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Plant Based Diets and the Risk of Type 2 Diabetes

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Abstract

Introduction: The prevalence of diabetes in the world continues to increase. Most cases of type 2 diabetes are caused by modifiable risk factors, including unhealthy diets based on meat and

processed products, low physical activity, overweight and obesity. Research suggests that plant-based diets have shown significant weight reduction benefits compared to non-plant-based diets and improve glycemic control to a greater extent than conventional diabetic diets.

The aim of the study: assessment of the frequency of developing diabetes t.2 in people eating various types of vegetarian diets compared to people whose diet contains animal products.

Material and methods: Standard criteria were used to review the literature data. The search of articles in the PubMed and Google Scholar database was carried out using the following keywords: plant based diet, vegetarian diet, type 2 diabetes.

Description of the state of knowledge: Food products such as red meat, especially processed meat, are one of the most important risk factors for metabolic disorders, including diabetes. A healthy and properly balanced plant-based diet can positively affect the carbohydrate metabolism. Due to the high fiber content, this diet has a low energy density. It also contains flavonoids and a high amount of antioxidants beneficial to human health.

Summary: Properly balanced vegetarian diets lower the risk of developing metabolic syndrome and diabetes. Plant-based diets range from vegan, lacto-ovo-vegetarian, peso-vegetarian, and semi-vegetarian diets. Different types of diets show differences in therapeutic effects. The most important factor connecting these different diets is the focusing on whole grains, vegetables and fruits, nuts, legumes, and limiting consumption of saturated and trans fats.

Key words: type 2 diabetes, plant based diet, vegetarian diet

INTRODUCTION

Diabetes mellitus is a chronic disease with epidemic proportions. According to data from WHO, the number of people with diabetes increased from 108 million in 1980 to 422 million in 2014 [1]. It is expected that by 2035 this number will increase to 592 million [2], and in 2045 to 693 million [3]. This disease carries many complications such as blindness, kidney failure, stroke and heart attack. The economic burdens associated with treating diabetes and its complications are high, therefore the possibility of preventing it may have a positive impact on the economy and health of the population. [4]

Type 2 diabetes is caused by the body not working effectively with insulin. The main factors of the incidence of this disease include, among others modifiable factors, especially the type of diet used. The popular Western diet tends to be low in whole grains, legumes, fruits and vegetables, and high in animal proteins and saturated fats. Some studies have found that implementing a plant-based diet relieves symptoms of hyperglycemia more than traditional medications [5, 6, 7, 8]. In countries where the Western diet is becoming more and more popular, the rate of diabetes is increasing. [9]

We distinguish several types of plant-based diets and determining which of them brings the best therapeutic effects and is the easiest to implement by patients is of great importance for patient care [4].

AIM OF THE STUDY

assessment of the frequency of developing type 2 diabetes in people eating various types of vegetarian diets compared to people whose diet contains animal products.

MATERIAL AND METHODS

Standard criteria were used to review the literature data. The search of articles in the PubMed and Google Scholar database was carried out using the following keywords: plant based diet, vegetarian diet, type 2 diabetes.

DESCRIPTION OF THE STATE OF KNOWLEDGE

There are several types of vegetarian diets. The vegan diet is the most restrictive of them all. It consists in refraining from consuming all animal products. Lacto-ovo-vegetarianism is a type of diet that involves the withdrawal of meat obtained from the muscles of animals, but it is possible to consume milk, dairy products and eggs. Pesco-vegetarianism involves eating fish, milk and dairy products, and eggs. Semi-vegetarians, on the other hand, do not completely restrict their meat consumption, they consume meat and meat products on a regular basis in minimal amounts.

A large number of observational studies on the effects of plant-based diets on the prevention and treatment of diabetes have been followed among Seventh-day Adventists [10, 8]. Among them, about 50% of the population followed a vegetarian diet and the other half were omnivores. Additionally, almost everyone avoided tobacco, alcohol and caffeine consumption. Among this social group, only 45% are diagnosed with diabetes. [11]. Even small amounts of meat have been shown to increase the risk of developing diabetes.

A study of 8,401 Seventh-day Adventist adults who were not diagnosed with diabetes at baseline found that after many years of follow-up (17 years in this study), people who consumed meat products once a week had a 29% higher risk of developing diabetes than those who did not have diabetes at baseline. non-meat eaters. This percentage increased to 38% when processed meat such as sausages and salted fish were also consumed [12].

The study also showed that in people who followed a vegetarian diet for a long time, the risk of developing carbohydrate disorders was reduced by 74% compared to those on a diet with a weekly supply of meat products [12].

A cross-sectional population study conducted in India of 156 317 adults aged 20-49 who participated in the National Family Health Survey in India found that in a large sample of adult men and women in India, vegetarian diet variants such as lacto-vegetarian and lacto-ovo-vegetarian were associated with at least a 30% lower risk of diabetes compared with those following a non-vegetarian diet. [13]

An observational study of 2,918 non-alcoholic and non-alcoholic Buddhists, initially free from chronic disease, showed that 183 people were diagnosed with diabetes after approximately 5 years of follow-up. [14]. During the observation, the diet was checked without distinguishing between the types of plant diets, fasting glucose and the level of glycated hemoglobin HbA1c. Lifelong vegetarian diets have been shown to reduce the risk of developing diabetes by 35%. In addition, the risk of developing diabetes in people who switched from a non-vegetarian diet to a plant-based diet was reduced by 53% compared to non-vegetarians. Other factors such as age, lifestyle, physical activity, and family history of carbohydrate disorders did not have a major impact on the results of the study. [4]

A study of 6798 participants from the Rotterdam Study in the Netherlands investigated whether following a more plant-based and less animal-based diet was associated with insulin resistance and the risk of pre-diabetes and T2D in the Dutch general middle-aged and elderly population [15]. Data were collected on diet, the presence of tissue insulin resistance, the presence of glucose intolerance, impaired fasting glucose, and type 2 diabetes. It was found that a higher plant-based dietary index score was associated with lower insulin resistance [$\beta = -0.09$ (95% CI - 0.10 to - 0.08)], a lower risk of glucose intolerance and impaired fasting glycaemia [HR = 0.89 (95% CI 0.81 to 0.98)] and a lower risk of diabetes [HR = 0, 82 (95% CI 0.73 to 0.92)] after adjusting for other important factors such as lifestyle, social and demographic conditions. Even after adjusting for BMI, these results remained significant for insulin resistance [$\beta = -0.05$ (95% CI - 0.06 to - 0.04)] and risk of diabetes [HR = 0.87 (95% CI 0.79 to 0.99)]. [15, 4]

As already mentioned, there are several types of plant-based diets. The 2009 study by Tonstad et al. investigated the relationship between the occurrence of diabetes and diet with the distinction between types of vegetarian diets [8]. The study classified the types of diets by obtaining data on weight, lifestyle and meal frequency questionnaires. Participants were designated vegans, lacto-ovo-vegetarian, pesco-vegetarian, semi-vegetarian, and non-vegetarian. The results obtained during the study showed that the incidence of glycemic disturbances increased gradually in these groups. The lowest rates of diabetes mellitus were 2.9% in vegans, 3.2% in lacto-ovo-vegetarians, 4.8% in pesco-vegetarians, and 6.1% in semivegetarians. and 7.6% nonvegetarians. [4]

There are many mechanisms by which plant-based diets affect glycemic control. We Will describe a few of them.

Weight Loss.

Weight loss is one of the most significant effects of plant-based diets on carbohydrate control [7]. A plant-based diet has been shown to reduce body weight without specifying the size of the meals consumed and without limits on energy consumption [16]. This phenomenon can be explained by low intake of fats and high intake of fiber [17]. When you lose excess weight, glycemic control improves and tissue sensitivity to insulin increases. In a randomized trial, weight loss was strongly correlated with a decline in HbA1c levels. However, weight loss is only one factor contributing to the hypoglycemic effect of vegetarianism. [18]

Changes in intramyocellular lipids.

In insulin resistance, which causes type 2 diabetes, there is an accumulation of lipids in the muscle cells. Diets containing a large amount of fats probably regulate the action of genes responsible for the accumulation of intracellular lipids, causing their excessive accumulation, while diseases with malabsorption of fat from the gastrointestinal tract have the opposite effect on the accumulation of fats [19]. Diets low in meat and animal products contain small amounts of fat, especially saturated fat. Consuming such a diet therefore has a lipid-lowering effect in cells. A case-control study was conducted in which lipid accumulation in soleus muscle was 31% lower than that of 21 vegans versus 25 meat-eating animals [20]. These studies show that a low-fat, meat-free plant-based diet reduces the accumulation of fat in the cells, which in turn leads to an increase in insulin sensitivity.

Increased consumption of fiber, fruits and vegetables. Replacing animal protein with other types of protein-containing products, such as soybeans, can provide the body with other nutrients beneficial to health. Soybeans are rich in such amino acids as lysine, leucine, isoleucine, phenylalanine, and in calcium and phosphates [14, 21]. All of the above-mentioned ingredients have been shown to have beneficial effects on carbohydrate control and tissue insulin sensitivity. A plant-based diet also provides more antioxidants. Antioxidants support the natural defenses of human cells. Research shows that eating plenty of fresh fruit and vegetables reduces the risk of developing type 2 diabetes [22]. Soluble fiber may be beneficial in treating and preventing diabetes because it binds glucose in the digestive tract, slowing its absorption into the bloodstream [23]. Both increased consumption of whole grain foods, fiber, and magnesium in vegetarians reduce the risk of dysregulation of carbohydrate levels. Magnesium is one of the essential elements for the human body and a cofactor or activator of over 300 enzymatic reactions. It controls blood glucose levels and insulin release. Research indicates that magnesium is a predictor of insulin resistance and diabetes, and that lower serum magnesium levels have resulted in an increased risk of insulin resistance and diabetes. [24]

Gastrointestinal hormonal response.

Another potential mechanism for improving glycemic control is improving the hormonal response of the gastrointestinal tract. Incretins play a significant role in the postprandial insulin surge. [25]. Patients with type 2 diabetes exhibit a reduced incretin effect [26] The consumption of processed

meat predisposes to disturb the release of gastrointestinal hormones. This happens both on an empty stomach and after meals. These disorders are not observed with eating vegan meals [27]. These observations suggest that plant-based diets may improve gastrointestinal hormone release in patients with type 2 diabetes [28].

SUMMARY

Observational studies show that in people with a plant-based diet, the risk of developing type 2 diabetes is significantly reduced. The evidence from this study shows that vegan diets low in fat are as effective in blood glucose control and weight reduction as more conventional diabetic diets, and are much more effective in lipid management.

Healthcare professionals, including doctors, should be aware of the beneficial effects of a plant-based diet and recommend a vegetarian diet to their patients with pre-diabetes or type 2 diabetes. However, it should be remembered that the type of food in the diet is very important in achieving therapeutic goals. Foods useful in preventing the development of diabetes include whole grains, fruits, vegetables, nuts, legumes, and unsaturated fats. Therapeutic effects occur after introducing each of the plant-based diets, regardless of its type.

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