

The effects of nutritional education on patients with type–II diabetes on the nutritional knowledge and consumption

Mahsa Malek¹ and F. Pınar Çakıroğlu²

¹*Food Industry and Chemistry Department, Islamic Azad University, Shabestar Branch, Shabestar, Iran*

²*Ankara Üniversitesi, Sağlık Bilimleri Fakültesi, Beslenme ve Diyetetik Böl. (Ankara University, Faculty of Health Sciences, Department of Nutrition and Dietetics)*

ABSTRACT

Prevention of occurrence or development of diabetes complications by providing a good metabolic control could only be achieved through diabetic patients' training. The aim of the study is to determine the effects of nutritional education of patients with type-2 diabetes on nutritional knowledge and consumption habits. The study is a descriptive research and is composed of 2 groups and 4 stages carried out to determine the effects of planned education of type-2 diabetes patients on their alimentary knowledge. Patients were divided into two groups, experiment (10 individuals) and control (10 individuals) groups. Nutritional education was given to the experiment group and not applied to the other group. In order to determine the nutritional knowledge, 20 questions related to the matter were presented to patients. "Individual nutrition consumption method" was used to determine the nutrition consumption. For the nutrition consumption analysis, daily energy and nutrition components were determined by using computer software "NUTRITIONIST II. At the end of nutritional education, significant differences were detected in experiment groups regarding nutritional knowledge level ($p < 0.001$), energy intake ($F_{(1,19)} = 6.033, p < 0.05$), protein intake ($F_{(1,19)} = 10.568, p < 0.05$), CHO intake ($F_{(1,19)} = 7.437, p < 0.05$), and fat intake ($F_{(1,19)} = 3.821, p < 0.05$). In addition, an increase was detected in sediment intake with education (initial measurement $14.03 \pm 8.06g$, last measurement $19.49 \pm 6.35g$). In order to control diabetes, eating habits should be regulated through nutritional education, and this should be adopted as a life style which will increase the life quality. Obtained results indicate that education was effective.

Key Words: Type II diabetes, nutrition education, nutrition therapy, metabolic control, nutritional knowledge.

INTRODUCTION

The diabetes has been noticed as a serious health problem since ancient eras and known for about 3,500 years, as a case of chronic hyperglycemia which occurred as a result of lack of, or ineffectiveness of the insulin hormone released by the beta cells in the pancreas. The disease leads to acute metabolic complications as well as vascular, renal, retinal and neuropathic changes in the long term. With the risk of morbidity and early mortality, it is a widespread disease with higher costs for individuals and society [1].

As diabetes is a disease which continues for a lifetime, the proper therapy methods should be applied in order to control the disease, remove or relieve the symptoms, prevent and delay the complications. The most important task is to be done by the patient, in this issue. The patient should be well-informed about his/her disease and diet. For this purpose, a cooperation should be established between the health personnel and the patient and a regular and

proper diabetic education should be planned, since the diabetes requires the patient to make changes in his/her nutritional habits, learn the daily food changes and be informed of the food preparing and cooking rules, the symptoms of the disease, and due to this, taking immediate actions.

A good metabolic control should be provided in order to prevent the occurrence or progression of the diabetes complications, which may only be achieved thanks to a good education provided for the diabetic patients [2-5], because knowledge allows the patients to cope with their problem and control their lives. This, in turn, motivates the patients to undertake their care [6,7]. Food selection and nutritional habit that begin with the birth and continue during the lifetime are one of the most important factors having impact on our level of health and life quality.

In studies on diseases such as obesity, cardiovascular diseases, digestive system diseases, cancer and diabetes, it has been emphasized that the nutritional education is very effective on metabolic control [3, 4, 6-11]. It has also been revealed in the studies that the occurrence or progression of the Type I and II complications may be prevented by providing a good metabolic control [12, 13].

This study aims to probe the effects of nutritional education of the patients with Type II diabetes on nutritional knowledge and food consumptions.

MATERIALS AND METHODS

The study is a descriptive research carried out in two steps with two groups to find out the impact of the planned education of the patients with Type II diabetes on the patients' nutritional knowledge.

The survey was carried out among 20 volunteer patients (13 women and 7 men) with Type II diabetes and had an outpatient treatment, whose ages were between 30 and 60 ($\bar{X} = 49.50 \pm 8.17$ year), BMIs were under 30 kg/m², and who used only oral anti-diabetic drug and did not have any other chronic disease, during the period between January, 2008 and January, 2009. The patients were provided with information on the purpose of the study, execution plan and the benefits of the study and they signed consent forms as an indication of their voluntary participation in the study.

The patients were divided into two groups, an experimental group (10 patients) and a control group (10 patients). The nutritional education was provided for the experimental group but not for the other group.

The education was provided by the researcher for 10 patients who were selected for the educational group, through a one-to-one method based on 1 hour a week, totally four hours. The education included the description of the diabetes, the complications, treatment methods, the importance of nutrition in diabetes, nutritional elements and the food groups, the glycemic indexes of the food, food change lists, food preparation and cooking rules, and the changes should be made in nutritional habits.

The patients were asked 20 questions in order to determine nutritional knowledge. The questions were asked to the patients once before the education (1), once after the education (2), once one month after the education (3) and once three months after the education (4), totally four times. The questions were prepared as a result of examining the previous studies [14, 15]. The right answers were evaluated as "1" point and the wrong or "I don't know" answers were evaluated as "0". The total point is 20, if all questions were replied correctly.

"The individual food consumption method" was used in determining food consumption state. This method is based on determining the amount of food consumed by the patient during a day and calculation of the energy and nutrition elements of the consumed food. The individuals' food consumptions in three consecutive days (a weekend day and two working days) were taken. For food consumption analysis, the computer program named NUTRITIONIST III was used to calculate the daily average energy and nutrition elements of the food consumed by the patients.

The SPSS package software was used in statistical analysis. For evaluation of the numerical data, the single factorial ANOVA was used in repetitive measurements for calculation of arithmetic average, standard deviation, the lower and upper values, and determination of the differences due to the education; the Bonferroni test was used to determine the resource of the differences; the t-test was used to determine the difference between the educational and control groups; and the two factorial ANOVA results were calculated [16].

RESULTS

The patients participated in the study were asked 20 multiple choice questions on nutritional knowledge. The knowledge questions were asked before the education and repeated just after, one month after and three months after the education; the same questions were asked to the patients in the control group within the same time frames. The obtained average points are given in Table 1.

Table 1. The single factorial ANOVA Results for calculation of arithmetic average, standard deviation, the lower and upper values of nutritional knowledge points regarding diyabetes and for repetitive measurements, before education, immediate after the education, one month after the education and three months after the education given to the patients

| The level of nutritional knowledge on diyabetes | Education Group (n=10) | | | |
|---|-------------------------------|------|-------|-------|
| | X | S | Lower | Upper |
| Before Education (1) | 12.10 | 2.92 | 6.00 | 16.00 |
| After education (2) | 17.10 | 2.47 | 12.00 | 20.00 |
| One month after education (3) | 17.60 | 1.51 | 15.00 | 19.00 |
| Three months after education (4) | 16.90 | 1.66 | 15.00 | 19.00 |
| | F=24.86 p<0.001 1-2. 1-3. 1-4 | | | |
| | Control Group (n=10) | | | |
| | X | S | Lower | Upper |
| Before Education (1) | 10.91 | 3.51 | 2.00 | 15.00 |
| After education (2) | 11.09 | 4.18 | 3.00 | 19.00 |
| One month after education (3) | 10.91 | 4.23 | 2.00 | 19.00 |
| Three months after education (4) | 10.27 | 3.85 | 2.00 | 17.00 |
| | F=0.82 p>0.05 | | | |
| | Total (n=20) | | | |
| | x | S | Lower | Upper |
| Before Education (1) | 11.30 | 3.19 | 2.00 | 16.00 |
| After education (2) | 13.70 | 4.54 | 3.00 | 20.00 |
| One month after education (3) | 13.85 | 4.64 | 2.00 | 19.00 |
| Three months after education (4) | 13.25 | 4.53 | 2.00 | 19.00 |
| | F=6.84 p<0.001 1-2. 1-3 | | | |

In evaluation of the points of the patients regarding nutrition knowledge, it has been found out that the average points of the educational group were 12,10 in the first evaluation, 17,10 in the second evaluation, 17,60 in the third evaluation and 16,90 in the final evaluation. In evaluation of the analysis results, it has been determined that there was a significant change in nutritional knowledge levels of the patients in the education group ($p<0.001$), while no changes were specified with the diabetic nutritional knowledge levels of the patients in the control group ($p>0.05$).

It is important to follow the diet in terms of the effectiveness of the diabetes treatment [17]. Thus, the positive changes are expected in taking energy and nutritional elements as a result of the provided education. The energy, protein, carbohydrate, fat and dietary fiber consumptions of the patients before and after the education are shown in Table 2.

While examining the energy takings of the individuals included in the scope of the study after the 1st, 2nd, 3rd and 4th measurements, it was found out that there were no significant differences in average points of the education and control groups in the 1st, 3rd and final measurements ($p>0.05$); however, a statistical difference was specified in the second measurement ($p<0.05$). According to the results of the ANOVA test which was applied to specify whether the receiving education made differences on the patients in gaining energy, the provided education provided a significant difference on energy takings of the patients ($F_{(1,19)}=6.033$, $p<0.05$).

While considering the protein has been taken by patients, there was statistical difference in the first step between the education and the control groups ($p<0.05$), although there was no statistical difference in the 2nd, 3rd, and the final steps ($p>0.05$). According to the ANOVA that was applied to find out if receiving education had impact on the patients in taking protein, the provided education resulted in a significant difference on protein taking of the patients ($F_{(1,19)}=10.568$, $p<0.05$).

Considering the measurements regarding carbohydrate intake of the patients in both education and control groups, it seems that there had been no significant statistical differences in the second ($p<0.05$) and third ($p<0.01$) measurements of the patients. According to the ANOVA test that was applied in order to find out whether receiving education had impact on the patients in CHO taking, it has been determined that the education had a significant difference on the patients in CHO taking ($F_{(1,19)}=7.437$, $p<0.05$).

Table 2. The average, standard deviation values of the energy and some nutritional elements taken by the patients in the 1st, 2nd, 3rd, and 4th measurements and the results of t-testing and two factorial ANOVA

| | Education G. | Control G. | t | P |
|------------------------------|--|-------------------|----------|----------|
| Energy(kcal) | X± S | X± S | | |
| Before education (1) | 2681,80±1056.11 | 1974.40±523.90 | 1.90 | .074 |
| After education (2) | 1382,80±378.18 | 1817.00±501.25 | 2.19 | .042* |
| 1 month after education (3) | 1545,90±692.36 | 1817.30±448.83 | 1.04 | .312 |
| 3 months after education (4) | 1508,40±1508.40 | 1713.10±373.07 | 1.15 | .266 |
| | F _(1,19) =6.033 p=.001 Significant difference=1-2,1-3,1-4 | | | |
| Protein (g) | X± S | X± S | t | P |
| Before education (1) | 117.72±44.96 | 82.34±26.81 | 2.14 | .047* |
| After education (2) | 67.55±16.94 | 72.16± 20.65 | 0.55 | .592 |
| 1 month after education (3) | 76.83±35.26 | 79.64± 23.64 | 0.21 | .837 |
| 3 months after education (4) | 69.68±16.05 | 75.84± 20.61 | 0.75 | .465 |
| | F _(1,19) =10.568 p=.004 Significant difference=1-2,1-3,1-4 | | | |
| Carbohydrate (g) | X± S | X± S | t | P |
| Before education (1) | 411.42±182.21 | 347.89±93.55 | 0.98 | .340 |
| After education (2) | 212.08±69.09 | 344.41±95.76 | 3.28 | .004** |
| 1 month after education (3) | 211.36±70.30 | 313.37±74.80 | 3.14 | .006** |
| 3 months after education (4) | 237.79±57.36 | 289.01±62.19 | 1.92 | .072 |
| | F _(1,19) =7.437 p=.000 Significant difference=1-2,1-3,1-4 | | | |
| Fat (g) | X± S | X± S | t | P |
| Before education (1) | 65.77±32.38 | 29.65±9.87 | 3.33 | .004** |
| After education (2) | 30.20±70.94 | 24.93±7.39 | 1.54 | .142 |
| 1 month after education (3) | 46.64±41.69 | 30.42±11.40 | 1.19 | .251 |
| 3 months after education (4) | 33.14±17.82 | 31.96±7.13 | 1.95 | .848 |
| | F _(1,19) =3.821 p=.005 Significant difference =1-2,1-4 | | | |
| Dietary fiber (g) | X± S | X± S | t | P |
| Before education (1) | 14.03±8.06 | 11.13±4.42 | 0.99 | .332 |
| After education (2) | 18.90±7.63 | 12.55±4.96 | 2.21 | .040* |
| 1 month after education (3) | 18.63±7.37 | 12.559±4.57 | 2.20 | .041* |
| 3 months after education (4) | 19.49±6.35 | 12.69±4.61 | 2.74 | .014* |
| | F _(1,19) =4.847 p=.005 Significant difference=1-2,1-3,1-4 | | | |

Evaluating the fat taking of the participant group in the first, second, third and final measurements, it has been determined that there was a significant difference in the first measurement ($p < 0.05$), while there was no significant difference among the average points in the other measurements ($p > 0.05$); and receiving education made a significant difference on fat taking of the patients ($F_{(1,19)} = 3.821$, $p < 0.05$).

Considering the first, second, third and the final measurements of the dietary fiber taking of the individuals participated in the scope of the research, it has been observed that there was a significant increase in the second, third and final measurements of the education and control groups ($p < 0.05$), while there was no significant statistical difference among the average values in the first measurement. Considering the results of ANOVA testing ($F_{(1,19)} = 4.847$, $p < 0.05$). It may be concluded that receiving education had a significant difference on taking dietary fiber by the patients.

DISCUSSION

Analyzing the impact of education on nutritional knowledge, it has been found that the average points of the education group in the first measurement was 12.10 ± 2.92 and the final measurement average point was 16.90 ± 1.66 ; and this difference between the points has been found significant ($p < 0.001$). The nutritional education has further importance in diseases that last for a lifetime, such as diabetes. Upon raising the awareness of the patients with diabetes regarding the disease and the diet, the patients' life quality may be increased and the complications may be prevented or delayed. Many researches on the influences of the education on nutritional knowledge and habit effectivity with the patients with Type II diabetes have found out that the education has delivered useful results in overcoming innutrition [18-20].

Regarding the results about the energy consumption which is one of the findings of the research, the energy consumption in the first measurement was $2681, 80 \pm 1056, 11$ kcal while it decreased to $1508, 40 \pm 1508.40$ kcal in the final measurement; and it is revealed that the given education made a significant difference on the patients in

receiving energy ($F_{(1, 19)}=6.033, p<0.05$). According to some studies, it is claimed that the risk of getting sick of Type II diabetes may be higher if the food with plenty of calorie, fat and less complex carbohydrate is consumed [21]. Consuming excessive fat and getting excessive calorie, obesity and physical inactivity result in atherosclerosis and increase the cardiovascular risks.

It is also known that obesity leads to an increase in complication risk and the amount of the drug used in treatment with the diabetic patients [22, 23]. That's why; the weight control is very important for the diabetic patients. While considering that 80% of the diabetic patients of Type II are over their ideal weight, it is desirable that they reduce energy consumption.

In experimental studies, it is shown that the dietary protein influences the changes in intra-glomerular pressure. In addition, the dietary protein is important in progression of loss of renal function and it increases the glomerular filtration which is playing an important part in pathogenesis of the glomerular sclerosis. While the high-protein diet speeds up the occurrence of the glomerular damage, the low-protein diet decreases the glomerular pressure and protects the kidney's structure and functions. The proposed daily protein amount for the patients do not have nephropathia is 0.8-1.0 g/kg; or 10-20% of the daily calorie should be composed of the protein, as with the healthy adults, [24]. According to DRI, the daily proposed protein amount is 56 g for men and 46 g for women between 31 and 70 years old. As shown in the table, the patients' protein taking is higher at the beginning (the first measurement shows 117.72 ± 44.96 g, the final measurement shows 69.68 ± 16.05 g). A decrease was observed as a result of the education. This shows that education is effective.

With the diabetic patients, the complex carbohydrates that absorbed slowly are used, among the carbohydrates. Since the complex carbohydrates require more time for being absorbed, a slow and medium level increase is observed in glucose level of the blood. For this purpose, the diabetic patients are recommended to avoid from the simple carbohydrates and increase the complex carbohydrate taking. In a research, it was found out that 86.7% of the patients did not have knowledge about the food increasing the blood glucose level. [25]. Recent scientific data show that the care, education and the efforts of the patient to overcome his/her problem have a great importance in preventing mortality and morbidity [26]. According to the suggestions by DRI, the daily carbohydrate taking is 130 g. The fact that this amount, which was higher four times, was reduced by half shows the influence of the education (the first measurement shows 411.42 ± 182.21 g, while the final measurement shows 237.79 ± 57.36 g). The given education led to a significant difference on CHO takings of the patients ($F_{(1,19)}=7.437, p<0.05$). It is possible to reduce this amount to the desired limits with an effective and regular education.

One of the basic purposes of the nutritional treatment of the diabetic patients is to prevent the increase in triglyceride, total and LDL cholesterol that increase the cardiovascular disease risk and the decrease in HDL cholesterol. For this reason, the patients should be careful in consuming the amount and type of the fat. In uncontrolled diabetics, the level of plasma lipid is higher. This increases the coronary heart disease incidence rate [24]. It has been determined that receiving education has made a significant difference on the patients in fat takings ($F_{(1,19)}= 3.821, p<0.05$).

In the studies, it has been pointed out that if the dietary fiber content is not increased along with higher carbohydrates, an increase is observed in the levels of triglyceride and LDL cholesterol and the glysemic regulation becomes easier, the usage of insulin or OAD decreases; it helps control the weight by providing saturation feeling in the stomach; reduces the cholesterol and blood pressure, therefore reducing the risk of coronary heart disease, with the diabetic patients with Type II diabetes [24]. Considering these positive effects of the dietary fiber, the adults are suggested to take 20-35g/day tendon. The dietary taking of the individuals participated in the research is found below the suggestions. The given education has increased the amount of dietary fiber taking (the first measurement shows 14.03 ± 8.06 g, while the final measurement shows 19.49 ± 6.35 g). This finding also shows the effectivity of the education.

One of the most important reasons for innutrition and malnutrition is lack of knowledge of nutrition and malnutrition habits that result in chronic diseases such as diabetes. Since there is no treatment method to completely remove the diabetes, what should be done to take the diabetes under control is to provide nutritional education and regularize the habits; to prevent the acute and chronic complications by providing the metabolic control; to train the patient to overcome with his/her problem; to have the patient to gain the essential information and capabilities and adopt this as a lifestyle; and thus increase his/her life quality.

It is essential the long-term follow-ups should be carried out and a good relationship between the physician and the dietician should be established in the larger samples that should be carried out to find out the effects of the planned education provided for the diabetic patients on their lifestyle and metabolic control values.

REFERENCES

- [1] Judi Middleton RN. *TCM* **2003**; 14(6): 43–47.
- [2] Ozer E. *Diabetes Forum* **2005**; 3(1): 61–66.
- [3] Visser A, Snoek F. *Patient Education and Counselling* **2004**; 53 (3): 251–255.
- [4] Ovayolu N, Parlar S, Karakaş S. *Nursing Forum* **2003**; 4(4): 19–23.
- [5] Rickheim PL, Weaver TW, Flader JL, Kendall DM. *Diabetes Care* **2002**; 25: 269–274.
- [6] Kartal A, Altuğ Özsoy S. *Int. J. of Nursing Studies* **2007**; 44(8): 1447–1458
- [7] Öz F. *The key concepts in health sector*. Ankara: İmaj İnport and Export Company, **2004**: 26-29.
- [8] Strine TW, Okoro AC, Chapmon PD. *Preventive Medicine* **2005**; 41(1): 79–84.
- [9] Funnell MM, Anderson RM. *Clinical Diabetes* **2004**; 22: 123–127.
- [10] Bruce DG, Davis WA, Cull CA, Davis TM. *J. of Diabetes and Its Complications* **2003**; 17(2): 82–89.
- [11] Skinner TC, Hampson SE. *Diabetes Care* **2001**; 24: 828–833.
- [12] Vincent D, Clark L, Zimmer LM, Sanchez J. *The Diabetes Educator* **2006**; 32(1): 89–97.
- [13] Rezai N, Tahbaz F, Kimiyagar M, Alavi H. *Shahrkork University of Medical Sciences* **2007**; 8(2): 52–58.
- [14] Susmon JJ, Helseth LD.. *American Family Physician* **1997**: 471–478.
- [15] Atak N, Arslan U. *Health Education J.* **2005**; 64: 339–346.
- [16] Buyukozturk S. *Data Analyssis Handbook for Social Sciences* 5th Edition, Ankara: Pegem, **2005**: 39–77.
- [17] Sumner J, Dyson PA. *Nursing Times* **2004**; 100(16): 51–53.
- [18] Arslan P, Buyuktopcu N. *Nutrition and Diet Magazine* **1978**; 7(1): 72–78.
- [19] Ercan ŞA, Arslan P. *Nutrition and Diet Magazine* **1990**; 19: 173- 188.
- [20] Arslan P. *Sendrom* **1992**; 4(5): 30–3.
- [21] Satman I, Yilmaz T, Sengul A. ve ark. *Diabetes Care* **2002**; 25(9): 1551–1556.
- [22] Tseng CH, Chong CK, Sheu JJ, Wu TH, Tseng CP. *Diabetic Medicine* **2005**; 22(4): 477–482.
- [23] Abdul-Ghani MA, Kher J, Abbas N, Najami T. *IMAJ* **2005**; 7(6): 360–363.
- [24] Baysal A, Aksoy M, Bozkurt N. et al. *The Diet Handbook*. 5th Edition, Ankara: Hatiboglu, **2008**: 271–74.
- [25] DeCoste KC, Scott LK. *AAOHN* **2004**; 52(8): 344–353.
- [26] Ucan O, Ovayolu N, Torun S. *Anatolian Nursing and Health Sciences Magazin* **2007**; 10(1): 89–96.