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Physical activity in cognitive and practical competences of individuals with diabetes type 1

ABSTRACT

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Background. Physical activity is an integral part of prevention and comprehensive diabetes management which prevents progression of carbohydrate metabolism disturbances in prediabetic states. The aim of the study was to evaluate the level of cognitive and practical competences in individuals with diabetes type 1 regarding the role of physical activity in their lives, including the benefits of physical activity, sources of information, frequency and type of undertaken activities, and barriers to physical activity.

Methods. Overall, 128 persons participated in this internet-based diagnostic poll, and the analysis was based on 90 questionnaires filled by individuals with diabetes type 1.

Results. Knowledge of benefits from physical activity was declared by 77.8% of the respondents. The most common sources of education regarding physical activity were internet resources (35.6%) and physicians (31.1%). Daily physical activity before the diagnosis was reported by 32.2% of the respondents, and after the diagnosis by 30.0% of the respondents. Activity for 30 minutes at least 3 times a week before the diagnosis was reported by 31.1% of the respondents, and after the diagnosis by 40.0% of the respondents. No physical activity was reported by 10.0% of the respondents.

Address for correspondence: Anna Ławnik Wydział Nauk o Zdrowiu Państwowa Szkoła Wyższa im. Papieża Jana Pawła II Biała Podlaska e-mail: lawnikania@gmail.com Clinical Diabetology 2021, 10; 2: 155–160 DOI: 10.5603/DK.a2021.0008 Received: 06.07.2020 Accepted: 03.11.2020 Conclusions. Most respondents declared knowledge of health benefits from undertaking physical activity by individuals with diabetes type 1. Internet websites and physicians are the major sources of education regarding physical activity in individuals with diabetes type 1. Most respondents reported being physically active daily or at least 3 times a week but one in ten respondents was not physically active at all. The major types of physical activity undertaken both before and after the diagnosis were walking and cycling. Hiking was undertaken more frequently after the diagnosis of diabetes. The respondents identified more barriers to physical activity after the diagnosis of diabetes type 1. (Clin Diabetol 2021; 10; 2: 155–160)

Key words: diabetes type 1, physical activity, education, knowledge, prevention

Introduction

Diabetes is an increasingly challenging problem in the modern world. Over the last twenty years, the number of patients with diabetes has doubled and continues to increase. Currently, the worldwide prevalence of diabetes is 9.3%, which translates to 463 million people with diabetes including 222 million women and more than 240 million men. In addition, 1.1 million children and adolescents suffer from diabetes. It has been predicted that worldwide, the number of people with diabetes will increase to 281 million women and 296 million men by 2030, and 342 million women and 257 million men by 2045 [1]. In the report "Diabetes. A Hidden Pandemic. Situation in Poland. 2014 Edition" (*Cukrzyca. Ukryta pandemia. Sytuacja w Polsce. Edycja 2014*), the number of people with diabetes in Poland has been estimated at 3 million [2].

Diabetes generates significant costs. In Poland, the expenses related to the treatment of diabetes and its complications along with indirect costs (disability and social security benefits) amounted to 7 million zloty in 2013 [3]. The International Diabetes Federation (IDF) estimated that the annual cost of diabetes treatment worldwide is 760 billion USD. The costs of treating diabetic complications amounted to more than half of this sum. Disability benefits, absence from work, and other indirect costs amounted for additional 35%. IDF estimates that the annual cost of diabetes treatment worldwide will increase to 825 billion USD by 2030, and 845 billion USD by 2045 [1].

A continuously growing number of new diagnoses of diabetes along with a large number of people with established diabetes should prompt actions to limit this growing incidence [3]. Physical activity is an integral component of prevention and comprehensive management of diabetes, preventing progression of carbohydrate metabolism disturbances in prediabetes. Thirty minutes of moderate physical activity 5 times a week are recommended [4-6]. Studies showed that in individuals with impaired glucose tolerance, healthy behavioural modification targeted at reducing overweight (by about 5–7%) and systematic physical activity (30 minutes daily 5 times a week) reduced the risk of developing diabetes by 58.0% over 2-3 years [7]. These results were obtained in patients with diabetes type 2 but the findings in patients with diabetes type 1 indicate that exercise is an important component of the management alongside insulin therapy and diet [8]. Use of glucose as an energy substrate for the body during exercise affects its blood level. Blood glucose level depends on the intensity and duration of exercise, and thus patients planning physical activity show know how to prepare to it. Regular physical activity should be encouraged particularly in young people with uncomplicated and well controlled diabetes. Patients should be educated regarding the effect of various type of physical activity (e.g., resistance, interval, or aerobic training) on blood glucose levels [4]. The intensity of exercise should be prescribed by a physician based on the overall clinical picture. The recommended forms of physical activity include nordic walking and brisk walking, which are aerobic activities. These types of activity are recommended in all age groups and considered safe even in overweight individuals [4, 5].

A well-educated person with diabetes type 1, treated with intensive insulin therapy and achieving adequate metabolic control, is able to undertake the same physical activity and to reach similar professional goals as non-diabetic subjects of a similar age [4]. Diabetes education regarding the approach to physical activity is a responsibility of the healthcare providers. However, the existing diabetes education programs cover these issues only very briefly [9].

The aim of the study was to evaluate the level of cognitive and practical competences in patients with diabetes type 1 regarding the role of physical activity in their lives, including the benefits of physical activity, sources of information, frequency and type of undertaken activities, and barriers to physical activity.

Material and methods

The study used the diagnostic poll method. An original questionnaire was used that included 8 questions, including 3 personal information questions (gender, age, and diabetes type) and 5 research subjectspecific questions. The questionnaire was posted on an internet social media portal for people with diabetes. The study included individuals with diabetes with an access to internet/Facebook willing to participate in an anonymous study. Overall, the questionnaire was completed by 128 persons. The analysis included 90 questionnaires filled by individuals with diabetes type 1 (incomplete questionnaires and those filled by persons with other diabetes type were rejected). The age range of the study subjects was 9 to 64 years (mean 29.34 years), thus encompassing all age groups including children, adolescents, adults, and older people. Females amounted for 65.6%, and males for 34.4% of all respondents. The obtained data were analysed using the Statistica software (the Wilcoxon signed-rank test and the signed test were employed) and reported in a graphical and descriptive fashion.

Results

Most respondents with diabetes type 1 (77.8%) declared being aware of the benefits of undertaking physical activity by diabetic individuals. Only 2.2% of respondents declared that they did not know the benefits and were not interested in that issue. Detailed results are shown in Figure 1.

Among the analysed educational sources providing information about undertaking physical activity by individuals with diabetes type 2, the respondents most commonly indicated internet websites (35.6%) and diabetes specialists or family physicians (31.1%). The least commonly indicated sources were support groups and nurses. Detailed results are shown in Figure 2.

The respondents were asked to evaluate the amount of their physical activity before the diagnosis of diabetes type 1 and currently. Most commonly (40.0%), the respondents indicated at least 30 minutes of physical activity at least 3 times a week, and 30.0% of the respondents indicated daily activity. One in ten



Figure 1. Knowledge of benefits from physical activity in diabetic individuals



Figure 2. Sources of information about undertaking physical activity by individuals with diabetes type 2 used by the respondents

respondents undertook no physical activity. When asked about physical activity before the diagnosis, similar proportions of the respondents declared 30 minutes of physical activity daily or at least 3 times a week (32.2% and 31.1%, respectively) but as many as 12.2% of the respondents did not answer this question. Detailed results are shown in Figure 3.

When the amount of physical activity before the diagnosis of diabetes and currently was compared, 11 questionnaires (12.2%) were rejected due to lacking answer regarding physical activity before the diagnosis. The analysis showed no statistically significant

differences. Most commonly, the declared amount of physical activity remained the same (41.8%). It was reported as reduced compared to the period before the diagnosis of diabetes by 31.6% of the respondents, and as increased by 26.6% of the respondents. Among individuals who reported no change in the amount of physical activity, nearly half (45.5%) declared daily physical activity.

Both before the diagnosis of diabetes and currently, the most common types of physical activity were walking and cycling. Of note, all forms of physical activity except for running were reported to be currently



Figure 3. How often a 30-minute physical activity was undertaken before the diagnosis of diabetes type 1 and currently



Figure 4. Types of physical activity undertaken by the respondents before the diagnosis of diabetes type 1 and currently. *Significant at P < 0.05

undertaken more frequently compared to the period before the diagnosis of diabetes. However, a significant difference was noted only for hiking (P = 0.0218). Detailed results are shown in Figure 4.

Both before the diagnosis of diabetes type 1 and currently, the most commonly reported barriers to undertaking physical activity were: lack of free time (24.4% and 48.9%, respectively), poor exercise capacity (18.9% and 24.4%, respectively), and unwillingness to exercise (16.7% and 18.9%, respectively). Compared to the period before the diagnosis of diabetes, the following barriers to undertaking physical activity were currently reported more frequently: lack of free time (P = 0.0002), fear of intensive exercise (P=0.0265), fear of health status worsening (P = 0.0026), and poor health status (P=0.0265). Lack of professional knowledge regarding the preparation for undertaking physical activity was reported by 7.8% of the respondents. Detailed results are shown in Figure 5.

Discussion

In a 2018 nationwide study by the Centrum Badania Opinii Społecznej (CBOS), six out of ten Poles reported participating in some sport or physical activity. The most popular forms of physical activity were cycling, swimming, and hiking. Less commonly reported activities included gym and sports hall training, home training, and running/jogging. Of the analysed sociodemographic variables, physical activity was most strongly related to age, as it was most commonly undertaken by young individuals. Additional important factors were education, financial status, and place of residence. Participation in sports was more commonly reported by the respondents who were better educated, more satisfied with their household financial status, and living in larger communities. According to CBOS, "Poles decide to participate in sports for various reasons. Most commonly, these are health-related motivations, followed by participation in sport for personal pleasure, and third, for better well-being and combating stress" [10].

The 2002 World Health Organization (WHO) report indicated that lack of physical activity was responsible for 15% of incident cancer, diabetes, and heart disease. Benefits of physical activity include improvement of the overall health status, quality of life, and diabetes control [11].



Figure 5. Barriers to undertaking physical activity before the diagnosis of diabetes type 1 and currently. *Significant at P < 0.05

The present study provided data on the place and role of physical activity in the lifestyle of patients with diabetes type 1. The findings illustrate the status of cognitive competence (awareness) of the respondents with diabetes type 1, as indicated by the reported educational sources and knowledge of the benefits of regular physical activity. According to the Diabetes Poland guidelines, patient awareness (cognitive competences) is an important factor that encourages the patients to undertake physical activity [14]. Knowledge regarding the health benefits of physical activity was declared by as many as 77.8% of the respondents. The respondents indicated internet websites (35.6%) and physicians (31.1%) as the most commonly used sources of information. As noted by Kobos et al. in 2014, patient education has become as important as the drug treatment in the currently used diabetes management strategy, i.e., the self-therapy model. Thus, diabetes education may be defined as "the process of providing individuals with information and skills necessary for diabetes care, problem coping, and introduction of lifestyle changes to successfully manage the disease" [12]. As highlighted by the Diabetes Poland, education is a constant, integral, and necessary component of diabetes management during each physician's visit, at the time of diagnosis, and also based on periodical feedback assessment of the patient's educational needs or at the patient's request. In the current epidemiological situation, it is also justified to use teleeducation based on recommendable internet websites and mobile applications [4].

According to Pastwa (2017), 65% of diabetic patients are aware what their disease is, and what are the causes and consequences of diabetes. Patients know how their condition is treated, what methods are available, and how diabetes can be treated. Patients can address symptoms of hyper- and hypoglycaemia, are able to diagnose these symptoms, and are able to react promptly. They are aware of negative effects of stimulants, and most of them try to comply with the recommended diet [13].

Another research task was to determine the practical competences of the respondents, i.e., skills enabling them to undertake specific forms of physical activity. Of note, among 7 forms of physical activity, all but running are currently undertaken more frequently compared to the period before the diagnosis. By far, the two most popular activities were walking and cycling, both showing upward trends (increase from 65.6% to 73.3% for walking, and from 62.2% to 67.8% for cycling). These activities are characterized by aerobic exercise. Studies by American authors showed that aerobic, resistance, and mixed (aerobic combined with resistance) exercise lead to a large reduction of blood glucose levels. To prevent late hypoglycaemia, single sprint sessions added to aerobic exercise may be advised [14]. Studies show that systematic exercise is one of the most important factors exerting a beneficial pleiotropic effect on most physiological processes [15].

Our study showed a high prevalence of undertaking physical activity by patients with diabetes type 1. At least 30 minutes of activity at least 3 times a week was declared by 40.0% of the respondents, and daily activity by 30.0% of the respondents. The characteristics of the study group likely contributed to these high rates, including small study sample, questionnaire study design, having access to internet/Facebook, and commitment to diabetes self-education by following web pages focused at diabetes. Much less favourable data regarding individuals with diabetes type were presented in the 2018 report "Polish family with diabetes" [Polska rodzina z cukrzycą]. In that report, systematic physical activity for 30 minutes at least 3 times a week was declared by 24% of patients, while less frequent activity was declared by 73% of the study subjects. Somewhat reassuringly, however, only 3% declared no physical activity at all [16].

Finally, another research task was to identify barriers that, in the respondents' opinion, precluded them from undertaking regular physical activity. Of note, all 9 barriers were reported to be currently present more frequently compared to the period before the diagnosis. The major barriers identified by the respondents included lack of free time (24.4% before the diagnosis, 48.9% currently), poor exercise capacity (18.9% and 24.4%, respectively) and unwillingness to exercise (16.7% and 18.9%, respectively). Studies in patients with diabetes type 2 indicate that individuals with chronic conditions are less willing to undertake moderate or intensive physical activity and are more likely to give up such activity. Specific barriers in diabetic patients include an increased risk of hypoglycaemia, foot discomfort during exercise, pain, general discomfort, and the need to monitor blood glucose levels [17]. An increased risk of hypoglycaemia is directly related to the type and intensity of daily physical activity. As shown by Zielińska et al., the rate of hypoglycaemia events depends on the type of diabetes and it is highest in patients with diabetes type 1, and in those in diabetes type 2 treated with insulin. The rate of hypoglycaemia increased with the intensity of physical activity. These studies were performed in a large patient sample, and thus provided robust data regarding the presence of this barrier [18].

Conclusions

- Most respondents declared knowledge of health benefits from undertaking physical activity by individuals with diabetes type 1.
- Internet websites and physicians are the major sources of education regarding physical activity in individuals with diabetes type 1.
- Most respondents reported being physically active daily or at least 3 times a week both before and after the diagnosis but one in ten respondents was not physically active at all.
- 4. The major types of physical activity undertaken both before and after the diagnosis were walk-

ing and cycling. Hiking was undertaken more frequently after the diagnosis of diabetes.

 The respondents identified more barriers to physical activity after the diagnosis of diabetes type 1.

Conflict of interest

The authors report no conflicts of interest.

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