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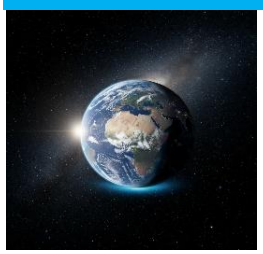

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Regular physical activity as a key element of type 2 diabetes prevention - case report of a 53-year-old man with diagnosed prediabetes

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Abstract

Background: Prediabetes is the intermediate stage between normal glucose levels and type 2 diabetes. Recognized methods for treatment are behavioral intervention (physical activity and diet) and pharmacotherapy. Regular physical activity can cause normalization of glycemia without the use of medication and diet.

Aim: The aim of this paper is to examine how regular, moderate physical activity influences metabolism and carbohydrate parameters in a prediabetic 53-year-old man without a change in diet or administering pharmacotherapy.

Material and Methods: The patient is a 53-year-old male exhibiting abnormal glucose values for 6 years. The patient had a sedentary lifestyle and refused pharmacotherapy and diet restriction of simple carbohydrates. OGTT tests showed:

2021 fasting glucose at 115mg/dL and after 2 hours 86mg/dL

2023 106 mg/dL

2025 107 mg/dL

The patient began physical activity (5 times a week running for 30 minutes, 2 times per week playing badminton for 90 minutes, and an increase in spontaneous physical activity). After a year of increased physical activity OGTT tests were performed resulting in normal results.

2026 fasting glucose 94 mg/dL, glucose after 2 hours 115 mg/dL

Accompanying the positive glucose results there was a reduction of body mass from 100 kg to 92 kg.

Conclusion: In a patient leading a sedentary lifestyle, physically little active after 12 months of regular physical activity, mainly aerobic there occurred normalization of glycemia and reversal of prediabetes.

Keywords: prediabetes, glycemia, physical activity, badminton, lifestyle medicine, case report.

Introduction

In Poland, about 5 million people have prediabetes, a disturbance of glycemia, which can lead to full-blown diabetes. Chronic hyperglycemia is associated with damage, disturbance of function and insufficiency of various organs, especially the heart, blood vessels, eyes, kidneys and nerves. Therefore, in persons in specific risk groups screening tests for diabetes should be performed every year, fasting glucose level or OGTT such as:

With overweight or obesity (BMI ≥25 kg/m2)

With diabetes occurring in the family (parents or siblings)

With previously diagnosed prediabetes

With arterial hypertension

With cardiovascular disease

With dyslipidemia

With a sedentary lifestyle.

Normoglycemia is defined as 70-99 mg/dl for a fasting blood glucose concentration. When a patient has a glycemia value between 100 and 125 mg/dl fasting then an oral glucose tolerance test (OGTT) should be performed. This test consists of a two-time determination of glucose – fasting and 2 hours after drinking 75 grams of glucose dissolved in 250-300 ml of water. Normal values of the test are 2 hours after loading <140 mg/dl.

Prediabetes is recognized under the following guidelines:

Impaired fasting glucose (IFG) glucose concentration from 100 to 125 mg/dl

Impaired glucose tolerance (IGT) glucose concentration in the 120th minute of the test between 140 - 199 mg/dl.

According to the Polish Diabetes Associations proposed treatment of prediabetes is with lifestyle changes. Such as a change in nutritional habits, reducing intake of simple sugars, an increase in physical activity and pharmacotherapy (metformin).

Regular aerobic exertion improves the sensitivity of tissues to insulin, favors reduction of body mass and normalization of metabolic parameters. The article presents a case of a 53-year-old man in whom because of systematic physical activity normalization of fasting glycemia and reversal of prediabetes were obtained.

Materials and Research methods

The patient is a 53-year-old male, resident of a city, working as an office worker (sedentary work, 8 hours a day), without chronic diseases. He has a family history of type 2 diabetes (brother was diagnosed at 48, father was diagnosed at 65). The patient does not smoke cigarettes, does not consume alcohol. Before reporting to the primary-care clinic the patient performed physical activity sporadically (walks with dog), most free time was spent in a sedentary position. He declared he ate irregular meals, composed of highly processed products. Baseline Anthropometric and Clinical Characteristics:

Height 185 cm

Weight 100 kg

BMI 29.2 kg/m2

Waist circumference 102 cm

Arterial pressure 120/80 mmHg

Resting pulse 80 bpm

Laboratory test results:

2021 OGTT – fasting glucose 115 mg/dl, 2 hours after loading 86 mg/dl

2023 glucose level 106 mg/dl

2025 glucose level 107 mg/dl

Based on applicable criteria of PTD and WHO prediabetes was recognized (impaired fasting glucose IFG). Previous recommendations of the family doctor included modification of diet, increase of physical activity and pharmacotherapy. From 2021 to January 2025 the patient did not undertake any behavioral therapy, did not agree to pharmacotherapy. Only after re-examination of glucose in January 2025 where the glucose level amounted to 107 mg/dl the

patient decided that he would change lifestyle, begin intensive physical activity. He still did not agree to pharmacotherapy.

Intervention

In January 2025, after consultation with the PHC doctor and assessment of cardiovascular capacity (ECG, laboratory tests) commencement of regular physical activity was recommended. The program consisted of three elements over 12 months:

Running – aerobic training, 5 times a week for 30 minutes, continuous running of moderate intensity allowing for free conducting of conversation, earlier warm-up 5-10 minutes of jogging and stretching exercises after finishing the run. In the first 3 weeks an adaptive period was applied (march interspersed with jogging), after which the patient moved to continuous run maintained through the whole training unit.

Playing badminton 2 times a week for 90 minutes (doubles, singles) with high intensity.

Increase of spontaneous physical activity, introduction of pedometer / monitoring application, goal is about 10000 steps per day, replacing short car trips with walking, using stairs instead of elevator, walks with dog.

In the studied period of the patient did not introduce radical dietary changes, he limited only sweets and increased consumption of vegetables. The main modification of lifestyle concerned physical activity. Hypoglycemic pharmacotherapy was not applied.

Results

Following 12 months of regular physical exertion (running, playing badminton, spontaneous physical activity) control tests were performed again. A OGTT test was performed and the patient returned to normoglycemic ranges of 94 mg/mL and 115mg/dL for the 2 hour post-load glucose. The patient reported an improvement of well-being and a decrease of feeling of fatigue during the day, along with increased exercise tolerance. There was a reduction of body mass of 8kg (8%), the patients' weight decreased from 100 kg to 92 kg. The weight loss corresponded to a decrease in BMI from 29.2 kg/m^2 to 26.9 kg/m^2.

Discussion

The presented case illustrates the clinical effectiveness of intensive lifestyle intervention, with particular emphasis on regular physical activity in a patient with prediabetes in a middle aged adult. The results are consistent with observations from the DPP (Diabetes Prevention Program) study. In this study 3234 persons with prediabetes (IFG and IGT) took part, average age of studied persons is 55 years, average BMI is 31 kg/m2. Patients were divided into 3 groups. The first group constitutes patients in whom only behavioral intervention was applied (aimed

for 7% reduction of body mass, 150 min of moderate physical activity weekly was recommended – mainly fast walk). The second group in this study received metformin, and the third group constitutes placebo. The results of this study: reduction of relative risk of diabetes in the behavioral intervention group amounted to as much as 58%, and in the group of patients using metformin only 31%. The DPP study confirmed very high effectiveness of behavioral intervention in prevention of type 2 diabetes.

In the presented case glycemia underwent normalization, approx. 8% reduction of body mass was achieved which exceeds the goal of the DPP program, arterial pressure remained without changes.

The metabolic mechanisms lying at the basis of this improvement are well documented: physical exertion increases transport of glucose to muscles independently of insulin action (activation of GLUT4 transporters), improves insulin sensitivity, decreases amount of visceral adipose tissue and favorably affects adipokine profile. Additionally anaerobic training increases muscle mass, increasing resting metabolic rate and capacity of buffering glucose.

The described training program is similar to recommendations of leading scientific societies (ADA, PTD), which recommend at least 150 min weekly of aerobic exertion of moderate intensity in persons from risk groups of type 2 diabetes. In the presented case the patient engaged in about 330 min of exertion weekly, corresponding to double the recommended amount. It is worth emphasizing that the intervention was exclusively non-pharmacological and still led to reversal of prediabetes.

A limitation of the described case is the lack of full documentation of all metabolic parameters including glycated hemoglobin, lipid profile and body composition, along with a lack of standardized exercise tests before and after intervention. Nevertheless, the clear improvement of the key parameter, fasting glycemia, together with the absence of other significant changes in lifestyle indicates the dominant role of physical activity in the obtained effect.

Conclusion

Regular, systematic physical activity realized in accordance with recommendations of prophylactic programs such as in the DPP study constitute a key element of effective prevention of type 2 diabetes in persons with prediabetes. In a 53-year-old man with prediabetes introduction of a physical activity program associated with slight modification of diet led within 12 months to normalization of glycemic parameters, significant reduction of body mass. The described case confirms the necessity of early detection of prediabetes and implementation of

intensive, individualized lifestyle intervention as a primary strategy of prophylaxis of type 2 diabetes.

Disclosure Patient consent

Obtained written, informed consent of the patient for publication of anonymous clinical data.

Ethics: in accordance with local regulations this case report of a single patient did not require approval by the Bioethics Committee.

Conflict of interest: the authors declare that there is no conflict of interest.

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Authors' contribution

Concept and design – AB, AR, AD

Data collection –AB KO, MZ

Analysis and interpretation – ZG, JB

Manuscript preparation – PS, IP

Critical verification – AB, AR

All authors read and approved the final version of the manuscript.

Use of artificial intelligence: artificial intelligence tool was used exclusively for linguistic editing and structuring of the manuscript. All clinical content, data and interpretations were developed, verified and are the responsibility of human authors.

References

American Diabetes Association. (2024). Standards of care in diabetes—2024. *Diabetes Care*, *47*(Supplement 1), S1–S321. https://doi.org/10.2337/dc24-S001

American Diabetes Association. (2025). Standards of care in diabetes—2025. *Diabetes Care*, *48*(Supplement 1), S1–S330. https://doi.org/10.2337/dc25-S001

Bird, S. R., & Hawley, J. A. (2017). Update on the effects of physical activity on insulin sensitivity in humans. *BMJ Open Sport & Exercise Medicine*, *2*(1), e000143. https://doi.org/10.1136/bmjsem-2016-000143

Colberg, S. R., Sigal, R. J., Fernhall, B., Regensteiner, J. G., Blissmer, B. J., Rubin, R. R., Chasan-Taber, L., Albright, A. L., & Braun, B. (2010). Exercise and type 2 diabetes: The American College of Sports Medicine and the American Diabetes Association joint position statement. *Diabetes Care*, *33*(12), e147–e167. https://doi.org/10.2337/dc10-1548

DECODE Study Group. (1999). Glucose tolerance and mortality: Comparison of WHO and American Diabetes Association diagnostic criteria. *The Lancet*, *354*(9179), 617–621. https://doi.org/10.1016/S0140-6736(98)12131-1

Diabetes Prevention Program Research Group. (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine*, *346*(6), 393–403. https://doi.org/10.1056/NEJMoa012512

Diabetologia po Dyplomie. (2023). Editorial: Nowoczesne podejście do stanu przedcukrzycowego [Modern approach to prediabetes]. *Diabetologia po Dyplomie*, *20*(1), 12–15.

Dubaj, P. (2025). Small steps, big changes: The impact of daily step counts on diabetes prevention and management — A systematic review. *Clinical Diabetology*, *14*(1), 56–64. https://doi.org/10.5603/cd.101566

Gerstein, H. C., Santaguida, P., Raina, P., Morrison, K. M., Balion, C., Hunt, D., Yazdi, H., & Booker, L. (2007). Annual incidence and relative risk of diabetes in people with various categories of dysglycemia: A systematic overview and meta-analysis of prospective studies. *Diabetes Research and Clinical Practice*, *78*(3), 305–312. https://doi.org/10.1016/j.diabres.2007.05.004

Grøntved, A., Rimm, E. B., Willett, W. C., Hu, F. B., & Mekary, R. A. (2012). A prospective study of weight training and risk of type 2 diabetes mellitus in men. *Archives of Internal Medicine*, *172*(17), 1306–1312. https://doi.org/10.1001/archinternmed.2012.3138

Hawley, J. A., & Lessard, S. J. (2008). Exercise training-induced improvements in insulin action. *Acta Physiologica*, *192*(1), 127–135. https://doi.org/10.1111/j.1748-1716.2007.01783.x

Harvard Health. (2025). Exercise variety, not just volume, is tied to longer life. *News-Medical Life Sciences*. https://www.news-medical.net/health/Exercise-variety-not-just-volume-tied-to-longer-life.aspx

Perreault, L., Skyler, J. S., & Rosenstock, J. (2023). Prediabetes remission: An emerging endpoint in diabetes care. *Diabetes Care*, *46*(12), 2098–2107. https://doi.org/10.2337/dc23-1000

Richter, E. A., & Hargreaves, M. (2013). Exercise, GLUT4, and skeletal muscle glucose uptake. *Physiological Reviews*, *93*(3), 993–1017. https://doi.org/10.1152/physrev.00038.2012

Rivera-Martínez, M., Salazar-Solarte, A. M., Sánchez-Machado, D. M., Figueroa Torregrosa, L., Pacheco, R., Bolaños-Moreno, Y., & Casanova-Valderrama, M. E. (2025). Factors related to reversal of prediabetes in patients from a cardiovascular risk program during 2019–2023. *Cardiovascular Diabetology*, *24*(1), 12. https://doi.org/10.1186/s12933-025-00224-w

Sandforth, A., Birkenfeld, A. L., et al. (2024). Role of weight loss-induced prediabetes remission in the prevention of type 2 diabetes: Time to improve diabetes prevention. *Diabetologia*, *67*(8), 1714–1718. https://doi.org/10.1007/s00125-024-06178-5

Sieradzki, J. (Ed.). (2015). *Cukrzyca* (Vol. 1). Via Medica.

Tabák, A. G., Herder, C., Rathmann, W., Brunner, E. J., & Kivimäki, M. (2012). Prediabetes: A high-risk state for diabetes development. *The Lancet*, *379*(9833), 2279–2290. https://doi.org/10.1016/S0140-6736(12)60283-9

Yang, R., Chen, L., et al. (2025). Comparative effectiveness of different exercise modality on glycaemic control and lipid profile for prediabetes: Systematic review and network meta-analysis. *Frontiers in Endocrinology*, *16*, 1518871. https://doi.org/10.3389/fendo.2025.1518871

Zhang, X., et al. (2025). Effects of practical models of low-volume high-intensity interval training on glycemic control and insulin resistance in adults: A systematic review and meta-analysis of randomized controlled studies. *Frontiers in Endocrinology*, *16*, 1481200. https://doi.org/10.3389/fendo.2025.1481200