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Effect of Providing Pharmaceutical Care in Diabetes Control

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ABSTRACT

Diabetes is a chronic disease occurred due to impaired insulin production and body function. It is highly necessary to control diabetes to achieve a proper mechanism in body that the care should be correct and drive the patient to improve. The study is aimed to determine the role of providing pharmaceutical cares by pharmacologist in controlling blood sugar of diabetic patients. The study was randomized clinical trial. Population of the study was non-hospitalized diabetic patients in the age range of 20-80 years, and pregnant women didn't include in the study. Randomly sampling of screened patients was conducted in Tabriz medical center of Shahid Balapour and health center of Maragheh. Patients were divided into two groups of control and intervention, which were considered 100 patients for each group according to similar conducted studies. Questionnaire was designed and demographic information and tests of patients was recorded. Information was statistically analyzed using SPSS software, T-test tests and Chi-Square. FBS average had a significant decrease in intervention group ($p < 0.0001$), while it had a meaningful increase in control group ($p = 0.045$). HbA1c mean had a significant decrease in intervention group ($p < 0.0001$), while increased in control group, but it was not a significant increase ($p = 0.578$). Pharmaceutical cares and pharmacologist consultations can have an effective role to control diabetic parameters of patients. Establishing pharmaceutical care system and following the process of patients' treatment can be effective to achieve the goals and reducing the costs of treatment.

Key words: pharmaceutical care, diabetes, FBS, HbA1c

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1. INTRODUCTION

Pharmaceutical care is direct relationship between pharmacologist and patient to improve response to treatment and quality of patient life. Pharmaceutical care can improve the pharmacotherapy of patient and enhance their quality of life. Pharmaceutical cares can be effective in all diseases, particularly chronic diseases; and have positive effects on the costs of health system (1). Pharmaceutical care is the process in which pharmacologist is intervening member. He/she has thus direct connection with patient, and directly or by telephone call gives the patient consultations such as type of drug, change in lifestyle, change in diet and daily nutrition, etc. sometimes patient disease isn't well controlled instead of prescribing right medicines, and it might have irreversible implications, or the patient might not be relative to correct prescription of considered drug, and sometimes patient forget medical advices. Pharmaceutical cares can enhance the quality of patients' life and reduce the problems of drugs (2). There are about 6 millions of diabetic patients in Iran (3), estimating treatment costs in Iran in 2004, reveal that more than 10 thousands of billion Tomans of diabetes tsunami is on the way. During estimation in 1985, it was discovered that there are 30 millions of diabetic patients in

the world. Although, today there are 194 millions of patients having diabetes, which it is 6 times more than last 20 years. If it doesn't prevent the pandemic disease, the number of people with diabetes will reach 330 million by the end of 2025 (3). In 1990, Helper & Strand presented a new definition of pharmacologists' responsibilities and pharmaceutical services, and used the term pharmaceutical care for new aspects of pharmaceutical services. According to the definition, pharmaceutical care is: "providing caring services of drug therapy aimed at achieving certain results which increase quality of life" (4). Pharmaceutical care can reduce the mortality of using drug, ADRs (Adverse Drug Reaction), duration of patients' hospitalization and the costs of treatment (4). In 2009, Al Mazroui et al conducted a study for 12 months in emirate, aimed at evaluating the effect of pharmaceutical care in controlling blood sugar of uncontrolled diabetic patients. During the study, patients were monthly visited monthly, and educated. After 10 months, mean HbA1c reduced from 8.5 % to 6.9 % (5). Another study conducted by W.Cranor et al in 2003 in North Carolina for 6 months. During the study, 85 diabetic patients undergo education and pharmaceutical care. Results revealed a significant reduction in HbA1c (6). The project is aimed at providing pharmaceutical care in controlling diabetes, determining the effect of

pharmaceutical and non-pharmaceutical care to control diabetes, predicting the rate of cardio-vascular diseases incidence in next 10 years, and it will be used to establish pharmaceutical care system for diabetic people in health center.

2. MATERIALS AND METHODS

2.1. Type of study

Type of study was randomized clinical trial. Study population of the study was non-hospitalized diabetic patients in the age range of 20-80 years, and we didn't include pregnant women in this study. Randomized sampling was performed among screened patients in Shahid Balapour medical center of Tabriz and health center of Maragheh by Excel software. In each of the centers one room become available to consult and visit the patients with coordination of supervisor and head of center. Patients were divided into two groups of intervention and control. 100 of major patients and 20 of storage patients for substitution in potential loss of patient or absence were considered to evaluate the conducted studies for each group. During November 2013 to April 2014 the study screened patients file and patients' information were entered the excel software (2007 version), and included each of two groups after random selection of patients. The call number of the patients was used to visit patients and coordinate for consulting. Furthermore, one day before, we called them to remind their visiting time, bringing used drugs, and the last test sheet. Each patient counseling time was considered 20-30 minutes. After consulting, related tests were wrote by physician of the center for the next referral and monitoring. Time interval for the next visiting was at least 3 months. It was planned by investigating similar conducted experiments (7). Patients were asked for the following information in the questionnaire:

- Patient information including first name, last name, age, gender, treating physician, education, weight, height, and body mass index (BMI).
- Information of diabetes disease of patients which include age of onset of disease, information related to managing the disease and its potential implications such as ocular problem, foot ulcer, asthenia, loss of consciousness and the time of occurrence of each of these cases, insulin related cases such as type of used insulin, changing the injection location.
- Information related to the history of illnesses which included heart diseases, kidney diseases, high blood lipid, high blood pressure, duration of the disease and its treatments.
- History of addiction, smoking, alcohol consumption and duration of consumption and also duration of quitting (in the case of leave).

- Diet and the lifestyle include using sweets, high-calorie food consumption, exercise (type of exercise and its frequency per week), walking (frequency per week), stress and problems in daily life.
- Medications (drug name, dose, frequency and how to take it).
- Data of clinical tests/ physical examinations include Fasting Blood Sugar (FBS) ,Glycated Hemoglobin(HbA1c) ,Post Prandial Blood Sugar(PP) ,Triglyceride (8) ,High Density Lipoprotein(HDL) ,Low Density Lipoprotein(LDL) ,Creatinine (6).

This section of questionnaire was filled by researcher. Flash card cited from Uptodate reference was designed to educate patients. It included followings:

Non-pharmacological trainings include: change in lifestyle, increasing physical activity, reducing consumption of high-calorie and sweet foods, reducing stress and stopping or reducing the smoking or alcohol.

Pharmacological trainings include: indication, dose, efficacy, side effects, contraindication, precautions of drugs used to treat diabetes, drug interactions and storage conditions of drugs and medication during pregnancy and lactation. In these flash cards, for each drug, picture of some samples in Iran drug market was added for observation and better understanding the patient. Boxes for all samples in Iran pharmaceutical market was prepared and showed to patients during training; in the case of forgetting to bring drugs, patient could select it drugs among them and receive it consultation. Before entering patients to the study, procedure was explained orally, and after patient approval, written consent was given to patients and entered the study after signing the informed consent form. Some pamphlets were prepared for more awareness of patients. The pamphlets included the cases related to diabetes such as information of the disease, principle of foot care, and correct nutrition.

2.2. Data analysis

Information was statistically analyzed using SPSS software (version 21) and using tests such as T-test and Chi-square. These tests were used to compare the results and also investigate the significance of project procedure. Quantitative variables between two groups of control and intervention obtained using independent T-test analysis, but analyzing quantitative variables within a group used paired T-test. Qualitative variables conducted using Crosstab analysis between two groups before and after study, and $P < 0.05$ was considered significant.

3. RESULTS AND DISCUSSION

3.1. Demographic profile

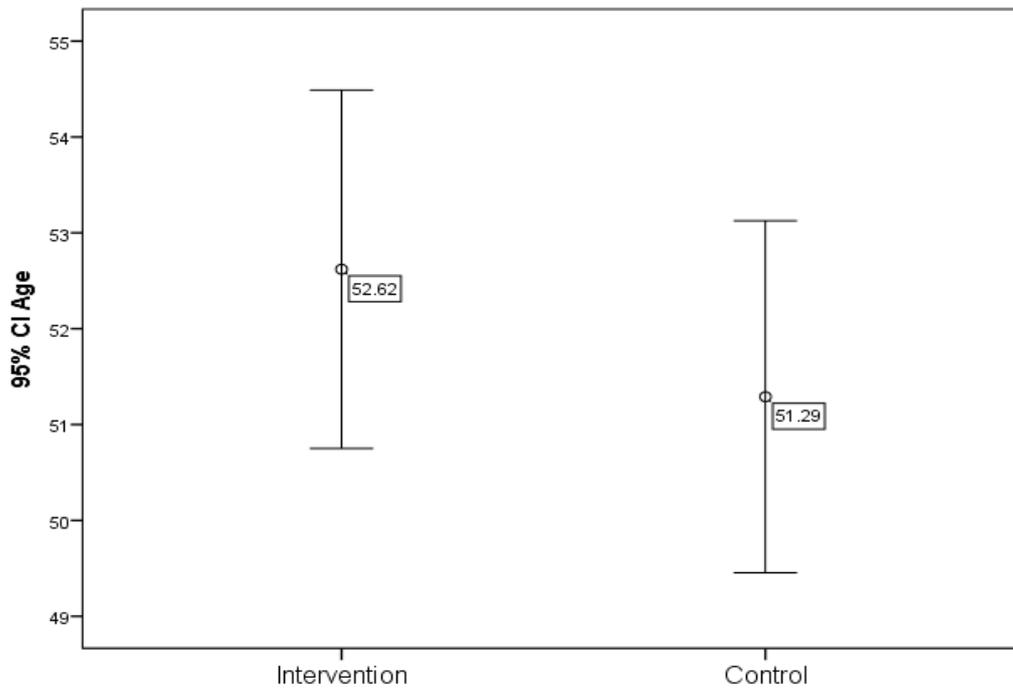
Mean age of under studied patients in intervention group

was 52.62±9.42 (35-75), and 51.29 ±9.25 (34-74) in control group. Regarding the gender distribution in intervention group, number of female patients was 53 (53 %) and number of male patients was 47 (47 %), and control group included 49 female (49 %) and 51 male (51 %). Mean height of patients in intervention group was 168.35 ± 0.09 centimeters and 169.29 ± 0.08 centimeters in control group. Before study, mean weight of patients in intervention group was 68.43 ± 8.95 (50-95) kilograms and 67.530±8.98 (49-93.50) kilograms. In control group, mean weight of patients was 75.505±9.98 (52-102) kilograms before study, and 75.840±10.06 (53-102) kilograms. Average BMI of patients in intervention group before study was 24.141±2.40 (17.90-28.69) kilograms, and after study it was 23.819±2.38 (17.75-28.36 Kg/m²). Mean BMI of patients in control group before study was 26.303±2.38 (19.33-33-62), and after study it was 26.422±2.43 (19.71-33.62 kg/m²). Highest level of education in intervention group was university education with 30 %, and in intervention group it was diploma with 30 % of population. 14 % of patients in intervention group had ocular problem due to diabetes that the value didn't change after study, while the problem in control group before study was 18 %, and after study it increased to 20 %. Diabetic foot problem in intervention group before and after study was 9 % that the value in control group before study was 13 % and after study it was 14 %, and none of

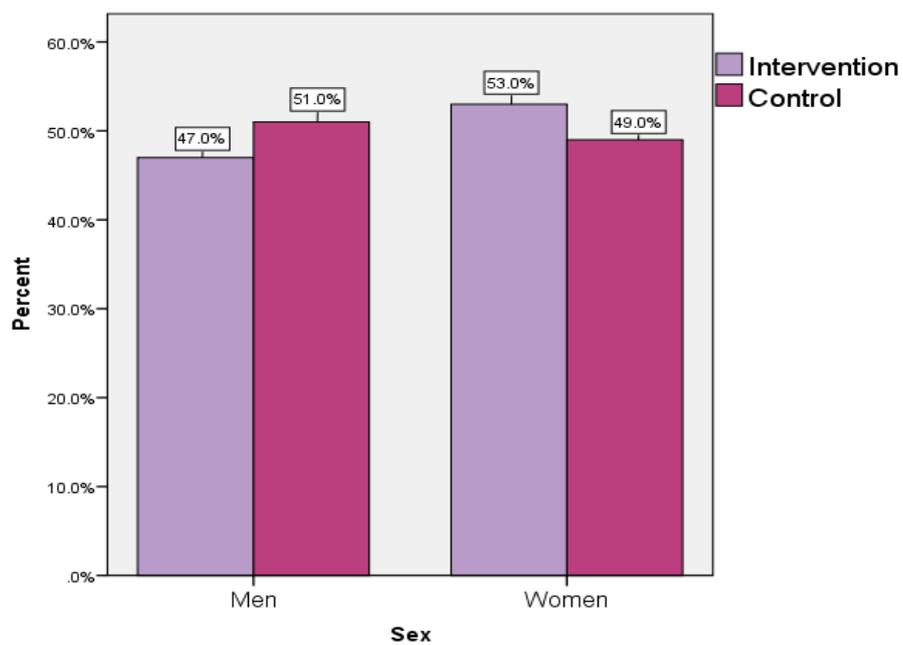
groups increased. 78 % of patients in intervention group claimed that they care their foot and do preventive measures that the amount was 19 % in control group. The rate of referring to ophthalmologist in intervention group was 54 % that increased to 92 % after study. 27 % of patients of intervention group had the experience of physical weakness that the amount was 44 % in control group. The problem of losing consciousness was 1 % in intervention group but the problem was 4 % in control group. 24 % of intervention group patients claimed that they have regular weakly exercise or walking program that the rate increased to 68 % after study, but 37 % of control group of patients claimed that the value was constant after study. In intervention group, caring diabetes disease was by patient itself that increased to 85 % after study; but in control group the value was 35 % before and after study. 63 % of patients of intervention group were under the general practitioner and 37 % were under supervision of specialist that in control group 40 % was related to general practitioner and 60 % related to specialist. 77 % of patients who used insulin were Pen type and the rest of them were typical syringe. Also 46 % of intervention group patients changed their insulin injection site that decreased to 19 % after study. [Table 1](#) and [Graph 1](#), [Graph 2](#) and [Graph 3](#) have highlighted demographic information of two groups.

Table 1 . Demographic information of two intervention and control groups

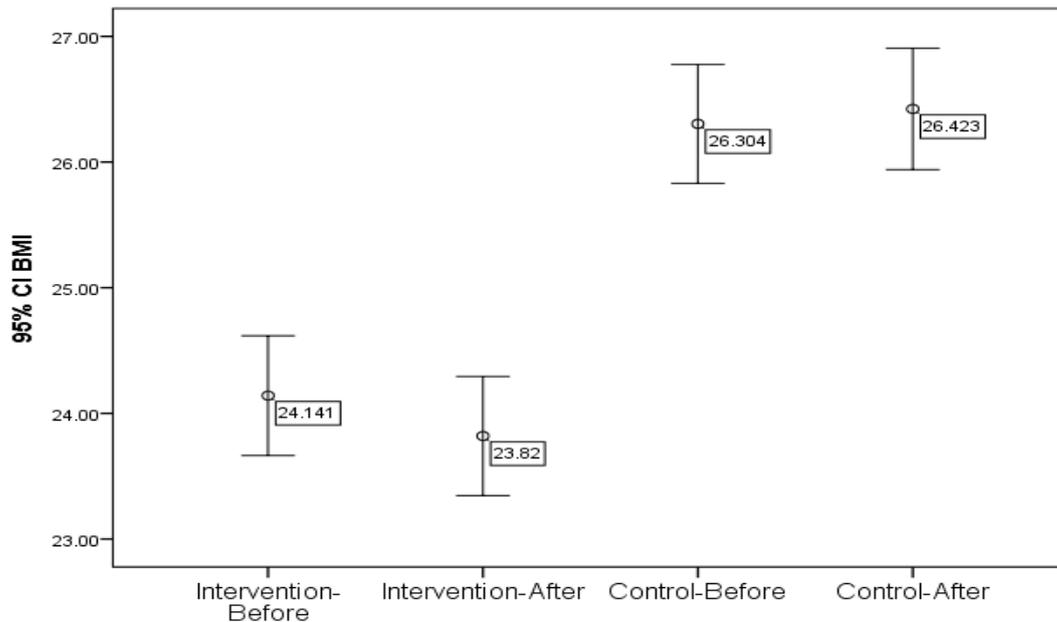
| <i>P-Value</i> | <i>Percent in control group</i> | <i>Percent in intervention group</i> | <i>Classification</i> | <i>Demography</i> |
|----------------|---------------------------------|--------------------------------------|-----------------------|-------------------|
| 0.574 | 51 | 47 | Male | Gender |
| | 49 | 53 | Female | |
| 0.315 | 15 | 10 | 20-40 | Age |
| | 65 | 62 | 41-60 | |
| | 20 | 28 | 61-80 | |
| 0.001 | 20 | 65 | 18.5-24.9 | BMI |
| | 77 | 35 | 25-29.9 | |
| | 3 | 0 | >30 | |
| 0.061 | 16 | 26 | Illiterate | Education |
| | 11 | 17 | Elementary | |
| | 0 | 1 | Guidance | |
| | 1 | 1 | High School | |
| | 41 | 25 | Diploma | |
| | 31 | 30 | University | |



Graph 1. Comparing patients age in two groups of intervention and control



Graph 2. Comparing the gender of two groups of intervention and control



Graph 3. Comparing BMI of two groups of intervention and control two steps before and after study

3.2. Information related to history of patients

34 % of intervention group claimed that their first degree relatives have diabetes, 26 % of patient had hypertension and 35 % of patient had background of hyperlipidemia and 4 % of patients had background of kidney disease and 1 % of them had the history of other illnesses. In intervention group, 26 % of patients had history of familiar diabetes and

27 % hyperlipidemia, 5 % had history of kidney disease, and 18 % of them had the history of other diseases. All the patients in all two groups of intervention and control claimed that they have not used alcohol and drugs. Percentage of used drugs in two groups of intervention and control has been presented in the [Table 2](#) .

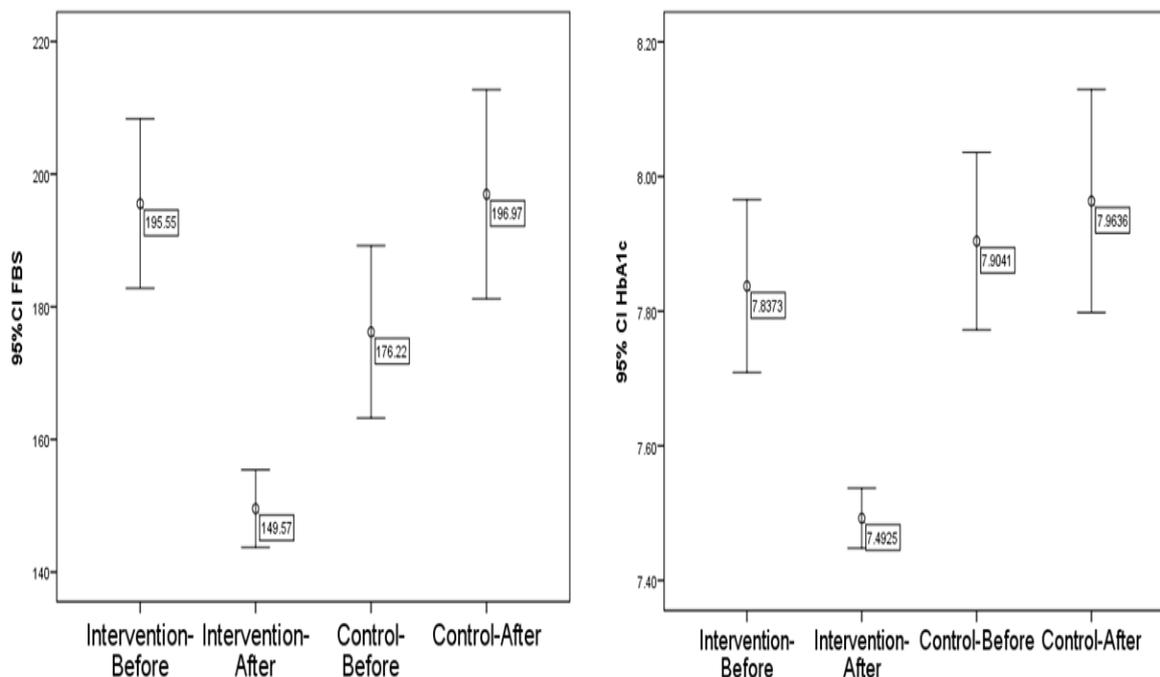
Table 2 . Percentage of used drugs in intervention and control group

| Percentage of used drug | | Name of using drug |
|-------------------------|--------------------|---------------------|
| Control group | Intervention group | |
| 57 | 67 | Insulin |
| 100 | 100 | Metformin |
| 50 | 45 | Glibenclamide |
| 23 | 14 | Pioglitazone |
| 2 | 3 | Acarbose |
| 55 | 43 | Atorvastatin |
| 33 | 5 | Enalapril |
| 0 | 1 | Captopril |
| 11 | 19 | Propranolol |
| 10 | 24 | Metoprolol |
| 3 | 15 | Hydrochlorothiazide |
| 42 | 30 | Losartan |
| 79 | 80 | Aspirin |

3.3. Information of diabetes

Mean FBS of patients in intervention group before study was 195.55±6.43 (101-354) milligram per deciliter and after study it reduced to 149.57±2.94 (106-250) milligram per deciliter (p<0.0001), while in control group mean FBS increased from 176.22 ± 6.54 (106-374) to 196.97 ± 7.93 (105-549) (p= 0.045). Mean HbA1c of patients in intervention group before study was 7.83±0.64 (7.09-9.82), where in reduced to 7.49±0.22 (7.11-8.12) after study, and thus training led to significant change in HbA1c of patients (P<0.0001). while in control group the value

increased from 7.90±0.66 (7.11-9.74) to 7.96±0.83 (7.14-9.81) that off course the increase isn't significant (p=0.578). Graph 4 has compared FBS and HbA1c factors by T-test before and after study, and presents effect of the study on these factors.



Graph 4. Comparing the FBS and HbA1c (a and b respectively) in two groups of intervention and control before and after study

In intervention group, 35 % of patients controlled their blood sugar at home while 72 % of control group patients controlled their blood sugar at home. Controls in intervention group in 15 % of patients was daily, 52 % weakly, 6 % monthly, and 27 % of them controlled their

blood sugar one or two times per year. Table 3 has evaluated the results related to experimental tests and their level of significance has been shown before and after study.

Table 3. Results of experimental tests before and after study

| Control group | | | Intervention group | | | Test * |
|---------------|--------------------------|--------------------------|--------------------|--------------------------|--------------------------|-------------|
| P-Value | After study | Before study | P-Value | After study | Before study | |
| 0.045 | 196.97±7.93 (105-549) | 176.22±6.54 (105-549) | 0.0001 | 149.57±2.94 106-250(| 195.55±6.43 (101-354) | FBS (mg/dL) |
| 0.578 | 7.96±0.83 (7.14-9.81) | 7.90±0.66 (7.11-9.74) | 0.0001 | 7.49±0.22 (7.11-8.12) | 7.83±0.64 (7.09-9.82) | HbA1c (%) |

| | | | | | | |
|-------|-------------------------|-------------------------|-------|-------------------------|-------------------------|-------------|
| 0.504 | 102.45±2.04 (65-149) | 100.47±2.13 (59-149) | 0.553 | 110.61±2.43 (65-157) | 112.76±2.67 (68-178) | LDL (mg/dl) |
| 0.064 | 41.20±0.40 (33-51) | 42.33±0.44 (33-52) | 0.207 | 40.52±0.46 (30-54) | 39.63±0.53 (31-53) | HDL (mg/dl) |

Results are presented as Mean ± SD (Min-Max)

3.4. Probability of cardio-vascular problems during next 10 years

Information of cardio-vascular diseases (CHD, CVD, MI, and Stroke) in intervention and control group during next ten years was reported according to Table 4.

Table 4. Probability of cardio-vascular diseases during next 10 years

| Control group | | | Intervention group | | | Cardio-vascular diseases |
|---------------|-------------|--------------|--------------------|-------------|--------------|-----------------------------|
| P-Value | After study | Before study | P-Value | After study | Before study | |
| 0.209 | 13.00 | 11.83 | 0.018 | 11.49 | 13.52 | CHD |
| 0.220 | 7.69 | 6.83 | 0.012 | 6.38 | 7.96 | MI |
| 0.427 | 3.97 | 3.64 | 0.033 | 2.95 | 3.64 | Stroke |
| 0.247 | 21.75 | 20.04 | 0.024 | 19.04 | 22.02 | CVD |
| 0.295 | 2.86 | 2.46 | 0.025 | 2.20 | 2.96 | Probability of death by CHD |
| 0.404 | 3.81 | 3.35 | 0.079 | 3.04 | 3.92 | Probability of death by CVD |

* The numbers in this table are given as mean consulting on the basis of significance or non-significance In Table 5, the process of efficacy of training and has been evaluated.

Table 5. Comparing the effect of training on studied factors among two groups after finishing the study

| P-Value (2 tailed) | Evaluated factors |
|-----------------------|---------------------|
| 0.041 | FBS |
| 0.007 | HbA1c |
| 0.019 | LDL |
| 0.004 | HDL |
| 0.007 | BMI |
| 0.0001 | Self-care |
| 0.0001 | Foot care |
| 0.018 | Feeling of weakness |
| 0.0001 | Consuming sweet |

Studies have revealed that diabetes can be started at any age, but usually initiating type I occurs at the ages below 20 years, and type 2 occurs at the ages above 25 years. Although, high blood sugar is not an unavoidable result of increasing the age and preventing the high blood sugar should be a real goal at any age. The issue can be seen in the Markhu Laako et al (9) study that investigated on 281 patients and revealed that incidence of different types of

diabetes varies in various ages. In the current study, mean age of patients in intervention group was about 53 years and in control group was about 51 years that is higher in aged patients. Meanwhile, about 52 % of diabetic patients were lower than 25 years old in intervention group that 98 % of them had type 1 diabetes mellitus. 46 percent of patients lower than 25 years old had diabetes that 94 % of them had type 2 diabetes mellitus. In all studies, the role of

education in enhancing the patients learning had been identified. Services related to non-communicable diseases are different from services related to communicable diseases and need more special services and education has an important role in the treatment process of the patients. However, high education level can increase the acceptance of treatment and compliance with medication regimen (10). Results of these studies revealed that the level of education and more awareness of patients have direct relationship with improving their diabetes (11). In the current study, the highest level of intervention group patients' education was related to university education that improving patients after study can be attributed to constant relationship between education and recovery. In the current study, most patients of intervention group (63 %) were under supervision of general practitioner that can be explained regarding the implementation of preventive program and diabetes control in health centers and patient referral to specialist. In control group most of the patients (60 %) were under supervision of specialist that can be attributed to increased awareness of people in referring to specialists and dissatisfaction of treatment by general practitioner. Planning to maintain health specialists' skills during their professional activity to present desired services to patients is one of the challenges of health responsible organizations. Studies have shown that 20 to 50 % of general practitioners are not aware of new scientific findings, and or they don't apply them in their profession (12). Usually 8 of each 10 patients having type 2 diabetes mellitus are obese and need to reduce their weight. Therefore, diabetic patient must always maintain his/her weight in normal range. Body mass index (BMI) is used to determine the weight (13). In the current study BMI of patients related to intervention group after consulting was decreased, which of course the decrease was not significant and it can obtain more desired results by increasing the study time. Diabetes control is accepted by patient itself and increases the pharmaceutical and non-pharmaceutical regimen. Therefore it can use diabetes prevent and control by patient itself to increase the acceptance among them (10). Numerous studies have evaluated the effect of self-care on diabetes, for example in the study by Susan L and colleagues positive effect of self-care on diabetes control has been approved (14). During the study by Parvaned Abazari et al barriers of diabetes self-management effectiveness was studied in two categories of barriers related to patient and barriers related to caregiver. The most prevalent barrier related to patient was issues such as demographic barriers, financial problems, ignoring the seriousness of the illness, psychological problems and lack of knowledge. Relationship between patient and caregiver, inadequate knowledge, and high working volume were the problems related to caregiver. Result of the review was introducing numerous and different factors that can make a serious challenge for patient and caregiver effectiveness of diabetes self-management. Knowing and understanding the barriers to cope with them, much help the patient

empowering to obtain self-management (15). Given the free distribution of glucometer device, measuring blood sugar has become possible for all diabetic patients at home and they can test the level of the blood sugar regularly and according to table and reach their proper food and drug regimen, and prevent fluctuations of blood sugar that can be the source of many dangerous consequences of this disease. In the study, 72 % of intervention group patients claimed that they care themselves at home, but results of their experiments didn't prove it. The value reached to 85 % after consultation that it is a statistically significant difference ($p=0.025$). Personal measuring the blood sugar can reduce the number of physician visits, costs, and number of used drugs and also increase the patient awareness than diabetes. Since long times ago, conventional syringes in the market were used to inject insulin; but today, with the emergence new generation of insulin and also reducing the side effects such as sudden decrease in blood glucose and or even reducing the pain of insulin injection, Pens have been entered the market that they have benefits such as less injection pain than conventional syringe and also accurate insulin dose regulation and reducing the personal inflammations (16). In the current study, amount of using insulin injected by syringe is 23 % and pen insulin is 77 %, which can be attributed to high level of patients' admission for this type of insulin. Studies have clarified that the slowest insulin absorption place is deltoid and femoral muscles and abdominal zone is the fastest absorption site for insulin (8). Experiments and investigations have proved that in the case of continuing insulin injection in a certain location of the body increases the possibility of lipoatrophy there that not only create unpleasant appearance of that area, but also significantly reduces its insulin absorption, which can have consequences. Because patient estimates that he/she has injected the insulin and doesn't know that injected insulin has not complete and effective absorption (17). In the current study 54 % of patients didn't change the location of insulin injection that the issue decreased to 19 % after training and aware the patient. Food regimen and controlling the weight is the basis to control and prevent diabetes. The aim of food regimen correction is controlling total receiving calorie to maintain in a reasonable weight and control the level of blood glucose. During a study by Doctor Noori Tajeri in 2005 in Ghazvin it was revealed that in the case of having a good counselor about the way and amount of using nutrition, it can expect a good control of diet by patients (18). Some pamphlets has been prepared for patients in the current study to give complete information to patients about diet and probably it can attribute the significant improvement of fasting blood sugar and HbA1c to this. Exercise lead to higher efficiency, weight loss, and filling of happiness and well-being. Increasing the physical activity is of great importance to control diabetes (19). Exercise and physical activity should be proportional to condition and well-being situation of individual and perform regularly and consistently. The

patients can do moderate exercises such as stretching and walking. Anyway, they can consult with practitioner of health center about type of exercise. During the study by Wen LK et al, it was shown that exercise and family support can have an effective role to improve the disease status (20). In the current study, after recommendations to patients about exercise, there was a significant difference in doing exercise by patients in intervention group and this might be one of the causes of improving fasting blood sugar and HbA1c. Caring the diabetic foot is very important. Two symptoms may be occurred in these patients: numbness of foot and infection and late improvement of foot ulcers. Therefore, respecting the important things of diabetic people foot hygiene is very important (21). During the study by CA Abbott and coworkers, 9710 diabetic patients were studied. They divided into 6 groups and after consulting them and training them the correct way of caring the foot, obtained results after two years indicated that only 200 of them had new ulcer (22). During the study by Naser Janmohammadi et al in Babel in 2009 (23), it was found that although diabetic foot ulcer cannot be completely prevented, it can highly reduce its occurrence and disability resulted from it by reducing the underlying risk factors and continued training. In the current study, diabetic foot problem in intervention group, before and after study maintained equally, while this value was increased in the control group which was not significant. Informing the patients about proper controlling the blood sugar and principles of caring foot are effective here. Diabetes can create cataract, glaucoma and vascular bleeding in your eye. Therefore, it should think about these consequences and coping with them. The best way is that patient keep his/her blood glucose in desired level without fluctuation. Most patients think that only if their fasting blood sugar be near 100, the problem is solved, but it is not so. Studies have shown that blood sugar should have the least fluctuation; the person should thus check his/her non-fasting sugar half hour, two hours, and four hours after eating food to achieve a certain medicinal-nutritional behavior that the sugar has no fluctuation and never go up to 200 (24). In the current study, 46 % of patients didn't refer to ophthalmologist or irregularly referred that after study and informing the patients we were able to decrease it to 8 % ($p=0.005$). Main factors in diabetes control are FBS and HbA1c. It can find how to control the disease by the results of the two factors. During the study by S Fasaei and colleagues in 2011, they aimed at investigating the effect of pharmacist consult in controlling diabetes disease, where the results showed that level of fasting blood sugar and HbA1c was significantly decreased at the end of three month period (25). Another study in 2011 in Colombia aimed at evaluating the role of pharmaceutical care in controlling diabetes showed that during the longtime the process can improve diabetic status of patient (26). Current study which was conducted on 200 patients revealed that fasting blood sugar and HbA1c were

significantly reduced. Results obtained from W B Kannel and coworkers have shown that diabetes can have an effective role in increasing the risk of cardio-vascular diseases (27). In the current study, probability of cardio-vascular diseases during the next 10 years was calculated using software designed by Doctor Robert Pin in 2010 at Edinburgh University from Framingham table in excel format. In intervention group it decreased after studying all cardio-vascular events that the decrease was significant in most cases. The risk increased in control group which can be concluded that if no intervention occurs, not only the events risk doesn't stand, but also it will increase (27).

4. CONCLUSION

By providing pharmaceutical trainings and controlling patients, significant reduction in fasting blood sugar and HbA1c of patients was seen; furthermore, positive changes such as increased HDL, reduced LDL was also observed. Therefore, with more following the patients' status and increasing patients' awareness we can reduce the consequences of disease and drug. Educational and caring planning in health care centers can take step toward improving the society health and enhance the society health.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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