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Physical exercise in health promotion among individuals with type 2 diabetes

Abstract

Introduction: Diabetes Mellitus (DM) is a global public health issue, with Type 2 DM being most prevalent, in which physical exercise may be the key to control and manage the disease, while Community Nurses have an active role in the prevention and management of this condition. Nurses Specialized in Rehabilitation have the skills, scientific knowledge and autonomy to prescribe physical exercise.

Objective: To ascertain the effectiveness of physical exercise in the promotion of health among individuals with Type 2 DM, as well as the role of rehabilitation nurses as promoters of physical exercise among individuals with Type 2 DM within the community.

Methods: Bibliographic research resorting to the PUBMED and BVS Nursing databases.

Results: The 4 studies included met the eligibility and methodological quality criteria established for this study. The benefits of physical exercise in individuals with Type 2 DM are extremely relevant to control cardiovascular risk factors, particularly in terms of lowering blood glucose values, leading to increased quality of life, thus representing a strategy to reduce health costs in this particular disease management.

Conclusion: Physical exercise emerges as a pilar in the prevention, control and treatment of Type 2 DM, being beneficial from physiological and economic standpoints for patients, families and populations in general, with special focus on the role of Nurses Specialized in Rehabilitation within the community.

Keywords: type 2 diabetes mellitus, physical exercise, promotion of health, rehabilitation nursing, community

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Introduction

Diabetes Mellitus (DM) is described as a disorder of diverse etiology, characterized by impaired carbohydrate, protein and lipid metabolism. It is the result of irregularities in the secretion of insulin, in its action, or both, occurring when the pancreas fails to produce insulin – Type 1 diabetes – or when the body fails to make good use of its produced insulin, manifesting as chronic hyperglycemia – Type 2 diabetes.[1–3] According to Novo et al.,[3] themain risk factors for Type 2 DM depend on several conditions ranging from genetic factors to lifestyle, with excess weight and physical inactivity standing out as most relevant, among others. The goals of DM treatment are, according to Batista et al.,[1] to reduce hyperglycemia-related symptomology and to minimize long-term complications, in order to maintain a metabolic balance that results in mitigating the risk of vascular complications. The therapeutic approach must be global, differentiated and always include interventions sustained by the triad of: diet, physical activity and therapeutics.

The American College of Sports Medicine (ACSM)[4] distinguishes between the concepts of physical activity and physical exercise, establishing a clear definition for each. Accordingly, physical activity is characterized as any bodily movement produced by muscular contraction that causes an increased caloric need compared to energy expenditure when in rest. In turn, physical exercise is defined by bodily movements that are planned, structured, and repetitive, seeking to improve or maintain one or more aspects of physical fitness. The International Classification for Nursing Practice (ICNP), 2019/2020 version,[5] defines physical exercise as the voluntary performance of physical exertion of the musculoskeletal and respiratory systems in order to improve physical shape, mobility and strength.

In treating DM, any form of physical activity should be encouraged, not merely with the goal of improving bloodglucose control, but also of reducing the risk of associated complications. The benefits of physical activity emphasize the need for regular practice so as to guarantee greater control over blood glucose values. Unfortunately, physical activity is underused in the treatment of diabetes.[3] Health education is considered a relevant, integral part of health promotion. It translates in the empowerment of individuals, groups, and ultimately, communities, equipping them with the ability to conduct a critical analysis of health determinants and, consequently, make educated choices towards healthy behaviors.[1]

Nursing care services help people manage community resources regarding health, all the while promoting a learning process that expands personal resources, which seek behavioral changes, such as the adoption of lifestyles that are more compatible with the promotion of health.[6] Community nursing addresses the community as a whole, promoting communication and collaboration between health care providers and community partners, with the ability to foster synergies that can provide a healthier development, respecting the fact that each community is unique and dynamic.[7] Nurses specialized in rehabilitation nursing have the specific knowledge recognized by the Ordem dos Enfermeiros (the Statutory Professional Association of Portuguese Nurses) to provide health care thatallows for community intervention in terms of physical exercise, promoting individuals' accountability for theirown health. The practice of community-based Type 2 DM and the promotion of health, can improve these patients' outcomes.[8] In accordance with the above, the literature review on the practice of physical exercise in the prevention of Type 2 DM aims to ascertain the effectiveness of physical exercise in the promotion of health among individuals with Type 2 DM, as well as the role

of rehabilitation nurses as promoters of physical exercise among individualswith Type 2 DM within the community.

Methods

Literature review on this topic focused on articles published on **PUBMED** and **BVS Nursing**, using the following Boolean conjunction: ((exercise) OR (physical activity)) AND (diabetes), during the 2019-2024 publication period. These are relevant articles the authors considered worthy of note, which were explored and described in order to answer the question, "What is the effectiveness of physical exercise in the promotion of health among individuals with Type 2 DM, and what is the role of rehabilitation nurses as promoters of physical exercise among individuals with Type 2 DM within the community?". This is line with the main goal established to ascertain theeffectiveness of physical exercise in the promotion of health among individuals with Type 2 DM and the role of rehabilitation nurses as promoters of physical exercise among individuals with Type 2 DM within the community.The authors took into consideration randomized controlled trials, full free-access articles published in Portuguese, English and Spanish.

Results

Even though the referred databases encompass extensive worldwide scientific literature, few studies were found with reference to the promotion of health in the community of individuals with Type 2 DM, and even fewer developed by nurses. Among those explored and analyzed, the Chiang et al.,[9] study refers to a prospective longitudinal study of 20 participants from a medical center (participants' mean age was 48.5 years, 65% male), eligible to undertake moderate-intensity physical exercise throughout 12 weeks. Participants were randomly assigned to 1 of 3 exercise schedules (morning, afternoon or evening). This study aimed to explore trends in blood glucose in response to a 12-week moderate-intensity physical exercise training in people with Type 2 DM, and toexplore post-exercise blood glucose predictors and exercise- induced blood glucose response. The applied trainingprogram followed the Frequency Intensity Time Type (FITT) principal, according to the ACSM Guidelines, including Frequency (3 times per week for 12 weeks), Intensity, (set at 70% heart rate reserve, Karvonen method),Time (40-50 minutes, 1 to 2 hours after a meal); Type (aerobic with use of treadmills). The results of this study concluded that: a moderate-intensity exercise training over the course of 12 weeks is safe and improves metabolic control over time for patients with Type 2 DM; a higher before-exercise blood glucose level or poor metabolic control lead to a larger magnitude of blood glucose reduction through a moderate-intensity exercise program; and lastly, exercise in the morning resulted in a larger magnitude of blood glucose reduction than in any other periodof the day.

In turn, Gallé et al.,[10] conducted a prospective study assessing the physical fitness and levels of physical activity in a sample of individuals with Type 2 DM (69 participants with a mean age of 63 ± 5.2 years, 62.3% M) before and after the implementation of a physical exercise training program combined with motivational and educational intervention sessions, compared with a control group of Type 2 DM patients (made up of 90 participants) who did not participate in the intervention. The study was part of the community-based health promotion program fundedby the National Center for Prevention and Control of Diseases of the Italian Ministry of Health. The goal of the study was to analyze the effects of a long-term community-based combined exercise program (for 9 months, 1- hour sessions, 2-3 times per week) consisting of aerobic, resistance, flexibility and agility/ balance training, associated with group motivational and educational interviews (12 interviews, 60 minutes each) towards behavioral changes and promotion of physical activity. The main findings of this study showed that a community-based physical exercise program combined with motivational and educational interviews improves Body Mass Index (BMI), physical fitness and habitual levels of physical activity in people with Type 2 DM, compared with those who did not have access to this intervention. Therefore, a motivational and educational program may increase adherence to physical activity in people with Type 2 DM, and structured exercise is useful to improve physical fitness in diabetic adults. Concurrently, a motivational and educational intervention combined with a physical exercise program may represent an effective public health strategy to improve self-management of the disease inpeople with Type 2 DM, as it can have positive consequences on cardiovascular risk, fall risk, and on the individuals' quality of life, representing a cost-saving strategy in the disease management.

Gray et al.,[11] conducted a randomized controlled clinical trial with two groups of participants, 133 in the intervention group and 130 participants in the control group. All individuals presented Type 2 diabetes and HbA1c

≥ 8%, aged between 30 and 70 years, with low income. This study aimed to: examine the effects of Peer Support for Achieving Independence in Diabetes (PeerAID) on diabetes self-management behaviors; evaluate whether the effects on behavior were mediated by self-efficacy or social support; and determine whether the effects of the intervention on behavior were moderated by gender, race/ethnicity and HbA1c baseline levels, diabetes distress, depression or food insecurity. The study findings revealed the predominant role of community health professionals in improving Type 2 DM self-management, especially among more vulnerable, low-income populations. Their interventions made particular difference in changing dietary behavior and physical activity. Concerning physical activity, these improvements were specifically notable as participants in the intervention group reported almost

2.5 additional hours of activity per week than controls.

Lastly, the study conducted by Domínguez et al.,[12] consisted of a randomized controlled clinical trial involving two parallel groups, with patients from a primary health care center in Salamanca, Spain. The study aimed to assess the short and long- term impact of a multifactorial intervention on physical activity and clinically relevant biochemical parameters in patients with type 2 DM. Participants were randomly assigned to control and intervention groups, and counselled on the importance of physical activity and maintaining a healthy diet. In addition, the intervention group also took five low-moderate intensity 4 km nurse-guided walks, received a smartphone application to promote healthy habits and attended a diet workshop.

Physical activity was measured objectively using a pedometer and subjectively using a shortened international physical activity questionnaire (at baseline, 3 and 12 months). In total, 204 participants were included (mean age

60.6 years, 45,6% were women). After 3 months, relative to the control group, the intervention group increased their daily number of steps by 1852, aerobic steps by 1623, distance walked by 994 m, and total metabolic equivalent minutes per week by 1297, decreasing sedentary time by 34.3 minutes per day. Differences from baseline persisted at 12 months, including mean increases of 1141 daily steps, 917 aerobic steps, and 1065 total metabolic equivalent minutes per week in the intervention group relative to the control group ($P<0.05$ for all).

Discussion

DM is considered a global public health concern, one of the most relevant challenges of the 21st century, as Type2 DM accounts for the majority of cases.[2] The articles under review revealed an overall regular practice of physical exercise, or even a structured physical exercise program among individuals with Type 2 DM. The extremely relevant benefits of healthy lifestyles in disease management are the corner stone of Type 2 DM treatment. Mostnotably, the benefits of reducing blood glucose levels, namely when physical exercise occurs in the morning period versus other moments of the day, the decrease in HbA1c, in body weight, cholesterol, blood pressure, as well as improved physical fitness with positive impact on metabolic control, cardiovascular risk, fall risk and quality of life for individuals, thus representing a cost-saving health care strategy in the disease management. Aerobic exercises were most prevalent in the exercise and physical activity programs described in the reviewed studies, as the combination of aerobic physical exercise with resistance training constitutes the most complete andideal approach.[1–3,9–13]

The American Diabetes Association guidelines recommend all adults, including those with chronic illness, undertake at least 150 cumulative minutes of moderate-intensity aerobic physical activity, or at least 75 minutes of vigorous aerobic physical activity, per week, in order to obtain health benefits.[2,13] The World Health Organization (WHO) 2020 recommendations were based on the following key messages: physical activity is goodfor the body and mind; any amount of physical activity is better than none and more is better; any physical activity counts; muscular strengthening activities benefit everyone; excessive sedentary behaviors are detrimental to health; everyone can benefit from increasing their levels of physical activity and decreasing sedentary behavior.[14]Moreover, these refer specific recommendations for physical activity and sedentary behaviors for 18-year-old or older adults with chronic conditions: at least 150 to 300 minutes per week of moderate-intensity aerobic physicalactivity, or at least 75-150 minutes per week of vigorous intensity, or some equivalent combination of both intensities throughout the week (for additional health benefits, increase weekly volume); moderate-intensity or higher muscular strengthening activities at least 2 times per week, involving the main muscular groups; at least 3 times per week, incorporate moderate-intensity or higher varied multicomponent physical activities that promote functional balance and strength training; limit time spent in sedentary behaviors, replacing these periods with physical activities of any intensity (including light- intensity activities).[15] Unfortunately, physical activity is still underused in the treatment of diabetes.[2]

According to Domínguez et al.,[12] some studies mention that, in general, the number of daily aerobic steps are not assessed, despite evidence these are intimately related with issues of obesity and metabolic pathologies. Sedentarism and obesity in individuals with Type 2 DM are predictive factors of physical fitness, while increased metabolic equivalents (METs)-min/week consumed in intense activities is an important finding and indicative of decreased risk of cardiovascular events, microvascular events and all-cause mortality in patients with Type 2 DM. In addition, researchers noted shorter sedentary periods are related to postprandial increases in plasma insulin levels and consequent decrease in glucose levels.[2,12] Gallé et al.,[10] further adds that a motivational and educative intervention combined with a community-based physical exercise program may represent a more effective public health strategy. In the Dominguez et al.,[12] study, a smartphone application was employed to promote healthy habits, as well as a diet workshop, ministered in the community by Nurses. The abovementioned literature meets the goals of DM treatment sustained by Batista et al.,[1] of reducing symptomology and minimizing long-term complications, in order to maintain metabolic balance, thus reducing the risk of vascular complications, based onthe triad therapeutic approach of diet, physical activity and therapeutics.

The WHO highlights community interventions as one of the best cost-effective investments to promote health, asthey become essential in the promotion of physical activity due to the potential to reach a major part of the population, through community programs aimed at promoting physical activity, which work on the problematic of physical inactivity, and through the creation of partnerships for community initiatives. These ensure physical activity, and above all, involve those from lower socioeconomic and educational backgrounds, with much higher rates of physical inactivity than the most differentiated groups.[16] The study by Gray et al.,[11] points out the development of projects within the community makes health more accessible to the most vulnerable populationswith lower income.

Looking at the Portuguese context, the National Physical Activity Promotion Program implemented by the Portuguese Directorate-General for Health, involved in the European project "EUPAP – A European Physical Activity on Prescription Model", seeks to transfer the positive Swedish practices regarding the promotion of physical activity in primary health care. The pilot project consisted of creating a system of brief counselling and physical activity appointments in different family health units across the country. This articulates general practiceand family medicine with the prescription of physical exercise by exercise professionals, duly qualified to work with patients within a clinical context. However, there were no rehabilitation specialist nurses found to be involvedin this project, even though these human resources could be better leveraged for this purpose, standing out as an added value for the community.[17] Nurses specialized in rehabilitation nursing have the specific knowledge recognized by the Ordem dos Enfermeiros to provide health care, particularly in the community context. Specializing in a body of skills and interventions that, combined with education in the areas of diet and physical activity, or structured physical exercise programs associated with medication, these specialists can act on the prevention and promotion of Type 2 DM with clear results on reducing the consequences or deterioration caused by this pathology. Nurses are viewed as health care professionals who, by having direct contact with patients, areable to educate and raise awareness to the prevention of Type 2 DM, as well as to promote health, allowing to improve disease management and quality of life.[2,12]

Conclusion

Among the different recommendations of physical activity as health promoter for individuals with Type 2 diabetes, structured physical exercise plans stand out as drivers of direct and effective benefits, namely in the reduction and control of blood glucose levels. The understanding of physical exercise as a vital component of thetriad that sustains the prevention, control and treatment of diabetes stands clear from both a physiological standpoint, and from the economic perspective it represents for people, families and populations. Type 2 DM is achallenging chronic illness for people on a daily basis, in terms of the disease self-management and its several aspects, namely adhesion to medication treatment, spanning to dietary care and physical activity. As physical activity is a non-medication approach, despite its study-proven efficiency, it is still difficult to convey as necessary and structural in this triad. Hence, policy makers, institutions, community partners and health care professionals need to join efforts in concerted strategies so as to acknowledge the vital role of physical exercise in the preventionand promotion of health for patients with Type 2 diabetes.

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In their capacity as nurses, carrying out general or specialized duties through educational and motivational actions, or structured intervention plans, these health care professionals intervene directly in the promotion of physical activity as a cornerstone in balancing and controllingDM. Realizing the pivotal role nurses play in the education, awareness and transformation to alleviate this public health issue, despite the scarce research in this topic, particularly by rehabilitation nurses who are among the most qualified for this purpose, it is clear there is a pressing need for more development in this field.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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