Assessment of adherence to physician recommendations among patients with diagnosed diabetes mellitus type 2

Ocena przestrzegania zaleceń lekarskich przez pacjentów ze zdiagnozowaną cukrzycą typu 2

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Abstract

Introduction. Adherence to physician recommendations and the principles of healthy lifestyle is the key to avoid diabetic complications. Daily physical activity, a healthy diet and adherence to drug therapy can delay the development of the disease and its complications, leading to an increased life expectancy.

The aim of the study was to evaluate the adherence to physician recommendations among patients with diagnosed diabetes mellitus type 2 (DM2).

Material and methods. We studied 57 patients, including 27 women (47.4%) and 30 men (52.6%) diagnosed with DM2. The patients were hospitalized in the Department of Diabetology and Internal Diseases at the Independent Public Central Clinical Hospital in Warsaw in April–August 2019. The average age was 57 years in women and 58 years in men. We analyzed the answers obtained from the respondents in response to the original questionnaire developed by the authors.

Results. We found that 70% of respondents did not follow dietary recommendations, 52% regularly consumed fast foods, 82% consumed sweets, 15% consumed the recommended amount of vegetables, 92% consumed meat at least once a day, and 39% were physically inactive. Among those declaring any physical activity, the most commonly reported type of activity was walking (32 patients or 56%).

Conclusions. The adherence to physician recommendations in patients with diagnosed DM2 is unsatisfactory. The available solutions lack cooperation within multi-specialist teams.

Key words: diabetes mellitus type 2, adherence, compliance

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Introduction

Diabetes mellitus type 2 (DM2) has been the first non-infectious disease to reach the epidemic proportions. It has been estimated that more than 3 million individuals suffer from diabetes in Poland, and this number will increase to about 4 million by 2040 [1]. If untreated or inappropriately treated, diabetes leads to serious complications such as neuropathy, retinopathy and vascular complications. The mainstay of the management involves normalization of

blood glucose levels with lifestyle intervention and drug therapy. Diabetes is characterized by a progressive course, eventually leading to the need for insulin therapy [2]. Studies showed a cardioprotective effect of metformin which is the most popular glucose-lowering drug [3]. Specific guidelines on nutrition [4] and physical activity [5] have been published. Lifestyle changes are most important in this type of diabetes, and they should always be the mainstay of the treatment. These mostly include adherence to a diabetic diet, appropriate physical activity, and avoiding stimulants.

Material and methods

We studied 57 patients including 27 women (47.4%) and 30 men (52.6%) with diagnosed DM2. The mean age was 57 years in women and 58 years in men. Data were analyzed using the Statistica 13 software. The study group included diabetic patients hospitalized in the Department of Diabetology and Internal Diseases at the Independent Public Central Clinical Hospital (Klinika Diabetologii i Chorób Wewnętrznych, Samodzielny Publiczny Centralny Szpital Kliniczny) in Warsaw in April–August 2019. Most patients were residents of a large city and had secondary (42%) or higher (33%) education. Twenty-two respondents were professionally active, and 34 were pensioners, social security benefit recipients, or unemployment allowance recipients. More than half of patients judged their economic status as "average". The respondents filled a questionnaire under supervision using a computer, with automatic answer storage in a Google Forms document. The inclusion criterion was the diagnosis of DM2. The exclusion criteria included diabetes mellitus type 1 and gestational diabetes.

The questionnaire items were related to the patients' diet, physical activity and habits. The first part of the questionnaire dealt with the diet and adherence to dietary recommendations. The next group of questions focused on so called "recreational" foods. The respondents were asked about the frequency of consuming such products. Next parts of the questionnaire dealt with physical activity and sources of knowledge about diabetes. The results were entered into a database which was subjected to statistical analysis.

The aim of the study was to evaluate the adherence to physician recommendations among patients with diagnosed DM2.

Results

The study included 57 patients with diagnosed DM2, including 27 women and 30 men. The mean age was 57 ± 16.8 years in women and 58 ± 11.2 years in men. Most patients were residents of a large city (47.7%). Higher education was reported by 19 (33.3%) patients, secondary education by 24 (42.1%) patients, vocational education by 13 (22.8%) patients, and primary education by one (1.8%) patient (Table 1).

The diets most commonly adhered to by the patients were the "diabetic" diet and low glycaemic index diet,

Table 1. Age, gender, place of residence and education profile of the study group

		Number (n = 57)	Percentage [%]
Age (years)	Men	58.8 ± 11.2	
	Women	57 ± 16.8	
Gender	Men	30	52.6
	Women	27	47.4
Place of residence	City > 250,000 inhabitants	27	47.7
	City < 250,000 inhabitants	4	7.0
	Town < 100,000 inhabitants	5	8.8
	Town < 50,000 inhabitants	4	7.0
	Town < 25,000 inhabitants	8	14.0
	Rural area	9	15.8
Education	Higher	19	33.3
	Secondary	24	42.1
	Vocational	13	22.8
	Primary	1	1.8

Table 2. Patients' adherence to dietary recommendations

Are you using any diet?		
	Number	Percentage
Gluten-free	1	1.80%
Lactose-free	1	1.80%
Low glycaemic index	15	26.30%
"Diabetic"	30	52.60%
Low-carb	3	5.30%
Paleo	1	1.80%
No specific diet	20	35.10%
How many meals do you consume daily?		
5 or more	20	35.10%
4	23	40.40%
3	13	22.80%
2	1	1.80%

indicated by 30 (52.6%) and 15 (26.3%) patients, respectively. No adherence to any specific diet was reported by 20 (35.1%) patients. Twenty-three (40.4%) respondents reported having 4 meals daily, 20 (35.1%) reported 5 or more meals, 13 (22.8%) reported 3 meals, and one (1.8%) patient reported 2 meals daily (Table 2).

Despite declaring adherence to the diabetic or low glycaemic index diet, many respondents [18 (31.6%) and 16 (28%) patients, respectively] consumed the recommended vegetable portions only 1–2 times a day. Only 5 (8.77%) patients consumed vegetables with every meal. A similar trend was noted for fruits, with 31 (54.4%) patients reporting consuming one portion of fruits daily, and 7 (12.3%) reporting no fruit consumption at all. A large proportion of patients (42 or 73.7%) consumed dairy products once daily. The most commonly chosen products were white cheese and milk. A dairy-free diet was reported by 6 patients (10.53%). Most respondents declared consuming meat once daily (25 patients or 43.86%), and 16 patients (28.07%) reported consuming meat twice daily. A vegetarian diet was reported by 4 respondents (7%). Fish was consumed once a week by 36 patients (63.16%), while as many as 17 patients (29.82%) reported no seafood consumption at all. Many respondents reported limiting consumption of cereal products to 2 or 3 meals [13 (22.81%) and 21 (36.84%) patients, respectively]. Two patients (3.51%) reported consuming no cereal products. Many respondents declared consumption of liquid fat in the everyday det. Most respondents (36 patients or 63.16%) reported consuming these products once daily, while 6 patients (10.53%) reported not consuming liquid plant fat at all. Regarding consumption of nuts and seeds, 29 patients (50.88%) reported no consumption of these products and 20 respondents (35.09%) consumed them once daily (Table 3).

Table 3. Consumption of selected food groups.

How many portions of the following products do you consume daily?			
	No. of meals	No. of patients	Percentage
Vegetables (80–100 g)	5 or more	5	8.77%
	4	4	7.02%
	3	13	22.81%
	2	16	28.07%
	1	18	31.58%
	0	1	1.75%
Fruits (80–100 g)	5	1	1.8%
	4	2	3.5%
	3	4	7.0%
	2	12	21.1%
	1	31	54.4%
	0	7	12.3%
Dairy products	5	0	0%
	4	0	0%
	3	1	1.75%
	2	8	14.04%
	1	42	73.68%
	0	6	10.53%
Meat	5	1	1.75%
	4	2	3.51%
	3	9	15.79%
	2	16	28.07%
	1	25	43.86%
	0	4	7.02%
Fish (weekly)	5	0	0.00%
	4	0	0.00%
	3	1	1.75%
	2	3	5.26%
	1	36	63.16%
	0	17	29.82%
Cereal products	5	2	3.51%
	4	9	15.79%
	3	21	36.84%
	2	13	22.81%
	1	10	17.54%
	0	2	3.51%
Liquid fat	5	0	0.00%
	4	1	1.75%
	3	1	1.75%
	2	13	22.81%
	1	36	63.16%
	0	6	10.53%
Nuts/seeds	5	0	0.00%
	4	0	0.00%
	3	4	7.02%
	2	4	7.02%
	1	20	35.09%
	0	29	50.88%

Table 4. Consumption of "recreational foods"

How often do you consume the following products?			
	No. of meals	No. of patients	Percentage
Fast-food	Daily	0	0.00%
	Several times a week	0	0.00%
	Once a week	0	0.00%
	Several times a month	1	1.75%
	Once a month	7	12.28%
	Several times a year	19	33.33%
	Once a year	3	5.26%
	Never	27	47.37%
Candy bars, pastries, candies	Daily	1	1.75%
	Several times a week	10	17.54%
	Once a week	3	5.26%
	Several times a month	18	31.58%
	Once a month	3	5.26%
	Several times a year	11	19.30%
	Once a year	1	1.75%
	Never	10	17.54%
Cakes	Daily	0	0.00%
	Several times a week	3	5.26%
	Once a week	3	5.26%
	Several times a month	11	19.30%
	Once a month	4	7.02%
	Several times a year	19	33.33%
	Once a year	0	0.00%
	Never	17	29.82%
Salty snacks	Daily	1	1.75%
	Several times a week	1	1.75%
	Once a week	1	1.75%
	Several times a month	9	15.79%
	Once a month	7	12.28%
	Several times a year	11	19.30%
	Once a year	2	3.51%
	Never	25	43.86%

A large proportion (27 patients or 47.37%) reported no consumption of fast-food at all, while 19 (33.33%) patients declared their consumption several times a year. Regarding consumption of confectionery, 10 patients (17.54%) reported consuming such products several times a week, 18 (31.58%) consumed them several times a month and 10 (17.54%) reported no consumption. The most commonly consumed sweets included candy bars, pastries, and candies. Cakes were consumed several times a month by 11 (19.3%) patients, several times a year by 19 (33.33%) patients, and not consumed at all by 17 (29.82%) patients. Salty snacks were occasionally consumed by 11 (19.3%) respondents, while 25 (43.86%) reported no consumption of such products.

Any leisure physical activity was reported by 35 patients (61.4%). The most commonly reported type of activity was walking (32 respondents). No physical activity was reported by 22 patients (Table 5).

Table 5. Physical activity

	Question to respondents	Number of patients	Percentage
Do you undertake any physical activity?	Yes	35	61.40%
	No	22	38.60%
What type of activity do you engage in?	Walking	32	56.10%
	Cycling	8	14%
	Gym exercises	2	3.50%
	Swimming pool	2	3.50%
	Nordic walking	4	7%
	Home exercises	3	5.30%
	Cardio (running, cross-trainer)	1	1.80%
	None	21	37.20%

Table 6. Interest in visits to a diabetes educator

Would you be interested in visits to a diabetes educator?	Number of patients	Percentage
Yes	7	12.30%
Yes if covered by the National Health Fund	27	47.40%
No	23	40.40%

Table 7. Reasons for not adhering to physician recommendations

What is the reason for not adhering to physician recommendations?	Number of patients	Percentage
Lack of time	10	18.20%
Lack of money	8	14.50%
Lack of motivation to fight the disease	17	30.90%
Belief that lifestyle changes would not improve the patient's health status	22	40%
Health status not allowing to engage in physical activity	18	32.70%
Lack of strong will	1	1.80%
Unforeseen events outside home	1	1.80%
I do adhere to all recommendations	5	9.10%

When asked whether they would be interested in visits to a diabetes educator and education regarding the diet, physical activity, and lifestyle in diabetes, the respondents mostly answered they would be willing to use such a service if covered by the National Health Fund (27 respondents or 47.4%), while 7 patients (12.3%) would be willing to pay out-of-pocket for such a service (Table 6).

When asked about the reason for not adhering to physician recommendations, the patients indicated that they did not believe that lifestyle changes would improve their health status (22 answers, 40%), that their health status would not allow engaging in physical activity (18 answers, 32.7%), or that they lacked motivation to fight the disease (17 answers, 31%), lacked time (10 answers, 18.2%), or lacked money (8 answers, 14.5%). Only 5 patients adhered in their opinion to all physician recommendations (Table 7).

Discussion

Diabetes is an interdisciplinary condition requiring patient support at various levels to increase therapeutic adherence and health literacy. The major goals in diabetes are not only to maintain normal blood glucose levels but

also to reduce and maintain normal body weight. Patient self-management is thus required to achieve these goals, including home monitoring of blood glucose levels using a glucose meter, monitoring haemoglobin A_{1c} (HbA_{1c}) level, and adherence to physician recommendations regarding diet, physical activity, and taking prescribed medications.

Dietary recommendations in DM2 include elimination of highly processed foods including meat, and foods containing simple carbohydrates. A special focus should be given to providing necessary vitamins and microelements. According to the most recent recommendations, carbohydrate intake should be limited to 40–50% of the total caloric intake and should be based on low or medium glycaemic index (GI) products. GI is the most precise system for classification of foods in regard to their postprandial digestion rate and carbohydrate absorption. It allows precise prediction of changes in blood glucose level at 2 hours after carbohydrate intake. The reference is glucose which has the GI of 100 [6]. Based on GI, the carbohydrate-containing products which should be chosen by patients with DM2 include coarse-grained groats, unrefined cereals, unrefined rice, and rolled oats. In our study, only 15 patients reported adhering to a low GI diet. The "diabetic" diet, adhered to by 30 respondents, is not consistent with the recommendations for diabetic patients, as it allows consumption of high GI products such as millet groats or bread made from white flour. No adherence to any specific diet was reported by 20 study participants.

Vegetables may be consumed without limitations due to their low GI and calorie content. They contain necessary vitamins, microelements, antioxidants, and soluble fiber which has a beneficial effect on weight reduction and stabilization of cholesterol levels. According to the World Health Organization (WHO) dietary guidelines and the food pyramid by the Polish National Food and Nutrition Institute, consumption of 5 portions of vegetables daily is suggested (with one portion defined as 100 g) [6, 7]. In our study, only 5 patients reported consuming the recommended daily amount of vegetables, while 18 and 16 respondents, respectively, reported consuming one or two portions of vegetables daily, mostly at the second or third meal during the day. When asked about the reasons for non-adherence to the recommendations, the respondents indicated a prohibitively high cost of fresh vegetables but did not mention their seasonal availability.

The amount of fruits consumed by diabetic patients should be limited to 200–300 g daily due to high GI of some fruits. Berry fruits are recommended due to their low GI, always as an addition to a meal and not as a stand-alone meal or snack [6]. In our study, 31 patients reported consuming fruits once daily, and 7 reported consuming no fruits at all. Many patients with DM2 are afraid of excessive

postprandial blood glucose levels following fruit consumption and thus limit fruits or eliminate them completely from their diet.

A study by Hidayat et al. showed that the presence of milk proteins in the diet results in a reduction of postprandial lipaemia in patients with DM2. Consumption of dairy products may lead to lipoprotein synthesis by the enzyme lipase [8]. The most commonly recommended products are low-fat white cheese, low-fat milk, and natural yoghurt without addition of sugar or powdered milk. In our study, 42 respondents reported consuming dairy products once daily. The most commonly chosen product was white cheese, consumed at breakfast.

In a study by Toumpanakis et al. [9], use of a plant-based diet was shown to have a positive effect on HbA_{1c} level. The difference between HbA_{1c} levels at baseline and at the end of the study was 0.55%, compared to 0.19% in the control group [9]. In our study, 25 respondents reported consuming meat once daily, and 16 reported consuming meat twice daily. Vegetarian diet was used by only 4 patients. Fish and other seafoods are particularly recommended as a source of essential unsaturated fatty acids and polyunsaturated fatty acids. Consuming marine fish at least twice weekly has been recommended [10]. In our study, consumption of one fish portion per week was reported by 36 patients, while 17 respondents did not consume fish or other seafoods.

Potatoes as the most commonly chosen addition to the main meal have become less popular compared to groats, rice, and pasta. Since 2005, potato consumption has fallen by about 25 kg per person. Consumption of complex carbohydrates has also fallen, from 145 kg per person in 1960 to 108 kg per person in 2010–2014 [10]. This group of food products was reported to be consumed three times per day by 21 patients and twice daily by 13 patients. The most commonly chosen sources of carbohydrates are bread, buckwheat and rice. Patient often choose so-called "GI bread" which, in contrast to what its name suggests, is not suitable for persons with impaired carbohydrate metabolism as it contains white flour and addition of sugar. For this reason, its GI and glycaemic load are high. Another frequently chosen product is white rice which also has a high GI of 70 [11].

Nuts are a valuable source of protein, fatty acids, vitamins, antioxidants, and microelements. Almonds contain L-arginine and are particularly recommended in the diet of diabetic persons. In addition to a vasodilating effect (resulting in smooth muscle relaxation and blood pressure reduction), L-arginine may stimulate insulin release [12]. Other studies showed that consumption of cashew nuts (10% of the total caloric intake) reduced the homeostatic model assessment for insulin resistance (HOMA-IR) index compared to the control group with no cashew nut

consumption [13]. In our study, only 35% of the respondents consumed nuts once daily, mostly as a snack, while more than 50% of the respondents reported no consumption of nuts.

Development of diabetes is strongly associated with consumption of so-called "recreational foods", *i.e.*, fast-food products, sweets, and highly processed foods. Consumption of "recreational foods" increases absorption of saturated and trans fats [14]. Studies showed the more frequent were visits to fast-food restaurants, the higher was the risk of developing DM2 [10]. In other studies, consumption of processed meats such as fried smoked bacon and frankfurters was also associated with a higher risk of incident DM2 [15]. A similar effect was associated with consumption of sweet and salty snacks [15]. Most patients avoid fast-food products, sweets, and salty snacks but some individuals continue to consume such products despite being aware of their harmful effects. In some cases, these products are consumed daily or several times a week.

Physical activity should be an inherent element of a healthy lifestyle in all individuals. WHO recommends moderate physical activity for about 150 minutes per week or intense activity for about 75 minutes per week [5]. One should also consider non-exercise activity thermogenesis (NEAT) which describes the amount of calorie expenditure related to daily non-exercise activity [16]. In our study, 22 patients reported being physically inactive. This has been mostly related to a poor health status precluding any activity. These are often patients after limb amputation due to diabetic neuropathy and diabetic foot. Any activity was declared by 35 respondents in our study. The most commonly chosen types of exercise were walking (56%) and cycling (14%).

A high level of health literacy is strongly associated with adherence to physician recommendations. Studies by Al Sayah et al. [17] and Dahal and Hosseinzadeh [18] showed an association between better knowledge about diabetes and adherence to a diet, physical activity, use of medications, or appropriate diabetic foot care. In our study, 25 patients did not expand their knowledge, as they believed that their current level of knowledge about diabetes was sufficient.

The study by Atmaca et al. [19] showed that the knowledge about the disease was erroneous or insufficient. This is related to the level of health literacy, patient education, and socioeconomic factors [19]. The Diabetes Attitudes, Wishes and Needs Second Study (DAWN2) highlighted a poor alignment of the healthcare system with the needs related to diabetes treatment, including lack of prevention and education, and inadequate communication with physicians and diabetic nurses [1]. There are no diabetes educators in Poland, which does not benefit the patients who do not know what diet they should adhere to and what physical activity would be best for them considering their current health status. In our study, 34 respondents were willing to use the services of a diabetes educator to support them in their fight against the disease.

Non-adherence to physician recommendations may have various forms and reasons. The WHO report listed reasons related to the patient, condition, therapy, healthcare system, and social and economic reasons [20]. The study by Kardas et al. [21] showed that adherence to physician recommendations was mostly affected by interpersonal relationships involving the family and friends. Socioeconomic factors such as the ability to fill prescriptions and access to healthcare are also important [21]. In our study, the reasons for non-adherence to physician recommendations listed by respondents included a belief that lifestyle changes would not improve the patient's health status (40%), health status not allowing to engage in physical activity (32.7%), and lack of motivation to fight the disease or lack of support (30.9%).

Conclusions

The level of adherence to physician recommendations in patients with diabetes type 2 is low, and their knowledge about the disease is unsatisfactory. Non-adherence to therapeutic recommendations has a negative effect on the patient's health and may lead to serious complications. In addition, it generates increased healthcare costs. Cooperation within multidisciplinary teams of physicians, nurses, physical therapists, dieticians, and educators is necessary to improve the current situation in this regard.

Conflict of interests

The authors report no conflicts of interests.

Streszczenie

Wstęp. Przestrzeganie zaleceń lekarskich i założeń zdrowego stylu życia jest kluczem do uniknięcia powikłań cukrzycowych. Codzienna aktywność fizyczna, zdrowa dieta oraz stosowanie się do farmakoterapii mogą opóźnić rozwój choroby oraz pojawiania się powikłań, a także wydłużyć spodziewaną długość życia.

Celem pracy była ocena poziomu przestrzegania zaleceń lekarskich przez pacjentów obciążonych cukrzycą typu 2 (DM2).

Materiał i metodyka. Badaniem objęto 57 osób: 27 kobiet (47,4%) oraz 30 mężczyzn (52,6%) ze zdiagnozowaną DM2. Pacjenci przebywali w Klinice Diabetologii i Chorób Wewnętrznych Samodzielnego Publicznego Centralnego Szpitala Klinicznego w Warszawie od kwietnia do sierpnia 2019 roku. Średni wiek kobiet wynosił 57 lat, a mężczyzn 58 lat. Materiał do analizy stanowiły odpowiedzi uzyskane od respondentów w badaniu przeprowadzonym za pomocą autorskiej ankiety.

Wyniki. Zaleceń odnoszących się do diety nie przestrzega 70% respondentów. Spośród ankietowanych 52% spożywa regularnie *fastfood*, 82% — słodycze, 15% — zalecaną ilość warzyw, a 92% osób — mięso przynajmniej raz dziennie, 39% respondentów jest nieaktywna fizycznie, natomiast Ci, którzy deklarują jakąkolwiek aktywność fizyczną, najczęściej wybierają spacery (32 pacjentów, tj. 56%).

Wnioski. Stopień przestrzegania zaleceń lekarskich przez pacjentów ze zdiagnozowaną DM2 nie jest zadowalający. W dostępnych rozwiązaniach brakuje współpracy zespołów wielospecjalistycznych.

Słowa kluczowe: cukrzyca typu 2, przestrzeganie zaleceń, *adherence*

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