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PRACA ORYGINALNA
ORIGINAL PAPER

# Eating habits of patients with type 2 diabetes mellitus with regard to body mass index

## Nawyki żywieniowe pacjentów z cukrzycą typu 2 z uwzględnieniem wskaźnika masy ciała

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**ABSTRACT**

**INTRODUCTION:** Recent years have seen a significant increase in the incidence of diabetes mellitus, type 2 diabetes in particular, which closely correlates with the growing problem of overweight and obesity. The aim of the study was to compare eating habits among type 2 diabetic patients with varying body weight as well as to verify whether there was a relationship between dietary habits and the body mass index in these patients.
**MATERIAL AND METHODS:** The study was conducted in diabetology outpatient clinics. A total of 353 diabetic patients participated in the study. The study consisted of two parts, i.e. authors' questionnaire and anthropometric measurements.
**RESULTS:** The recommended number of 4–5 meals a day was declared by 48.6% of subjects with normal body weight, 50.3% of overweight and 48.4% of obese patients. Daily consumption of breakfast was confirmed by 77.1%, 73.9% and 77.8% of respondents, respectively. Daily consumption of whole-grain bread and coarse grits was mostly declared by subjects with normal body weight (62.8%), followed by overweight and obese patients (22.9% and 23%, respectively). Daily consumption of milk and fermented dairy beverages was reported by 24.3% and 15.7% of subjects with normal body weight, 22.3% and 14.7% of overweight patients as well as by 16.7% and 12% of obese patients, respectively.
**CONCLUSIONS:** Eating habits among patients with type 2 diabetes are varied, with healthy eating habits dominating in subjects with normal body weight. A relationship was found between the patients' BMI values and some of the eating habits as well as consumption rates of various food products.

KEY WORDS
diabetes mellitus, BMI, eating habits

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## STRESZCZENIE

**WSTĘP:** W ostatnich latach odnotowuje się znaczący wzrost zachorowalności na cukrzycę, zwłaszcza typu 2, co ściśle koreluje z narastającym problemem nadwagi i otyłości. Celem pracy było porównanie nawyków żywieniowych pacjentów z cukrzycą typu 2 o różnej masie ciała oraz odpowiedź na pytanie, czy występują zależności pomiędzy nawykami a wskaźnikiem masy ciała (BMI) badanych osób.
**MATERIAŁ I METODY:** Badanie zostało przeprowadzone w poradniach diabetologicznych wśród 353 pacjentów z cukrzycą. Składało się z dwóch części – przeprowadzenia ankiety z wykorzystaniem autorskiego kwestionariusza oraz wykonania pomiarów antropometrycznych.
**WYNIKI:** Spożywanie zalecanej liczby 4–5 posiłków w ciągu dnia zadeklarowało 48,6% osób z prawidłową masą ciała, 50,3% z nadwagą oraz 48,4% z otyłością. Codzienne spożywanie I śniadania potwierdziło odpowiednio 77,1%, 73,9% oraz 77,8% z nich. Codzienną konsumpcję pełnoziarnistego pieczywa i gruboziarnistych kasz najczęściej deklarowały osoby z prawidłową masą ciała (62,8%), rzadziej osoby z nadwagą i otyłością, odpowiednio 22,9% i 23% wskazań. Spożycie mleka i mlecznych napojów fermentowanych każdego dnia deklarowało odpowiednio 24,3% i 15,7% osób z prawidłową masą ciała, 22,3% i 14,7% z nadwagą oraz 16,7% i 12% z otyłością.
**WNIOSKI:** Nawyki żywieniowe badanych pacjentów z cukrzycą typu 2 są zróżnicowane, przy czym największą liczbę prawidłowych nawyków żywieniowych zaobserwowano u osób z prawidłową masą ciała. Stwierdzono, iż występuje zależność pomiędzy BMI badanych pacjentów a niektórymi nawykami żywieniowymi i częstością spożycia poszczególnych produktów spożywczych.



SŁOWA KLUCZOWE
cukrzyca, BMI, nawyki żywieniowe


## INTRODUCTION

There has been a significant increase in the incidence of diabetes mellitus, type 2 diabetes in particular, in recent years. Diabetes is increasingly often referred to as a 21st century epidemic [1,2,3,4]. According to the International Diabetes Federation (IDF), there will be 592 million people living with the disease in 2035 [5]. Diabetes was diagnosed in 52 million Europeans aged between 20 and 79 years in 2014. At the same time, it has been highlighted that more than 17 million Europeans may be unaware of being affected, and thus do not receive the necessary treatment [5]. Epidemiological data concerning Poland are also alarming. It is estimated that almost 3 million persons of the adult Polish population may be affected by diabetes, with up to 1 million of undiagnosed or pre-diabetic individuals [6]. This situation is closely correlated with the growing problem of overweight and obesity both in Poland and worldwide [5]. An unbalanced diet, poor physical activity, alcohol consumption and smoking tobacco are risk factors for metabolic disorders, with an increased BMI being the most important risk factor for diabetes mellitus [7]. Appropriately motivated patients can have significant effects on their health. Therefore, educational measures in the field of therapeutic management are of key importance [3]. The treatment of diabetes is not based solely on maintaining target blood glucose levels, but it also involves normalising body weight, blood pressure and the lipid profile [8]. The current recommendations of Diabetes Societies, including the Polish Diabetes Association (PTD), indicate that the diet of patients with diabetes should not differ from that of healthy individuals, however, individualisation of nutritional recommendations is important. The diet should provide the necessary nutrients and comply with the demands of the body [9, 10]. Parameters such as age, sex, body weight, physical activity and current health status should be considered when planning a diet [11]. Furthermore, the diet should include whole-grain bread and coarse grits, low-fat dairy products, vegetables, legumes, fruit as well as poultry and fish. Consumption of red meat and well as products high in simple carbohydrates should be limited [9,12].
The aim of the study was to compare eating habits among type 2 diabetic patients with varying body weight as well as to verify whether there was a relationship between dietary habits and the body mass index in these patients.

## MATERIAL AND METHODS

A total of 353 adult patients diagnosed with type 2 diabetes mellitus, who reported to diabetology outpatient clinics in the region of Upper Silesia, were included in the study. All the patients received infor-

mation on the purpose and course of the study as well as gave their consent to participate.
The characteristics of the study population are presented in Table I.

**Table I.** Characteristics of study population
**Tabela I.** Charakterystyka badanej grupy

| | Features | N = 353 | % |
|---|---|---|---|
| Gender | female | 185 | 52.4 |
| | male | 168 | 47.6 |
| Age | under 60 | 88 | 24.9 |
| | 60–70 years old | 205 | 58.1 |
| | over 75 | 60 | 17.0 |
| BMI | normal body weight | 70 | 19.8 |
| | overweight | 157 | 44.5 |
| | obese | 126 | 35.7 |
| Duration of diabetes mellitus | 5 years or less | 111 | 31.4 |
| | 6–10 years | 104 | 29.5 |
| | 11 years or more | 131 | 39.1 |
| Treatment of diabetes mellitus | oral antidiabetic agents | 140 | 39.7 |
| | insulin therapy | 112 | 31.7 |
| | oral antidiabetic agents + insulin therapy | 101 | 28.6 |

The study consisted of several stages. The first stage involved developing the research tool. The authors' own questionnaire including personal details, questions on the course and treatment of diabetes as well as assessing eating habits, including the frequency of consuming various food products in the last 30 days preceding the study, was used as the research tool. The second stage involved a pilot study including 15 patients. Its aim was to verify whether the questions included in the questionnaire were clear for the participants. After correcting the questionnaire, we proceeded to the next stage, i.e. the actual study. The questionnaire was filled in by the patients followed by anthropometric measurements (body weight [kg] and height [cm]) performed by a nurse. Based on the obtained results the BMI was calculated and the obtained values were interpreted with reference to a BMI of 18.5 to 24.9 kg/m$^2$ indicating normal weight, 25.0 to 29.9 kg/m$^2$ indicating overweight and 30.0 kg/m$^2$ indicating obesity [13]. The final stage involved developing a database using MS Excel 2010 software as well as statistical analysis using Statistica 12.0. The Shapiro–Wilk test was used to verify whether the quantitative variables were normally distributed. The Gamma correlation coefficient test was used to assess the relationship between BMI (normal body weight, overweight, obesity) and the patients' eating habits as well as the consumption rates for various food products. A p-value < 0.05 was considered statistically significant.

## RESULTS

Selected dietary habits of the patients are shown in Figs 1–3.

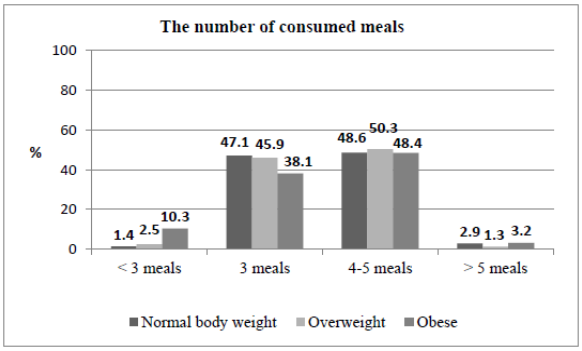


**Fig. 1.** Number of consumed meals daily with regard to patient BM.
**Ryc. 1.** Liczba spożywanych posiłków w ciągu dnia z uwzględnieniem BMI pacjentów.

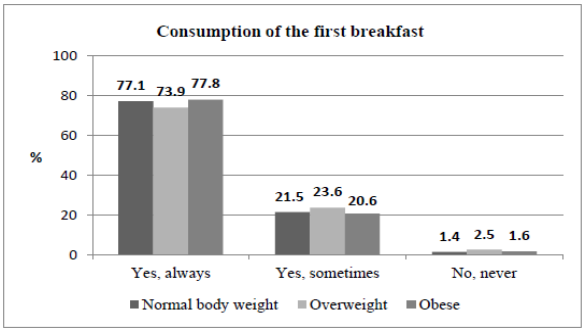


**Fig. 2.** Consumption of first breakfast with regard to patient BMI.
**Ryc. 2.** Spożywanie I śniadania z uwzględnieniem BMI pacjentów.

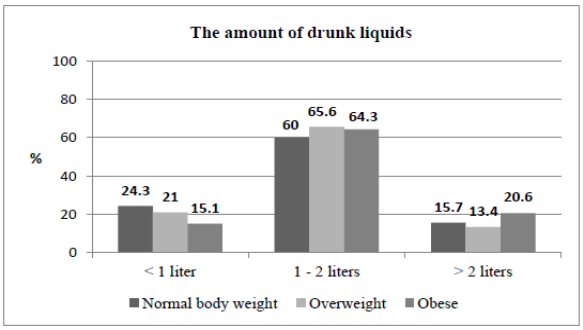


**Fig. 3.** Amount of liquids drunk daily with regard to patient BMI.
**Ryc. 3.** Ilość wypijanych płynów w ciągu dnia z uwzględnieniem BMI pacjentów.

The recommended number of 4–5 meals a day was declared by 48.6% of subjects with normal body weight, 50.3% of overweight and 48.4% of obese patients. Daily consumption of breakfast was confirmed by 77.1%, 73.9% and 77.8% of respondents, respectively. The intake of 1–2 litres of fluid per day

was declared by 60% of patients with normal body weight, 65.6% of overweight and 64.3% of obese patients (Fig. 1–3).

A correlation was found between patient BMI and the daily intake of fluid (gamma correlation coefficient test; $p = 0.01$; $\gamma = 0.16$). The results obtained in statistical analysis indicate that the daily intake of fluids increases with an increase in BMI. However, no relationship was found between patient BMI and the number of meals per day (gamma correlation coefficient test; $p = 0.44$) or consumption of breakfast (gamma correlation coefficient test; $p = 0.66$) (Fig. 1–3).

The consumption rates for various food products are shown in Tables II–IV.

Analysis of the frequency of consuming plant-derived products showed that a daily intake of whole-grain bread and coarse grits was usually declared by subjects with normal body weight (62.8%), and less commonly by overweight and obese patients (22.9% and 23%, respectively). A daily intake of fruits and vegetables was reported by 55.7% and 65.7% of individuals with normal body weight, 44.5% and 49% of overweight as well as 42.1% and 45.3% of obese patients, respectively. The recommended intake of leguminous plants seeds (several times a month) was most often declared by individuals with normal body weight (45.6%), while lower intake rates were reported for obese and overweight patients (23.8% and 22.3%, respectively) (Table II).

A correlation was found between patient BMI and the consumption rates for whole-grain bread and coarse grits, vegetables and fruit. Statistical analysis indicates that the frequency of consumption of whole-grain bread and coarse grits, vegetables and fruit decreases with an increasing BMI (Table II). Analysis of the frequency of consuming animal-derived products showed that a daily intake of milk and fermented dairy beverages was reported by 24.3% and 15.7% of subjects with normal body weight, 22.3% and 14.7% of overweight patients as well as by 16.7% and 12% of obese patients, respectively. The occasional consumption of yellow cheese and/or processed cheese was declared by up to 41.4% of individuals with normal body weight; and by only 21% and 14.3% of overweight and obese patients, respectively. The highest consumption rates for fish (several times a week) were observed among patients with normal body weight (64.3%), followed by 36.4% of overweight and 35% of obese patients (Table III).

**Table II.** Frequency of consumption of plant-derived products with regard to patient BMI
**Tabela II.** Częstość spożycia produktów pochodzenia roślinnego z uwzgędnieniem BMI pacjentów

| Food product group | Frequency of consumption | Normal body weight | | Overweight | | Obese | | Test result |
|---|---|---|---|---|---|---|---|---|
| | | N = 70 | % | N = 157 | % | N = 126 | % | |
| Whole-wheat bread and coarse grits | every day | 44 | 62.8 | 36 | 22.9 | 29 | 23.0 | p < 0.01 γ = -0.26 |
| | a few times a week | 10 | 14.3 | 43 | 27.4 | 32 | 25.4 | |
| | a few times a month | 2 | 2.9 | 15 | 9.6 | 13 | 10.3 | |
| | occasionally | 2 | 2.9 | 36 | 22.9 | 22 | 17.5 | |
| | never | 12 | 17.1 | 27 | 17.2 | 30 | 23.8 | |
| Vegetables | every day | 46 | 65.7 | 77 | 49.0 | 57 | 45.3 | p < 0.01 γ = -0.20 |
| | a few times a week | 22 | 31.5 | 73 | 46.5 | 64 | 50.8 | |
| | a few times a month | 1 | 1.4 | 5 | 3.2 | 3 | 2.3 | |
| | occasionally | 1 | 1.4 | 2 | 1.3 | 2 | 1.6 | |
| Fruits | every day | 39 | 55.7 | 70 | 44.5 | 53 | 42.1 | p < 0.01 γ = -0.15 |
| | a few times a week | 28 | 40.0 | 80 | 51.0 | 64 | 50.8 | |
| | a few times a month | 3 | 4.3 | 5 | 3.2 | 6 | 4.8 | |
| | occasionally | 0 | 0.0 | 2 | 1.3 | 3 | 2.3 | |
| Leguminous plant seeds (beans, peas) | every day | 0 | 0.0 | 1 | 0.6 | 0 | 0.0 | p < 0.08 |
| | a few times a week | 2 | 2.9 | 16 | 10.2 | 11 | 8.7 | |
| | a few times a month | 32 | 45.6 | 35 | 22.3 | 30 | 23.8 | |
| | occasionally | 26 | 37.2 | 81 | 51.6 | 64 | 50.8 | |
| | never | 10 | 14.3 | 24 | 15.3 | 21 | 16.7 | |

p – significance level for gamma correlation test; γ – gamma coefficient value

**Table III.** Frequency of consumption of animal-derived products with regard to patient BMI
**Tabela III.** Częstość spożycia produktów pochodzenia zwierzęcego z uwzględnieniem BMI pacjentów

| Food product group | Frequency of consumption | Normal body weight | | Overweight | | Obese | | Test result |
|---|---|---|---|---|---|---|---|---|
| | | N = 70 | % | N = 157 | % | N = 126 | % | |
| Milk | every day | 17 | 24.3 | 35 | 22.3 | 21 | 16.7 | p < 0.12 |
| | a few times a week | 28 | 40.0 | 41 | 26.1 | 45 | 35.7 | |
| | a few times a month | 5 | 7.1 | 10 | 6.4 | 12 | 9.5 | |
| | occasionally | 13 | 18.6 | 33 | 21.0 | 27 | 21.4 | |
| | never | 7 | 10.0 | 38 | 24.2 | 21 | 16.7 | |
| Fermented dairy beverages (kefir, yogurt) | every day | 11 | 15.7 | 23 | 14.7 | 15 | 12.0 | p < 0.19 |
| | a few times a week | 43 | 61.4 | 87 | 55.4 | 74 | 58.7 | |
| | a few times a month | 8 | 11.4 | 22 | 14.0 | 18 | 14.3 | |
| | occasionally | 6 | 8.6 | 14 | 8.9 | 11 | 8.7 | |
| | never | 2 | 2.9 | 11 | 7.0 | 8 | 6.3 | |
| Yellow cheese and/or processed cheese | every day | 3 | 4.3 | 4 | 2.6 | 2 | 1.6 | p < 0.01 γ = -0.15 |
| | a few times a week | 10 | 14.3 | 55 | 35.0 | 48 | 38.2 | |
| | a few times a month | 23 | 32.9 | 51 | 32.5 | 42 | 33.3 | |
| | occasionally | 29 | 41.4 | 33 | 21.0 | 18 | 14.3 | |
| | never | 5 | 7.1 | 14 | 8.9 | 16 | 12.6 | |
| Fish | every day | 0 | 0.0 | 0 | 0.0 | 2 | 1.6 | p < 0.08 γ = -0.20 |
| | a few times a week | 45 | 64.3 | 55 | 35.0 | 46 | 36.4 | |
| | a few times a month | 16 | 22.9 | 51 | 32.5 | 39 | 31.1 | |
| | occasionally | 8 | 11.4 | 41 | 26.1 | 31 | 24.6 | |
| | never | 1 | 1.4 | 10 | 6.4 | 8 | 6.3 | |

p – significance level for gamma correlation test; γ – gamma coefficient value

**Table IV.** Frequency of consumption of products contraindicated in diet of people with diabetes with regard to patient BMI
**Tabela IV.** Częstość spożycia produktów przeciwwskazanych w diecie osób z cukrzycą z uwzględnieniem BMI pacjentów

| Food product group | Frequency of consumption | Normal body mass | | Overweight | | Obese | | Test result |
|---|---|---|---|---|---|---|---|---|
| | | N = 70 | % | N = 157 | % | N = 126 | % | |
| Confectionery | every day | 2 | 2.9 | 8 | 5.1 | 13 | 10.3 | p < 0.01 γ = 0.34 |
| | a few times a week | 10 | 14.3 | 43 | 27.4 | 48 | 38.2 | |
| | a few times a month | 19 | 27.2 | 58 | 37.0 | 42 | 33.3 | |
| | occasionally | 32 | 45.6 | 28 | 17.8 | 12 | 9.5 | |
| | never | 7 | 10.0 | 20 | 12.7 | 11 | 8.7 | |
| Sweetened carbonated beverages | a few times a week | 4 | 5.7 | 11 | 7.0 | 20 | 15.9 | p < 0.01 γ = 0.30 |
| | a few times a month | 2 | 2.9 | 11 | 7.0 | 17 | 13.5 | |
| | occasionally | 17 | 24.3 | 61 | 38.9 | 37 | 29.4 | |
| | never | 47 | 67.1 | 74 | 47.1 | 52 | 41.2 | |
| Fast-food products | a few times a week | 0 | 0.0 | 0 | 0.0 | 1 | 0.8 | p = 0.20 |
| | a few times a month | 9 | 12.9 | 18 | 11.5 | 20 | 15.9 | |
| | occasionally | 26 | 37.1 | 80 | 51.0 | 52 | 41.2 | |
| | never | 35 | 50.0 | 59 | 37.5 | 53 | 42.1 | |

p – significance level for gamma correlation test; γ – gamma coefficient value

A relationship was found between patient BMI and the consumption rates for yellow cheese and/or processed cheese and fish. Statistical analysis indicates that an increased BMI correlated with increased consumption rates for yellow cheese and/or processed cheese and decreased intake rates for fish (Table III). Analysis of consumption rates for products that should be either reduced or eliminated from the diet of patients with diabetes showed that confectionery is not consumed by 10% of individuals with normal body weight, 12.7% of overweight and 8.7% of obese patients. Consumption of sweetened carbonated beverages and fast-food products was confirmed by 67.1% and 50%, 47.1% and 37.5% as well as 41.2% and 42.1% of respondents, respectively (Table IV).

A correlation was found between patient BMI and the consumption rates for confectionery and sweetened carbonated beverages. Statistical analysis indicates that the consumption of confectionery and sweetened carbonated beverages increases with patient BMI (Table IV).

## DISCUSSION

An abnormal BMI is very common in type 2 diabetic patients, as confirmed in a number of studies [11,14, 15]. Reducing excessive body weight and compliance with dietary recommendations by patients with diabetes mellitus is an essential component of therapy. A well-composed diet has positive effects on patient health by promoting the maintenance of metabolic control, however, the recommendations of global organisations on the optimal diet in type 2 diabetic patients vary [16,17].

Consuming 4–5 meals per day is one of the basic principles of rational nutrition [8]. Our study showed that this was the most frequently chosen option in the questionnaire, with the highest response rate among patients with obesity (50.3%). Leszczyńska et al., who assessed the knowledge on the principles of proper nutrition in 120 type 1 and 2 diabetic patients, observed that 68% of respondents had 4-5 meals a day [14]. Górska-Ciebiada et al., who assessed dietary habits among 122 type 2 diabetic patients, observed a higher response rate for this option. Consumption of the recommended number of meals was declared by up to 76.2% of patients [8].

Consuming breakfast was another important aspect. Omitting this meal raises concerns, particularly in patients with diabetes. It was shown that individuals consuming breakfast have an improved lipid profile and higher tissue susceptibility to insulin compared to those omitting breakfast [18]. Our study demonstrated that 1.4% of individuals with normal body weight, 2.5% of overweight and 1.6% of obese patients never have breakfast. More optimistic results were obtained by Włodarek and Głąbska who evaluated dietary habits among 328 type 2 diabetic patients. Only 0.3% of respondents declared that they never had breakfast [19].

Proper hydration is another important aspect. According to the recommendations of the European Food Safety Authority (EFSA), between 2000 and 2500 mL of fluid, i.e. 8-10 glasses, should be ingested on a daily basis [20,21]. Brzuskiewicz et al. found in their study, which aimed to collect data on the nutritional status and dietary habits in 50 patients with metabolic syndrome, that the ingestion of fluids was insufficient. Most of the respondents reported values ranging between 1500 and 1750 mL per day (40% of responses), with up to 26% of respondents declaring daily fluid ingestion below these values [21]. Our results may also raise concern: up to 24.3% of individuals with normal body weight, 21% of overweight and 15.1% of obese patients ingest less than 1000 mL of fluid per day, which is a very small amount, particularly considering the season the study was conducted in.

A well-balanced diet should be characterised by careful selection of food products. Diabetic patients are recommended to consume whole grain products, which are a valuable source of dietary fibre, on a daily basis [19]. In our study, the highest response rates for this consumption frequency were observed among the respondents with normal body weight (62.8%). Białek-Dratwa et al. asked 81 patients with type 2 diabetes about the frequency of consuming whole grain bread. A total of 51.86% of patients declared daily consumption of whole grain bread [22]. Szczepańska et al., who assessed the dietary habits of 122 type 2 diabetic patients prior to and after an individual educational programme, showed lower response rates for this option. This answer was provided by 46.7% of respondents before implementing nutritional education [23].

Fruits and vegetables is a group of products that should be consumed on a daily basis and should be incorporated into each meal. Their consumption significantly improves the overall composition of the diet, increasing the intake of dietary fibre, minerals and polyphenols. Additionally, consuming fruits and vegetables has positive effects on inflammatory and oxidative stress markers [24]. However, it should be remembered that vegetables should be consumed more often than fruit due to their lower content of simple sugars, which should be reduced in the diet of diabetic patients [14]. In a study conducted by Ewa Mędrela-Kuder, which assessed the diet of 100 patients with type 2 diabetes, daily consumption of fruits and vegetables was declared by 78% and 74% of respondents, respectively [25]. Similar results were obtained by Włodarek and Głąbska, with daily consumption of fruits and vegetables reported by 72.9% and 71.4% of

respondents, respectively [19]. Our results seem less optimistic compared to the above mentioned studies – lower response rates for compliance with the dietary recommendations related to the daily consumption of these products were observed. This is particularly alarming as the study was conducted in the summer season, when the consumption of fruits and vegetables is usually higher compared to other months of the year.

Cow's milk is a valuable source of nutritious proteins, at the same time, it has effects on blood glucose levels due to the content of lactose. Szczepańska et al. reported in their study that daily consumption of milk was declared by 19.7% of patients prior to dietary education and 4.1% of respondents after dietary education [23]. Our results are comparable to those received by the authors prior to implementation of the educational training programme. Attention should also be paid to the consumption of fermented dairy beverages as there are scientific reports suggesting that fermentation and enrichment of dairy products with probiotic cultures and vitamin D can have beneficial effects on carbohydrate metabolism [26]. Our study showed the highest daily consumption rates for these products (15.7%) in the respondents with normal body weight.

Fish is desirable in the diet of patients with diabetes mellitus. It is a source of polyunsaturated fatty acids (omega-3 fatty acids), which, among other things, reduce LDL cholesterol levels and help normalise blood pressure [14].

Fish should be consumed several times a week [21]. Our study showed that less frequent consumption of fish was declared by up to 65% of overweight patients, 62% of obese patients and 35.7% of individuals with normal body weight. Szewczyk et al., who assessed the diet of 78 type 1 and type 2 diabetic patients, showed that 70.4% of type 2 diabetic patients declared a fish consumption frequency of less than several times a week [27]. Different results were obtained by Wlodarek and Głąbska. Such an answer was provided by 45.4% of respondents [19]. It is widely known that patients with diabetes mellitus should eliminate confectioneries and sweetened carbonated beverages from their diet. Consumption of these products promotes obesity, increases the severity of inflammation and processes related to insulin resistance [28]. Szczepańska et al. showed in their study that 12.3% of diabetic patients declared daily consumption of confectionery [23]. Similar findings were presented by Białek-Dratwa et al. who attempted to assess confectionery consumption among 147 patients with type 1 and type 2 diabetes; daily consumption of sweets was declared by 13.6% of respondents with normal body weight and 25% of obese respondents [22]. Our study showed lower response rates for daily consumption of confectionery. This option was most often selected by obese patients (10.3%), followed by those overweight (5.1%) and individuals with normal body weight (2.9%). Szczepańska et al. showed in their study that consumption of sweetened carbonated beverages was declared by 40.2% of patients, with occasional consumption reported by 4.1% of respondents [23]. Białek-Dratwa et al. demonstrated that the consumption of sweetened carbonated beverages was declared by 18.2% of respondents with normal body weight and 25% of overweight patients. It should be noted that none of the underweight or obese patients declared consumption of these products [22]. For comparison, our study showed that the consumption of sweetened carbonated beverages was reported by 32.9% of respondents with normal body weight, 52.9% of overweight and 58.8% of obese patients. In conclusion, the dietary habits in the studied population are improper in some cases. It is therefore necessary to implement appropriate education to increase patients' knowledge on nutrition in diabetes as well as on the benefits of body weight normalisation.

## CONCLUSIONS

- Eating habits among patients with type 2 diabetes are varied, with healthy eating habits dominating in subjects with normal body weight.
- A relationship was found between the patients' BMI values and some of the eating habits as well as consumption rates of various food products.

**Author's contribution**

Study design – E. Szczepańska
Data collection – K. Janion
Data interpretation – K. Janion, E. Szczepańska
Statistical analysis – K. Janion
Manuscript preparation – K. Janion, E. Szczepańska
Literature research – K. Janion, E. Szczepańska

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