

Analysis on the influence of a low-carbohydrate diet and a high-protein diet on the glucose level of diabetes

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Abstract. The treatment of type 2 diabetes has been greatly aided by dietary changes. The practice of adopting a healthy diet has become increasingly popular around the world. In addition to assisting with the maintenance of appropriate blood sugar and blood pressure levels, this also helps to prevent long-term organ damage and enhances general health. In this analysis, we look at the research on high-protein and low-carbohydrate diets for diabetes patients with the goal of better glycemic control. To better understand the connection between type 2 diabetes and food, this study will examine the effects of a high-protein diet and a low-carbohydrate diet on blood sugar levels in persons with the disease.

Keywords: high-protein diet, low-carbohydrate diet, glucose level, type 2 diabetes.

1. Introduction

Type 2 diabetes is a non-communicable disease that is becoming increasingly common. Non-insulin dependent diabetes mellitus (NIDDM), also known as Type 2 diabetes, accounts for about 90% of all occurrences of diabetes. Type 2 diabetes has emerged as one of the public health crises with the fastest global expansion due to modern unhealthy lifestyle and eating habits, which are expected to double the number of victims within the next 25 years. The World Health Organization estimates that 642 million people will have diabetes by 2040, making it the most common chronic disease in the world. And it caused serious damage to total body health as limiting results, such as heart disease, peripheral vascular disease, and retinal aberrations that could lead to blindness, difficulties that carry heavy financial and medical costs. Diet plays a significant role in defining human health, and making dietary adjustments can aid in the control of diabetes. Glycemic control and nutritional health can both benefit from a better understanding of the effects of different diets on diabetes patients.

To begin, the dietary factors that can affect one's risk of developing diabetes are the primary emphasis of this review. Substantial study on the link between health and food indicates that nutrition is an important element in diabetes control, making dietary management critical for the body. Most of the previous studies have either emphasized the importance of high protein or low carbs. Even while low-carbohydrate, high-protein diets are gaining popularity, the data regarding their efficacy in the management of diabetes is mixed. Taking their impact on blood sugar levels into account can help provide more solid proof for or against their usage in diabetes management.

Second, the effectiveness of a high-protein diet and a low-carbohydrate diet in managing blood sugar levels in persons with type 2 diabetes is compared and contrasted in this systematic study. The goal is to

give patients more information about how different diets affect diabetes care so that they can create programs that work for them based on factors like age, weight, and profession. By focusing on the benefits of limiting consumption of complex carbs and dietary protein, this study hopes to provide light on the potential advantages of these diets for persons with type 2 diabetes.

2. Diabetes

Diabetes mellitus is a metabolic illness marked by high blood glucose levels and glycosuria, and is caused by damage to pancreatic beta cells and insulin resistance. Glucose or sugar is generally produced by the body after digestion of food and is used for energy. However, those with diabetes tend to have higher blood glucose levels because they either don't make enough insulin or are unable to properly utilize the insulin they do create. Protein and lipid metabolism both undergo changes in later phases. Diabetes risk increases with age, obesity, poor diet, lack of exercise, higher socioeconomic status, higher blood pressure, and higher levels of psychological stress. Complications from high blood sugar include blindness, kidney failure, nerve damage, and an increased chance of developing cardiovascular disease and high blood pressure. The two most frequent forms of diabetes are type 1 and type 2. Blurred vision, a painful throat, increased thirst, frequent urination (especially at night), and blurred vision are all symptoms of untreated diabetes. In order to properly treat diabetes, blood glucose levels must be maintained through a combination of dietary and physical activity restrictions, medication, and close monitoring.

2.1. Type-2 diabetes

Approximately 90–95% of all instances of diabetes are attributable to type-2 diabetes, also known as non-insulin-dependent (NIDD) diabetes. This form of diabetes often affects adults, and it develops slowly over time. It might take up to ten years for someone to be diagnosed with high blood glucose levels because the condition often has no symptoms until complications arise. Both insufficient insulin synthesis by the pancreas and insulin resistance in the body's cells contribute to the impaired glucose uptake seen in type 2 diabetes. There may be an abundance of insulin in the body, but if the cells are immune to its effects, glucose will continue to build up in the blood. The symptoms of being overweight, being middle-aged or older, and having a family history of diabetes are all present in a sizable percentage of patients with type-2 diabetes. Although it typically manifests in those 40 and older, it can strike younger people, particularly those of South Asian and African-Caribbean descent. Renal failure, blindness, heart disease, and stroke are some of the complications of diabetes that can occur if the condition is not addressed. Treatment options include alterations to the patient's diet and exercise routine, as well as medication and insulin injections. The onset of Type-2 diabetes may be postponed or avoided entirely with the help of lifestyle modifications including increasing physical activity and keeping the weight where it should be. With the correct diagnostics, medical attention, and dietary adjustments, type-2 diabetes can be effectively controlled.

2.2. Effect of low carbohydrates on type 2 diabetes

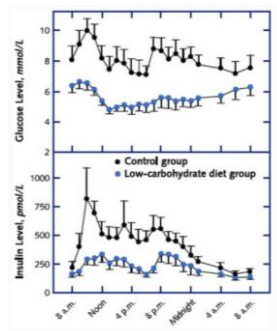


Figure 1. The concentration level of glucose and Insulin after implementing low carbohydrate diet after 24 hours [1].

For better blood sugar control and overall health, many people have turned to low-carbohydrate diets, in which they consume fewer carbs such as sugars and starches. The amount of carbohydrates eaten is cut back from what would be considered a normal or high-carb diet. In the first study, the low-carbohydrate diet group had lower post-meal and fasting glucose levels. In this study, eight individuals with untreated type-2 diabetes were given a LoBAG diet, a high-protein, low-carbohydrate diet. Weight-maintaining and non-ketogenic, the diet's carbohydrate:protein:fat ratio was 20:30:50. 55:15:30 was the control diet. A 5-week washout was used in the randomized crossover experiment.

The integrated glucose concentration over the course of 24 hours dropped dramatically as a result (Fig.1). Thus, a low-carbohydrate diet lowered both post-meal and fasting glucose levels, as well as 24-hour and 5-week integrated glucose levels and the percentage of glycohemoglobin concentration.

A 24-week research comparing a low-glycemic, reduced-calorie diet to a low-carbohydrate diet for patients with obesity and type-2 diabetes found the former to be superior in terms of glycemic management [2]. Group meetings, nutritional supplements, and exercise advice were all included in the two diet plans that were randomly assigned to the 84 study participants. The outcomes demonstrated reductions in weight, glucose, and insulin levels after both therapies. Hemoglobin A1c, body weight, and high-density lipoprotein cholesterol all improved in both groups, although the low-carbohydrate group reduced or eliminated their diabetic medication more often. Low-carbohydrate therapy and other lifestyle adjustments were found to improve and in some cases reverse diabetes in patients with type 2 in the study.

2.3. Effects of high protein on type2 diabetes

Previous studies shown that after 5 weeks, glycohemoglobin levels decreased significantly (from 8.1% to 7.3%) when carbohydrate intake was reduced and protein intake was increased from 15% to 30% of total food energy [4]. Despite lower post-meal glucose levels, the fasting glucose concentration did not change.

This follow-up study aimed to further reduce the carbohydrate content of the diet while maintaining the 30 percent protein intake found in the first. In example, the proportion of glycogen to total meal energy went down from 40% to 20%. The control group in all studies followed a diet comparable to that suggested for reducing coronary heart disease risk [5]. This 24-week trial compared a low-carbohydrate diet to a low-glycemic, reduced-calorie diet on glycemic management in obese and type 2 diabetic patients. Group meetings, nutritional supplements, and exercise advice were all included in the two diet plans that were randomly assigned to the 84 study participants. The outcomes demonstrated reductions in weight, glucose, and insulin levels after both therapies. The low-carbohydrate group, however, saw bigger reductions or eliminations in the use of diabetes medications, as well as greater improvements in hemoglobin A1c, body weight, and high density lipoprotein cholesterol. The results of the study show that people with type 2 diabetes can improve their condition and even reverse it with the help of low-carbohydrate therapies as part of a healthier lifestyle.

Another study confirmed the same benefit from adopting a high-protein diet [7]. This study examined the metabolic health of untreated type 2 diabetics on a high-protein diet versus a control diet. The macronutrient breakdown of the high-protein diet was 30:40:30, while that of the control diet was 15:55:30. The patients stayed the same weight throughout the research despite following either diet for a total of 5 weeks. In comparison to the control diet, the high-protein diet was found to improve glucose management by lowering the mean 24-hour integrated glucose area response by 40%. Glycated hemoglobin levels were reduced by 0.8% on the high-protein diet compared to 0.3% on the control diet. High-protein diet participants also showed a considerably faster rate of change over time compared to the control diet participants [8]. The high-protein diet lowered fasting triacylglycerol relative to the control diet. Insulin, C-peptide, and free fatty acid concentrations were similar between diets [9].

Based on the results of these two studies, it appears that a high-protein diet may improve glucose management in persons with type 2 diabetes when compared to a control diet. To determine the entire amount of the reaction, any potential negative effects, and the diet's long-term acceptability, however, more research is needed over longer time periods.

3. Suggestions

Longer intervention periods (say, 12 or 24 weeks) might help researchers learn more about the long-term impact of a low-carbohydrate diet on glucose management for those with type-2 diabetes. Researchers would be able to investigate the potential for long-term consequences of any benefits discovered if the intervention was larger in scope. The statistical power and generalizability of the study could also be improved by increasing the size of the sample. A larger sample size would also permit a more in-depth analysis of the potential variations in how the low-carb diet affects glucose control in various subgroups of people with type 2 diabetes, such as those with different degrees of insulin resistance or different HbA1c readings at the outset of the study. More data on critical outcomes like weight loss, blood pressure reduction, and lipid profiles may be able to paint a fuller picture of the impact of a low-carbohydrate diet on the health of people with type-2 diabetes. More definitive results on the effect of the low-carbohydrate diet on glucose control and other health outcomes in patients with type-2 diabetes require a larger, longer-term experiment. More information on these results might help doctors better care for their type-2 diabetic patients. This is for the best interests of the patients.

4. Conclusion

Effective lifestyle changes in preventing type-2 diabetes include adopting a balanced food pattern and engaging in regular physical activity. Therefore, it is essential to place emphasis on encouraging people, especially those at high risk, to adopt healthier lifestyle choices such as eating a balanced diet. The results of this research add to the mounting evidence supporting the advocacy of a high-protein, low-carbohydrate diet. Due to the lack of true experimental settings for exploring the topic in the real world, the work has certain limitations; for example, the variables (study length, protein/carbohydrate intake) leading to the result are not fully identical. As a result, this review can only provide a broad assessment of the papers included in it.

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