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Original Article

Association of Self-efficacy and Decisional Balance with Stages of Change for Fiber Intake and Glycemic Control in Patients with Type 2 Diabetes

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ABSTRACT

Background and Objectives: Constructs of behavioral models such as trans-theoretical model can be associated with healthy eating behaviors like increasing fiber intake. They can also be effective in improving these behaviors in patients with diabetes. This study aimed to assess the association of self-efficacy and decisional balance with stages of change for fiber intake and glycemic control in patients with type 2 diabetes.

Materials and Methods: A cross-sectional study was conducted on 145 literate male and female patients with type 2 diabetes (aged 30 to 65 years); they were randomly selected from the patients' list of "Charity Foundation for Special Diseases" and "Iranian Diabetes Society" in Tehran-Iran. Stages of change, self-efficacy, and decisional balance questionnaires were filled out, and three food records were used to assess their nutritional status. Blood samples were taken to assess fasting blood glucose, HbA1c, serum insulin, and insulin resistance. One-way ANOVA and logistic regression were used to analyze the data. The tests were done using the SPSS software (ver. 16). $P<0.05$ was considered significant.

Results: 126 patients with type 2 diabetes completed the study. Participants' mean age was 53.5±6.02 and 65% were men. Patients in post-action stages revealed higher self-efficacy than did those in pre-action stages ($P=0.035$). A relationship was observed between insulin resistance and self-efficacy ($P=0.040$). One unit increase in self-efficacy decreased the risk of insulin resistance by 12%, and each unit increase in decisional balance increased the chance of eating sufficient fiber by 2.2 times. There was also a significant relationship between the perceived cons ($P<0.0001$) and self-efficacy ($P=0.037$) with fiber intake after adjustment with confounders.

Conclusions: This study suggests that there is a relationship between transtheoretical model constructs such as self-efficacy and decisional balance, especially cons, with fiber intake in patients with type 2 diabetes. So it seems that considering these constructs in educational interventions could be effective in increasing the fiber intake in such population.

Keywords: Dietary fiber, Type 2 diabetes, Decisional balance, Self-efficacy

Introduction

Although patients with diabetes are advised to increase their intake of dietary fiber to control blood glucose, American Diabetes Association (ADA) has recommended the intake of 20 to 35 grams of fiber a day (1). In Iran, studies have shown that fiber intake is lower than the recommendation for these individuals (2, 3). In a study, mean fiber intake in patients with diabetes was 14.7 ± 3.7 in four non-consecutive days(2). Shadman et al. (3) showed that fiber intake in 60% of diabetic participants is lower

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than the amount recommended. Since the increase in knowledge by itself is not enough to change the behavior, to make an efficient, long-term behavior modification, as well as behavioral models and theories are suggested (4); they should be used to help individuals better understand eating behaviors (5).

The Transtheoretical Model (TTM) has demonstrated positive impacts on individuals with different risk behaviors related to non-communicable diseases (5). The model constructs are: 1) Stages of change: the readiness to change health behavior; 2) Decisional Balance (DB): the importance of the perceived pros and cons of change; 3) Self-Efficacy (SE): confidence in one's ability to change behavior, especially in difficult conditions; and 4) Processes of change: the behavioral strategies that help individuals to progress through the stages. TTM claims that people have different consultation needs based on the stages they are in. Decisional balance and self-efficacy, two important constructs, are the key predictors of transition between stages (6). The DB is both qualitative and quantitative, and involves a person weighing his/her own pros and cons of making a change. This construct states that an individual will not change his/her behavior unless he/she understands the pros of change for assessing its cons (7). In studies, following nutritional recommendations more efficiently is related to increase of self-efficacy and decisional balance. Fruit, vegetable and fat intake is related to the perceived cons, and the people who have fewer cons, eat more fruits and vegetables (8, 9). Also an increase in the stage of change decreases the cons of eating fat and increases the pros (10). High self-efficacy is also related to higher intake of fruits and vegetables (8, 9). People who have fewer cons and more pros and self-efficacy are in higher stages of change; they are also more prepared to follow health recommendations (9, 11, 12).

Due to the importance of increasing fiber intake in the diet of diabetic people for controlling glycaemia and preventing diabetes' complications, studying the model constructs, specially the stages of change, perceived pros and cons and self-efficacy for increasing fiber intake in patients with diabetes and their relationship with glycemic control could be effective to improve healthy behaviors, and could be considered as the first step toward designing appropriate educational programs for increasing fiber intake and having better glycemic control. Therefore, this study aimed to assess the association of self-efficacy and decisional balance with stages of change for fiber intake and glycemic control in patients with type 2 diabetes.

Materials and Methods

Subjects and procedure: This is a cross-sectional descriptive-analytic study. which was conducted in 2012 on 145 diabetic men and women, aged 30- 65 years, referring to "Charity Foundation for Special Diseases" and "Iranian Diabetes Society" in Tehran-Iran; they were selected from the list of 2000 patients with type 2diabetes, considering sex ratio and using stratified random sampling. The initial list of men and women names were separated and numbered; then individuals in each stratum were selected using random number table and invited to participate in the study by telephone calls. Sample size was calculated using α=0.05, r=0.25 (13) and power of study was estimated at 80%. The sample size was increased by 15% to allow for probable attrition. The participants had type 2 diabetes at least for 3 years and it was at least 3 months after they attended nutritional education class; they were literate and cooperated with the researcher. The participants referred to the health center in the pre-determined date, and the researcher explained about the study. An informed consent form was signed by all participants. They also filled out the general information questionnaire. Blood samples (5cc) were taken after 12-14 hrs. of fasting; then they learned how to record food by the existing tools in the kitchen using food album. Three food record forms were given to them. These forms were filled during one week (2 weekdays and 1 weekend). Food information was collected in the second session afterwards. After analyzing food records, the amount of fiber intake for each person was determined, and the questionnaires of the stages of change, self-efficacy, and decisional balance were filled out. In order to determine the amount of fiber intake, a table consisting of the average amount of food groups was used (14). All procedure used to measure glycemic control indices have been explained completely in other paper (15).

Demographic and anthropometrics questionnaire: This questionnaire covers demographic and anthropometrics data including information on age, sex, education, income, marital status, diabetes controlling drugs, and BMI. All weights and heights were measured using the same SECA digital scales

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(calibrated in Iran) while the subjects wore light clothing and no shoes. BMI was calculated and expressed in kg/m^2.

Nutritional assessment: Three food records were used in order to assess fiber intake in the diets of diabetic people participating in the study; they were analyzed using the modified Nutritionist 4 program for Persian food, and the amount of fiber and energy intake was calculated.

Stages of change: The stages of change instrument measured an individual's readiness; it consisted of five statements by which the participants were categorized into different stages of change. After analysis of three-day food record of diabetic people, if the amount of fiber intake was more than 20 grams, they were asked questions about being in action and maintenance stages; and if the amount of fiber intake was less than 20 grams, the researcher asked questions regarding the pre-action stages (pre-contemplation, contemplation and preparation) and the participants' stages of change were determined (16, 17).

Self-efficacy: The patients' ability to increase dietary fiber intake in certain conditions and situations was assessed using the five-item self-efficacy questionnaire of Schwarzer (9, 18) rated on 5-point Likert scale. The internal consistency of the questionnaire in the present study was assessed, and the Cronbach's Alpha was calculated (α=0.89). The questionnaire gives a score ranging from 5 to 25 (1=not at all confident, 2=not very confident, 3=moderately confident, 4=very confident, and 5=extremely confident).

Decisional balance: The decisional balance instrument measures the importance of the pros and cons of making the decision to eat enough high fiber diet for the diabetic patient. The questionnaire of decisional balance regarding fiber intake was not available. In order to develop a questionnaire, focus group discussions and in-depth interviews were done; the results were previously explained in detail (19). Content validity was assessed by 13 experts, and principle component analysis and confirmatory factor analysis were performed to assess the construct's validity. The Cronbach's alpha coefficient and Test–retest, measured by ICC (Intra-class correlations), were performed to assess the reliability. The Cronbach's alpha coefficient was 0.78 for the benefit scale, and 0.70 for the barrier scale, and ICC was between 0.62 and 0.78. The final questionnaire consisted of 11 phrases for perceived benefit (pros) and 10 phrases for perceived barrier (cons) of increasing dietary fiber; it was rated on 5-point Likert scale. Total score for the perceived benefits ranged from 11 to 55, and for perceived barriers from 10 to 50. (1=not at all important; 2=slightly important; 3=moderately important; 4 =very important; 5 =extremely important).

Statistical analysis: Normality was checked for all quantitative variables, and the main variables in our study were normally distributed.

Differences between the groups were determined by one-way ANOVA, and Chi-square and T-test were used for group data. Post-hoc comparisons were performed using Tukey's test. Logistic Regression was used to determine the relationship between the stages of change and glycemic control indices. The results were adjusted regarding the confounding factors such as gender (male and female), duration of being stricken with diabetes, marital status (married, and not married), patient's education (elementary school/guidance school, high school, diploma, and university), number of glucose lowering drugs, body mass index (Kg/m^2), physical activity (MET.h/day), and calorie intake (kilocalorie). The tests were done using the SPSS software (ver. 16). $P<0.05$ was considered significant in this study.

Results

126 out of the 145 diabetic patients (aged about 30 and 65 years) completed the study. The attrition was due to not attending the second session and not completing the food record and other questionnaires, and it did not affect the power of study because the sample size was not decreased under the calculated amount. 65% of these patients were males and 35% females; their mean age was 53.5±6.02. Most participants (77.8%) had high school education or higher. With regard to fiber intake, 10 (8%), 15 (12%), 28 (22.4%), 7 (5.6%), and 66 (52%) of the participants were in pre-contemplation, contemplation, preparation, action and maintenance stages, respectively.

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Table 1. Individual characteristics of the participants regarding the stages

Individual characteristics		Total N (%)	Pre-contemplation n=10	Contemplation n=15	Preparation n=28	Action n=7	Maintenance n=66	P_value
			N (%)					
Gender	Male	82 (65.1)	9 (11)	9 (11)	15 (18.3)	4 (4.9)	45 (54.8)	0.298
	Female	44 (34.9)	1 (2.3)	6 (13.6)	13 (29.5)	3 (6.8)	21 (47.8)	
Employment condition	Unemployed	3 (2.4)	0	0	0	0	3 (100)	0.107
	3d grade job	15 (11.9)	1 (6.7)	5 (33.2)	4 (26.7)	1 (6.7)	4 (26.7)	
	2nd grade job	55 (43.7)	6 (10.9)	5 (9.1)	10 (18.2)	4 (7.3)	30 (54.5)	
	1st grade job	8 (6.3)	0	1 (12.5)	2 (25)	2 (25)	3 (37.5)	
	Retired	45 (35.7)	3 (6.7)	4 (8.9)	12 (26.7)	0	26 (57.7)	
Marital status	Married	117 (92.9)	9 (7.7)	12 (10.2)	25 (21.4)	6 (5.1)	65 (55.6)	0.093
	Single	9 (7.1)	1 (11)	3 (33.5)	3 (33.5)	1 (11)	1 (11)	
Education	Elementary school	17 (13.5)	1 (5.9)	3 (17.6)	3 (17.6)	1 (5.9)	9 (53)	0.462
	Guidance school	11 (8.7)	3 (27.3)	0	2 (18.2)	0	6 (54.5)	
	High school & diploma	62 (49.2)	4 (6.5)	9 (14.5)	15 (24.2)	2 (3.2)	32 (51.6)	
	University	36 (28.6)	2 (5.6)	3 (8.3)	8 (22.2)	4 (11.1)	19 (52.8)	

Individual characteristics	Total Mean±SD	Pre-contemplation	Contemplation	Preparation	Action	Maintenance	P_value
		mean±SD					
Age (year)	53.5±6.02	55±3.4	51.8±7.3	53.8±6.3	53.7±6.4	53.5±5.9	0.761
The number of years stricken with diabetes	9.18±5.31	8.3±3.4	9.0±5.9	8.1±4.2	8.6±4.1	9.9±5.9	0.627
Glucose lowering drugs	0.46±1.12	0.2±0.6	0.3±0.7	0.4±0.8	0.6±1.3	0.5±1.2	0.892
Body mass index (kg/m2)	29.22±4.27	28.9±3.9	29±4.0	30.5±5.6	29.7±2.9	28.7±3.8	0.471
The amount of physical activity based on MET§.h/day	32.84±3.75	33±4.6	32.5±3.8	32.1±3.8	33±5.8	33.2±3.4	0.755

Diet characteristics	Total	Pre-contemplation	Contemplation	Preparation	Action	Maintenance	P value
		mean±SD					
Dietary fiber intake (g)*	23.05±7.76	16.29±5.07	16.87±4.65	17.30±4.09	25.18±4.09	27.36±6.37	<0.0001
Calorie intake** (Kcal)	2220±594.9	2062±538.1	2046±605.0	1927±464.8	2238±509.4	2397±603.1	0.004

§ Metabolic Equivalent of Task

*Significant difference between the stages of pre-contemplation and action (P=0.013), pre-contemplation and maintenance (P<0.0001), contemplation and action (P=0.012), contemplation and maintenance (P<0.0001), preparation and action (P=0.009), and preparation and maintenance (P<0.0001)

**Significant difference between the stages of preparation and maintenance (P=0.003)

Table 1 shows the characteristics of the study sample in total and regarding stages of change. Higher perceived pros of fiber intake were present among the less educated (elementary education) than the more educated (high school and diploma education) subjects (P=0.047). Women had significantly more self-efficacy than men (P=0.003), and fiber intake was higher in married people than in singles (P=0.014). There were no other significant differences between the patients' characteristics and model constructs. Glycemic control indices also did not have any significant correlation with age, income and physical activity.

The average score of the perceived pros and cons of fiber intake that is expected to be between 1 and 5 was 3.28±0.8 and 1.74±0.66, respectively. The score of decisional balance that is the difference between pros and cons was 1.54±1. The high perceived pros score shows that the patients in this study knew more facilities and benefits for consumption of high fiber food, and the opposite is also true about the cons. The low con scores also suggest that people have perceived fewer cons about the fiber intake. In these conditions, high fiber food intake among these patients is expected. The score of self-efficacy (expected to be between 5 and 20) was also 15.5±3.3 (Table 2).

A significant effect for stages of change was observed for decisional balance (P<0.0001), cons (P<0.0001) and self-efficacy (P=0.035). The mean score for decisional balance in the post-action stages was higher than in the pre-action stages. Pros did not differ across stages for consuming high fiber diet. The cons' scale was also significantly different across the stages of change; in the pre-action stages it was more than in the post-action ones. Patients in the maintenance, action and preparation stages revealed higher self-efficacy than did those in the pre-contemplation and contemplation stages. The difference between the self-efficacy score of pre-contemplation stage and preparation stage was statistically significant (P=0.031) (Table 2).

The relationships among fasting glucose, glycosylated hemoglobin, serum insulin and constructs of trans-theoretical model such as self-efficacy, the score of decisional balance and the perceived pros and cons with and without adjustment by confounders of age, gender, the number of years having diabetes, marital status, patient's education, number of glucose lowering drugs, body mass index (BMI), physical activity and calorie intake were assessed, and no significant relationship was observed (Table 3).

Table 2. The mean and standard deviation of decisional balance, pros, cons and self-efficacy regarding the stages of change (mean ± SD)

	Score (mean±SD) Minimum-maximum	Pre-contemplation	Contemplation	Preparation	Action	Maintenance	P value
DB[1a]	1.54±1 -1.31-3.82	0.74±0.89	0.69±0.83	1.57±0.84	1.93±0.77	1.81±0.99	<0.0001
Pros	3.28±0.8 1.18-5	2.94±0.58	3.16±0.99	3.32±0.72	3.70±0.55	3.29±0.85	0.395
Cons[2]	1.74±0.66 1-3.6	2.20±0.65	2.46±0.73	1.75±0.58	1.77±0.47	1.48±0.53	<0.0001
SE[3b]	15.5±3.3 5-20	12.9±3.07	14.46±2.97	16.43±3.15	16.14±1.07	15.68±3.49	0.035

[a] Decisional balance
[b] SE: Self-efficacy
1The difference between the stages of pre-contemplation and maintenance (P=0.008), contemplation and preparation (P=0.30), contemplation and action (P=0.034), contemplation and maintenance (P<0.0001) are significant.
2 There is a significant difference between the stages of pre-contemplation and maintenance (P=0.004), contemplation and preparation (P=0.002) and contemplation and maintenance (P<0.0001).
3 The difference between the score of self-efficacy stage pre-contemplation and preparation stage is statistically significant (P=0.031).

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Table 3. The relationship between the model construct and fiber intake and glycemic control indexes (Odds ratio: 95% CI)

		Fiber intake	Fasting glucose	HbA1c	Serum insulin	Insulin resistance
DB [a]	Model 1	1.83(1.22-2.75) P=0.003	0.89(0.63-1.26) P=0.515	0.79(0.56-1.13) P=0.212	1.26(0.88-1.79) P=0.20	1.09(0.77-1.55) P=0.62
	Model 2	2.2(1.29-3.78) P=0.004	0.92(0.63-1.35) P=0.672	0.77(0.52-1.13) P=0.183	1.08(0.73-1.6) P=0.705	1.09(0.74-1.6) P=0.652
Pros	Model 1	1.03(0.65-1.62) P=0.897	0.86(0.56-1.33) P=0.503	0.82(0.53-1.27) P=0.383	1.1(0.71-1.7) P=0.666	1.03(0.67-1.59) P=0.896
	Model 2	1.03(0.59-1.81) P=0.918	0.89(0.56-1.42) P=0.627	0.79(0.49-1.27) P=0.338	0.92(0.56-1.5) P=0.732	0.93(0.58-1.49) P=0.771
Cons	Model 1	0.26(0.14-0.49) P<0.0001	1.05(0.62-1.78) P=0.861	1.26(0.74-2.14) P=0.402	0.68(0.39-1.16) P=0.156	0.85(0.5-1.45) P=0.551
	Model 2	0.13(0.05-0.36) P<0.0001	1.01(0.56-1.84) P=0.963	1.31(0.72-2.4) P=0.375	0.72(0..39-1.34) P=0.304	0.72(0.39-1.32) P=0.283
SE [b]	Model 1	1.07(0.96-1.19) P=0.211	0.97(0.87-1.08) P=0.555	0.97(0.87-1.08) P=0.591	0.94(0.84-1.05) P=0.261	0.91(0.81-1.01) P=0.080
	Model 2	1.17(1.01-1.36) P=0.037	0.95(0.85-1.07) P=0.422	0.95(0.84-1.06) P=0.373	0.88(0.77-1.0) P=0.052	0.88(0.77-0.99) P=0.040

[a] Decisional balance

[b] SE: Self-efficacy model 1: Unadjusted

model 2: Adjusted with age, gender (male and female), duration of being stricken with diabetes, marital status (married, and not married), patient's education (elementary school/guidance school, high school, diploma, and university), number of glucose lowering drugs, body mass index (Kg/m^2), physical activity (MET.h/day) and calorie intake (kilocalorie)

Insulin resistance had no significant relationship with decisional balance, pros and cons, but a significant relationship was seen between insulin resistance and self-efficacy after being adjusted with confounders (P=0.040). One unit increase in self-efficacy decreased the risk of insulin resistance by 12%.

The relationship between the amount of fiber intake and the constructs was studied by logistic regression. Fiber intake was divided into two groups consisting of people who consumed less than 20 grams and those taking more than 20 grams of fiber per day. After adjusting with confounders, for each unit increase in decisional balance, the chance of fiber intake in more than 20 grams a day was 2.2 (P=0.004). In fact, every one unit increase in the score of decisional balance decreased the risk of low fiber intake by about 54% (Table 3). No significant relationship was observed between taking fiber pros and the amount of fiber intake before and after adjustment with confounders (P=0.918). There was also a significant relationship between the perceived cons and fiber intake (P<0.0001), and after being adjusted with confounders, for every one unit increase in cons score, the chance of taking more than 20 grams fiber a day was 0.13. The relationship between self-efficacy and fiber intake was also significant regarding confounders after adjustment. For each unit increase in self-efficacy, the chance of taking more than 20 grams of fiber a day was 1.17 (Table 3). After adjusting with all confounders, there was no relationship with fiber intake and Glycemic Control Indices (data are not shown).

Discussion

In this study, the mean intake of fiber in patients with diabetes (23.05±7.76 grams) was more than the minimum amount recommended (20 gr per day); however, more than 76% of the participants reported lower intake than the average of recommended amount (27.5 gr); this can be a considerable issue. Studies have reported various results regarding fiber intake in diabetic people (20-22); this is probably because different methods are used to determine the dietary fiber in different studies. Food record used in the present study was more accurate and reliable as compared to other methods. The high perceived pros and low perceived cons scores can also be an explanation for the relatively appropriate amount of fiber intake in the studied society. The mean self-efficacy score was 15.5±3.3 among these diabetic

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patients; this indicates that the studied patients gained 77% of the maximum score, and a high self-efficacy, though the scores ranged between 5 and 20.

Based on this model, there are relationships between the stages of change and other TTM constructs such as barriers and self-efficacy, and it is expected that those in the later stages have higher perceived benefits and self-efficacy and lower perceived barriers. In the present study, perceived benefits were increased during the stages but the difference was not significant. The lowest pro was reported in the pre-contemplation and contemplation, and the highest was in the action and preparation stages (PC<C<M<P<A). In previous studies, the lowest pro was also in the pre-action stages, especially in the pre-contemplation stage (23, 24), and the highest pro was reported in the final stages, especially in the maintenance stage (23, 25). In Rabinson's study (26), the benefits of decreasing fat intake in the maintenance stage was less than in the pre-action stages; this result is not in the same line with other studies' results including ours.

The results of studies show that decreasing the barriers occurs in the final stages of behavior change (12, 23, 27). In some studies, there was no significant difference of cons between the stages (24, 26). Our results are similar to the previous studies so that the people who were in the maintenance stage had the lowest barriers, and the ones in the stages of pre-contemplation and contemplation had the highest cons in comparison with the other stages. The difference between the cons scores in the first two stages and maintenance stage was significant (M<P<A<PC<C). As the differences of decisional balance and the cons of behavior change were significant, and the pros scale was not significantly different between the stages, focus and intervention on decreasing the perceived cons can be more efficient than increasing the perceived pros with regard to fiber intake in this diabetic society.

Diabetics in the pre-contemplation and contemplation stages showed lower self-efficacy than did those in other stages, and the highest self-efficacy score was related to the preparation stage. A significant difference was just observed between the pre-contemplation and preparation stages. Most studies have indicated that those in the later stages had higher self-efficacy (12, 23, 27) , and the lowest self-efficacy was reported in the pre-contemplation stage (24). In some studies, the amount of self-efficacy had no significant difference among the stages of behavior change (26). The present study confirms the Green et al.'s (24) findings in that self-efficacy score was the lowest in the pre-contemplation stage, which was increased in the stages of contemplation/preparation. But this increase did not have any linear trend through the stages.

There was a significant relationship between the perceived barriers and fiber intake (P<0.0001). Also the relationship between self-efficacy and fiber intake was significant after adjustment to confounders. The people whose fiber intake was more than 20 grams a day (the minimum recommended) had higher self-efficacy than the group who consumed less than 20 grams. A number of studies reported the same results and showed a negative relationship between the cons and fruit and vegetable intake (8, 28, 29) but some studies did not report any significant relationship (30). Moreover, some articles indicated a positive relationship between self-efficacy and eating fruits and vegetables (8, 28, 29), and some others reported different results and observed no significant relationship between these constructs and fruit and vegetable intake (30).

Fasting blood glucose, HbA1c and serum insulin also showed no significant relationship to decisional balance, pros, cons and self-efficacy. There was no significant relationship between insulin resistance and decisional balance, pros and cons. There are a few studies on the comparison of the relationship between the constructs of the model and glycemic control. In Lin et al.'s (31) research on patients with diabetes, self-efficacy had a gradual increasing trend from pre-contemplation to maintenance stages of behavior change. But no relationship was seen between HbA1c and self-efficacy (31), which is similar to our results.

Although increasing dietary fiber has been recommended in patients with diabetes, the effect of fiber on glycemic control indices is controversial in various articles. Many studies report different effects of dietary fiber on insulin sensitivity (32), glucose control (33, 34) and level of HbAlc (33, 34). High-fiber diet intake (50 grams) in comparison with the ADA recommendation (24 grams of fiber) (35), and

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15 grams fiber intake in another study (33) was significantly effective for decreasing plasma glucose and HbA1c. Jenkins et al. (34) reported no improvement in glycemic control indices after using high-fiber diet in patients with diabetes for 3 months. And a twenty-year cohort study in 7 countries showed no relationship between the diet's fiber and glucose intolerance or diabetes (36).

Conclusion: Pre-action stages were reported with more perceived cons for fiber intake than maintenance, and the differences between pre-contemplation and maintenance, contemplation and maintenance, and contemplation and preparation were significant. Self-efficacy for increasing fiber intake was lower in the pre-contemplation and contemplation stages and it was higher in the preparation stage than in other stages. The difference between self-efficacy in pre-contemplation stage and preparation was significant. Decisional balance and barriers can be significant predictors of high fiber food consumption. HbA1c, fasting glucose and serum insulin had no significant relationship with the constructs of the model.

Choosing stages of change by patients with diabetes while they exactly know their own amount of fiber intake is one of the strengths of this study, and the problems of objective answers found in other studies were controlled. Determining the benefits and barriers of increased fiber intake using a focus group discussion to develop an appropriate decisional balance questionnaire in diabetic society that has the same criteria as the participants in the present study is also useful to achieve a real outcome. This study was designed as a cross-sectional study, so it does not show a cause and effect relationship.

The present study suggests that, especially in the first stages of change, educational intervention for increasing decisional balance and decreasing the perceived cons for fiber intake can be more effective than focusing on the pros of behavior change in patients with type 2 diabetes.

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