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ORIGINAL RESEARCH

An analysis of fat-related and fiber-related behavior in men and women with type 2 diabetes mellitus: key findings for clinical practice

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Tereza Hendrychova[1]
Magda Vytrisalova[1]
Jiri Vlcek[1]
Alena Smahelova[2]
Ales Antonin Kubena[1]

[1]Department of Social and Clinical Pharmacy, Faculty of Pharmacy in Hradec Kralove, Charles University in Prague, Czech Republic; [2]Diabetology Centre, Department of Gerontology and Metabolism, University Hospital and Faculty of Medicine in Hradec Kralove, Charles University in Prague, Czech Republic

Background: Despite the efforts of health care providers, adherence of patients with type 2 diabetes to the recommended diet is poor. The aim of this study was to describe the eating habits with emphasis on fat and fiber-related behavior (FFB) as well as the relationship between FFB behavior and parameters of diabetes control in men and women with type 2 diabetes mellitus.

Methods: The subjects in this observational cross-sectional study were 200 patients (54.5% male, mean age 66.2 ± 10.1 years, mean Diabetes Control and Complications Trial [DDCT] glycosylated hemoglobin [HbA_{1c}] 7.6% ± 1.7%) recruited from diabetes outpatient clinics in the Czech Republic. The subjects filled out the Fat- and Fiber-related Diet Behavior Questionnaire. The most recent patient data on diabetes control and drug therapy were derived from patient medical records.

Results: Patients tend to modify the dishes they are used to, rather than remove them completely from their diet and replace them by other types of foods. It is easier to perform healthier fat-related behaviors than fiber-related ones. Women scored significantly better than men on the fat-related diet habits summary scale ($P = 0.002$), as well as on "modify meat" ($P = 0.001$) and "substitute specially manufactured low-fat foods" ($P = 0.045$) subscales. A better score on the fat-related diet habits summary scale was significantly associated with higher HbA_{1c} ($\rho = -0.248$; $P = 0.027$) and higher waist circumference ($\rho = -0.254$; $P = 0.024$) in women.

Conclusion: Type 2 diabetes patients are likely to vary in their FFB behavior, and their dietary habits depend on gender. Health care professionals should pay attention to these facts when providing specific education. Emphasis should be placed on how to increase the fiber intake in diabetic patients.

Keywords: Fat- and Fiber-related Diet Behavior Questionnaire, dietary fat, dietary fiber, adherence

Introduction

Diet is an important part of the comprehensive management of type 2 diabetes mellitus. To achieve the best possible adherence with the dietary recommendations, it is necessary to provide suitable education to the patient on a repeated basis, taking into account the individual's lifestyle, personal, and cultural preferences, socioeconomic status, and willingness to change. The advice has to be adapted to the specific needs of the individual, which may change with time and circumstances. The recommended dietary modifications should be made gradually, and the focus should remain on modifying an individual's existing eating habits in an acceptable and therefore achievable way.[1]

Despite the efforts of health care providers, adherence of patients with type 2 diabetes to a recommended diet is poor.[2] This has a negative impact on diabetes control,

Correspondence: Tereza Hendrychova
Department of Social and Clinical Pharmacy, Faculty of Pharmacy in Hradec Kralove, Charles University in Prague, Heyrovskeho 1203, 500 05 Hradec Kralove, Czech Republic
Tel +420 495 067 291
Fax +420 495 512 266
Email terhen@centrum.cz

promoting the development and progression of serious complications of the disease. Moreover, based on the available data, patients with type 2 diabetes consider diet to be less important in diabetes control than drug therapy.[3] They perceive recommendations for healthy eating as confusing and also difficult to adhere to.[4]

There is still disagreement as to which diet is best for patients with type 2 diabetes. However, there is general consensus that it is crucial to reduce the intake of saturated fats while specifically increasing intake of dietary fiber.[5] This often demands changes in long-term food consumption and food preparation habits,[6] along with adoption of multiple new behaviors, including the substitution and modification of various types of food.[6,7]

An individual's existing eating habits may be influenced by various factors. The available literature[8–10] describes some social and cultural influences shaping food behavior. Culture seems to be the most important determinant of food intake, because it may affect dietary patterns independent of material conditions.[8] Considering these facts, it is important that separate, specific diet behavior research be conducted for each country or cultural group.

Keeping in mind that this national dietary survey would be the very first conducted with type 2 diabetes patients in the Czech Republic, the primary goal of the present study was to describe eating habits in this patient population with emphasis on fat- and fiber-related behavior (FFB).

Men and women have different attitudes and behaviors related to health care. Some of these differences may have evolved from the distinct roles that men and women have traditionally played within the family structure (with women having greater responsibilities for family health).[11] It is reasonable to assume that diet behavior, commonly perceived as important for general health, might differ between men and women, and that these differences may be expressed as "distinct rates" in various dietary areas. This led us to the second aim of the current study, ie, to compare the eating habits of men and women with type 2 diabetes with emphasis on FFB.

According to the available evidence,[12–14] obese subjects report a lower energy intake. Nevertheless, there is a distinct lack of studies on type 2 diabetes patients focusing on FFB, which is another reason we decided to study the relationship between FFB behavior and the major parameters of type 2 diabetes control.

The type of knowledge sought by the current study may significantly facilitate the work of health care providers and lead to increased treatment efficacy by providing guidance on how to tailor dietary education to the needs of particular subgroups of patients with type 2 diabetes as well as on which aspects of diet that should be concentrated upon. Such targeted education could increase adherence of patients with dietary recommendations.

Materials and methods

Study design and setting

This observational cross-sectional study was conducted in three diabetes outpatient clinics in Hradec Králové and Pardubice in the Czech Republic from March to June 2011. The study was approved by the regional ethics committee.

Participants

All patients who presented at one of the three clinics on randomly selected days were approached to participate in the study. Those who agreed to fill out the questionnaire, met the enrolment criteria, and provided informed consent to a review of their medical records were enrolled in the study. The enrolment criteria were that the patient had to have been diagnosed with type 2 diabetes at least 3 months earlier and be able to understand the questionnaire. Of 208 subjects approached, 200 (96%) agreed to participate in the study. The three outpatient clinics recruited 61, 67, and 72 study subjects.

Main outcome measure

To analyze dietary fat and fiber intake in the previous 3 months, the study subjects filled out the Fat- and Fiber-related Diet Behavior Questionnaire (FFBQ),[7] which had been translated into Czech and adapted to local dietary habits. The Czech version of the questionnaire consists of 25 questions developed into 36 subquestions. Fifteen questions (20 subquestions) relate to dietary fat intake and five questions (seven subquestions) relate solely to dietary fiber intake, while five questions (nine subquestions) cover both areas. Two subquestions are repeated twice intentionally in different modifications, with only one version of each subquestion used for computing the summary scores.

The responses to the FFBQ questions are marked on a four-point scale [1 (always), 2 (often), 3 (sometimes), 4 (never)], with a high score corresponding to higher fat/lower fiber intake. The questions are grouped into five fat intake subscales featuring 2–7 items each: "modify meat to be low in fat", "avoid fat as flavoring", "replace high-fat meat with low-fat alternatives", "substitute specially manufactured low-fat foods", "replace high-fat foods with fruits and vegetables", as well as three fiber intake subscales with

3–6 items each: "fruit and vegetables", "substitute high-fiber for low-fiber foods", and "cereals and grains".[7] The summary scores for each of the subscales and the summary scales for dietary fat and fiber intake were calculated as the mean of the non-missing item. The higher the scores, the poorer the eating habits of the respondent, ie, the higher his/her dietary fat intake and the lower his/her dietary fiber intake.

To ensure the quality of the FFBQ in Czech, forward–backward translation was performed by two independent translators. To adapt the tool to local dietary habits, one question ("Did you eat casseroles or mixed dishes?") was omitted and some others were modified to be more understandable by Czech patients. The understandability of the questions was then tested on 10 patients with type 2 diabetes. No modifications of the Czech version of the questionnaire were required.

The Cronbach's α values for the Czech version of the questionnaire were 0.812 (37 items), 0.772 for the part concerning dietary fat intake (24 items), and 0.484 for the part concerning dietary fiber intake (13 items).

The questionnaire also included questions on gender, age, and age at diagnosis of type 2 diabetes (if the patient was not sure, the date of diagnosis was derived from medical records). The questionnaire was either self-administered by patients after instruction or with assistance from the investigator. The average time needed to fill out the questionnaire was 10 minutes.

Medical records served as the source of data on type of diabetes treatment (diabetes diet alone, oral antidiabetic drugs, insulin therapy, or a combination of oral antidiabetic drugs and insulin therapy), number and types of drugs used to control diabetes, and the most recent data on body height and weight, from which the body mass index (BMI) was calculated, as well as measurements of glycosylated hemoglobin (HbA_{1c}), and waist circumference.

Data analysis

Statistical analysis was performed using PASW version 18.0 software (IBM Corporation, Armonk, NY, USA). A P-value <0.05 was considered to be statistically significant. Data are summarized as the mean or range for continuous variables and as a percentage for categorical variables. Differences in patient characteristics and eating habits between genders were compared using the Mann–Whitney U test for continuous variables and the χ^2 test for categorical variables. Spearman correlations were used to investigate associations with respondent outcomes on the FFBQ and clinical parameters (continuous variables). The reliability of the Czech translation of the FFBQ was measured using Cronbach's α.

Results

Characteristics of participants

Data were collected from 200 patients with type 2 diabetes. The basic characteristics of the study cohort are given in Table 1. Men and women differed significantly only in BMI ($P = 0.016$). Table 2 summarizes the diabetes treatment characteristics of the study cohort. Based on composite calculation, men and women differed significantly only in types of diabetes treatment ($P = 0.016$).

Main outcome measure

Results from the FFBQ including information about significant differences in FFB between men and women are shown in Table 3. The most favorable scores were for the "avoid fat as flavoring" subscale, while the least favorable were for the "substitute high-fiber for low-fiber foods" subscale.

Women scored better than men on all subscales and on the summary scales for dietary fat and fiber intake, but the difference between genders was only significant for the fat-related diet habits summary scale. The most significant difference between men and women was on the "modify meat" subscale and questions featuring the categories "trim visible fat from red meat", "take the skin off chicken", and "trim visible fat from red meat before cooking".

Relationships between FFB and diabetes control parameters

The score from the fat-related diet habits summary scale correlated with HbA_{1c} ($\rho = -0.248$; $P = 0.027$) and waist circumference ($\rho = -0.254$; $P = 0.024$) in women. The correlations were controlled for age and duration of disease in all cases. No significant relationship was found between the

Table 1 Basic characteristics of the study cohort

Characteristic (mean ± SD)	Total (n = 200)	Men (n = 109)	Women (n = 91)
Age (years)	66.2 ± 10.1	65.4 ± 10.4	67.1 ± 9.9
Age at diabetes diagnosis (years)	54.4 ±10.9	53.7 ± 10.1	55.2 ± 11.7
BMI (kg/m²)*	31.1 ± 5.0	30.3 ± 4.6	32.2 ± 5.4
Waist circumference (cm)	104.6 ± 11.2	105.6 ± 11.0	103.5 ± 11.3
DCCT HbA_{1c} (%); IFCC HbA_{1c} (mmol/mol)	7.6 ± 1.7; 59.0 ± 18.9	7.6 ± 1.8; 59.1 ± 19.8	7.6 ± 1.6; 59.0 ± 17.8

Note: *Statistically significant difference between men and women ($P < 0.05$).
Abbreviations: SD, standard deviation; BMI, body mass index; DCCT, Diabetes Control and Complications Trial; HbA_{1c}, glycosylated hemoglobin; IFCC, International Federation of Clinical Chemistry.

Table 2 Characteristics of diabetes treatment in the study cohort

Type of diabetes treatment (%)*	Total (n = 200)	Men (n = 109)	Women (n = 91)
Diet alone	5	3	8
Oral antidiabetic drugs	64	69	58
Insulin therapy	16	19	12
Oral antidiabetic drugs + insulin therapy	15	9	22
Mean number of antidiabetic drugs[a] (range)	1.7 (0–4)	1.7 (0–4)	1.7 (0–3)

Notes: [a]For combination drugs, each active ingredient is taken into account separately, as is each type of insulin used; *statistically significant difference between men and women ($P < 0.05$), composite estimate.

summary scales for dietary fat and fiber intake and diabetes control parameters in men.

Discussion

The present study was designed to describe the eating habits of men and women suffering from type 2 diabetes with emphasis on FFB in the Czech Republic. We studied relationships between the major parameters of type 2 diabetes control and FFB behavior in routine clinical practice.

Appropriateness of the questionnaire

Described previously in detail and tested for validity and reliability,[7] the FFBQ has been used in several studies.[15,16] Only the fat-related part of the FFBQ has been tested for reliability in patients with diabetes.[17]

The FFBQ was used in this study because it is simple and not time-consuming, which are relevant criteria when conducting surveys in clinical practice. In the Czech version, Cronbach's α is lower in the fiber-related part of the FFBQ than in the fat-related part or in the entire FFBQ. This can only be explained by the wider scope of questions in the fiber-related part, since no significant negative correlation was found for any of the items (Cronbach's α is 0.429–0.503 if item deleted). The Cronbach's α values of our version of the FFBQ is somewhat higher than for the original version of the questionnaire (0.38–0.66),[7] which might be attributable to a more homogenous population in terms of the defined diet in our sample.

FFB in patients with type 2 diabetes

According to the previous studies of Mannucci et al,[18,19] in comparison with nondiabetic subjects, patients with known type 2 diabetes report dietary intakes somewhat differently, thus seem to be aware of the need to modify their eating habits. However, the corrections that are made to dietary habits do not appear to be consistent with current recommendations,[5] since the consumption of total and saturated fats and dietary fibers is not significantly different.[19] Based on the results of the current study, it may be suggested that patients tend to modify the dishes they are used to, eg, by reducing their fat content, rather than to remove them from their diet completely or replace them with other types of food. This is in accordance with the results of Quandt et al,[6] and has also been confirmed by our clinical experience. The modification of fat-related behavior is probably easier to achieve than a change in fiber-related behavior. In particular, substitution of low-fiber foods for high-fiber variants seems to be a problem (an exception being the consumption of whole grain types of bread and crackers). Similar results have been reported by Beresford et al.[20]

Scores on the subscales "avoid fat as flavoring" and "substitute fat" in studies analyzing the impact of various dietary interventions or differences in dietary fat intake, eg, among various ethnic groups,[7,21,22] have shown the most significant variations or differences. This supports our assumption that the most readily accepted approaches to reducing dietary fat intake are using less fat in the preparation of food or using low-fat alternatives to traditional high-fat ingredients. Our results are supported by the previously reported highly significant correlations between the above-mentioned subscales in the work of Spoon et al.[23]

FFB in men and women

Based on our results, men differ from women in their dietary behavior, with men having a higher dietary fat intake than women. Other studies have confirmed this supposition.[16,24] Women usually have more knowledge of what a healthy diet consists of,[25] and tend to devote more attention to their health than men.[11] Some authors[26,27] have found that women place more emphasis on slimness and body shape than men. This may further explain this difference, given that this attitude is commonly connected in particular with lower fat intake. Women also typically engage in preparation of food, so are responsible for the type and composition of the diet, which is supported, eg, by Peel et al.[28] The fact that subjects with full or shared responsibility for meal preparation had a more favorable change in fat consumption after an intervention is also evidenced in the above-mentioned work of Beresford et al.[20] The biggest difference between genders was found in the score for the "modify meat" subscale and the "trim visible fat from red meat" question, which is also likely due to the fact that women engage in preparation of food more often than men.[28]

Table 3 Items and scales of the Fat- and Fiber-related Diet Behavior Questionnaire

How often did you…	Mean ± SD			*P*-value[b]
	Total	Men	Women	
Item[a]				
Eat broiled, baked, or poached fish?	2.41 ± 1.00	2.50 ± 0.97	2.28 ± 1.04	0.115
Eat broiled or baked chicken?	1.97 ± 0.77	1.97 ± 0.79	2.00 ± 0.74	0.912
Take the skin off chicken?	2.81 ± 1.30	3.07 ± 1.21	2.49 ± 1.35	**0.007**
Eat pasta or noodles without meat?	2.57 ± 0.80	2.62 ± 0.79	2.52 ± 0.80	0.547
Eat whole-wheat pasta or noodles?	3.51 ± 0.73	3.54 ± 0.70	3.48 ± 0.77	0.827
Trim visible fat from red meat?	2.00 ± 1.18	2.24 ± 1.21	1.69 ± 1.06	**0.001**
Eat extra-lean ground meat?	2.59 ± 1.14	2.61 ± 1.10	2.58 ± 1.20	0.459
Eat bread, rolls, or crackers without butter or margarine?	2.58 ± 0.96	2.72 ± 0.91	2.42 ± 1.01	**0.028**
Eat whole grain types of bread, rolls, or crackers?	2.47 ± 1.01	2.53 ± 1.00	2.41 ± 1.02	0.416
Eat high-fiber cereal or add dried fruit?	2.87 ± 1.04	3.00 ± 1.00	2.74 ± 1.10	0.644
Add bran or some type of fiber to cereal?	3.29 ± 1.00	3.33 ± 0.91	3.24 ± 1.03	0.821
Use low-fat or nonfat milk?	2.55 ± 1.26	2.68 ± 1.21	2.39 ± 1.30	0.394
Eat specially made low-fat cheese?	2.45 ± 1.04	2.60 ± 1.02	2.26 ± 1.03	**0.028**
Eat low-fat or nonfat frozen dessert?	3.10 ± 0.96	3.08 ± 0.90	3.13 ± 1.03	0.304
Add butter, margarine, or other fat to cooked vegetables?[c]	2.30 ± 1.08	2.25 ± 1.10	2.36 ± 1.07	0.246
Eat fried vegetables?[c]	1.53 ± 0.66	1.60 ± 0.70	1.46 ± 0.61	0.592
Eat fried potatoes?[c]	1.56 ± 0.58	1.59 ± 0.60	1.51 ± 0.57	0.409
Add butter, margarine, or sour cream to potatoes?	2.47 ± 1.08	2.55 ± 1.09	2.38 ± 1.08	0.462
Eat brown rice?	3.54 ± 0.68	3.55 ± 0.64	3.52 ± 0.73	0.799
Eat salads without dressing?	2.41 ± 1.19	2.45 ± 1.22	2.36 ± 1.16	0.742
Eat salads with low-fat or nonfat dressing?	2.57 ± 1.20	2.70 ± 1.17	2.43 ± 1.23	0.514
Eat no meat, fish, eggs, or cheese at dinner?	3.02 ± 0.82	3.07 ± 0.82	2.97 ± 0.83	0.563
Eat two or more vegetables at dinner?	2.70 ± 0.75	2.74 ± 0.69	2.65 ± 0.81	0.141
Eat one or more vegetables at lunch?	2.49 ± 0.77	2.61 ± 0.72	2.36 ± 0.82	**0.037**
Eat fresh fruit at breakfast?	3.57 ± 0.65	3.59 ± 0.64	3.53 ± 0.67	0.991
Eat cereal or oats at breakfast?	3.79 ± 0.52	3.76 ± 0.57	3.82 ± 0.46	0.168
Add cream or whipped cream to dessert?[c]	1.45 ± 0.82	1.55 ± 0.90	1.34 ± 0.71	0.730
Eat only fruit for dessert?	2.70 ± 0.89	2.62 ± 0.82	2.80 ± 0.95	0.320
Eat raw vegetables as a snack?	2.85 ± 0.85	2.87 ± 0.80	2.83 ± 0.89	0.154
Eat fresh fruit as a snack?	2.49 ± 0.81	2.64 ± 0.79	2.35 ± 0.81	0.926
Use olive oil when frying?	2.58 ± 1.31	2.63 ± 1.05	2.52 ± 1.23	0.119
Trim visible fat from red meat before cooking?	2.02 ± 1.19	2.59 ± 1.21	1.7 ± 1.08	**0.009**
Eat low-fat or nonfat mayonnaise?	2.90 ± 1.09	3.00 ± 1.03	2.77 ± 1.15	0.573
Use less fat when baking cookies or cakes?	2.75 ± 1.16	2.72 ± 1.18	2.78 ± 1.16	0.162
Scales				
Modify meat	2.30 ± 0.69	2.44 ± 0.66	2.12 ± 0.69	**0.001**
Avoid fat as flavoring	2.09 ± 0.49	2.15 ± 0.55	2.03 ± 0.39	0.139
Replace, meat	2.79 ± 0.58	2.83 ± 0.58	2.73 ± 0.59	0.159
Substitute	2.61 ± 0.73	2.71 ± 0.71	2.50 ± 0.74	**0.045**
Replace, fruit and vegetables	2.71 ± 0.67	2.74 ± 0.71	2.67 ± 0.64	0.451
Fat-related dietary habits summary scale	2.39 ± 0.42	2.47 ± 0.42	2.28 ± 0.38	**0.002**
Fruits and vegetables	2.86 ± 0.49	2.92 ± 0.47	2.79 ± 0.50	0.058
Substitute	3.34 ± 0.48	3.38 ± 0.45	3.31 ± 0.51	0.539
Cereals and grains	3.16 ± 0.61	3.17 ± 0.65	3.15 ± 0.57	0.654
Fiber-related dietary habits summary scale	3.06 ± 0.40	3.10 ± 0.40	3.01 ± 0.39	0.079

Notes: [a]Item used for evaluation; [b]$P \leq 0.05$, statistically significant (in bold); [c]reverse scoring (always–never is represented as 4-1).
Abbreviation: SD, standard deviation.

Relationship between FFB and basic parameters of diabetes control

Based on the results reported, it can be assumed that women with type 2 diabetes with a higher waist circumference and HbA_{1c} tend to report a lower intake of dietary fat. It is questionable, however, if this finding is due to their greater awareness of the need to modify their eating habits although they may not practice this behavior, or if it is in fact due to their higher actual adherence with the dietary recommendations than is the case with patients who indicated lower

values of these parameters. The first assumption is supported by some previous work.[12–14] In these studies, however, lower energy intake was connected with obesity defined by BMI. In our study, no significant relationship was shown with FFB.

It may be deduced that it is primarily women who associate diet (especially fat-related behavior) with parameters of diabetes control, and that this may motivate them to adhere with dietary recommendations. Given that women have been shown to place more emphasis on slimness and body shape than men,[26,27] results regarding waist circumference may be connected with this. Similarly, because women in general pay more attention to their health than men,[20] they may consider HbA_{1c} as a significant indicator of diabetes control.

Strengths and limitations

One strength of our study lies in its focus on both fat-related and fiber-related behavior, parameters which are of utmost importance in patients with type 2 diabetes. Another strength is the implementation of our study in the European region. So far, the relevant work published[6,20–22,24,29] has been from the US, and has mainly dealt with fat-behavior and has not studied this in patients with type 2 diabetes.

The percentage of patients approached who consented to participate in the study was high (96%), so almost eliminated the possible influence of different dietary behavior in non-respondents. It was also possible to compare gender differences, because the same numbers of men and women were included, and male and female respondents did not differ in any basic characteristics except for mean BMI, which is physiologic.

A maximum of only 2.5% of questions were not answered for a particular item in the FFBQ, which also contributes to the strength of the study. Missing data were generally caused by inattention of patients when filling in the questionnaire.

The patients included in the study were not randomly selected, and were recruited on randomly selected days when attending an ordinary appointment in a diabetes clinic within the study period.

It can be assumed that patients who had been diagnosed with diabetes earlier had received dietary education more often than those who had been diagnosed more recently, given that the number of dietary interventions depends on duration of follow-up. According to the Czech guidelines,[30] a dietary intervention should be part of each health check for a patient with type 2 diabetes. Thus, all correlations were adjusted for age and duration of diabetes when testing the relationship between FFB and basic parameters of diabetes control.

Taking into account only the last HbA_{1c}, BMI, and waist circumference measurement may have had an influence on our results. Nevertheless, the questionnaire used has been designed to estimate dietary fat and fiber intake in the last 3 months and, because check-ups for patients with type 2 diabetes are typically scheduled 2–4 times a year,[30] not more than a single value could be obtained for each parameter studied.

The results could be biased by false responses on the FFBQ, although the statistical analyses used are generally designed to minimize the influence of possible false responses on the overall outcome of a questionnaire. Respondents with poorer diabetes control are likely to pretend to be more compliant, eg, subjects with a higher BMI have a significantly higher tendency to under-report their energy intake than those with a lower BMI.[12–14] This might have somewhat biased our results. However, patients enrolled in the study had been assured that the data collected would not be made available to the health care professionals caring for them, which should have reduced the risk of intentional under-reporting.

As previously mentioned, although culture seems to affect dietary patterns independent of material conditions,[8] another negative feature of this study is the absence of data about socioeconomic status. However, it is thought that if this information had been requested, the willingness of patients to complete the questionnaire would have decreased, given that financial information is considered to be quite personal. Nevertheless, based on the age range of the study subjects, it can be inferred that most were senior citizens of low socioeconomic status. The question of who usually prepares meals in the household was not included in the questionnaire.

Consumption of certain types of food, especially fruit and vegetables, may vary according to season. However, it is generally considered that at the present time these items are accessible throughout the year for almost everyone in our country, so the results would not have been greatly affected.

Conclusion

The results of the present study may be helpful to health care professionals who engage in the practice of type 2 diabetes education as guidance on how to tailor dietary education to the needs of particular subgroups of patients, and which aspects of diet should be concentrated on. Patients with type 2 diabetes are likely to vary in their FFB behavior, and their dietary habits depend on gender. Such patients tend to modify the dishes they are used to, rather than remove them completely from their diet and replace them by other types

of food. It is easier to develop better fat-related behavior than fiber-related behavior in these patients. For this reason, emphasis should be placed on how to increase fiber intake in diabetic patients. Women with higher waist circumference and HbA_{1c} report a lower intake of dietary fat, and the particular reasons for that behavior should be investigated further. The FFBQ can be used in clinical practice as a simple tool for monitoring compliance with the recommended diet as well as for identifying which area in the diet of a given patient needs to be targeted during education.

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Disclosure

The authors report no conflicts of interest in this work.

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