

# Current Status of Research on Diets High in Dietary Fiber for Patients with Gestational Diabetes Mellitus

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**Abstract:** The purpose of this study is to analyze whether the intake of soluble dietary fiber plays a positive role in regulating the blood glucose level of patients with gestational diabetes mellitus through the comparative analysis of experimental data of the previous researchers and the dietary nutritional data of various countries, and to explore whether supplementing the nutritional combination of high soluble dietary fiber has a positive effect on blood glucose level of patients with diabetes mellitus in the whole period of pregnancy and thus verify whether high soluble dietary fiber has an effective intervention effect or even a therapeutic effect on controlling the blood glucose level of patients with gestational diabetes mellitus. The effect of supplementation with highly soluble dietary fiber on the blood glucose level of patients with gestational diabetes mellitus in the whole pregnancy period, so as to verify whether highly soluble dietary fiber has an effective intervention effect or even a therapeutic effect on the control of blood glucose level of gestational diabetes mellitus patients. Compare and contrast with the intake of insoluble dietary fiber, and compare and discuss whether different dietary fibers have different effects on the blood glucose level of gestational diabetes mellitus patients. It also summarizes the current methods of dietary fiber intervention in the treatment of gestational diabetes mellitus, and thus provides an outlook on the possible tendencies of future development.

**Keywords:** Dietary Fiber; Gestational Diabetes Mellitus; Blood Glucose Levels; Nutritional Profile.

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## 1. Introduction

### 1.1. Gestational Diabetes and Dietary Fiber

Gestational diabetes mellitus is one of the most common endocrine diseases, which occurs in late pregnancy and is a common complication of pregnancy in pregnant women[1]. Until now, the exact pathogenesis of gestational diabetes mellitus has not been clarified, but most of them are caused by overnutrition of pregnant women who consume a large amount of foods high in sugar, oil, and saturated fatty acids in order to ensure that they are able to provide sufficient nutrition for the fetus during pregnancy, which leads to the emergence of insulin resistance in pregnant women or the first appearance of insulin resistance[2]. In addition, gestational diabetes mellitus can be harmful to both the mother and the fetus, leading to adverse pregnancy outcomes and complications for both mother and child, but it can be effectively mitigated through active intervention at 24-28 weeks and the development of a rational treatment plan[3].

Dietary fiber is an edible plant component that includes cellulose, hemicellulose, pectin, and other substances that are macromolecules that are difficult to digest by the enzymes contained in the human body. Dietary fiber is often referred to as the "seventh major nutrient"[4]. According to the different solubility of dietary fiber, it can be divided into soluble dietary fiber (SDF) and insoluble dietary fiber (IDF). While soluble dietary fiber can bypass the small intestine, it can be partially or fully fermented by intestinal flora at the colon[5]. The main reason dietary fiber can serve the purpose of lowering blood glucose is because dietary fiber allows food to remain in the human gut for a shorter period of time, and at the same time, it can absorb water and swell in the gut, thus increasing satiety and delaying glucose absorption[6]. The source is widely distributed, often in the cytosol and intercellular matrix, in vegetables and fruits, cereals and fungi

such as black beans, avocados, broccoli, figs[7], for the prevention and improvement of gestational diabetes mellitus should have a broader significance.

### 1.2. Research Background

In recent years, with the rapid development of human science and technology, as well as the deepening of knowledge of the natural world, the level of medical care around the world has been significantly improved. For some of the diseases faced by human beings at present, more effective treatment means have been available. However, in recent years, with the improvement of people's daily life and diet quality, the prevalence of gestational diabetes mellitus has been increasing year by year [8-10]. In response to this problem, research in various countries has also achieved some results in this field. The research in this paper also focuses on the effectiveness of dietary intervention for gestational diabetes mellitus in the world, and through sorting out the results of domestic and international research, we can sort out the position of dietary intervention in the effective treatment of gestational diabetes mellitus as well as discover the possibilities and challenges of future development, and also provide some theoretical support for subsequent research.

## 2. Literature Review

According to the literature read by the author, there are more in-depth studies at home and abroad on the impact of diet and nutrition on blood glucose levels in patients with gestational diabetes mellitus and adverse pregnancy outcomes, and foreign scholars focus on carbohydrates or a certain dietary structure such as the Mediterranean diet, ketogenic diet and other aspects of a comprehensive study. On the other hand, domestic scholars mostly focus on the proportion of a certain nutrient in the diet structure on the patients' blood glucose level and the direction of improving the outcome of pregnancy, which is more targeted. Compared

with the mature dietary structure system researched by foreign scholars, domestic scholars are more inclined to customize different dietary structures according to individualized differences.

At present, domestic scholars focus on the question of whether dietary fiber can play a role in the treatment of gestational diabetes mellitus, a variety of data to prove the feasibility of the method, most scholars use the method of clinical data collection and analysis, but the grouping and variable settings are relatively single, excluding the presence of dietitian intervention, there is no other type of experimental design. There are difficulties and challenges in further research questions on the availability of dietary fiber. This phenomenon may be due to insufficient experimental data or insufficient experimental subjects, which stops current research at nutritional interventions as well as means of combined drug therapy.

### 3. Research Status

Gestational diabetes mellitus is a high-risk pregnancy, and its impact on the mother and the fetus is undoubtedly huge, and for the current clinical treatment of the common way of metformin drug therapy, insulin therapy and the emerging probiotic capsule therapy[11]. However, no matter which method is used as the main treatment, nutritional guidance and dietary control are necessary parts of the auxiliary treatment. This shows the significance of the presence of dietary nutrition in the therapeutic regimen of patients with gestational diabetes mellitus.

#### 3.1. Nutritional Interventions

Up to now, there are many research data showing that nutritional interventions perform well in the treatment program of gestational diabetes mellitus. Although there is no standardization of nutritional interventions around the world, and nutritional interventions have not been used as a primary medical treatment for patients with gestational diabetes mellitus, there are a number of studies that have demonstrated the substantial role of nutritional interventions[12].

Low-carbohydrate diet is an approach that has been proven to be one of the most effective, and in the early stage of the study, it was shown that this pattern of diet helps to improve adverse pregnancy outcomes and can significantly reduce postprandial glucose, etc [13]. However, in the subsequent clinical data, it has been shown that the low-carbohydrate diet structure is prone to cause maternal anxiety and other adverse effects[14]. The ketogenic diet is also essentially a very low-carbohydrate diet, but the dangers of this diet for the pregnant woman as well as for the fetus itself and the safety of the measures to be taken need to be further examined.

The low GI diet and the Mediterranean diet have also been shown to be safe and effective. The low-GI dietary pattern is effective in improving blood glucose levels in patients with adequate energy supplementation, and when intervened synergistically with dietary fiber, appears to be strongly associated with improved adverse pregnancy outcomes[15]. The Mediterranean diet, a dietary pattern based on vegetables and fruits and the consumption of olive oil for cooking, was first proposed in 1960, and studies over the years have confirmed that it is an effective intervention.

With the continuous development of human medical technology and clinical research, many other dietary patterns have also been proposed, but whether the rest of the dietary patterns have effective results in influencing blood glucose as

well as pregnancy outcomes in patients with gestational diabetes mellitus or whether they are detrimental compared to the above mentioned approaches that have already reached maturity needs to be confirmed by more research data.

#### 3.2. Nutritional Structure High in Dietary Fiber

As nutritional interventions are gradually proved to be effective in clinical applications, more and more researchers are focusing on the effects of the proportion of individual nutrients in the dietary structure on the blood glucose levels of diabetic patients as well as on pregnancy outcomes. Among them, high dietary fiber interventions are more effective in treating gestational diabetes. In addition, the American Diabetes Association (ADA) has suggested that the recommended amount of dietary fiber needed for diabetic patients is 14 g/1,000 kCal per day[16], which can be improved in diabetic patients in order to achieve glycemic improvement.

It has been suggested in the literature that the treatment of diabetes should be a comprehensive one, including medication, diet and other interventions, but diet is the foundation of all types of diabetes treatment, and effective diet is a prerequisite for subsequent pharmacologic interventions as well as blood tests[17].

The earliest clinical data on the therapeutic effect of dietary fiber intervention on gestational diabetes mellitus available in China is a study by Wu Jinhui[18], in which 105 gestational diabetes mellitus patients were divided into a control group receiving basic dietary treatment and a treatment group increasing the proportion of roughage, and the patients' fasting glucose and postprandial glucose were tested every day, and it could be found that the treatment group's values of fasting glucose and postprandial glucose are both higher than those in the control group and postprandial glucose. Postprandial blood glucose in the treatment group was significantly lower than that in the control group. It can be proved that the intake of dietary fiber has a significant correlation with the blood glucose level of gestational diabetes mellitus patients, and can effectively control the blood glucose level of the patients.

In the following three years, there was no correlation study, until the 2014 study by Lian Jufei[19] et al. 148 patients were divided into a control group that controlled their own diets and a treatment group that received personalized dietary interventions from a dietitian, and the results were similar to the results of the study by Wu Jinhui[18]. The results were similar to those shown in Wu Jinhui's study, which showed that a scientific diet plan with a high dietary fiber structure that takes advantage of individual differences can effectively help patients maintain their blood glucose levels and other indicators at a better level and help them develop good eating habits. In a follow-up study, Chinese scholars Pan Fang et al[20]. selected patients from Jiangsu Healthcare Hospital in China as the study subjects and gave wheat fiber granules intervention, which also confirmed that an increase in the amount of dietary fiber can be effective in blood glucose and blood lipid levels. The feasibility of high dietary fiber therapy and its contribution in reducing the risk of gestational diabetes is further supported by the study of Jiang Yanzhu[21] et al. There are also many studies[22-27] that provide sufficient data to support the feasibility of this program.

In the coming years, more and more clinical studies will be published, including most of the data analyzed from different

regions of China, including the south and the north. In recent years, there has also been an analysis of the effectiveness of metformin combined with high dietary fiber in the treatment of gestational diabetes by Wang Guixiang[28] et al. Their experiment divided the patients into a control group that took oral metformin and a study group that added a customized diet by a dietitian on top of the metformin, and then monitored the incidence of adverse gestational outcomes in the newborn after the pregnancy was over, and found that the combined nutritional intervention was more effective in improving gestational outcomes relative to pharmacological interventions alone. Improving pregnancy outcomes. Subsequent studies by Zhang Guanqun[2] and others have been able to further demonstrate the significant contribution of dietary fiber in this direction.

#### 4. Conclusion

With the increasing application of dietary interventions in clinical treatment, in the future development and research, dietary fiber may be changed from an adjunctive therapy to a primary therapy, turning drug therapy into an adjunct or even out of drug therapy, reducing the harm and burden of drugs on the body of pregnant patients. However, although this research has a broad future prospect but needs a lot of experimental data to prove that there is no research basis, but can be used as a direction for research.

In conclusion, the use and efficacy of dietary fiber in nutritional interventions have contributed to the prevention of gestational diabetes mellitus, the improvement of blood glucose levels in patients with gestational diabetes mellitus, and adverse pregnancy outcomes. Although dietary interventions are an important part of the treatment regimen for gestational diabetes mellitus, there is a need to incorporate them into the treatment rather than controlling the daily nutritional intake by simply telling patients to avoid foods or by approximating the structure of the diet. This study will also help to advance the research on the role of dietary fiber in the improvement and treatment of gestational diabetes, and will continue to explore the potential application of soluble dietary fiber.

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