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HEALTH-RELATED BEHAVIORS OF PEOPLE WITH TYPE 2 DIABETES

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Abstract: Estimates show that the number of people with diabetes exceeded 1 million in Poland and in 90% of cases, type 2 diabetes was recognized. It constitutes a problem not only due to its chronic character, but foremostly, to the complications that develop in the course of the disease, which are often dangerous to a patient's life

Research objective: assessment of knowledge as well as health-related behaviors of patients suffering from type 2 diabetes.

Material and method: The study conducted from 19 to 29 March 2019 covered 100 adult patients of NZOZ 'Diabetolog' on Ppłk. Łukasza Cierplińskiego 4/2 street in Ostrołęka. The management of the Health Care Unit agreed on the study. The method of diagnostic survey was used. The research tool used was a self-designed survey questionnaire.

Results. Half of the studied group (50%) measured glucose levels several times a day. 40% of the respondents chose cooking as the main means of preparing dishes. Meat and its products were eaten with variable frequency by different groups of the respondents. Everyday relax in front of the TV was the most frequent type of spending leisure time (50%).

Conclusions: The majority of the respondents regularly participated in checkups at the diabetes clinic or at the GP's. The members of the studied group were not very physically active. In spite of the respondents' knowledge on an unfavorable impact of stimulants on their organisms, especially on those suffering from diabetes, many of the respondents used them.

Key words: diabetes, health-related behaviors, patient.

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Introduction

Diabetes may be defined as a group of metabolic disorders connected with poor carbohydrate metabolism – it is called primary diabetes. It is related to chronic metabolic disorders, which manifest in glycosuria (the presence of sugar in the urine) as well as fasting hyperglycaemia, or increased levels of glucose concentration in peripheral blood reaching above 11.1 mmol/l, 120 minutes after the 75-gram oral glucose tolerance test [1, 2].

This disease constitutes one of the most significant problems of the contemporary medicine. It is estimated that in Poland, the number of people with diabetes exceeds 1 million, with type 2 diabetes making up about 90% of the cases. This disease is problematic not only due to its chronic character, but foremostly, due to the complications that develop in its course, which are often dangerous to the patient's life. Early diagnosis of diabetes has a great impact on patient's lifestyle, it can lead to the emergence of emotional changes that eventually lead to the deterioration in patient's quality of life [3].

Health education is of great importance in diabetes, as it provides knowledge to people with this disease and their families. The main objective of the education is to hamper the development of the disease as well as motivate patients to cooperate in the process of treatment and self-control. Moreover, health education should minimize the fear of the disease, teach patients how to live with it as well as improve their quality of life [4].

The increasing prevalence caused by type 2 diabetes constitutes one of the most important and most difficult diabetes problems in the whole medicine of the early 21st century. In the developing countries, the morbidity for the disease reaches even a few percent of the population and is quickly expanding. Type 2 diabetes is an undeniable cause of premature mortality of patients mainly due to cardiovascular complications. Diabetes leads to numerous complications, which cause among others sight loss, nervous sys-

tem disorders, kidney failure as well as limbs amputation. Moreover, patients are noted to face serious psychological and economic consequences, which affect not only patients themselves, but also their families, local community and health care system, i.e. the whole society [5].

Epidemiological data show that type 2 diabetes concerns 5-7% of the world?s population, i.e. about 200 million people. This number stays underestimated as a considerable number of people affected by the disease have not yet been diagnosed. Only 50-60% of cases constitute the known diabetes and in the case of the remaining 40-50%, it is the unknown diabetes [1, 6].

WHO informs that in 1980, the number of people with diabetes worldwide reached 108 million, in 2014 it expanded to 422 million. In 1995, 135 million people were diagnosed with diabetes all over the world, with 84 million people in developing countries and 51 million in developed countries. Probably in 2025, there will be 300 million people with diabetes, with 228 million in developing countries and 72 million in developed countries and in 2030, there will be 360 million people with diabetes. It forecasts the general increase in the number of people diagnosed with diabetes of 122%, where in the developing countries this number will increase to 170% and in developed countries to 43%. The greatest increase in the number of people with diabetes is in Asian countries, the Middle East as well as the Western Pacific Islands [1, 7, 8].

In Poland, 3 million people were diagnosed with diabetes and about 750 thousand are not aware of the disease. The prevalence of diabetes amounts to the threshold of 1.6-3.7% and it is probably higher in urban population of 3.5% on average. The incidence for 100 thousand people is estimated to about 200 people. The average age of people with diabetes is usually fewer than 30 years and the incidence increases with age. According to the data prepared by the task force assessing diabetes epidemiology, in 2013, about 1.50 million men and 1.44 million women suffered from diabetes. The greatest number of people with diabetes in 2013 resided in Silesian Voivodeship (6.5%), Łódź Voivodeship (6.4%), Opolskie (6.2%) and Lower Silesian (6.0%) and the lowest number in Podkarpackie Voivodeship (4.6%) and Podlaskie (4.8%). The mortality ranges to about 15 in 100 thousand people with 70% of deaths caused by cardiovascular complications [1, 9, 10].

Currently, 60 million patients suffer from diabetes in Europe. The lowest incidence of this disease is in China and Venezuela – it amounts to 0.1% in 100 thousand people, in Asia and South America $< 1\%$ in 100 thousand people, the incidence $> 20\%$ in 100 thousand in Norway, Great Britain, Sweden and Portugal. The greatest number of people suffer from diabetes in Finland and Sardinia – more than 36% in 100 thousand. In the USA, 7.8% of the whole population is inflicted with diabetes [9].

The diabetes morbidity increases in every age group, especially with middle-aged people between 45 and 64 years [1].

In enthiopathogenesis of diabetes, the most important are two phenomena: interaction between genetic factors and the environmental ones as well as various levels of insulin secretion impairment and also the peripheral insulin resistance. Diabetes is characterized by two-four increase in the risk of cardio-vascular complications. The risk of limbs amputation, stroke and death is especially enhanced in the course of the disease [11].

Polygenic inheritance may play a significant role in the development of type 2 diabetes, however, the genes responsible for the disease have not yet been recognized. In case of improper insulin secretion, except for the genes responsible for the MODY type diabetes, the group of candidate genes may include the glucose transporter 2 gene (GLUT2), sulfonylurea receptors, potassium channels, calcium channels as well as numerous intracellular changes of calcium and also structural proteins of insulin secretory granules [1, 11].

Insulin resistance is probably caused by genetic factors related to the insulin receptor defect, or postreceptor protein coding genes – e.g. protein and serine kinases, insulin receptor substrate as well as glucose transporter. The greatest number of data were gathered on polymorphisms in varying populations related to the peroxisome proliferator-activated receptor gamma (PPARγ), vitamin D receptor as well as the capelin gene [11, 12].

Undoubtedly, the diabetogenic impact is also characteristic to polymorphisms of genes responsible for production and secretion of numerous substances and hormones produced in an adipose tissue, e.g. resistin, adiponectin, which decide on the increase in insulin resistance intensity and by their role in pathogenesis of metabolic syndrome, they participate in the development of type 2 diabetes. Those polymorphisms have a diabetogenic impact on integration with other polymorphisms of genes responsible for insulin secretion and activity as well as with environmental factors [11, 12].

A sudden growth in the frequency of type 2 diabetes incidence is caused, among others, by obesity and low physical activity. Obesity, especially the abdominal one, constitutes the most important acquired environmental risk factor in the development of type 2 diabetes. This risk rises together with the growth of body mass index (BMI) as well as the waist-hip ratio (WHR). An indisputable epidemiologic correlation between obesity and type 2 diabetes is caused by insulin resistance, which results from obesity. Excessive production of free fatty acids in a visceral adipose tissue causes the increase in oxidation of fat in liver and muscles,

which eventually inhibits glucose metabolism by reducing hexokinase activity. Such lipotoxicity in relation to glucose metabolism results in insulin compensatory secretion by β cells. The increase in insulin secretion, especially in case of genetic tendency to this defect, with obese people leads to the depletion of β cells reserves as well as the refraction of glucose metabolic processes. Harmful influence of obesity on the development of diabetes may be linked with the increase in the cell capacity of adipose tissues as well as their adverse profile of secretion (increase in leptin and resistive, TNF, decrease in adiponectin secretion) and a stimulation of adrenergic system [1, 5, 13].

Low physical activity contributes to obesity and inhibits glucose oxidation. As a result, it decreases the activity of cell glucose transporters and intensifies the effect of free fatty acids increased production [1, 12, 13].

Research Objective

The research objective of the work was the assessment of knowledge and health-related behaviors of people suffering from type 2 diabetes.

Material and Method

The study conducted between 19 and 29 March 2019 covered 100 adult patients of NZOZ 'Diabetolog' on Ppłk. Łukasza Cierplińskiego 4/2 street in Ostrołęka. The management of the Health Care Unit agreed on the study.

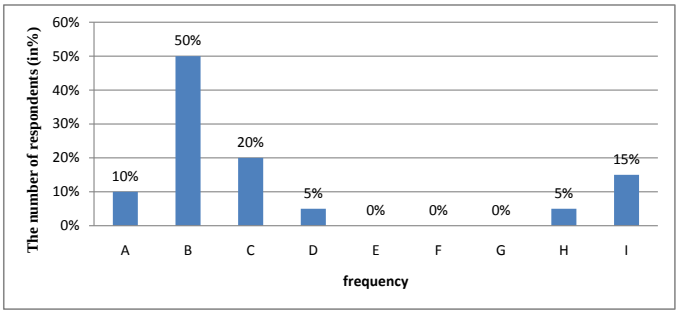
The method of diagnostic survey was used. The research tool was a self-designed survey questionnaire composed of questions divided into two parts: respondents' particulars (6 questions) as well as detailed questions (22 questions). The content included in the questionnaire related, among others, to the respondents' knowledge on diabetes, their habits and lifestyle, dietary preferences as well as stimulants used.

Results

100 people took part in the conducted study. They were the patients of the diabetes clinic suffering from type 2 diabetes. Almost half of the respondents – 45% were people above 51 years. Slightly fewer – 35% – were people between 41 and 50 and 20% of the respondents were between 31 and 40. The vast majority – 70% of the studied people were women. The remaining 30% were men. Half of the respondents (50%) possessed higher education, almost every third (30%) – secondary education. Among the respondents of the questionnaire there were also people with vocational education – 5% and primary education – 15%. Half of the people participating in the survey (50%) inhabited a town with the population of 20 to 60 thousand people. However, every third of the respondents (30%) lived in a village. Moreover, 15% of the studied people inhabited a town with a population of up to 20 thousand and 5% - a bigger one with over 60 thousand people. 40% of the respondents were manual workers, 35% - intellectual workers, 10% were on Disability Living Allowance, 10% were pensioners and 5% were unemployed.

60% of the respondents did not suffer from other chronic diseases except for type 2 diabetes. The remaining 40% suffered from other chronic diseases, such as hypertension (20%), coronary heart disease (10%), asthma (5%) and osteoporosis (5%).

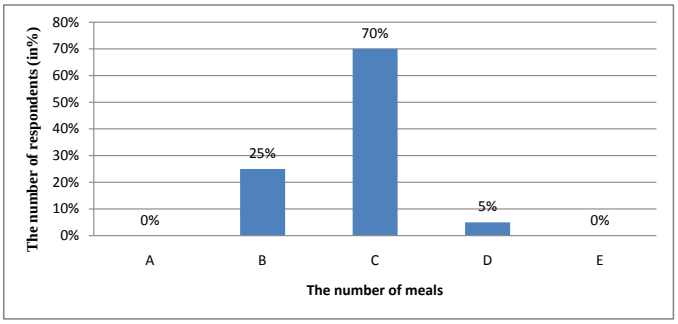
Half of the respondents (50%) measured their blood glucose level once a day. Moreover, 20% of the respondents declared that they measure glucose levels before every meal and 15% less frequently than once a month (Figure 1).



A – once a day B – several times a day C – before a meal D – after meals E – once a week
F – 2 – 3 times a week G – several times a month H – once a month I – less frequently

Fig. 1: The frequency of blood glucose measurements.

The majority of the respondents (70%) declared the consumption of 4–5 meals a day (Figure 2).

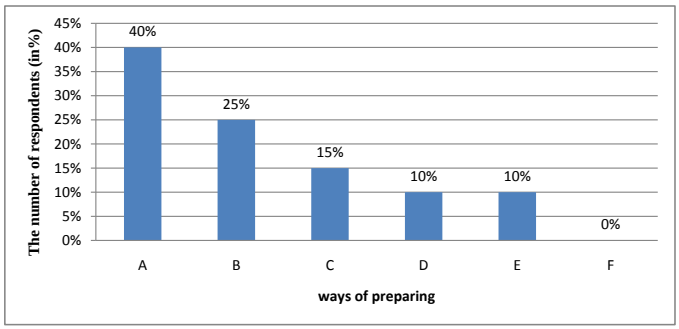


A – 1 – 2 meals B – 3 – 4 meals C – 4 – 5 meals D – 5 – 6 meals E – 7 and more meals

Fig. 2: The number of meals consumed during a day.

65% of the respondents preferred self-prepared meals. The remaining 35%, on the other hand, declared that they eat the same meals as other members of their family.

40% of the respondents chose cooking as the main way of preparing meals. Simultaneously, every forth of the respondents (25%) preferred steam cooking (Figure 3).



A – cooking B – steam cooking C – baking D – frying E – stewing F – other

Fig. 3: Preferred way of preparing meals.

Among the cereal products, the most often i.e. several times a day, the respondents consumed dark, whole-wheat bread (70% of the respondents). Simultaneously, such products as: barley, buckwheat, bulgur and whole-wheat pasta were consumed several times a week (40% of the respondents).

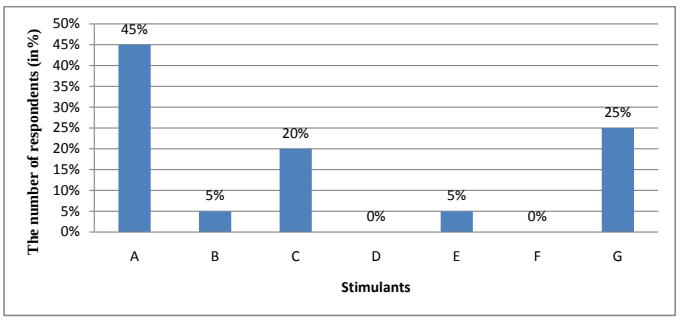
Every third of the studied people (35%) consumed milk several times a day and once a day –curd (35%), natural yoghurt and kephir (30%). Among fresh vegetables and fruit, apples and watermelons were eaten several times a day. On the other hand, $\frac{1}{4}$ of the respondents ate pears and brassica vegetables. In case of snacks and sweets, they are usually consumed less frequently than other products.

Meat and its products were eaten with variable frequency by different groups of respondents. The consumption of meat once a day was declared by 10% of the respondents for each of the following: pork, beef and rabbit and by 20% in case of poultry (Table 1).

From the data presented below (Figure 4), it can be concluded that almost a half, i.e. 45% of the respondents, used a stimulant in the form of strong coffee/tea. Less than a half of them (20%) were people who smoked cigarettes. Apart from that, some of the studied people drank alcohol (55%) or energy drinks (5%).

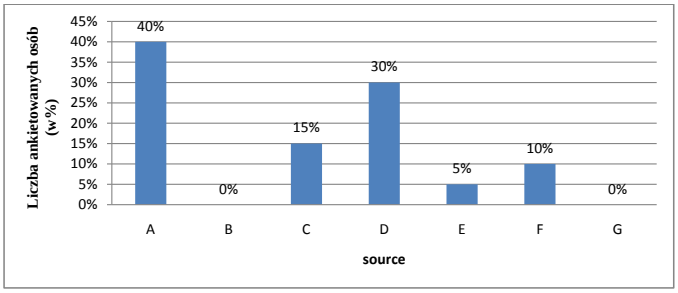
The respondents obtained information on diabetes from the GP – 40%, medical employees of the diabetes clinic – 30%, nurse/midwife – 15%. There were also people who gained information from books, booklets, leaflets (15%). The Internet constituted a source for the studied group in only 5% of cases (Figure 5).

The respondents preferred various forms (ways) of spending free time. Everyday relax in front of the TV was the most frequent one (50%). Almost every third of the studied people (30%) spent his or her free time on walking or reading on daily basis (Table 2).



A – strong coffee/tea B - e-cigarettes C – cigarettes D – drugs E – energy drinks F – other G – none from the above

Fig. 4: Stimulants used by the respondents.



A – from a GP B – from a friend/acquaintance C – from a nurse/midwife D – from a diabetics clinic E – from the Internet F – from books, booklets, leaflets G – from the TV/radio

Fig. 5: Source of obtaining knowledge on diabetes.

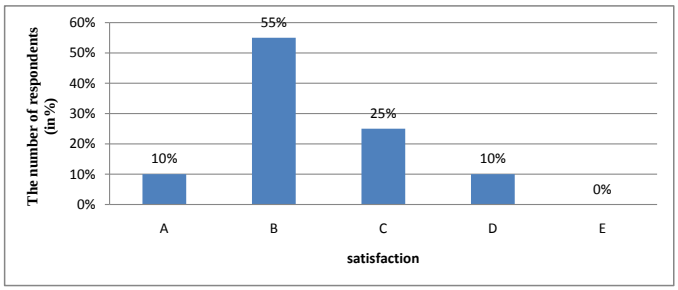
Table 2: Preferred way of spending free time.

Type of activity	Everyday	Severaltimes a week	Severaltimes a month	Seldom	Never
Cycling	15%	20%	30%	15%	10%
Swimming	-	-	15%	25%	35%
Walking	30%	40%	15%	5%	-
Gardening	5%	15%	25%	15%	20%
Needlework	5%	5%	10%	15%	30%
Reading	30%	25%	15%	10%	5%
Relaxing in front of the TV	50%	30%	5%	%	-

Table 1: Frequency of products consumption.

Products	Several times a day	Once a day	Several times a week	Several times a month	From time to time	Never
Cereal products (dark and whole-wheat bread, groats and whole-wheat pasta)						
Dark/ whole-wheatbread	70%	25%	5%	5%	-	5%
White bread: wheat bread, rolls	20%	20%	15%	10%	15%	20%
Pearl barley, buckwheat groats, bul gar	55	15%	40%	20%	15%	5%
Whole-wheat pasta	5%	15%	30%	15%	35%	-
White pasta	-	10%	20%	20%	25%	5%
Yeast and spongecakes	-	5%	10%	20%	35%	15%
Milka and its products						
Milk	30%	30%	20%	5%	5%	5%
Curd	15%	30%	25%	155	5	-
Natural yoghurt, kephir	15%	35%	20%	15%	5%	5%
Fruityoghurt	5%	15%	15%	25%	20%	20%
Yellow cheese, smoked cheese	5%	20%	20%	15%	15%	15%
Margarine	5%	15%	-	15%	20%	25%
Butter	15%	25%	-	15%	15%	10%
Processedcheese	-	-	-	20%	15%	30%
Dairy desserts e.g.: Monte, Belriso…	-	-	-	20%	15%	50%
Fresk fruit and vegetables						
Pears	5%	25%	20%	15%	15%	5%
Grapes	5%	5%	25%	15%	15%	15%
Strawberries	5%	5%	20%	20%	15%	10%
Apples	30%	5%	15%	5%	20%	-
Watermelon	20%	5%	20%	10%	15%	5%
Citrusfruit	5%	15%	15%	10%	25%	5%
Brassica vegetables (cabbage, cauliflower, broccoli, kohlrabi, Brussel sprouts etc.)	10%	255	5%	15%	20%	5%
Root vegetables (carrot, beetroot, parsley etc.)	10%	25%	20%	15%	5%	-
Tomatoes	20%	30%	25%	5%	5%	-
Cucumbers	15%	30%	20%	10%	5%	-
Pepper	15%	25%	20%	5%	5%	5%
Chives, onion	10%	20%	20%	10%	-	5%
Radish	5%	15%	15%	20%	5%	5%
Raw salads	5%	30%	20%	15%	5%	5%
Snacks and sweets						
Milkchocolate	-	-	15%	15%	20%	30%
Dark chocolate	-	5%	15%	20%	15%	30%
Potatocrisps	-	-	-	5%	20%	40%
Salty sticks	-	-	5%	10%	15%	40%
Ice-cream	-	-	5%	10%	20%%	30%
Sweets	-	5%	5%	5%	15%	35%
Fast-food products						
Pizza	-	-	-	10%	25%	30%
Hamburger, kebab	-	-	-	5%	15%	45%
Breaded meat	-	-	-	5%	20%	30%
French fries	-	-	-	5%	20%	30%
Fish						
Tuna	5%	5%	15%	15%	30%	15%
Salmon	5%	5%	15%	15%	25%	10%
Cod	5%	5%	15%	15%	25%	15%
Mackerel	-	5%	15%	10%	15%	15%
Sardines	-	5%	15%	15%	15%	15%
Herring	-	15%	20%	10%	20%	5%
Meat and its products						
Pork	5%	10%	35%	15%	15%	-
Beef	-	10%	15%	25%	20%	5%
Poultry	10%	20%	20%	-	15%	5%
Rabbit	-	10%	15%	15%	15%	15%
Veal	-	-	5%	15%	25%	20%
Smokedbacon	-	5%	5%	5%	25%	25%
Porkham/ tenderloin	15%	5%	15%	15%	20%	5%
Poultryham	15%	10%	15%	15%	15%	5%
Sausage	5%	15%	20%	10%	15%	5%
Frankfurters	5%	5%	20%	20%	10%	10%
Pates	5%	5%	5%	15%	20%	5%
Alcohols						
Wine	-	-	5%	10%	15%	45%
Vodka and other strong alcohols	-	-	-	15%	15%	45%
Beer	-	-	-	5%	15%	50%
Liqueurs	-	-	5%	5%	15%	50%
Drinks						
Fizzy drinks like coca-cola, orangeades	-	5%	5%	5%	15%	50%
Fruitjuices	-	5%	5%	15%	25%	20%
Syrups	-	-	5%	-	25%	20%
Fruitdrinks	-	-	5%	-	15%	20%
Freshly squeezed fruit or vegetable juices	-	5%	10%	10%	15%	20%
Compote	10%	15%	10%	10%	15%	15%
Sparklingwater	20%	15%	5%	5%	10%	5%
Stillwater	50%	15%	5%	5%	-	-
Green tea	40%	30%	5%	5%	-	5%
Coffee	15%	20%	15%	-	5%	5%
Black tea	5%	15%	10%	5%	10%	5%
Energydrinks	-	5%	5%	-	5%	55%

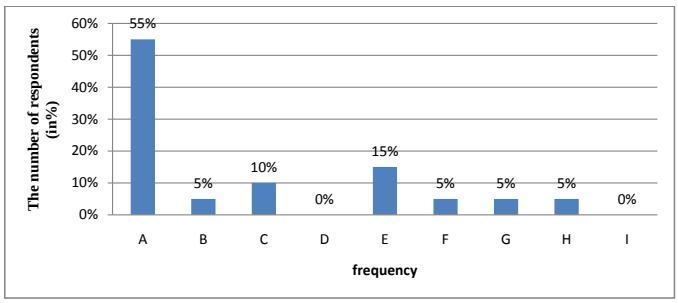
On the basis of the data presented below, it can be stated that the majority of the respondents (65%) were satisfied with their health condition (Figure 6).



A – definitely yes B – rather yes C – hard to say D – rather not E – definitely not

Fig. 6: Satisfaction with health condition.

More than half of the respondents (55%), regularly participated in checkups at the diabetes clinic, or at the GP's. Simultaneously, there were those that participated in such visits once half a year (15%), or once a month (10%). (Figure 7)



A – regularly according to doctor's recommendations B – once 2-3 weeks C – once a month

D – once 2-3 months E – once half a year F – once a year G –only in case of health deterioration

H – more often, always when blond glucose measurements were inappropriate I – do not go on a checkup

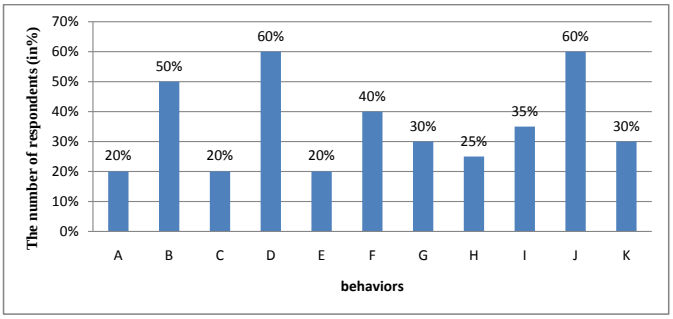
Fig. 7: The frequency of checkups at the diabetes clinic or at the GP's.

The most frequent behaviors connected with skin and feet care were buying loose shoes, measured in the afternoon, when feet are swollen, so that shoes do not constrict feet (60% of the respondents) as well as regular clipping of toenails, not too short (60% of the respondents) (Figure 8). Moreover, rather frequent care procedures were as follows:

- watching feet at least once a day in order to check if they do not have injury, corn, callus (50% of the respondents);
- avoiding excessiveheating and cooling of feet (40% of the respondents);
- not walking barefoot (35% of the respondents);
- not washing feet in hot water and not warming them next to the radiator (30% of the respondents);
- taking a bath in warm water and moisturizing skin after each bath (30% of the respondents).

Furthermore, the skin and feet care of the respondents included also:

- applying fat cream on feet just after washing (25% of the respondents);
- buying loose shoes measured in the afternoon, when feet are swollen, so that the shoes do not constrict feet (20% of the respondents);
- Going to the beautician's in order to remove callus and resigning from removing them alone (20% of the respondents).



A – I do not take care of feet and skin in any particular way

B – I take a look at my feet at least once a day in order to check if there is no injury, corn or callus;

C –I buy loose shoes measured in the afternoon, when feet are swollen, so that shoes do not constrict my feet excessively;

D- I buy light shoes, which enable comfortable walking;E – in case of the appearance of callus, I do not remove them myself, but go to the beautician's;

F - I avoid excessive heating and cooling of feet;G –I do not wash my feet in hot water and I do not warm them next to the radiator;

H – I always apply fat cream just after washing my feet;I – I do not walk barefoot;J – I regularly cut my toenails not too short;

K – I take a bath in warm water and moisture my skin after each bath

Fig. 8: Skin and feet care by the respondents.

Discussion

The Polish Diabetological Association [14] defines diabetes as a group of metabolic diseases, which are accompanied by hyperglycemia caused by insulin secretion defect or its activity. Diabetes treatment, according to Zozulińska [6], is a comprehensive process demanding the application of some or all possible methods simultaneously: diabetics treatment, physical exercise, pharmacological treatment with oral medications lowering blood sugar and insulin as well as therapeutic education. Sieradzki [1], Grzeszczak [7] as well as Tatoń and Czech [8] jointly agree that the existing rules of application and content of contemporary diabetes diet correlate with the rules of healthy lifestyle.It is necessary to consume food regularly; take similar total caloric

content everyday; reduce caloric intake by obese and overweight people, aimed at achieving desirable body mass; the quality content of a diet should provide an adequate participation of all nutrients, one that constitutes the preventive method of atherosclerosis risk factors.The majority of patients who participated in the survey knew the recommended and prohibited products in diabetes diet. Among the cereal products, they indicated especially: barley, buckwheat, bulgur, whole-wheat pasta and dark/whole-wheat bread.Moreover, according to them, the recommended products included, among others: dairy products, e.g. natural yoghurt, curd, brassica and root vegetables as well as fish in the form of raw/baked salmon as well as drinks – water and green tea. On the other hand, the prohibited products in diabetes diet, according to the respondents, are among others: white pasta and cakes, snacks and sweets, e.g. milk and dark chocolate, crisps, ice-cream, sweets, fast-food products as well as meat products, such as smoked bacon, pork ham, frankfurters, pates. The majority of the respondents (70%) consumed 4-5 meals a day, 25% had 3-4 meals and 5% even 5-6 meals daily. They usually prepared meals alone according to their diet (65%), or consumed meals prepared at home, but the same for the whole family (35%).

As Kropornicka et al. [15], Kurowska and Szomszor [16] as well as Król et al. [17] state, for the proper functioning of patients with type 2 diabetes, it is important to obey the diet and avoid stimulants. According to the self-prepared research, 45% of the respondents drank strong tea or coffee, 20% smoked cigarettes, 5% declared the consumption of alcohol or energy drinks. Every forth of the respondents (25%) did not use any stimulants. Unfortunately, 45% of the respondents used stimulants several times a day and 25% - once a day.

Physical activity has a significant impact on diabetes treatment. The respondents preferred various forms of spending free time and participated in them with varying frequency. They mostly chose relaxation in front of the TV. 50% of the respondents spent their free time everyday in such a way and 30% - a couple of times a week. As a form of leisure activity, walking was practiced everyday by 30% of the respondents.

Diabetes is a chronic disease, the course of which can be controlled. ZarzyckiorazPopławska [18] pay attention to the necessity of conducting a comprehensive treatment, which would cover numerous fields of activity. Proper education of patients and their families plays a crucial role. It should be based on health-related behaviors diagnosis, which could prevent complications either the acute and chronic ones. 40% of the studied people gained information on the disease from the GP, 30% from medical staff of a diabetes clinic and 15% from nurses or midwives. The rest sought information on the disease alone, e.g. in books and booklets (10%) or the Internet (5%). The majority of the respondents (65%) were satisfied with their health condition and more than a half (55%) had regular checkups at the diabetes clinic or at the GP's according to the recommendations.

Conclusions

The following conclusions were drawn after analyzing the research material:

1. The respondents knew the rules of the diabetes diet, chose the recommended or prohibited diabetes diet products correctly.
2. The majority of the respondents practiced the rules of diabetes diet.
3. The majority of the respondents regularly attended checkups at the diabetes clinic or at the GP's.
4. The studied patients were not very physically active.
5. In spite of the knowledge of the respondents on an unfavorable impact of stimulants on their organisms, especially on people with diabetes, a lot of the respondents used stimulants.

Literature

[1] Sieradzki J. *Choroby wewnętrzne*, chapter Cukrzyca i zespół metaboliczny, pages 1179–1204. Medycyna Praktyczna, Kraków, 2005.

[2] Kowalec P., Kielar M., Pilc A. Koszty leczenia cukrzycy typu 1 i 2 w polsce. *Diabetologia Praktyczna*, 7:287–294, 2006.

[3] Pufal J., Goerach M., Pufal M. et al. Wpływ czynników społeczno-demograficznych i klinicznych na jakość życia chorych na cukrzycę typu 2. *Diabetologia Doświadczalna i Kliniczna*, 4:137–143, 2004.

[4] Hein P. *Cukrzyca. Krótki kurs diabetologii.* PWN, Warszawa, 1997.

[5] Małecki M.T. Otyłość – insulinooporność – cukrzyca typu 2. *Kardiologia Polska*, 64:561–566, 2006.

[6] Zozulińska D. Historia naturalna i leczenie cukrzycy typu 2. *Przewodnik Lekarza*, 3:30–39, 2006.

[7] Grzeszczak W. Cukrzyca typu 2 – aktualne możliwości prewencji. *Przewodnik Lekarza*, 6:16–23, 2003.

[8] Tytoń J., Czech A. *Zwyciężyć cukrzycę.* PZWL, Warszawa 2012.

[9] Sieradzki J. *Cukrzyca typu 2.* Via Medica, Gdańsk 2016.

[10] Moczulski D. *Wielka Interna – Diabetologia*, chapter Epidemiologia cukrzycy, pages 33–35. Medical Tribune Polska, Warszawa 2010.

[11] Chojnowski P., Wasyluk J., Grabska-Liberek J. Cukrzyca – epidemiologia i patogeneza. *Postępy Nauk Medycznych*, 6:420–428, 2009.

[12] Grzeszczak W. Patogeneza i leczenie chorych na cukrzycę typu 2. co nowego opublikowano na ten temat w pierwszej połowie 2010 roku? *Choroby Serca i Naczyń*, 3:118–125, 2010.

[13] Walicka M., Chomiuk T., Filipiak K.J. et al. Zapobieganie rozwojowi cukrzycy typu 2. stanowisko grupy ekspertów wsparte przez sekcję farmakoterapii sercowo-naczyniowej polskiego towarzystwa kardiologicznego. *Kardiologia Polska*, 10:949–957, 2015.

[14] Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2017. stanowisko polskiego towarzystwa diabetologicznego. *Diabetologia Praktyczna*, 3(suplement A), 2017.

[15] Kropornicka B., Baczewska B., Stefaniak E. et al. Zachowania prozdrowotne pacjentów w z cukrzycą typu 2. *Przedsiębiorczość i Zarządzanie*, 10:395–408, 2013.

[16] Kurowska K., Szomszor M. Wpływ zachowań zdrowotnych na jakoś życia u osób z rozpoznaniem cukrzycy typu 2. *Diabetologia Praktyczna*, 12:142–150, 2011.

[17] Król H., Zboina B., Nowak-Starz G. et al. Styl życia osób z rozpoznaną cukrzycą typu 2. *Zdrowie Dobrostan*, 4:150–158, 2013.

[18] Zarzycki W., Popławska E. Edukacja terapeutyczna chorych na cukrzycę. *Diabetologia Praktyczna*, 3(suplement B):21–26, 2002.

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