P<0.001).

Conclusion: TBL method had more effects on controlling diabetes type 2 in the elderly than the lecture method. It is suggested that health providers should consider TBL for the education of the elderly with diabetes.

Keywords: Diabetes mellitus, Learning, Blood pressure, Blood glucose

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INTRODUCTION

Diabetes is one of the most common metabolic diseases.¹ According to the International Diabetes Federation (IDF), the diabetes epidemic is emerging dramatically worldwide. In 2021, the number of diabetes adults reached 537 million and will be 783 million in 2045. In Iran, 5.4 million adults (9.1%) suffer from diabetes, which is estimated to reach 9.5 million by 2045.² Type 2 diabetes accounts for approximately 90% of all diabetes cases.³ Several studies have shown that the prevalence of diabetes increases with age.^{4,5} According to the report of the IDF in 2019, the number of people with diabetes among those 65 and over has reached 136 million.³ Management of type 2 diabetes is especially challenging in the elderly.⁶

According to the World Health Organization, education is at the core of diabetes prevention and treatment.⁷ Training, along with the change of attitudes, leads to the alteration of a person's lifestyle and, consequently, the success of medical treatments. It also greatly increases adherence to the use of drugs and, as a result, reduces the possible side effects in them.^{8,9} The use of the best training methods to achieve maximum efficiency and success is what has been discussed in most studies conducted in this field. According to this purpose, several different educational interventions have been utilized for diabetes by using technology such as the Internet,¹⁰ mobile phones,¹¹ individual and group training, and group discussion training all over the world.^{12,13} However, due to the low level of literacy and low tendency to technology in the elderly, the application of these methods is not practical.¹⁴ Studies have indicated that the elderly are more vulnerable to complications of diabetes and refer to the emergency rooms due to hypoglycemia caused by diabetes,^{15,16} which is a sign of the failure of preventive and educational programs to improve lifestyle in these patients.¹⁷ The lecture method is used in Iranian health centers, which usually does not lead to meaningful and deep learning.¹⁸ The

lecture is a simple, fast, and cheap method to present vast issues to a lot of groups of learners. Disadvantages of this method include inactive learning, tiring long lectures, one-way communication, and fast forgetting of the issues.¹⁹ As a result, most diabetics do not have eligible control over their blood sugar.²⁰ Therefore, for an effective education for the elderly, the types of methods should be used in which the learner has an active role.⁹ One of the methods that seem to have the required potential to be used in the training of the elderly is participatory education.²¹ Participatory education has various types, one of which is team-based learning (TBL). TBL is a pedagogical approach that combines both active and cooperative learning.²² Learners have an active role in this method.²² It emphasizes group interaction and the creation of motivation to participate in group discussions.²² Since this method can be implemented with a teacher in a large classroom, it can be used in health centers.²² According to the results of the study conducted on students, it was indicated that the use of the TBL method was more effective than other educational methods in the university.²³ Compared with the lecture method, TBL is more emphatic on the learners' innovative consciousness, active communication, and creative ability.²⁴ Also, the TBL method is very suitable for training in allied health professions.²⁵

According to the fact that the elderly population with diabetes is growing rapidly worldwide, they need adequate knowledge to control diabetes, which requires an effective educational method; given that the use of the lecture method has some disadvantages and also due to the characteristics and potentials of the TBL, this study is conducted to compare the effect of education with TBL method and lecture method on BP, FBS, HbA1c, and BMI in the elderly with diabetes.

METHODS

This is a quasi-experimental study that was

conducted in the Rafsanjan Diabetes Center in Four months between October 2018 and January 2019. This center provides services to all age groups with both types of diabetes. Services provided include medical examinations and tests, such as disease management, treatment plans, and diabetes education. To estimate the sample size, we considered $\alpha=0.05$ and $\beta=0.10$, power=90%, $d=1.2$, and $\sigma=1.4$ based on HbA1c,²⁶ using the following formula:

$$n = \frac{2\sigma^2(Z_{1-\alpha/2} + Z_{1-\beta})^2}{d^2}$$

$$n = \frac{2(1.96 + 1.29)^2 1.4^2}{1.2^2} = 28.8$$

The minimum required sample for each group was estimated to be 28 people, and with 5% attrition rate, 30 people were considered for each group.

The inclusion criteria of the study were the need for insulin injection, age of 60 to 65 years old, lack of participation in the same training program, willingness to participate in the study, lack of chronic mental disease, or cognitive disorder, and lack of any severe life-threatening disease. Also, the exclusion criteria of the study included not attending one of the training sessions, participating in another training program simultaneously, not performing tests to monitor diabetes status, not being willing to continue attending the training classes, and using other treatment methods such as yoga or traditional treatments.

The participants were selected from among 300 diabetic patients referred to diabetes

clinics using simple random sampling. Then, the participants were divided into two groups. Those in the group of training based on the lecture method participated in 4 sessions of 120 minutes (one session per week) in October 2018 with the topics mentioned in Table 1.

The instructor was one of the diabetes clinic nurses who had a lot of experience in working with diabetic patients. The main researcher supervised her work. Prior to the meetings, the principles of lecture were shared with the individuals. The instructor was selected from outside the research team to avoid any probable bias. In this method, first, the instructor talks about the issue and explains it with slides, and answers the questions of the elderly at the end of the session.

The elderly who were in the TBL method of training group participated in 4 sessions of 120 minutes (one session per week) in October 2018. The topics of the sessions were completely similar to those of the lecture method group of training (Table 1). In the implementation of the TBL method, there were three stages of preparation, program implementation, and evaluation in each session. These sessions were held in the presence of the instructor. In the stage of preparation, the data of the participants, which were received from their environment, physicians, nurses, and routine training programs either during life or after the diagnosis of diabetes, were assessed. In the stage of the implementation of the program, the elderly were divided into small groups of typically five to six elderly in each session. They discussed the topic of the session with each other and became aware of each other's

Table 1: The teaching protocol based on the lecture method and the team-based learning method

| Session | General topic | The topics taught | Time |
|-----------|-----------------------------|---|-------------|
| Session 1 | Nutrition | General principles of nutrition, diabetes eating habits, diabetic diet, low-sodium diet | 120 minutes |
| Session 2 | Exercise | The manner of the adjustment of an exercise program, exercise and weight loss, exercise movements and weight loss | 120 minutes |
| Session 3 | Prevention of complications | Complications and signs of hypoglycemia and hyperglycemia and prevention of late complications such as effects on eyes, feet, kidneys, and blood pressure | 120 minutes |
| Session 4 | Insulin therapy | The time and manner of drawing, injecting and adjusting insulin dose, place of insulin injection, insulin storage and using Glucose meter | 120 minutes |

experiences in these groups. Also, at the end of this stage, the person who managed the session provided the required training in the areas where the elderly were challenged by them during group discussions and needed further explanations. The evaluation was conducted at the final stage.

The content of the training package was prepared based on a review of the texts.^{1,27} The initial version of the educational content was provided to 10 faculty members of Rafsanjan Faculty of Nursing and Midwifery, and it was studied. After making the necessary changes in the training program, we prepared the final version of this program and provided it to the instructors.

The training classes were held from 9-11 am in the classroom of the Diabetes Center of Rafsanjan, which is under the supervision of the Deputy of Health of Rafsanjan, to prevent the effect of place and time on the educational process. The lecture method group classes were held on Sunday, and TBL method classes were held on Monday to prevent the exchange of information between the participants of the two groups. Also, during the selection of the samples, we made an attempt to assign the people who were related to each other in separate groups to reduce the possibility of the exchange of information between the participants.

In this study, HbA1c, FBS, BMI, and BP were measured in the two groups before and three months after the end of the intervention. The variable of weight was measured by using a digital scale with an accuracy of 0.1 kg, and the variable of height was measured with a tape meter with an accuracy of 0.5 cm. Then, BMI was calculated and recorded by using the formula of weight in kilograms divided by height in meters squared. BP was measured three times during the relaxation time by using a digital sphygmomanometer with a measurement accuracy of 1 mmHg, which was the same device for all participants, and an average value was calculated and recorded for patients according to the guidelines of the European Society of Hypertension. Five ccs of

blood samples were taken from patients after 8 hours of overnight fasting. Serum blood levels of HbA1c and FBS were measured and recorded by using an autoanalyzer and the Pars Azmoon commercial assay kits, made in Iran. It should be noted that blood sampling and tests were performed by a certified nurse.

The protocol was approved by the Ethics Committee of the Vice Chancellor for Research of Rafsanjan University of Medical Sciences and Health Services (IR.RUMS.REC.2015.114). The objectives of the study were explained to the patients, and their written informed consent was obtained. The right of withdrawal from the study was preserved for all participants without any changes in their care.

The obtained data were processed through SPSS software version 21. Chi-square was used to compare the demographic characteristics of the two groups. Independent t-test and paired t test were used to compare the mean of variables between and within groups.

RESULTS

A total of 80 elderly patients with diabetes were evaluated for being enrolled in the study, but 19 patients were not willing to participate in the study. Finally, a total of 61 individuals including 33 in the TBL group and 28 in the lecture group participated in our study. The demographic characteristics of the participants are presented in Table 2. Accordingly, the results of the independent sample t-test indicated no significant difference in the mean age of TBL (63.36 ± 4.74) and lecture group (65.92 ± 5.94) ($P=0.06$). In addition, the results of the chi-square test also showed no significant difference between the two groups in terms of sex and level of education ($P>0.05$).

There was no significant difference in the mean of FBS ($P=0.598$), HbA1c ($P=0.340$), systolic BP ($P=0.696$), diastolic BP ($P=0.357$), and BMI ($P=0.315$) between the two groups before the intervention (Table 3).

Findings showed no significant difference in the mean of FBS ($P=0.808$), HbA1c ($P=0.139$),

Table 2: Demographic characteristics of the elderly with diabetes in the team-based learning and lecture groups

| Variables | Lecture group N (%) | TBL ^a group N (%) | P value* |
|--------------------------------|------------------------|---------------------------------|----------|
| Sex | | | |
| Female | 20 (71.41) | 24 (72.72) | 0.910 |
| Male | 8 (28.62) | 9 (27.33) | |
| Level of education | | | |
| Just read and write | 15 (53.61) | 14 (42.41) | 0.317 |
| Elementary School | 6 (21.43) | 13 (39.42) | |
| To diploma | 7 (25) | 6 (18.22) | |
| History of high blood pressure | | | |
| Yes | 21 (75) | 21 (63.62) | 0.340 |
| No | 7 (25) | 12 (36.43) | |
| History of other diseases | | | |
| Yes | 11 (39.33) | 21 (63.63) | 0.058 |
| No | 17 (60.71) | 12 (36.42) | |

^aTeam-based learning; *Chi-square

Table 3: Comparison of the desired parameters between the two groups before and 3 months after the intervention

| Variables | Lecture group Mean±SD | TBL ^a group Mean±SD | P value* |
|---------------------------------------|--------------------------|-----------------------------------|----------|
| FBS ^b (mg/dl) | | | |
| Before the intervention | 177.32±61.44 | 184.39±42.08 | 0.598 |
| 3 months after the intervention | 165.14±41.04 | 162.54±41.89 | 0.808 |
| P value** | 0.313 | 0.011 | --- |
| HbA1c ^c (%) | | | |
| Before the intervention | 7.771.27± | 8.06±1.08 | 0.340 |
| 3 months after the intervention | 7.61±1.33 | 7.13±1.18 | 0.139 |
| P value** | 0.453 | >0.001 | --- |
| Systolic blood pressure (mmHg) | | | |
| Before the intervention | 150.71±16.70 | 152.42±17.09 | 0.696 |
| 3 months after the intervention | 144.65±15.54 | 134.24±13.52 | 0.007 |
| P value** | >0.001 | >0.001 | --- |
| Diastolic blood pressure (mmHg) | | | |
| Before the intervention | 84.46±11.65 | 86.96±9.43 | 0.357 |
| 3 months after the intervention | 80.71±10.69 | 73.63±6.40 | 0.002 |
| P value** | 0.059 | >0.001 | --- |
| BMI ^d (kg/m ²) | | | |
| Before the intervention | 27.67±4.60 | 28.91±4.88 | 0.315 |
| 3 months after the intervention | 27.57±4.67 | 28.84±4.69 | 0.298 |
| P value** | 0.693 | 0.741 | --- |

^aTeam-based learning; ^bFasting Blood Sugar; ^cHemoglobin A1C; ^dBody Mass Index; *Independent T-test; **Paired t-test

and BMI (P=0.298) between the two groups three months after the intervention. However, the difference of the mean of the systolic BP (P=0.007) and diastolic BP (P=0.002) between the two groups was significant three months after the intervention (Table 3).

The mean of the variables of FBS (P=0.011), HbA1c (P<0.001), and systolic and diastolic BP (P<0.001) had a significant decrease in the TBL method group three

months after the intervention. However, in the lecture group, despite the fact that the average FBS, HbA1c and diastolic BP decreased, only the mean of systolic BP had a significant decrease three months after the intervention (P<0.001) (Table 3).

DISCUSSION

In this study, the effect of education with the

TBL method was compared with the lecture method in the elderly with diabetes. The results of our study showed that the impact of the TBL method was more than the lecture method. This finding is consistent with those of some studies.²⁸⁻³³ The results of a study showed that the effect of the TBL method was stronger than the lecture-based learning in improving the ability of clinical reasoning in students.³⁰ The results of another study showed that participation in the TBL education program provided the patients with an opportunity to apply the information they were learning in a new way.³³ The above-mentioned studies show that training programs offered by TBL groups can effectively encourage people to increase appropriate health behaviors. The reason for compatibility may be the same training methods of the studies. For example, in the TBL group, there were more group discussions, question and answer, and interpersonal interactions,²² while only lecture was used as a training method in the lecture group.³⁴ Therefore, the rate of learning in patient-centered methods such as the TBL method was higher than the lecture method, which is one of the advantages of learning in a patient-centered and active method compared with current educational patterns and one-way transfer of information.³⁴

In general, the findings of this study indicated that training with TBL resulted in the reduction of the average FBS, HbA1c. These findings have been supported by those of other studies.^{35, 36} The results of a study showed that educational intervention was effective on FBS, HbA1c in the elderly with diabetes.³⁵ Another study also showed that implementing an educational intervention can improve self-care practice and reduce HbA1c in the elderly with type 2 diabetes.³⁶ The results of the mentioned studies emphasize the effectiveness of educational interventions and have improved FBS and HbA1c levels in the diabetic elderly. These findings are consistent with the results of our study.^{35, 36}

Also, in the present study, three months after the intervention, the team-based training method compared to the lecture method had

significantly reduced systolic and diastolic BP in patients with diabetes type 2. This demonstrated that the TBL education method improved BP control in these patients. These findings have been supported by those of other studies. It has been reported that the TBL education method has positive effects on systolic and diastolic BP. The results of another study revealed that TBL education could improve systolic and diastolic BP in patients with diabetes type 2.^{33, 37} The finding of the mentioned studies was consistent with those of the current study. This is indicative of the effect of this non-pharmacological treatment method on reducing BP in the elderly with diabetes.

Furthermore, patients' BMI in this study was measured once after three months, and there was no significant difference between the two methods before and three months after the intervention. However, the results of a study showed that there were clear benefits in the TBL group as to BMI and diabetes knowledge.³³ This contradiction between our findings and that reported by a previous study may be due to the differences in the time period of assessment of BMI after the intervention.

In this study, the subjects were aware of the type of intervention, which was not controllable. The selection of the adult population with type II diabetes who were looking for medical care at the diabetes clinic limited the generalizability of the findings to this statistical population.

The main strength of the present study was its new approach to the educational method, which was without complications for managing the disease and promoting health literacy in diabetic patients. One of the limitations of this study was the short follow-up duration, which was limited to 3 months.

CONCLUSION

The results of this study showed that the TBL method had more effects on controlling diabetes

type 2 in the elderly than the lecture method which was demonstrated via favorable FBS, HbA1c levels, and improvement of systolic and diastolic BP. Providing adequate and useful information by community-based organizations makes diabetic patients able to manage their diabetes properly and prevent its irreversible side effects. On the other hand, the appropriate implementation of the TBL method improves deep learning and facilitates learning in the elderly. Thus, it is recommended that the TBL method should be used along with other methods of patient education for the elderly. Also, further research with longer follow-up periods is suggested to be performed on the issue.

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Conflict of Interest: None declared.

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