The Effects of Nutrition Education and Diet Therapy on Glycemic and Lipidemic Control in Iranian Patients with Type 2 Diabetes

[1]*Department of Clinical Nutrition & Dietetics, Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran*
[2]*SBMU, National Nutrition and Food Technology Research Institute, Tehran, Iran*

any study to evaluate the e ects of nutrition education plus diet therapy on biochemical markers in Iran. We thought that one of the reasons for failure of many weight reducer diets may be poor awareness of importance of a healthy diet. We supposed that increase in nutrition knowledge may lead to increase motivation to adherence to a healthy diet. erefore, we evaluated the e ects of nutrition education of individuals plus a weight reducer diet on glycemic and lipidemic control in Iranian patients with T2DM.

Methods

Participants

Patients were recruited from Aliebneabitaleb Hospital in Ghom. By convenience sampling, 494 patients with T2DM, aged 14-87 years from both genders participated in this randomized controlled trial. T2DM was veri ed by patients' medical records. We assumed several categories of age in which each category was 5 years older than previous category. So, we assumed 15 age groups. e rst referred participant of each age group assigned to an intervention group while the second referred participant of each age group was assigned to a control group and so on. All participants were outpatients and they had been referred to the hospital's nutrition unit to receive an appropriate diet. A trained dietitian visited them and described them about the method of the study in Persian language. Diabetic patients who were lactating or alcoholic or who were on insulin therapy or taking contraceptive drugs, glucocorticoids or weight reducer drugs were not allowed to enter the study. All participants gave written, informed consent to participate in the study. e study was approved by the Medical Center Institutional Review Board (Shahid Beheshti University of Medical Sciences).

General information assessment

e participants completed a general information form that included questions on age, marital status, pregnancy, lactation and taking oral contraceptive drugs (for women), any neuroendocrine or metabolic disorders, taking any hormonal drugs, neuroendocrine drugs, appetite e ective drugs, supplements or weight loss medications, following any diet, smoking, drinking alcohols and education level.

Anthropometric measurements

Trained certi ed dietitians conducted all anthropometric measurements. Body weight was measured to the nearest 500 g using digital scales (Beurer, Germany) with participants in minimal clothing and without shoes. Height was measured in a standing position without shoes with the shoulders in a normal position using a non-

life. e correlation coe cient is more than 0.7 which is acceptable. Cronbach's alpha was 0.9 which indicates the good reliability of this questionnaire.

Visual Analogue Scale (VAS) was assessed the maximum feeling of hungry using 100-mm visual analogue scales for ten time points including: before and a er breakfast, morning snack, lunch, evening snack and dinner. Subjects were requested to make a vertical mark on each line that best matched how they were feeling at the time. Each score was determined by measuring the distance from the le side of the line to the mark [31].

Intervention

e participants were divided into two 247 person groups through strati ed randomization. e two groups were matched on the basis of age. Intervention group were educated individually about the carbohydrate counting, sugar content in each food item, the importance of snacking, the e ects of complex and simple carbohydrates on blood glucose, the di erences between glycemic index and glycemic load, importance of vegetable and fruit consumption, disadvantages of high intake of cholesterol, saturated and trans fatty acid and the importance of the time for food consumption regarding the time for taking glucose reducer drugs by a trained certi ed dietitian within a 45 minute session. Duration of intervention was two months. Both groups received a weight reducer diet based on their adjusted ideal body weight, while the control group did not receive any nutrition education. Both groups were followed every two weeks via telephone contact to ensure good adherence to the recommendations and diet.

Statistical analysis

SPSS so ware version 11.5 was used for statistical analysis. We used the Kolmogorov-Smirnov test to determine if variables showed a normal distribution. Independent T-test and the Mann-Whitney test were used to compare the di erences between the two groups (for variables with normal or abnormal distribution as appropriate). Chi-square test was used to compare the mean of categorical variables between the two groups. Wilcoxon tests were used to compare the changes before and a er intervention. Logistic regression was used to determine the relation between intervention and patients' outcome. P-value < 0.05 was considered as signi cant.

Results

Age and weight had normal distribution and an Independent T-test was used for analysis, while the other variables had abnormal distribution and a Mann-Whitney test was used to compare data between two groups. e Chi-square test was used to compare qualitative variables between two groups. However all participants had BMI > 25 kg/m^2, the results showed that the two groups were di erent in terms of weight at baseline, signi cantly. Moreover, percentage of smokers was signi cantly higher within intervention group than control group. e other variables had similar distribution in both groups (Table 1).

To compare mean of weight and biochemical parameters before and a er intervention, paired t-test and Wilcoxon test were used. e results showed that weight and all biochemical parameters decreased a er intervention, signi cantly. Furthermore, the mean of fasting plasma glucose (FBS) and 2 hours a er 75 g plasma glucose (2 Hpg) decreased signi cantly in the control group a er two months (Table 2).

Table 3 [illegible]

nutrition education and physical exercise intervention, could be a feasible model for control of diabetes and its risk factors [32]. In Saudi Arabia and Britannia, the positive e ects of nutrition education on knowledge, attitude and practice of diabetic patients has been shown [33,34]. In recent years, patient counseling programs for American usage to educate patients about self management became a process that improved their ability to adapt themselves to their disease and its management [35-36]. ese educational programs help patients to change their unsuitable dietary and lifestyle habits [37].

Generally, a dietary pattern including carbohydrate from sources such as fruits, vegetables, whole grains, legumes, and low-fat milk is encouraged for good health. Although many diabetic patients believed that a high carbohydrate diet is the most harmful factor for control of diabetes, studies show that a low-carbohydrate diet, restricting total carbohydrate below 130 g/day, is not recommended in the management of diabetes. Low-carbohydrate diets which restricted carbohydrate to 130 g/day are not recommended in the treatment of overweight/obesity patients, because the long-term e ects of these diets are still unknown [38]. On the other hand, diabetic patients should know that carbohydrate can be an important source of energy, ber, vitamins and minerals. Furthermore, carbohydrates are important in diet palatability [38]. So, helping diabetics to understand how to carbohydrate count and use the food exchange system, will allow them to better control the portion size of carbohydrate-rich foods served and assist in managing their total daily carbohydrate intake. It might be a key strategy in achieving glycemic control.

Our ndings about the e ect of nutritional intervention on glycemic and lipidemic control are consistent with several clinical trials which have shown decrease in HbA1c of 1–2% in type 2 diabetes through medical and nutritional therapy [39,40]. Furthermore, in the UK prospective diabetes study, which recruited a newly diagnosed cohort, a er three months of dietary treatment, HbA1c levels decreased from 9.1% to 7.2% [41]. e level of HbA1c did not change in our study a er the intervention. It may be because the half life of HbA1c is more than duration of our follow up.

Elevation of plasma cholesterol and triglycerides in type 2 diabetic patients are predictors of the need for renal replacement therapy [42]. Some observational studies suggest that dyslipidemia increases albumin excretion and the rate of progression of diabetic nephropathy [43]. Because many diabetic patients have dyslipidemia, we also educate them about the e ects of cholesterol, trans and saturated fatty acids on lipid pro le. Following the recommendations and diet therapy, cholesterol and TG showed a signi cant decrease a er two months.

Unfortunately, weight gain may be a consequence of some anti-diabetic medications [44]. So, weight loss is an important therapeutic objective for diabetic patients [45]. All participants in the current study were categorized as overweight at baseline. e intervention group showed a signi cant weight loss (approximately 2%) a er adherence to weight reducer diet and nutritional recommendation for two months. Several studies have shown the direct e ect of weight loss on signi cant reduction of fasting triglyceride and total cholesterol [46,47]. ey suggest that modest weight reductions (as little as 5%) lead to reductions in fasting plasma glucose and triglyceride and long term bene ts in patients with type 2 diabetes [48]. Some short term studies also have found that moderate weight loss in diabetic patients can lead to decreased insulin resistance and improved glycemic and lipidemic factors [49]. On the other hand, some studies showed that energy restriction independent of weight loss can have considerable a ects on glycemic control [50]. ere are also several studies that have shown that improved glycemic control could be achieved within 10 days of imposing energy restriction even before any signi cant weight loss [48]. However the amount of weight loss in our participants was not as much of 5% that observed in previous studies, the intervention group showed a signi cant weight loss a er two months. Furthermore, the mean of weight di erences within intervention group was signi cantly more than within control group. One of the interesting points of this current study is use of two di erent kinds of intervention between two groups. According to our knowledge, there is not any study to compare the combination of diet therapy and nutrition education with diet therapy alone, at least in Iran. Our nding showed that when nutrition education is added to energy restricted diets; it may have more bene cial outcomes than restriction of energy intake without any education. On the other hand, FBS and 2 hours a er 75 g plasma glucose decreased in control group, too. Although the control group did not show any weight reduction, the bene cial e ects of a healthy diet might improve some patients' outcome in this group, independently of the weight loss. Since both groups had received a weight reducer diet, we may conclude that nutrition education has positive e ect on adherence to a healthy diet, maybe through increase of patients' motivation or their responsibility for adherence to a healthy diet. It is also possible that nutrition awareness makes patients stricter to follow the healthy dietary programs. All together, we could not neglect the bene cial e ects of weight loss on diabetes outcomes,