

ROLE OF PHYSICAL ACTIVITY IN THE PREVENTION AND TREATMENT OF DIABETES

(Review article)

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Abstract

This research is a systematic review and analysis of the previous studies about the role of physical activity in preventing and treating diabetes that have been published over the past fifteen year. Descriptive and historical methods have been used and different data sources such as electronic articles on the relevant topic, as well as printed literature. The research includes a sample of respondents aged 17 to 75, both sexes and different levels of physical fitness. Dealing with some aspect of physical activity, even of a moderate intensity, has a major impact on diabetes prevention and treatment.

Keywords: *physical activity, stress, obesity, blood glucose, cardiovascular disease, correlation of physical activity with diabetes, subcutaneous fat, visceral fat, demographic factors, health factors*

INTRODUCTION

Diabetes is a disease of modern times, which takes epidemic proportions and is a significant mortality factor in modern man. Stress, obesity and physical inactivity are the leading factors that lead to its creation. The endocrine part of pancreas secretes the hormones glucagon and insulin whose role is the regulation of carbohydrate metabolism. In the case of diabetes, insulin secretion is reduced or it is a consequence of cell membrane tolerance to its effects. As a consequence, there are increased blood glucose levels. Hyperglycemia is the main symptom of this disease. Exercise is a specific form of physical activity that is conducted in order to raise the level of physical fitness, whose main component is called cardiovascular fitness and it is directly related to primary prevention of diabetes. Its most important determinant, in addition to the age, gender, health status and genetic components is the usual level of physical activity. Sedentary lifestyle and low cardio respiratory fitness are directly associated with the progression of normal glucose metabolism in diabetes and it is also an important cause of premature mortality of patients. Therefore, it is important to emphasize the prevention of this disease through promotion of moderate-intensity physical activity by a doctor as well as raising awareness of patients to improve their quality of life.

The issue of the research is a review of published scientific research papers in the last fifteen years that examine the effects of exercise on the prevention and improvement in patients with diabetes.

The aim of this study is collection of papers dealing with this issue and analysis of the results and conclusions obtained by authors in the reviewed scientific papers.

THEORETICAL CONSIDERATION OF THE ISSUE

The method of work

Collecting the previous studies via the Internet browsers "Kobson" and "Google scholar" and available scientific journals in the field of sports were used (Jornal Sports Med Phys Fitness, J Sport Med, International Journal Management of Stress, etc.). search keyword: physical activity, diabetes, prevention, treatment, women and men. The collected data presented in this paper will be presented in relation to the age distribution of respondents by a special sub-groups, and includes subjects of both sexes aged 17 - 75 years. Data processing methods is descriptive.

The role of physical activity in preventing and treating diabetes

Type Two Diabetes is increasing, primarily due to overall sitting lifestyle and obesity. 522 overweight people (172 men and 350 women) average age 55 years, BMI 31 divided into two groups, experimental and control. They were subjected to individual counseling to reduce total weight excluding fat from the meals, especially certain fats and increasing fiber intake and physical activity increase. Glucose tolerance test was conducted on an annual basis, a diagnosis of diabetes was

confirmed at the second (consecutive) test. The total duration was 3.2 years. Subjects are annually losing about 4.2 ± 5 kg. in the experimental group and 0.8 ± 3.7 kg in the control group. The cumulative incidence of diabetes creation was about 11% of the experimental and 23% of the control group. During the experiment, the risk of diabetes was reduced 58% in the experimental group, which is directly linked to lifestyle changes.

Gang, Lindström, MSc, Valle, Eriksson, Jousilahti, Silventoinen, Qiao, Tuomilehto, (2004) examined how sedentary lifestyle, obesity and decreased glucose regulation are associated with any risks for diabetes two. 2017 men and 2352 women in Finland aged between 45 and 64 years without diabetes. Cox model was used to individually and jointly confirm effect that physical activity, BMI and blood glucose have. Study lasted 9.4 years, 120 cases were reported diabetes. After the evaluation of contributing factors the conclusion was that physical activity was inversely associated with risk of diabetes. The relationship was found in patients with obesity and the lowered regulation of glucose or at least one of these two factors and also BMI. Increased physical activity can reduce risk of diabetes. Physical activity and weight control are critical factors in preventing diabetes in patients with normal and reduced glucose regulation.

Ali, Barbara, Bowman, Ford, James, & Marks, (2001) investigated the presence of obesity, diabetes and weight control strategy use among adults in the United States in 2000 year. Telephone survey was conducted during 2000 in 184 450 adults older than 18. Obesity was found in 19.8% and diabetes in 7, 3%, combined 2.9%. 27% do not engage in any physical activity and 28.2% aren't regularly active. 42.8% of the addressed to professionals to lose weight. Obesity and diabetes continues to increase among adults in America. It is necessary to intervene in the sense of improving physical activity and diet nutrition for the entire nation.

To examine the association between sports activity and the risk of diabetes among the Chinese population, was the goal of the study conducted by Chien, Chen, Hsu, Su, & Lee, (2009). The level of physical activity has been tested by a questionnaire. The study lasted nine years from 1936 participants 312 developed diabetes. Participants with increased physical activity had a significantly lower risk of obesity. Participants who were obese and inactive were under far greater risk than healthy, normal weight and physically active. Sport activities are very significant in terms of reducing the risk of diabetes in middle-aged Chinese population.

Frank, Ronald, Janet, Rich-Edwards, Graham, Colditz, Solomon, Willett, JoAnn, (1999) pointed to the role of medium intensity physical activity such as walking in terms of reducing the risk of type two diabetes. Use the effects of intense exercise and walking as factors for the reduction of type two diabetes. 70 102 women aged 40 years to 65 without diabetes, cardiovascular disease and cancer. During the eight years 1419 cases of diabetes were registered. Increased physical activity reduces risk of diabetes in which it is particularly significant moderate intensity, but its duration is also important.

Watching TV, sitting principal activity in America is associated with obesity. The hypothesis was that prolonged TV watching may increase risk of type two diabetes in the study (Frank, Michael, Leitzmann, Meir, Stampfer, Colditz, & Willett, (2001). Physical Activity and Television Watching in Relation to Risk for Type 2 Diabetes Mellitus in Men. *Arch. Intern. Med.*, 161, 1542-1548.). 1986, 37 918 men age 40-75 years without diabetes, cardiovascular disease and cancer completed a detailed questionnaire on physical activity. Since 1988, respondents reported average time per week spent watching TV. 1058 cases of diabetes were diagnosed exactly ten years ago. Increase physical activity reduces the risk of developing diabetes, while sitting lifestyle that includes leisure spent in front of the TV is directly related to risk. The results show the importance of reducing sitting lifestyle for prevention of type two diabetes.

Examination of comparative significance and association with BMI, physical activity on the development of type two diabetes was the aim of the study Amy, Weinstein, Sesso, Nancy, JoAnn, Julie, & Gaziano (2004). Relationship of Physical Activity vs Body Mass Index With Type 2 Diabetes in Women. The study lasted 6.9 years. In 1361 there was diabetes. BMI and physical activity were significant factors diabetes. BMI and physical inactivity are independent risk factors for type two diabetes, their joint action is far more important. This indicates that their relationship is a significant determinant of diabetes.

Christensen, Friis, Mwaniki, Kilonzo, Tetens, Boit, Omondi, Kaduka, & Borch-Johnsen, (2009) questioned the glucose intolerance of people in rural and urban areas of Kenya as well as among different ethnic groups. We also examined the association of risk factors in relation to the lifestyle of glucose intolerance. The sample consisted of three African tribes and ethnic groups in mixed urban and rural parts of Kenya. Diabetes was diagnosed using OGIT test (oral glucose tolerance test), BMI. Subcutaneous adipose tissue, as well as physical activity and fitness were measured. The questionnaire resulted in diagnosis of diabetes. Family history of diabetes, smoking habits and alcohol consumption. 1459 respondents, the average age 38.6 years (17-68 years).. Members of the Luo tribe had the highest prevalence of glucose intolerance by all members of rural communities. High BMI, abdominal, and subcutaneous thickness of adipose tissue, low levels of physical activity, alcohol consumption, and life in urban places are associated with glucose intolerance. Prevention of diabetes in different populations of people in Kenya is in the middle range and is the highest among members of the Luo tribe. The role of lifestyle and ethnicity among African populations require further study.

Plotnikoff, Ronald C, Taylor, Lorian M, Wilson, Philip M, Courneya, Kerry S, Sigal, Ronald J, Birkett, Nicholas, Raine, Kim, Svenson, Lawrence W. (2006). fortified the key demographic and health factors associated with physical activity in adults with diabetes type one and two. The sample were adults over 18 years from the province of Alberta in Canada, which was previ-

ously diagnosed with type one diabetes (697) and two (1614). Recommended physical activity is not practiced by 63.7% of patients with one type, and 71.9% of type two. In patients with diabetes type one, a higher level physical activity was associated with young age, single lifestyle avoiding cigarettes, while in patients with type two is associated with younger age, male gender higher education, lower BMI values. A significant negative relationship was found between the BMI and physical activity. Promoting physical activity in a population of patients with type two diabetes, and one must take into account the specific demographic and health factors associated with it.

CONCLUSION

Diabetes is one of the major diseases of our time, from both the personal and social, and economic aspect. Besides the genetic component that is an important factor in its creation, it must be borne in mind the correlation between genetic and environmental components in the etiology of this disease.

Epidemiological studies show that physically active people have 30-50% less likely to develop diabetes type two of which also goes inactive and coronary heart disease. 30 minutes of medium intensity activity a day is enough to reduce risk.

Prevention mechanisms of physical activity also include body weight regulation, insulin resistance, hypertension, glycemic control, fibrous endothelial function.

It is recommended to include physical activity in the middle range to improve metabolic and cardiovascular health in a broad population of inactive people. (Caspersen, , 2005).

he extraordinary, though under-emphasized, is the importance of the strategies of public health services and promotion of healthy lifestyles of patients and also healthy people. In particular, if we consider that obesity, leisure time spent without physical activity and stressful, fast way of life is our reality.

REFERENCE

- Ali, H., Barbara, A., Bowman, S., Ford, F., James, S., & Marks, P. (2001). The Continuing Epidemics of Obesity and Diabetes in the United States. *JAMA*. 286, 1195-1200.
- Amy, R., Weinstein, D., Sesso, L., Nancy, R., JoAnn, E., Julie, E., & Gaziano M. (2004). Relationship of Physical Activity vs Body Mass Index With Type 2 Diabetes in Women. *JAMA*. 292,1188-1194.
- Caspersen, C., & Gregg, E. (2005). Physical disability and the cumulative impact of diabetes in older adults. *The British Journal of Diabetes & Vascular Disease*, 5(1), 13-17.
- Christensen, D.L., Friis, H., Mwaniki, D.L., Kilonzo, B., Tetens, I., Boit, M.K, Omondi, B., Kaduka, L., & Borch-Johnsen, K. (2009). Prevalence of glucose intolerance and associated risk factors in rural and urban populations of different ethnic groups in Kenya. *Ann Hum Biol*. 35(2), 232-249.
- Chien, K.L., Chen, M.F., Hsu, H.C., Su, T.C., & Lee, Y.T. (2009). Sports activity and risk of type 2 diabetes in Chinese. *JAMA*, 292(10),1188-1194.
- Frank, B., Ronald, J., Janet, W., Rich-Edwards, INICIJAL NA IMETO Graham, A. Colditz, G., Solomon, C., Willett, E., JoAnn, E. (1999). Walking Compared With Vigorous Physical Activity and Risk of Type 2 Diabetes in Women. *JAMA*, 282,1433-1439.
- Frank, B., Michael, F., Leitzmann, Meir, J., Stampfer, A., Colditz, C., & Willett, B.R, (2001). Physical Activity and Television Watching in Relation to Risk for Type 2 Diabetes Mellitus in Men. *Arch. Intern. Med.*, 161, 1542-1548.
- Frank, B., Meir, J., Stampfer, Caren S. Simin L, Graham A. Colditz, Frank E. Speizer, Walter C, Willett, JoAnn E. Manson. (2001). Physical Activity and Risk for Cardiovascular Events in Diabetic Women , 134 (2), 96-105
- Gang H, Lindström J, MSc; Valle T, Eriksson J, Jousilahti P, Silventoinen K, Qiao Q, Tuomilehto J. (2004). Physical Activity, Body Mass Index, and Risk of Type 2 Diabetes in Patients With Normal or Impaired Glucose Regulation. *Arch Intern Med*. 164, 892-896.
- Krause, Maressa P, Goss, Fredric L, Robertson, Robert , daSilva, Sergio G.(2007). Analysis of the Association of Adiposity, Cardiorespiratory Fitness and Habitual Physical Activity with Type II Diabetes Risk Factors in Elderly Brazilian Women. *Medicine & Science in Sports & Exercise*. 39(5) str.
- LaMonte, MJ., Blair, SN. & Church, TS. (2005). Physical activity and diabetes prevention. *J Appl Physiol* 99, 1205-1213
- Plotnikoff, Ronald C, Taylor, Lorian M, Wilson, Philip M, Courneya, Kerry S, Sigal, Ronald J, Birkett, Nicholas, Raine, Kim, Svenson, Lawrence W. (2006). Factors Associated with Physical Activity in Canadian Adults with Diabetes. *Medicine & Science in Sports & Exercise*. 38(8),1526-1534
- Tuomilehto J, Lindstrom J, Eriksson J, Valle T, Hamalainen H, Parikka P ,Kiukaanniemi S, Laakso M, Louheranta A, Rastas M, SalminenV, Aunola S, Cepaitis Z, Moltchanov V, Hakumaki M, Mannelin M, Martikkala V, Sundvall J, Uusitupa M.(2001). Prevention of Type 2 Diabetes Mellitus by Changes in Lifestyle among Subjects with Impaired Glucose Tolerance. *The New England Journal of Medicine*. 344, 1343-1350

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