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Original article

Nutritional habits of people with type two diabetes mellitus

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Summary. *Background and aim of the work:* Prevalence of diabetes mellitus has reached pandemic proportions. Our aims were to recognize nutritional habits of people with type two diabetes mellitus, as well as the differences in respect of gender and nutritional state. *Methods:* The study encompassed 50 patients from Polyclinic for Endocrinology, Diabetes and Metabolic Diseases of the Clinical Center of Vojvodina. Data were collected based on a questionnaire specially designed for this study. *Results:* The majority of polled patients were overweight and obese (86%), and there were no undernourished subjects. The analysis of nutritional habits showed that the intake of fatty meat and offals by males was statistically significantly higher compared to females (p=0.0229). In the group of the same nutritional state, obese subjects consumed significantly more meat products compared to those with normal nitritional status (p=0.0097). No other differences were observed. *Conclusions:* It is a worrying finding that the majority of subjects with type two diabetes mellitus are overweight or obese. This indicates that the energy intake is not in proportion with the energy expenditure. It is necessary to carry out more detailed studies on a larger number of subjects, which would include the amounts of foodstuffs consumed, as well as the daily energy intake, accompanied by the analysis of the level of the subjects' physical activities.

Key words: diabetes melitus, diet, adults, attitude to health, Body Mass Index

Introduction

Diabetes melitus (DM) represents one of the greatest public health challenges in the 21st century. According to the data of the World Health Organization (WHO), there are presently about 422 million of adults with this disease (1). If no adequate preventive measures were taken, the prognoses indicate that in the period of twenty years this number will amount to 522 million. The majority (about 80%) of people with DM live in developing countries, where a highest increase of those with this disease could be expected in the future (2,3).

A similar situation is observed in Serbia. According to the data of the National Institute of Public Health there are currently 7.6% of adults with DM (4).

DM type 2 represents a group of similar metabolic disturbances that are manifested as hyperglycemia (elevated glucose blood level), caused by a complex interaction of genetic and external factors, as well as by lifestyle (5). Overweight, especially when accompanied with sedentary lifestyle and inappropriate diet, can be one of the major triggers for DM type 2 (6).

Nutritional therapy and appropriate physical activities represent the basis of DM type 2 treatment (7,8). Adequate changes in the patient's daily routines lead to better lifestyle quality and lessen the risk of cardiovascular, cerebrovascular disorders (6).

The aim of the study was to identify the nutritional habits of patients with type 2 DM, as well as the differences in respect to gender and nutritional status.

Material and methods

The study was carried out in October 2017 at the Polyclinic for Endocrinology, Diabetes and Metabolic Diseases of the Clinical Center of Vojvodina. It was a cross-sectional study. The sample included all hospitalized patients with DM type 2 at the Clicinal Centre at that period of time. There were 50 subjects of both genders.

The criteria for excluding certain patients from the study referred to their unwillingness to give a consent for taking part in the research or those whose condition (e.g. dementia) would prevent them from supplying valid answers, the information provided from the patients' doctors. None of the patients was exluded from the study.

The data for the study were collected from patients via face-to-face interviews, using a questionnaire[1] that was filled anonimously. The questionnaire was specially designed for the purpose of this study and had not been pilot-tested nor validated. It consisted of two parts. The first part contained questions concerning general data of the subjects - gender, age, duration of the disease, body height and body mass. The patients' height and weight were not measured during the study, as these values had been obtained when the patients came to the Clinical Centre. These were considered as valid self-reported data, as it has been the case in many other studies (9,10). The data for height and body mass were used to calculate the body mass index (BMI), which served as the basis for assessing the nutritional status of the patients (11).

The second part was concerned with the frequency of consumption of particular foodstuffs. The questions concerning nutrition were designed in such a way to provide information about the frequency of consuming particular foodstuffs in the last seven days. These questions encompassed both the foodstuffs that are recommended and not recommended by WHO in the nutritive therapy of type 2 DM (12). For each question, there were four proposed answers, from which the subjects could choose only one.

Ethics

This study was approved by the Ethical Committee of the Faculty of Medicine, University of Novi Sad.

Data Analysis

The respondents' answers were coded and entered into a Microsoft Excel table. They were analyzed using descriptive quantitative statistics and presented in the form of graphs and tables. The gender dependence of the obtained answers relating to nutrition was analyzed using the Mann-Whitney nonparametric test, whereas the comparison in respect to the BMI groups was performed using the Kruskall-Wallis nonparametric test. Both tests were carried out at the significance level of 0.05.

Results

The study group of subjects with type 2 DM consisted of 30 (60%) females and 20 (40%) males. The average age of the subjects was 60.02 ± 10.84. The youngest subject was 26 years of age, and the oldest one was 75 years old.

The total number of those with normal nutritional status was 7 (14%), the number of the overweight was overweight 28 (56%), whereas the group of obese (class I, II, and III) consisted of 15 (30%) subjects.

The average BMI value was 28.92 ± 3.99 kg/m^2: 29.20 and 28.77 kg/m^2, for females and males, respectively.

Table 1 shows the participants' responses concerning the foodstuffs recommended for patients with type 2 DM.

By analyzing the responses related to the foodstuffs recommended for nutrition of patients with type 2 DM, shown in Table 1, it can be seen that the majority of pa-

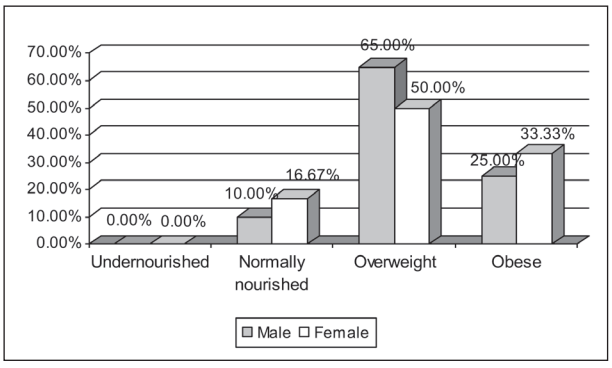

Figure 1. Gender dependence of the noursihment status based on BMI

1 The original questionnaires are available from the authors

Table 1. Intake of foodstuffs recommended for patients with type 2 DM.

Foodstuff	Every day		3-5 x weekly		1x weekly		Never	
	n	%	n	%	n	%	n	%
Whole-grain cereals	25	50.00	8	16.00	7	14.00	10	20.00
Citruses and apples	35	70.00	11	22.00	4	8.00	0	0.00
Nut fruits	4	8.00	4	8.00	23	46.00	19	38.00
Fresh vegetables	33	66.00	16	32.00	1	2.00	0	0.00
Low-fat dairy products	26	52.00	17	34.00	4	8.00	3	6.00
Young animals' lean meat	14	28.00	31	62.00	4	8.00	1	2.00
Fish	0	0.00	7	14.00	28	56.00	15	30.00

Table 2. Intake of foodstuffs that are not recommended for patients with type 2 DM.

Foodstuff	Every day		3-5 x daily		1x daily		Never	
	n	%	N	%	n	%	n	%
White-flour and fatty bakery products	4	8.00	25	50.00	14	28.00	7	14.00
Other fruit types (*grapes, bananas, figs,...)*	4	8.00	25	50.00	14	28.00	7	14.00
Dry fruits	0	0.00	2	4.00	15	30.00	33	66.00
Legumes and potato	11	22.00	33	66.00	5	10.00	1	2.00
High-fat dairy products	2	4.00	12	24.00	26	52.00	10	20.00
Fatty meat and offals	1	2.00	5	10.00	19	38.00	25	50.00
Meat products	9	18.00	17	34.00	20	40.00	4	8.00

tients consumed the recommended foodstuffs. However, a worrying fact is that that 30% of the subjects never consumed fish.

Table 2 gives the answers concerning the intake of the foodstuffs that are not recommended for patients with type 2 DM.

The data presented in Table 2 show the frequency of intake of foodstuffs that are not recommended for patients with type 2 DM, especially of white-flour products and fatty bakery products, fruits with high sugar content, high-fat dairy products, and meat products.

The comparison of the answers given by the subjects of different genders, using the Mann-Whitney nonparametric test, showed that there was a statistically significant difference only in respect to the intake of low-fat dairy products (p=0.0322) and intake of fatty meat and offals (p=0.02292) (Table 3). The other differences were not statistically significant.

The analysis of the answers of the subjects of different nutritional status using the Kruskall-Wallis nonparametric test showed that there was a statistically significant difference only in respect to the intake of meat products (p=0.0097) (Table 3).

The other differences were not statistically significant.

Discussion

There are numerous risk factors responsible for the onset of diabetes, but of special importance is the fact that some of them can be modified. These factors may prevent the beginning of the disease and its development and they are termed modifiable risk factors. On the other hand, there are some factors that cannot be influenced by lifestyle and these are called non-modifiable risk factors (race, gender, age, genetic predisposition, etc.) (13).

The group of modifiable factors includes obesity, nutritional habits, physical inactivity, etc. (13).

Obesity is one of the most important etiological factor in the development of type 2 DM, and it is significantly present in patients suffering from this disease (14-16).

In the present study, the average BMI value of the subjects was 28.92±3.99 kg/m^2, which indicates that it is higher than the recommended values, as well as the values reported in some similar investigations (17-19).

The analysis of nutritional status of the patients showed that there were only 7 (14%) of them with normal status values. The largest number of patients (28, 56%) were overweight, whereas none of them was underweight.

Table 3. Statistical significance of difference between the genders and between patients of different nutritional status in respect to the intake of particular foodstuffs

Foodstuff	Difference between the genders p-value	Difference between patients of different nutritional status p-value
Whole-grain cereal products	0.4838	0.4192
Citruses, apples	1	1
Nut fruits	0.823	0.7654
Fresh vegetables	1	1
Low-fat dairy products	0.0322	0.9524
Young animals' lean meat	0.2364	0.9404
Fish	0.2169	0.2466
White-flour and fatty bakery products	0.8089	0.1352
Other fruit types (*grapes, bananas, figs,...)*	0.1427	0.1584
Dry fruits	0.9135	0.6008
Legumes and potato	0.2364	0.9404
High-fat dairy products	1	0.0882
Fatty meat and offals	0.0229	0.4878
Meat products	0.5412	0.0097

As it has already been said, the basic principle of treating patients with type 2 DM is the appropriate diet aimed at preventing and curing the disease, as well as preventing development of acute and chronic complications (20). It is assumed that diabetes treatment should be a proper combination of correct calory intake and choice of foodstuffs with other therapy methods (oral antidiabetics, physical activity, reduction of body mass, etc.) (8, 21-23).

The analysis of nutritional habits of the patients encompassed by this study showed that even 73% of them consumed white-flour products and fatty bakery products once or several times a weak. This kind of diet poses serious problems to people with type 2 DM because it involves high concentrations of simple carbohydrates, along with saturated and trans fats, which directly influence the levels of blood glucose and LDL cholesterol. Also, it should be pointed out that fine white flours do not contain adequate concentrations of vitamins, minerals, and dietetic fibers from the grain husk, as all of these ingredients are highly recommendable to the patients. Hence, it is necessary to replace such foodstuffs with whole- grain bakery products (24-27).

Apart from whole-grain products, important sources of dietetic fibers, vitamins, and minerals make foodstuffs from the group of vegetables and fruits. People with type 2 DM should consume fresh raw vegetables and less sweet fruits (citruses, apples, berries, etc.) every day (24-27). The present study did not show statistically significant differences in respect to the intake of different flour products, vegetables and fruits, either related to the nutritional status or gender.

There was a gender-dependent statistically significant difference in respect to the intake of dairy products, as females more frequently consumed these products with lower fat content. On the other hand, the males appeared to be more frequent consumers of fatty meat and offals. No other gender differences were found.

As far as the intake of meat products is concerned, they were involved in diets of the majority of subjects, whereas only 4 (8%) never consumed them. Still, it was found that obese subjects consumed more meat products compared to the other subjects and this proved to be statistically significant difference. Apart from this, no other significant differences were observed in respect to the nutritional status. This study confirmed the results of similar investigations carried out in the surrounding countries and worldwide. The nutritional habits of patients with type 2 DM are most often in accordance with the pertinent recommendations, and are not often related to the nutritional status and gen-

der. Namely, there were more patients who frequently consumed the recommended foodstuffs than those who did not. In most cases these were the patients who previously obtained the knowledge from their family physicians (28, 29, 13).

A shortcoming of this study lies in the fact that it analyzed only one segment of therapy of type 2 DM and it included a small number of subjects, which appears as an impediment for drawing some more precise conclusions.

Conclusion

This investigation showed that, although patients to a significant extent followed the recommendations about dietetic regime, especially in respect to the recommended foodstuffs, their nutritional status was not in accordance with the recommendations for patients with type 2 DM. The recomendations strictly insist on reduced energy intake, more frequent consumption of recommended foodstuffs, and more limited intake of those foodstuffs that are not recommended in the nutritional therapy.

Further investigations should be focused on the analysis of the energy intake, amounts of foodstuffs consumed, as well as on the type and frequency of physical activity, along with the addiction to smoking and alcohol.

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Statement on conflict of interests

The authors of the paper claim that the manuscript has not been published elsewhere as a whole or partly. We agree with the content of the manuscript and approve about its publication in ²Progress in Nutrition². Researching has been approved by institutional ethics committee. These are no financial problems that might lead to a conflict of interest.

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