SPER Publications and Solutions Pvt. Ltd.

Original Article

Determining the status of hemoglobin A1C in diabetic adolescents Relying on self-care training for family and peers

Neda Salimi [1], Zahra Godarzi [2]*, Parisa Salimi [3], Asadollah Rajab [4]

[1] MSc Student of Pediatric, Faculty of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran. [2] MSc, Faculty Member Department of Pediatrics and NICU Nursing Education, School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran. [3] MSc Student of Neonatal, Faculty of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran. [4] MD. Endocrinologist, Iranian Diabetes Association, Tehran, Iran.

Correspondence: Zahra Godarzi, MSc, Faculty Member Department of Pediatrics and NICU Nursing Education, School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran. Email: godarziz@sina.tums.ac.ir

ABSTRACT

Background and Aim: Self-care is important to control the disease in adolescents living with diabetes, so the present study aims to determine the status of hemoglobin A1C in diabetic adolescents; we rely on family and peer self-care training at the Medical Center Hospital and the Iranian Diabetes Association .**Materials and Methods**: In this randomized and evidence-based clinical trial, we selected 180 patients among two center; we individually divided them into 90 people in each center and assigned them in each center to three groups: education by family, education by peer, and control group through the randomized classification block method. Data collection tools included a demographic information questionnaire and A1C hemoglobin checklist for adolescents with type 1 diabetes. We collected data at the beginning of the study and three months later. In the education by family group, family health and self-care education was provided to the adolescent by family, and in the education by peer group, it was done by peer; the control group received only the center's usual training. **Findings:** We used a One-way ANOVA test to compare the mean hemoglobin before and after the intervention between the three groups . At the Medical Center Hospital, the mean glycosylated hemoglobin in the three groups did not differ before the intervention (P = 0.32), but after the intervention, the mean difference between the three groups was strongly significant (P <0.001). In the Iranian Diabetes Association, there is no significant difference in mean hemoglobin before the intervention between the three groups of the peer, family, and control (P = 0.28); but after the intervention, the mean difference between the three groups is very significant (P <0.001). **Conclusion:** From this observation, we can conclude that teaching self-care behaviors by family and peers is an effective way to control diabetes in reducing complications in diabetic adolescents.

Keywords: Education, Family, Peer Group, Diabetes, Self-Care, Type 1 Diabetes, Hemoglobin A1C.

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by a relative or absolute deficiency of the insulin hormone or both [1]. The most common type of diabetes in children and adolescents is type 1 diabetes [2]. The measurement of glycosylated hemoglobin levels (HbA1C) is a satisfactory way to check for long-term diabetes control. As red cells flow in the blood, glucose molecules gradually adhere to HbA1C molecules and create a stable compound for 120 days. This compound is not reversible. Therefore, glycosylated hemoglobin reflects the mean blood glucose level in 3 months ago [3]. HbA1C hemoglobin should be measured four times a year and its results should be used in consultation with the patient [2].

Access this article online	
Website: www.japer.in	**E-ISSN:** 2249-3379

How to cite this article: Neda Salimi, Zahra Godarzi, Parisa Salimi, Asadollah Rajab. Determining the status of hemoglobin A1C in diabetic adolescents Relying on self-care training for family and peers. J Adv Pharm Edu Res 2020;10(S1):197-206. Source of Support: Nil, Conflict of Interest: None declared.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

With the advancement of biosynthetic studies on hemoglobin, the researchers have introduced a suitable method as a blood sugar control index called glycosylated hemoglobin (HbA1c) to evaluate and control the effectiveness of treatment pathways and reveal therapeutic and self-care effects. Measurement of HbA1c hemoglobin, as the most important criterion for the control of long-term diabetes, is a gold standard for measuring self-care status in diabetes care; the continuation of diabetes treatment is adjusted in accordance with it [4].

Although normal blood sugar control may reduce the risk of long-term complications of diabetes in people with type 1 diabetes, children and adolescents often have a permanent all-round problem with a difficult treatment regimen. Some researchers have shown that this is especially problematic for adolescents compared to younger children. Throughout life, sufferers experience dramatic changes in their lifestyle, including the daily need for a drug called injectable insulin, frequent visits to the doctor, blood sugar control, and attention to daily nutrition. The deaths and illnesses of these patients, following acute metabolic disorders [5], are a set of potential diabetes problems that need to be carefully monitored, but as the adolescent goes through the days of his life, he/she enters the stage of self-care. It is at this stage that much and continuous training is needed. Generally speaking, the individual's environment plays a central role in the treatment and care of the disease. In other words, like any chronic illness, the individual's family plays a key role in encouraging and supporting treatment-related behaviors. Diabetes may require the help of the family to distribute responsibilities, and modify daily care routines.

Given that much of the care of these patients occurs at home, we cannot ignore the role of the family in the adaptation of patients with diabetes to stress-related illnesses [6]. Education by family can be very effective in supporting patients with diabetes who have self-care problems. Adolescents (12 to 17 years old) with type 1 diabetes depend on family support to better control their disease [7]. However, this procedure leads to better control of diabetes with more control. But studies have shown that family care alone is not enough. Diabetes treatment and management are complex, and diabetes is everywhere with the affected person, including home and school. As a result, diabetes management should be optimally facilitated with the support of both family members and peers. But researches for studying ways that may affect or support children and adolescents with diabetes are still in its infancy.

Nowadays, communication technology can help diabetics receive adequate care and education. However, this is enhanced by an interaction between the patient and his caregivers [8]. Training by a successful peer is the exchange of information, attitudes, and behaviors by those who are not professionally trained but have shared experiences [9]. In other words, instead of health professionals, training is provided by successful peers who encourage each other to choose healthy behavior [10]. The foundation of this educational approach is the fact that individuals, especially young people, are more likely to listen to and exchange information when their message is their peer. Due to the membership of peers and patients in one group, the sense of empathy and social identity increases and promotes knowledge [11]. The role of the peer group includes providing accurate information, supporting members, facilitating relationships between group members, and advising as needed. In this training strategy, because the peer group has previous experience in the field of educational content, it can have a positive effect on peer behaviors and facilitate and create optimism in peers for a better future. The effectiveness of the peer-to-peer educational approach is based on a theory based on which sensitive information is more easily presented between peers and yearlings. Peers' good knowledge of the socio-cultural environment of the target group, improving social norms and supporting values of positive attitudes and health behaviors, and engaging adolescents in designing their own projects are some of the benefits of the peer group approach [12].

Self-care in diabetes will lead to an improvement in the patient's general health, active participation in the care process, improving the quality of life, and ultimately reducing treatment costs [13]. The goal of self-care is to improve the physical well-being or health of patients through measures such as diet, exercise, blood sugar monitoring, and the search for preventive or medical services and the use of prescribed treatments [14]. Optimal blood sugar control requires a constant balance between diet, exercise, and the amount of insulin injected into growing and evolving adolescents [15]. On the other hand, nurses have the best opportunity to contact the patient and their family in terms of their profession, so they are the most suitable professionals for educating patients. In relation to the regulation of the self-care training program for diabetic patients by the nurse, today the evidence has come to the aid of strengthening the role of the nurses, so that the results of studies confirm this.

If nurses and other members of the treatment team are aware of the impact of family response on self-care and the variables that affect it, they can better guide affected children and families and communicate more effectively with them. However, little is known about the level of self-care of diabetic children in the country; we do not know how parents react to their children's illnesses and how their behavior can affect their self-care and disease control. Even according to studies, there is little research on how parents' behavior affects children's and adolescents' self-care capacity [16].

Materials and Methods

The present research is a randomized clinical trial of block before and after with a control group. The study population was adolescents with diabetes in the age group of 12 to 16 years and the parent active in the family (according to adolescents with diabetes) referred to the clinic of Medical Center Hospital and

Iranian Diabetes Center which were eligible for sampling. Due to the quantitative variable under study and its comparison in the intervention and control group to calculate the sample size based on the results of the thesis of Reza Safat et al. [17] and with 95% confidence and 80% test power, the number of samples required was equal to 25.7 namely 28 people in each group. In terms of a 10% drop, we determined about 30 people in each group and a total of 90 people. From this number, 2 people of the peer group in the medical center hospital, and one of the family group and 2 people of the family group in the Iranian diabetes association due to lack of cooperation were excluded.

Method of data collection

In this research, we used a questionnaire to obtain data.

1. Individual-social information questionnaire
2. A checklist for recording glycosylated hemoglobin before the start of training and three months after the end of training [18]. The researcher completed the glycosylated hemoglobin registration checklist by observing the laboratory report.

Validity and reliability: To determine the validity of the spectrophotometer, the certificate of calibration of the device was taken, and to determine the reliability of the device, a blood sample was measured twice with the device.

Method of implementing the intervention

After receiving a letter of introduction from the deputy for Research and Technology and obtaining a license from the University's Ethical Committee with the code IR.TUMS.FNM.REC.2017.2176 and receiving a letter of introduction from the Research deputy for the Faculty of Nursing and Midwifery and presenting it to research environments, including the Children Medical Center Hospital and the Iranian Diabetes Association, the researcher explained the objectives of the research and attracted the cooperation of these centers to conduct the present study.

In a randomized, stratified intervention study and with the control group, adolescents were selected initially from the samples at convenience (180 people; adolescents with 12 to 16 years of age with a history of 1 year with diabetes capable of reading and writing and having a glucometer device and a medical record in the above two centers). Then in each center, 30 blocks of 3 were selected using block randomization method. From these 6 cases, one of the cases was selected for all 3 groups by accident, and individuals were assigned to the groups under study. The number of individuals was determined based on the block randomization list and the researcher intervened in the number of the groups' individuals based on the predetermined list. Because the type of intervention has an educational aspect, it was not possible to perform the study as a single-blind and a double-blind. However, the list of individuals was determined based on the time of entry by block randomization method in each class and provided to the researcher. Adolescents were divided into three groups of 30 family intervention, peer and control in two centers.

In the active parent group, the educator in the family stated the objectives of the research to the active parent being able in reading and writing selected to obtain written consent and their participation in the study. In the group of training through a successful peer, we selected first in each center a girl and a boy in the ages of 14 and 16 with a history of 1 year of diabetes with a first or second level of middle school literacy, and successful in controlling glycosylated hemoglobin in a good control range less than 7.5 percent and without recurrence of fasting blood sugar over 120, without a history of low blood sugar, without low hemoglobin level, and no ketoacidosis in the past six months as a successful peer to educate peers.

The study was conducted in three stages. In the first stage, the researcher educated successful peers and active parents for two weeks after the end of the visit of doctors in the clinic of the centers understudy during six two-hour sessions (to become empowered and aware of the principles and methods of teaching diabetes care, active parents and successful peers in groups of 12-16 [19], according to their own view, were taught in the classroom of the Medical Center Hospital Clinic and the Diabetes Association with a board, magic, video, and projector and a sufficient number of seats). In the second phase, the successfully trained peers trained their peers with diabetes during six two-hour sessions at the clinic of the Medical Center and the Diabetes Association [17]. Parents active in the family-based education group, trained in the first stage, teach their diabetic adolescents at home. Diabetic adolescents in the control group also received routine training from their therapeutic units. According to the researchers, the possibility of group parents' encounters was not effective in creating bias, because the schedule did not allow for contact. In the third stage, three months after the training of diabetic adolescents, the intervention groups and the control group completed self-care questionnaires.

It is worth mentioning that completing the checklist related to registering hemoglobin A1c every three months was another study tool; we asked adolescents to check their hemoglobin A1c once before starting education; at the end of the training, it was checked again after three months of intervention.

Researcher and peer presented educational materials to diabetic adolescents [17] during 6 2-hour training sessions as follows:

Training sessions:

- First session: familiarity with diabetes: Familiarity with type 1 diabetes, etiology, pathophysiology, symptoms, and diagnostic methods of type 1 diabetes, along with questions and answers.
- Second session: familiarity with hypoglycemia and hyperglycemia, its symptoms, and care.
- Third session: familiarity with the treatment methods of type 1 diabetes, especially insulin injection, vial and insulin

syringe specifications, how to draw and mix insulin, where insulin is injected, and how to inject insulin.

- Fourth session: familiarity with the effects of insulin injection and diabetes, exercise-related care, and puberty.
- Fifth session: diet in adolescents with type 1 diabetes and ways to adapt to diabetes.
- Sixth session: a review of the course and questions and answers.

The educational content for teaching all groups was exactly the same. The prerequisite for all stages of the training sessions was a group discussion to express individual experiences and learning (participatory method) that complemented the educational discussion. At the beginning of the training, we gave the training materials to them in the form of booklets and pamphlets. At the end of each of the 6 training sessions, if necessary, training time continued.

Data Analysis Method: The research data were entered into SPSS software for analysis. Using the Chi-square and Fisher statistical tests, we compared the analysis of variance and Toki data obtained from the intervention and control groups. We performed statistical analyzes at a significance level of 95% (α <0.05).

Results

According to the approved protocol of this study, 30 patients were included in the study in each group. This means that we examined a total of 180 patients, of which 5 people were unable to continue during the study for some reason and were excluded, and finally 175 patients completed the study.

Table 1: Frequency distribution and frequency percentage of the history of diabetes in the family, number of injections and, the status of glucometer in diabetic adolescents in groups of education by family and education by peer and control group in Medical Center Hospital and Iranian Diabetes Association.

Center			Frequency	Group			Fischer exact significance test
				Peer	Family	Control	
Medical Center Hospital	History of diabetes	Yes	number	6	10	7	P=0.478
			Percentage	21.4	34.5	23.3	
		No	number	22	19	23	
			Percentage	78.6	65.5	76.7	
Iranian Diabetes Association	History of diabetes	Yes	number	8	7	11	P=0.569
			Percentage	26.7	25	36.7	
		No	number	22	21	19	
			Percentage	73.3	75	63.3	
	Injection						
Medical Center Hospital	1		number	1	2	0	Value=3.65 P=0.764
			Percentage	3.6	6.9	0	
	2		number	3	2	1	
			Percentage	10.7	6.9	3.3	
	3		number	18	17	21	
			Percentage	64.3	58.6	70	
	4 & above		number	6	8	8	
			Percentage	21.4	27.6	26.7	
Iranian Diabetes Association	1		number	2	1	0	Value=5.23 P=0.499
			Percentage	6.7	3.6	0	
	2		number	1	3	3	
			Percentage	3.3	10.7	10	
	3		number	21	19	17	
			Percentage	70	67.9	56.7	
	4 & above		number	6	5	10	
			Percentage	20	17.9	33.3	
	Using glucometer						
Medical Center Hospital	Yes		number	27	27	29	Value=6.95 P=0.841
			Percentage	96.4	93.1	96.7	
	No		number	1	2	1	
			Percentage	3.6	6.9	3.3	

Iranian Diabetes Association	Yes	number	30	28	28	Value=2.631 P=0.326
		Percentage	100	100	93.3	
	No	number	0	0	2	
		Percentage	0	0	6.7	

As shown in Table 1, at the Medical Center Hospital, the majority of adolescent participants (73.6%) had no history of diabetes in the family. In the center of the Iranian Diabetes Association, most adolescents (70.5%) had a similar condition. Due to the qualitative nature of the variable under study (history of diabetes), we used the chi-square test to investigate the homogeneity of the distribution of individuals between three groups. Examination of the history of diabetes in three groups at the Medical Center Hospital and the Diabetes Association Center with the chi-square test showed that peer, family and control groups did not differ statistically and significantly in terms of the history of diabetes in the family; the significance values were P = 0.478 and P = 0.569, respectively, and in other words, the three groups were similar in both centers in this respect.

According to Table 1, in the hospital of the medical center, the majority of the participating patients (64.4%) had 3 injections in the study. In the center of the Iranian Diabetes Association, most adolescents (64.8%) had 3 injections. Due to the qualitative nature of the variable under study (number of injections), we used the Fisher exact test to investigate the homogeneity of the distribution of individuals between the three groups. Examination of the number of injections in three groups in the hospital of the Medical Center and the Diabetes Association Center with Fisher exact test showed that the peer, family, and control groups did not differ statistically and significantly in terms of the number of injections. The significance values were P = 0.764 and P = 0.499, respectively, and in other words, the three groups were similar in both centers in this respect.

In the medical center's hospital, the majority of the participating patients (95.4%) had glucometers. At the center of the Iranian Diabetes Association, most adolescents (97.7%) had glucometers. Due to the qualitative nature of the variable under study (glucometer), we used the Fisher exact test to investigate the homogeneity of distribution of individuals between the three groups. Examination of the glucometer in three groups at the Medical Center Hospital and the Diabetes Association Center with a careful Fisher test showed that peer, family, and control groups did not differ significantly and statistically in terms of glucometer; significance values were P = 0.841 and P=0.326, respectively. In other words, the three groups were similar in both respects.

Table 2: Frequency distribution and frequency percentage of hemoglobin A1C status in diabetic adolescents in groups of education by family and peer-to-peer education and control in the Medical Center Hospital

Iranian Diabetes Association	Mean ± standard deviation			ANOVA test results	Results of Two to two Toki Multiple tests
	Peer	Family	Control		
Before intervention	9/16±1/476	8/86±1/82	8/57±1/05	F=1/67 Df:(2,86) P=0/32	
After intervention	7/83±0/57	7/90±0/53	8/75±0/972	F=21/99 Df=2 P<0/001	Peer and control (P<0/001) Control and family (P<0/001) Peer and family (P=0/934)
Average difference before and after the intervention	1/33±1/27	0/96±1/74	-0/176±0/81		
Results of Intragroup paired T test (T-pair)	P<0/001 T=5/52 df=27	P=0/006 T=2/96 df=28	P=0/245 T= -1/18 df=29		

In Table 2, we used a one-way ANOVA test to compare the mean hemoglobin before and after the intervention between the three groups of peer, family, and control, given that the index was a quantitative and normal value. The results of this test showed that in the hospital of the medical center, there was no significant difference in mean hemoglobin before the intervention between the three groups of the peer, family, and control (P = 0.032), but after the intervention, the mean difference between the three groups was strongly significant (P <0.001). Therefore, the result shows that the hemoglobin between the three groups changed significantly after the intervention. We used a two-to-two Toki test to investigate the source of this change. The results showed that after the intervention, there was a significant difference between the

mean hemoglobin of the peer group (7.83) and the control group (8.75) and the hemoglobin of the peer group patients was significantly lower than the control group. The results of this test showed that after the intervention, the average hemoglobin between the family (7.90) and the control group is significantly different (P <0.001) and the hemoglobin of the patients after the intervention in the family group was significantly lower than the control group. The test also showed that there was no significant difference between hemoglobin in patients in the family and peer groups after the intervention. We used pair t-test to investigate the difference in hemoglobin before and after the intervention because this index was quantitative, normal, and continuous (collected from the same individuals before and after the intervention). The results of this test showed that the mean hemoglobin in the peer group increased from 9.16 to 7.83 and this change was strongly significant (P <0.001). The mean hemoglobin in the family group decreased from 8.86 to 7.90, and this decrease was statistically significant (P <0.001). The average control group increased from 8.57 to 8.75 (P = 0.245), which is not statistically significant.

Table 3: Frequency distribution and frequency percentage of hemoglobin A1C status in diabetic adolescents in groups of education by family and education by peer and control group in Iranian Diabetes Association

Iranian Diabetes Association	Mean ± standard deviation			ANOVA test results	Results of Two to two Toki Multiple tests
	Peer	Family	Control		
Before intervention	8/03±0/674	8/43±1/172	8/32±1/07	P=0/28 F=1/29 df=2	
After intervention	7/77±0/712	7/51±0/514	8/14±0/471	P<0/001 F=8/91 df=2	Peer and control (P=0/039) Control and family (P<0/001) Peer and family (P=0/191)
Average difference before and after the intervention	0/253±0/67	0/921±1/10	0/176±0/88		
Results of Intragroup paired T test (T-pair)	P=0/04 T=5/52 df=29	P<0/001 T=5/52 df=27	P=0/283 T=5/52 df=29		

According to Table 3, since the index was a quantitative and normal value, we used a one-way ANOVA test to compare the mean hemoglobin before and after the intervention between the three groups of peer, family, and control. The results of this test showed that in the Iranian Diabetes Association, there is no significant difference in mean hemoglobin before the intervention between the three groups of the peer, family, and control (P = 0.28), but after the intervention, the mean difference between the three groups is very significant (P <0.001). As a result, hemoglobin changes significantly between the three groups after the intervention. To test the origin of this change, we used a two-to-two Toki test. The results showed that there was a significant difference between the mean hemoglobin of the peer group (7.77) and the control group (8.14) after the intervention. Hemoglobin in patients in the peer group was significantly lower than in the control group (P = 0.039). Also, the results of this test showed that after the intervention, average hemoglobin was significantly different between the family group (7.51) and control one (P <0.001); Patients' hemoglobin A1C was significantly lower than the control group after intervention in the family group. According to this test, there was no significant difference between the hemoglobin of patients in the family and the peer group after the intervention (P = 0.191).

Because this indicator is quantitative, normal, and continuous (before and after the intervention, collected equally), we used the T-pair test to check for hemoglobin differences before and after the intervention. The results of this test showed that the mean hemoglobin in the peer group increased from 8.03 to 7.77 and this change was significant (P = 0.04). The mean hemoglobin in the family group decreased from 8.43 to 7.51, and this decrease was statistically significant (P <0.001).

Discussion and conclusion

In this research, we examined the status of hemoglobin A1C in diabetic adolescents relying on self-care training of family and peers in the hospital of the Medical Center and the Iranian Diabetes Association. The results show that there are 175 people in the two centers (87 in the Medical Center Hospital and 88 in the Diabetes Association). At the Medical Center Hospital, 87 people fall into three groups (28 in the peer-to-peer education group, 29 in the family-based education group, and 30 in the control group). In the Iranian Diabetes

Association, 88 people fall into three groups (30 in the peer-to-peer education group and 28 in the family-based education group and 30 in the control group). In this study, the units under research in three groups in each center did not differ significantly in terms of demographic variables; with this in mind, we can consider more confidently the results as affected by the intervention.

The results of the study showed that after implementing a 6-month self-care program, both groups showed a significant decrease in the bA1C level. This improvement was maintained in both groups after 12 months, but, after 18 months, the HbA1C level was maintained only in the peer group, and in the population, health care group the mean HbA1C level was increased [20]. Although the indicator of this study is glycosylated hemoglobin A1C, the level of A1C itself is one of the indicators of self-care in diabetic patients. The duration of the study was different in the abovementioned study and the present study, so that Tang's study was performed for 6 months, but the present study was performed for 3 months. In the present study, peers were more effective in improving self-care, but family education was more effective than them. Therefore, in general, based on the findings of this study, we can conclude that both family- and peer-based education methods affect the self-care behaviors of adolescents with diabetes. We can use it as an intervention by nurses and other health staff in these centers and other diabetes centers and clinics. According to the results of this study, managers and nurses of diabetes clinics and centers can want the help of those diabetics who have been able to control their disease in the best possible way with proper self-care, as well as the families of diabetic adolescents. Along with their guidance and training, they can use their own experiences to provide comprehensive and effective care to improve self-care for patients.

In this regard, we did not find studies similar to ours in the three groups on comparing the group of peers with the family-based education group. The study of Ahmadi et al. (2017) examined the effect of self-care behavior training by Health and peer caregiver on glycosylated hemoglobin of patients with diabetes. The results showed that the mean score of the three groups in each center was significantly different after training. The Toki test was performed and the pairwise comparisons showed that there was no statistically significant difference between the HbA1C mean of the patients in the two groups of the health care and peer and two groups of peer and control. However, there was a significant difference between the HbA1C mean of the patients in the two groups of health care and the control and its mean was lower in the intervention group by the health care provider. In general, both health care and peer-to-peer methods were effective, but the health caregiver was more effective than the control group [21]. This is in line with the present study, which shows that two educational methods have been effective in self-care indicators. Although this study was conducted in three groups, the difference between this study and ours was that here the health care group was compared with the peer group and in our study, the family education group was compared with the peer group.

The results of a three-group study conducted by Sadeghi et al. (2014), who used the patient-centered and family-oriented empowerment model as an educational intervention, showed that both methods improved self-care indicators such as knowledge and Glycosylated hemoglobin in people with type 2 diabetes [22].

In a study on 72 patients with type 2 diabetes, Chen et al. (2015) examined the effect of family empowerment program on self-care behaviors and glycosylated hemoglobin in the three stages of before, immediately and three months later. The findings showed the positive effect of this method in improving these indicators in the third stage [23], which is in line with our study.

In their study, Sadeghi et al. [24] examined two methods of education based on a patient-centered and family-centered empowerment model in patients with type 2 diabetes. The results of the study showed the positive effects of both methods, but family-centered care was associated with a further decrease in glycosylated hemoglobin. In this regard, the family plays an important role in the management and control of chronic diseases, including diabetes; we should consider the family in educational programs to achieve the desired self-care.

Paying attention to self-care education for adolescents with type 1 diabetes is a key solution to controlling complications and premature mortality. Complications are a common problem, with more common in the UK than in other European countries. The findings of this research are based on improvements in HbA1c status and adolescent quality of life and its comparison with the control group [24].

Ahmadi et al. (2017) conducted a study aimed at comparing the effect of self-care behavior training by health care-giver and peer on health and peer care on hemoglobin glycosylation in diabetic patients. Findings: The mean glycosylated hemoglobin in the three groups did not differ significantly before the intervention ($P = 0.29$). After the intervention, the results of the ANOVA test showed that the HbA1C level was significantly reduced in the health caregiver group compared to the other two groups ($P = 0.04$) [21]. Although it is concluded that self-care behavior training by health care-giver is an effective way to help control diabetes in patients and its promotion can be effective in reducing the complications of diabetic patients, the effects of other training methods in the field of diabetes self-care should be compared with together [25].

Paying attention to patients' family education can facilitate their optimal management and control. In the study of Sadeghi et al. (2013), conducted to compare the effect of patient-centered and family-centered education (based on empowerment model) on knowledge and metabolic control of patients with type 2 diabetes, 153 patients with type 2 diabetes were randomly assigned to three groups of control (A), patient-centered intervention (B), and family-centered intervention (C). There

was no significant difference between the knowledge score and HBA1C level before the intervention ($p < 0.05$), but there was a significant difference between the two variables after the intervention ($p < 0.001$). The level of knowledge and HBA1C of groups B and C was significantly differed from the control group ($p < 0.05$). Although there was no significant difference between groups B and C, the study of the coefficient of changes shows the higher reduction of HBA1C in the family-centered intervention group than in the patient-centered group. However, the results of the study showed positive effects of the implementation of empowerment-based education in two forms: patient-centered and family-oriented. Given the important role of the family in the management and control of chronic diseases, including diabetes, we should consider the role of the family in education using this educational model to achieve optimal metabolic control [22].

Cheraghi et al. conducted in 2013 a study to investigate the effect of family-centered care on blood sugar management in diabetic adolescents. There was a significant difference between the mean blood sugar level recorded during the week before and one week after the intervention and the average glycosylated hemoglobin level (HbA1c), before (8.4 ± 1.12) and three months after (7.78 ± 1.2) ($P < 0.001$). Pearson correlation coefficient showed a positive relationship between caregiver monitoring behaviors and adolescent management behaviors before and after the intervention ($P < 0.001$). Interventions have shown that empowering adolescents with type 1 diabetes and their caregivers at home can improve the blood sugar management of diabetic adolescents and reduce the amount of glycosylated hemoglobin (HbA1c). Thus, family-centered care can provide a better diet at home [26]. It seems that to get more reliable results, it is necessary to select a larger sample size, which we considered in the present study.

- In a study conducted by Khawasi et al. In 2014 to investigate the effect of peer education on the self-efficacy and quality of life of diabetic patients, 70 type-2 diabetic patients participated. The findings of this research show that diabetes education to patients by an individual similar to themselves can easily improve their self-efficacy and quality of life. As a result, it can associated with better control of blood sugar, reduction of diabetes complications, and reduction of hospital costs in diabetic patients [27]. In this study, the effectiveness of the program seems to be based solely on the self-efficacy score, while in our study, due to the importance of sustainability of the training provided, the result of glycosylated hemoglobin test before training and 3 months after training seems to be fundamental.
- Heidari et al conducted a study in 2011 to determine the effectiveness of the empowerment model on the HbA1C level of type 1 diabetic adolescents. The research was a quasi-experimental study conducted among type 1 diabetic adolescents visiting Zanjan health centers. The 47 eligible adolescents were randomly divided into two intervention and control groups, and were followed up for 2.5 months. Participants completed research tools including personal-social information, knowledge, self-efficacy, and self-esteem. Their HbA1C level was also measured. The educational intervention was implemented based on the three steps of the empowerment model (understanding threat, problem-solving, and evaluation). Data analysis was performed by SPSS statistical software version 11.5. After the implementation of the training program, there was a significant difference between increasing the average score of knowledge, self-efficacy, and self-esteem, as well as reducing the amount of hemoglobin among adolescents in the intervention and control groups ($P < 0.05$) [28].

In 2010, Nyunt et al. conducted a cross-sectional study on self-efficacy, self-care, and metabolic control in patients with type 2 diabetes. This study aimed to investigate the factors associated with metabolic control in patients with diabetes. The research tool was a four-part questionnaire, the first part of which included personal-social information, the second part included the Tobert and Glasgow self-care questionnaire, and the third part included the self-efficacy questionnaire in diabetes.

In the fourth part of the questionnaire, HbA1C was recorded from the patients' files. In the analysis of the logistic regression test, two models showed that the age 60 and older, taking blood sugar-lowering drugs, and self-care in sport have a significant statistical relationship with metabolic control (95% confidence interval). In the second model, which was performed with the presence of the self-efficacy variable, the results showed that age 60 and older, blood sugar-lowering drug use, body mass index, and high self-efficacy had a statistically significant relationship with metabolic control (95% confidence interval). The results also showed high self-efficacy as a factor in greater metabolic control. Therefore, the findings of this research showed that interventions to increase self-care and self-efficacy can improve the metabolic control of patients with diabetes [29]. Therefore, in the present study, the researcher aimed to increase the level of self-care of this sensitive group by performing self-care education intervention for adolescents with type 1 diabetes.

In general, in our study, peers were more effective in improving self-care, but the family education group was more effective than them. Therefore, in general, based on the findings of this study, we can conclude that teaching self-care behaviors by family and peers affect the self-care of diabetic patients; we can consider it as an important intervention by nurses and other health employees in these centers and other diabetes centers and clinics.

The present research can serve as a basis for future researches. Therefore, we have compiled the following suggestions in this regard.

- Comparison of peer-to-peer training methods with other training methods.
- Comparison of a family-based educational method with other educational methods.
- Given that our study was performed on children with type 1 diabetes, we recommend that studies be performed on other children with chronic diseases.

References

1. Piaseu, N., Schepp, K., Belza, B. Causal analysis of exercise and cal cium intake behaviors for osteoporosis prevention among young women in Thailand. Health Care Women Int. 2002 Jun;23(4):pp. 364-76.
2. Kligman, RM., Jenson, HB., Behrman, R., Markdont, KH., Bonitaf, S. Nelson: Text book of pediatric.18th edition. Philadelphia: Saunders Inc. 2007;pp. 2404-2431.
3. Smeltzer, S. C., Bare, B. G., Hinkle, J. L., & Cheever, K. H. Brunner and Suddarth's textbook of medical-surgical nursing (12th ed.). Philadelphia: Lippincott Williams & Wilkins. 2010; translated from persian by Dabiran, A., Shaban, M., Tehran; Andisheh rafi.2012;pp.135-197(Persian).
4. Alhani, F. Design and evaluation of the family-centered prevention of iron deficiency anemia.MSN Dissertation, Tehran, Tarbiyat Modarres University. 2003. pp. 89-125 (Persian).
5. Bott, U., Muhlhauser, I., Overmann, H., Berger, M. Validation of a diabetes-specific quality-of-life scale for patients with type 1 diabetes. Diabetes Care. 1998; 21(5):pp. 757-69.
6. Ahanchi, N S., Eslami, A. Sharifirad, G. Effects of family-based theory of social support on perceived support levels in type 2 diabetic patients. Health Sys Res 2012;8(5):pp. 757-64. (Persian)
7. LaGreca, A. M., Follansbee, D. j., & Skyler, K.s. Developmental and behacioral aspecs of diabetes management in children and adolescents. Children's Health Care. 1990; 19(19) :pp. 132-139.
8. Nouhi, E., Khandan, M., Mirzadeh, A. Effective of electronic education on knowledge attitude and self-care in patient's diabetic type 2 refer to diabetic center of Kerman University of medical science. IJNR. 2011; 6 (22) :pp. 73-80(Persian).
9. Cartagena, RG., Veugelers, PJ., Kipp, W., Magigav, K., Laing, LM. Effectiveness of an HIV prevention program for secondary school students in Mongolia. Journal of Adolescent Health. 2006; 39(6):pp. 9-16.
10. Sriranganathan, G., Jaworsky, D., Larkin, J., Flicker, S., Campbell, L., Flynn, S., Janssen, J., & Erlich, L. Peer sexual health education: Interventions for effective program evaluation. Health Education Journal. 2010; 71(1):pp. 62-71.
11. Shirazi, M., Anoosheh, M., Rajab, A. The effect of self care program education by group discussion method on self concept in diabetic adolescent girls reffered to Iranian Diabetes Society. IJNR. 2011; 6 (22) :pp. 40-52(Persian)
12. Taghdisi, M., Noori Sistani, M., Merghati Khoi, E., Hoseini, F., Asgharnejad, F. Impact Peer Education Approach on Knowledge and Practice about Mental Health of Adolescent Girls. TB. 2012; 10 (3 and 3-4) :pp. 92-105(Persian)
13. Barikani, A. High risk behaviors in adolescent students in Tehran. Iranian Journal of Psychiatry and Clinical Psychology. 2008;14:pp. 192-198 (Persian)
14. Bagheri, H., Ebrahimi, H., Taghavi, N., Hasani, M. Survey quality of life in Diabetics patients based on complication, referred to Emamhosain Hospital of Shahrood. Shahrekord University of medical sciences. 2005; 7(2):pp. 50-56(Persian)
15. Faulkner, MS.,Chang, LI.Family influence on self-care,quality of life and metabolic control in school-age children and adolescents with type I diabetes.pediatric nursing.2007;22(1):pp. 59-68
16. Law Son T. Famly Coping And Disease Control When A Child Has Type 1 Diabetes Melitus. J Specialist Pediat Nurs. 2007; 12(1):pp. 49-52
17. Rezasefat Balesbaneh, A. Effect of self-efficacy based intervention on self-care level in diabetics adolescents referred to Pediatrics center.2012. MSN Dissertation.Rasht University of Medical Sciences Nursing and Midwifery faculty(Persian)
18. Schilling, LS., Dixon, JK., Knafl, KA., & et al. A new self-reported measure of self-management of type I diabetes for adolescents. nursing research. 2009; 58(4): pp. 228-236.
19. Bobo, K., Jackie K., & Steve M. (1991). Organizing for Social Change: A Manual for Activists in the 1990s. Cabin John, MD: Seven Locks Press. Chapter on Designing and Leading a Workshop, pp. 124-131
20. Pandis, N., Switzerland, B., Greece, C. Randomization. Part 2: Minimization. Am J Orthod Dentofacial Orthop. 2011; 140:pp. 902-4
21. Ahmadi, Z., Sadeghi, T., Loripoor, M., Khademi, Z. Comparative Assessment the Effect of Self-care Behavior Education by Health Care Provider and Peer on HbA1c Level in Diabetic Patients. Iranian Journal of Endocrinology and Metabolism. 2017; 19 (3) :pp. 144-150(Persian)
22. Sadeghi, M., Pedram Razi, Sh., Nikbakht Nasrabadi, A., Ebrahimi, H., Kazemnejad, A. Comparison of the impact of education based on the empowerment model and family-center empowerment model on knowledge and metabolic control of patients with type 2 diabetes mellitus. J Nurs Educ 2013;2(3):pp. 18- 27 (Persian)
23. Chen, M., Wang, R., Lin, K., Hsu, H., Chen, S. Efficacy of an empowerment program for Taiwanese patients with

type 2 diabetes: A randomized controlled trial. Appl Nurs Res. 2015 Nov; 28(4):pp. 366-73

24. Price, KJ1., Wales, J., Eiser, C., Knowles, J., Heller, S., Freeman, J., Brennan, A., McPherson, A., Wellington, J. Does an intensive self-management structured education course improve outcomes for children and young people with type 1 diabetes? The Kids In Control OF Food (KICk-OFF) cluster-randomised controlled trial protocol. BMJ Open. 2013 Jan 24;3(1):pp. 1-8
25. Sargazi Shad, T., Kerman Saravi, F., Navidian, A. Effect of the Family-Centered Empowerment Model on Quality of Life and Self-Efficacy in Adolescents With Type 1 Diabetes Referring to the Ali Asghar's Clinic in Zahedan, 2016. Iranian Journal of Endocrinology and Metabolism. 2018; 19 (5) :pp. 330-339(Persian)
26. Khavasi, M. Effects of peer education on self-efficacy and quality of life in diabetic patients. MSN Dissertation. July 2012.Tehran University of Medical Sciences Nursing and Midwifery faculty (Persian)
27. Bastable, S. B. Nurse as educator: Principles of Teaching and learning for nursing practice. 5th ed. Newyork: Amazon ,2008;pp. 567
28. Heidari, M., Alhani, F., Kazemnejad, A., Tol, A., Moezi, F. Assessing the Effect of Educational Program Based on Empowerment Model on HbA1C among Adolescents with Type 1 Diabetes. J Health Syst Res 2013; 8(7):pp. 1376-84(Persian)
29. Wynn Nyunt, S., Howteerakul, N., Suwannapong, N., Rajatanun, T.Self-efficacy, self-care behaviors and glycemic control among type-2 diabetes patients attending two private clinics in Yangon, Myanmar.Southeast Asian J Trop Med Public Health. 2010 Jul;41(4):pp. 943-51.