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Non-drug treatment of type II diabetes literature review

Tratamento não medicamentoso da diabetes tipo ii revisao bibliográfica

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ABSTRACT
Diabetes Mellitus (DM) has become a major global public health problem and is growing every year. DM is divided into two types. Type II is the most common and will be explored in this article in an exploratory literature review on its non-pharmacological treatment. Articles were searched in databases such as PubMed, Scielo and Scopus and reviewed through texts with scientific relevance. The different origins of this chronic disease, which is considered multifactorial, were researched and its non-pharmacological treatments were described, grouping them into: Treatments with physical activities, dietary measures and other alternatives. We conclude that its treatment is personalized and should aggregate not a single therapy. One of the best strategies for the treatment of DM II is self-management. Patients who control their eating habits and physical activity have a great improvement in their quality of life, since individuals who are well informed about their diet tend to make choices that are more appropriate to their health. Our article concludes that the non-pharmacological treatment of DM II should have an eclectic and multidisciplinary view and rely on the patient's essential commitment.

Keywords: Diabetes, Non-pharmacological treatment.

1 INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease caused by the inability of the pancreas to secrete insulin (type I diabetes) or decreased tissue sensitivity to insulin (type II diabetes). It can also be caused by degeneration or inactivation of beta cells in the islets of Langerhans1. It is a syndrome in the metabolism of carbohydrates, proteins and fats, and can be multifactorial 2,3.

Due to the deficiency of insulin in the tissues, the metabolism will not have enough glucose to generate energy. Therefore, it uses fat as an energy source and consequently blood glucose levels are altered1.

Currently, Diabetes has become a major global public health problem and is growing every year. In 2009, there were about 285 million diabetics in the world, and in 2023, this number reaches the mark of 529 million people worldwide. One in every 350 children has type I diabetes, which is caused by the destruction of insulin-producing cells due to an immune system problem in which antibodies attack the cells that produce insulin. Type II, on the other hand, is the resistance or deficiency of insulin secretion. It is the most common, 90% of cases are acquired throughout life[4].

The increase in diabetes cases in the world is related to several socioeconomic, demographic, genetic and environmental factors. Where there is an increase in risk factors, such as obesity, lifestyle with lack of physical activity and a healthy diet, among other multifactorial causes. Chronic diseases are one of the biggest public health problems in Brazil and in the world, with high economic costs for society, in addition to the impacts on people's quality of life and life expectancy3.

In Brazil, diabetes affects about 7.7% of the Brazilian population, ranking second among the chronic diseases with the highest incidence and fourth in mortality from chronic diseases in Brazil3.

2 METHODOLOGY

The methodology chosen to carry out the following research was a literature review with an exploratory approach.

For Marconi and Lakatos, bibliographic reviews have the purpose of putting the researcher in direct contact with everything that has been written, said or filmed on the subject. It is not a mere repetition of the subject, but provides analysis of the theme from another point of view or approach, in order to reach new conclusions5.

The research followed the recommended methods, after choosing the theme and preliminary research. The samples, were read, selected, evaluated and analyzed. The characteristics of the research were defined and then the results were discussed, interpreted and presented.

The guiding question was: what are the non-pharmacological treatments currently used for the treatment of type II diabetes mellitus?

For a bibliographic review of the theme, searches were carried out in printed bibliographies and digitized articles. The articles were collected, preferably, in the last 5 years, raising studies specifically related to the proposed theme, which resulted in 21 articles.

In the researched articles, a pattern was noticed in the problem addressed, that is, the authors also had the same doubt as in the present study with the object of the research.

Understanding this subject is of great importance for medical professionals as well as physical educators and physical therapists.

3 RESULTS AND DISCUSSIONS

Diabetes is subdivided into two types. Type I Diabetes and Type II Diabetes, each of which has specific characteristics.

Type II, the subject of our research, is the most common. The two main problems are insulin resistance and compromised insulin secretion. Insulin resistance refers to the reduction of tissue sensitivity to insulin. Normally, insulin binds to special receptors on cell surfaces and initiates a series of reactions involved in glucose metabolism. In type II diabetes, these intracellular reactions are decreased, thus making insulin less effective at stimulating glucose by tissues and regulating glucose by the liver. The exact mechanism that leads to insulin resistance and impaired insulin secretion in type II diabetes is unknown, although genetic factors are believed to play a role1.

To overcome insulin resistance and prevent blood glucose buildup, larger amounts of insulin must be secreted to keep the glucose level normal or slightly elevated. However, when beta cells cannot cope with the increased demand for insulin, the glucose level rises, developing DM II [1].

Long-term diabetes can lead to complications such as eye disease, peripheral neuropathy, peripheral vascular diseases, and diseases that may have developed before the actual diagnosis of diabetes is made1.

Because it is a very present public health problem that affects the population at different ages, it is causing an increase in mortality, morbidity and reduced quality of life. Even with the improvement in its management, there is still inadequate handling in the lifestyle, which involves eating habits and physical exercise2.

Patients have varying levels of adherence to different aspects of self-management. When addressing behavior change, it is more effective to assess and work on each behavior separately, focusing on one or two main behaviors per visit6.

One of the best strategies for treating DM is self-management. Patients who control their eating habits and physical activity have a great improvement in their quality of life, since individuals who are well informed about their diet tend to make choices that are more appropriate to their health. This is especially relevant for chronic diseases, as highlighted by the World Health Organization (WHO), aiming to maintain or improve people's quality of life[7].

If patients do not seem ready to change, the physician should assess the significance of the change and the patient's confidence in the change. This helps determine the most appropriate techniques to motivate them to adopt a posture of readiness. At each medical visit, the professional should select one or two techniques to increase the patient's conviction or confidence6.

In order for patients with DM to be able to follow an adequate action plan to change their lifestyle habits, it is necessary to have effective self-management. It is necessary for health professionals to motivate patients by analyzing the degree of responsibility that patients are likely to assume in the management of diabetes self-care7.

Public health policies should focus on the ability to address the rising incidence of diabetes, a complex disease that requires a comprehensive approach. It is crucial to empower patients and provide education on self-management and lifestyle7.

Patients should take a gradual approach, starting with modest behavior goals and, over time, increasing the level of adherence to healthy eating habits, physical activity, and behavioral skills. This process allows patients to develop confidence through small steps, each of which is more likely to be successful in the long run6.

The prevalence of diabetes is associated with several factors, including a sedentary lifestyle, unbalanced diet, obesity, epidemiological transition, and population aging, among others8.

DM II can be avoided or delayed in people at high risk for disease through weight reduction and increased participation in moderate exercise1.

Regarding non-pharmacological treatment, we will divide our literature into three groups:

Treatment with physical activities; Treatment with dietary measures; Other treatments

3.1 TREATMENT WITH PHYSICAL ACTIVITIES

According to the SBD, Brazil is among the most sedentary countries in the world. More than half of the Brazilian population does not perform physical activity. Therefore, knowing that physical activity has great benefits in the prevention and treatment of diabetes, incentive policies are needed to do so. Guidance from professionals to culminate in an improvement in the quality of life, especially for diabetic patients. In 2019, the Brazilian Society of Diabetes (SBD) updated the guidelines for the care and guidance of diabetic and pre-diabetic patients, including and modifying guidelines for frequent physical activity, as a non-pharmacological treatment method for patients[8].

Some cases of insulin resistance are associated with obesity, the primary treatment of type II diabetes is weight loss. Exercise is also important in stimulating the effectiveness of insulin. Hypoglycemic agents may be added when diet and exercise are not successful in controlling blood glucose levels. Some patients need insulin on an ongoing basis, and others may need insulin on a temporary basis during periods of acute physiological stress, such as illness or surgery1.

A meta-analysis of 2,208 individuals with DM II confirmed the positive impact of aerobic physical activity and other physical training on glycemic control, BP reduction, cholesterol reduction, among other benefits[9].

A sedentary lifestyle plays a significant role in the origin of chronic conditions and a variety of complications due to lack of physical activity. When it comes to individuals suffering from DM, regular systematic physical activity is crucial to preserve well-being, as it helps control bodily functions and can improve health, often eliminating the need for medications10.

Fitness trackers and popular smartphone apps are reliable for tracking activities and enhancing diet tracking. They offer extensive food lists, track daily nutritional information, and provide resources such as goal setting, social media support, reminders, incentives to achieve goals, and review of achievements over time6.

Physical activity and exercise are crucial for preventing complications and managing blood glucose in people with diabetes. They improve glycemic control, reduce cardiovascular risks, promote well-being, and can help with weight loss. Even without weight loss, eight weeks of exercise reduces HbA1c by 0.66 percent. People with diabetes should avoid a sedentary lifestyle, incorporating light activities, such as standing or walking1.

Physical activity can delay or halt the progression of type II diabetes by directly increasing insulin sensitivity and indirectly contributing to weight management. Moderate-to-vigorous intensity activities have a positive impact on beta cell function and glucose regulation, regardless of obesity. The American Diabetes Association (ADA) recommends that people at risk for TD II increase their physical activity to at least 150 minutes per week of moderate to intense activity, such as brisk walking. Combined diet and physical activity interventions significantly reduce the risk of DM II, with a potentially superior effect than dietary interventions alone11.

Diabetes self-care management involves education, support, and lifestyle modification. The collaborative and communicative patient-provider relationship results in increased patient satisfaction, adherence to treatment plans, and improved health outcomes. It is of paramount importance to promote a patient-centered approach to better define decisions about health care, based on their informed preferences, taking into account their experience with the disease, personal characteristics, knowledge of health and disease, physical limitations, family support, socioeconomic status, and the living environment7.

Any movement that has expended energy, produced by the skeletal muscles is a physical activity. On the other hand, a physical activity with a specific intensity, frequency and structure, with the objective of improving physical conditioning and health is considered a physical exercise9.

Well-guided and correctly practiced physical exercise by individuals with diabetes mellitus provides great benefits. Always considering the individual management plans for each case and considering the individual and general risks. According to the SBD, in a study by the Diabetes Prevention Program (DPP) it was possible to prove the benefits of lifestyle changes and weight reduction and glycemic control in 58% of patients with frequent physical activity, while 31% of incidence in the group treated with metformin[12].

Supervised aerobic exercise outperforms unsupervised exercise in improving HbA1c and weight loss. No significant differences in weight loss were found between aerobic exercise modalities. Combined exercise may be more effective for glycemic control in patients with DM II, although there are variations in the effects on cardiovascular risk factors13. The role of the team for guidance is crucial in the flexibility of training and heart rate monitoring to improve the quality of life of DM II patients14.

Overall, network meta-analyses support the recommendation of exercise in patients with T2DM, especially supervised exercise. Limited evidence supports the benefits of flexibility and balance exercises15.

3.2 TREATMENT WITH DIETARY MEASURES

The way of life of a person who has diabetes often involves physical inactivity, lack of regular exercise, an inadequate and unhealthy diet. Healthy practices are fundamental in the management of diabetes, and may or may not include drug therapy. To this end, it is essential to maintain an appropriate diet, practice regular physical activity, avoid smoking and excessive alcohol consumption, and set weight management goals3.

Education for self-management and nutritional counseling are essential, ensuring that patients know how to monitor and control their glucose levels. Focusing on people with diabetes and their families, encouraging their active role in prevention and management, can be key to addressing the growing diabetes epidemic7.

On the other hand, dietary patterns such as the Mediterranean diet and the DASH diet (Dietary Approach to Stop Hypertension) which was initially proposed in 1995 to aid the control of hypertension (AH) show promising effects against type II diabetes. adherence to a healthy diet has been shown to reduce the risk of DM II4.

Healthy eating and increased physical activity can prevent or delay diabetes and its complications. To assist in the preparation of patients who have resistance to change, it is effective to assess and address their confidence and conviction. Patients facing the challenge of making significant changes to their lifestyle benefit from guidance in setting specific short-term behavioral goals and behavioral outcome goals. Personalizing this process is crucial, tailoring goals and objectives according to each patient's individual preferences and progress, building trust through small steps, and, when necessary, implementing more intensive interventions based on a progressive care model. At each medical visit, the monitoring of the goals and objectives monitored by the patient increases motivation and allows for a more personalized plan6.

The American Diabetes Association advises an intensive lifestyle intervention for patients with TD II who are overweight or obese and want to lose weight. Meanwhile, the American Academy of Clinical Endocrinologists recommends offering structured counseling and consideration of meal replacement for patients who are experiencing an increase in obesity or have related comorbidities6.

Studies indicate that vitamin D insufficiency may be able to affect the development of diabetes by influencing glucose tolerance and insulin release. The relationship between vitamin D and calcium is able to reduce the risk of diabetes when ingested in appropriate amounts Dietary management and careful monitoring are key in the management of diabetes10.

DM results from the interaction between insulin resistance and beta cell dysfunction. Diet plays a key role in regulating glucose and insulin. The foods we consume influence glucose-insulin homeostasis, and consequently have an impact on blood sugar levels. Low-calorie, low-carbohydrate diets, which aim to reduce body weight, show benefits in insulin sensitivity and blood sugar control11.

Better food knowledge is linked to an improvement in glycemic control. People with dietary knowledge are inclined to make decisions that are appropriate to their health status7.

Stimulating the regulation of appropriate fasting blood glucose levels may encounter obstacles, considering the frequency of low blood glucose episodes in young individuals with diabetes, along with the shortage of qualified specialists to provide guidance and supervision during exercise. Exercise helps to reduce blood glucose levels10.

Achieving lasting changes in diet and physical activity is a multi-year process, and long-term interventions are more likely to sustain improvements in weight loss and physical activity. Initially, lifestyle strategies should involve frequent meetings, with a gradual reduction in frequency over time6.

Studies combining healthy diet, weight management, and physical activity in people with diabetes have shown significant improvements in BMI, HbA1c, and blood pressure. However, these interventions have not yet consistently demonstrated a reduction in the risk of cardiovascular morbidity or mortality7.

Intensive dietary intervention soon after diabetes diagnosis can improve glycemic control. In addition, a 5% reduction in initial body weight in obese people with diabetes appears to benefit glycemic control, lipid levels, and blood pressure7.

There is no one-size-fits-all dietary pattern for patients with diabetes. Adherence to the diet decreases over time, low-carbohydrate diets are effective in the short term in reducing HbA1c and weight. On the other hand, Mediterranean diets, with carbohydrate moderation, low glycemic index, high in protein and low in fat, are more effective in the long term, especially in patients over 60 years of age7.

The nutritional schedule should be customized according to each person's daily caloric needs. Nutrition guidelines aim to promote a balanced diet that is appropriate to individual nutritional needs10.

Carbohydrates are the main source of energy and maintain the preservation of cellular structures, especially through fiber. They are known as carbohydrates and play a vital role in

managing diabetes. The constitution of carbohydrates affects the transformation of sugars in the body, with simple carbohydrates being the most prevalent in food10.

Quality carbohydrates, such as those found in low-glycemic or complex carbohydrate diets, are linked to increased insulin sensitivity and improved beta cell function. In addition to macronutrients, micronutrients, such as fiber, play a crucial role in regulating glucose and insulin in the human body. High fiber intake improves insulin sensitivity throughout the body by stimulating the production of short-chain fatty acids, such as acetate, propionate, and butyrate, in the colon, which are important end products of dietary fiber fermentation by gut bacteria. Increased fiber intake significantly decreases the risk of DM II[11].

Carbohydrate quantification is a dietary approach that provides flexibility in the diet of diabetic individuals, seeking to balance glucose, carbohydrate consumption and insulin. Foods such as cheeses, meats, eggs, olive oil, and mayonnaise require carbohydrate measurement, requiring label verification10.

Consumption of alcoholic beverages, which contain carbohydrates, can cause hypoglycemia in people who use insulin. The recommended daily limit is up to two servings for males and one for females, equivalent to 360 ml of beer10. Moderate consumption is associated with lower vascular risk. A 2015 clinical trial suggests that moderate consumption of wine, especially red wine, by well-controlled diabetics on a healthy diet is safe and reduces cardiometabolic risk7.

Lipids represent a significant source of energy. Dietary recommendations establish the allocation of 30% of daily calories, with a limit of 7% for saturated fats, a suggestion of 10% or more for monounsaturated fatty acids and 10% for polyunsaturated fatty acids, along with a daily restriction of cholesterol consumption to 200 mg10.

It is advisable to distribute food intake from five to six meals throughout the day, comprising three main meals (breakfast, lunch and dinner) and two to three intermediate meals (morning snack, afternoon snack and supper)[10].

Lifestyle programs that encourage healthier eating and increased physical activity have the ability to create a daily calorie deficit ranging from 500 to 750, leading to weight loss. The choice of diet should be tailored to the patient's individual preferences and needs, since diets with similar calorie restriction tend to produce comparable results. Physicians should work closely with patients to select a long-term plan, starting with brief bouts of moderate-intensity physical activity that are chosen in collaboration with the patient, such as brisk walking, cycling, dancing, garden work, or other activities of interest6.

The nutrition guideline has shown an effective way to promote improvements in the way of life, resulting in positive changes. It seeks to reduce anxiety, combat sedentary lifestyle, and address elements of the environment that can influence diabetes complications10.

Adopting healthy dietary patterns, such as the Mediterranean and DASH, implementing low-calorie, low-fat dietary interventions, and combining diet with physical activity, along with reducing the consumption of red/processed meat and sugary drinks, significantly reduces the risk of developing DM II.

The initial low-calorie diet benefited obese individuals at risk for cardiometabolic disease by improving metabolic syndrome, abdominal obesity, and inflammation. After one year, interventions such as exercise, diet, and the combination of both showed additional reductions, with the combined approach being the most effective, suggesting greater reductions in risk for cardiometabolic disease in adults with obesity[12].

3.3 OTHER TREATMENTS

Currently, non-pharmacological treatments are the initial practice to be adopted, considered urgent, since lifestyle is directly associated with DM II. Therefore, it is recommended to adopt healthy habits, daily physical activities, reduce the consumption of processed foods, control weight and abandon tobacco use if you are a smoker16.

Osteoporosis and DM II are associated with an increased risk of stress fractures. Hyperglycemia impairs osteoblast function, affecting bone formation, and vitamin D3 deficiency contributes to structural defects in bones.

The administration of vitamin D3 is recognized to promote the intestinal absorption of calcium and phosphorus, which are essential for bone health. In addition, vitamin K2 supplementation has been linked to reduced risk of diabetes, playing a crucial role in the gamma-carboxylation of osteocalcin, favoring the integration of calcium into[bone17].

Supplementation of vitamins D3 and K2 improves glycemic metabolism and osteocalcin regulation in patients with DM II, providing valuable perspectives for innovative therapeutic approaches in its management, aiming not only at glycemic control, but also at the bone health of these patients[17].

Patients with DM II have a significant reduction in vitamin K2, which is very important for the body, since it plays a fundamental role in improving glycated hemoglobin and lipid profile in patients with type II diabetes mellitus18. such as calcium and vit. D [10] may be part of a

dietary management, but if they need to be supplemented, they will be part of medication measures that are outside the context of discussion in this article.

The use of herbal medicines, such as standardized extract of *B. forficata* (tea from a plant known as pata-de-vaca) has shown an improvement in metabolic control19, but they can also be understood as drug measures.

Traditional Chinese medicine (TCM) is being used more in the control of DM II, focusing on non-pharmacological interventions. TCM emphasizes practices such as healthy diet, physical activity, emotional therapy, and acupuncture to prevent type II diabetes[20]. Acupuncture, including several forms, has shown potential for exhibiting hypoglycemic effects and improving glycemic control20. Auricular acupuncture can also prevent complications, such as diabetic foot, by improving circulatory conditions. These findings suggest the feasibility of acupuncture in the prevention of diabetic complications20. Since its adjuvant use together with routine treatment may not lead to a significant reduction in the symptoms of peripheral neuropathy and in the severity of fatigue among individuals with diabetic neuropathy21.

4 CONCLUSION

The non-pharmacological treatment of DM II is personalized and should include not a single therapy. One of the best strategies for the treatment of DM II is self-management. Patients who control their eating habits and physical activity have a great improvement in their quality of life, since individuals who are well informed about their diet tend to make choices that are more appropriate to their health.

Our article concludes that the non-pharmacological treatment of DM II should have an eclectic and multidisciplinary view and rely on the patient's essential commitment.

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