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Application of Low Glycemic Index Diet in Nutritional Treatment of Gestational Diabetes

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Abstract: *The article aims to explore the value of using low glycemic index diet in nutritional treatment of diabetes patients during pregnancy. In this research, 64 patients with gestational diabetes admitted to our hospital from February 2022 to June 2023 were selected as the objects, and they were divided into a control group and an observation group, with 32 cases in each group. The patients in the control group were implemented with routine nutrition management, while the observation group were implemented additional hypoglycemic index diet on the basis of control group. The improvement of blood sugar levels, pancreatic islet function, and inflammatory factor levels were compared between the two groups of patients. The results of this research show that there was no significant difference in the improvement of blood glucose levels, pancreatic islet function, and inflammatory factor level index between the two groups before treatment (P>0.05). After treatment, compared with the control group, the observation group had lower blood glucose concentration levels, tumor necrosis factor-a levels, interleukin-6 and C-reactive protein levels, as well as lower incidence of adverse pregnancy outcomes such as postpartum hemorrhage, macrosomia, and ketoacidosis (P<0.05). Moreover, the levels of tumor necrosis factor-a, interleukin-6, and C-reactive protein in the observation group were superior to those in the control group (P<0.05). Comparing the stress response levels of the two groups, the observation group showed significantly better levels of superoxide dismutase, malondialdehyde, and peroxidase than the control group after treatment (P<0.05). According to the statistics on the proportion of total calories, carbohydrates, protein, and fat intake in the two groups, the observation group was lower than the control group in terms of carbohydrate intake, fat intake, and glycemic index (P<0.05). According to the results, the conclusion can be drawn that the low glycemic index diet in the nutritional treatment of gestational diabetes can more effectively improve the blood sugar level of patients, reduce the level of inflammatory factors in the body, prevent adverse pregnancy outcomes, and improve the function of islets of langerhans, which plays an important role in ensuring the pregnant and fetal health.*

Keywords: *Low Glycemic index Diet, Gestational Diabetes, Nutritional Treatment*

1. Introduction

Gestational diabetes is the most common type of disease in women during pregnancy, and its pathogenic factors are complex, which will have a certain impact on the health of pregnant women and the health of the fetus. In the process of treating patients with gestational diabetes, if hypoglycemic drugs are used for treatment, it is easy to affect the health of the fetus. In combination with clinical practice, although insulin is effective, the acceptance of patients is not high, the dependence is poor, and the role of insulin has great differences[1-2]. It is the safest and most effective way to treat diabetes in pregnancy according to the nutritional treatment. By strictly controlling the intake of calories and carbohydrates during pregnancy, patients can improve their blood sugar levels[3-4]. However, based on clinical practice, it can be found that after food restriction, there are still significant fluctuations in blood sugar levels in some patients. Applying the low glycemic index diet to the nutritional treatment of diabetes patients during pregnancy can more effectively manage their blood sugar level and improve their body status in all aspects, which plays an important role in improving pregnancy outcomes[5-6]. This study mainly explores the specific value of low glycemic index diet in nutritional treatment of diabetes patients during pregnancy.

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2. Materials and Methods

2.1. General Information

From February 2022 to June 2023, 64 patients with gestational diabetes in our hospital were selected as research objects, and randomly divided into the control group (32 cases with routine nutrition management during treatment) and the observation group (32 cases with low glycemic index diet on the basis of routine nutrition treatment) through the numerical table method. The control group was aged between 24 and 36 years old, with a mean of (28.83 ± 1.83), of which 20 were first pregnancies and 12 were second pregnancies. The age of the observation group was between 23 and 37 years old, with a mean of (28.98 ± 1.75), of which 19 were first pregnancies and 13 were second pregnancies. There was no difference in the comparison of basic data between the two groups (P>0.05).

2.2. Method

The control group received routine nutritional treatment: The diet of patients during pregnancy is managed by obstetricians and nutritionists. Patients' daily carbohydrate need to be controlled intake at 50% to 60%, protein intake at 20%, and fat intake at 20% to 30%. At the same time, it is necessary to control the ratio of 2:4:4 in the distribution of nutritional intake for the three meals, and strictly manage the intake of vitamins, iron, and calcium in the daily diet process based on the actual situation of the patient, and guide the patient to carry out reasonable exercise during pregnancy to improve their physique and promote metabolism. The observation group needs applying a low glycemic index diet on the basis of the control group during the nutritional treatment process: The obstetricians and nutritionists should guide patients to conduct blood glucose levels at least twice a day during the observation process, and timely grasp the changes in patients' blood glucose levels. According to the principle of eating less and eating more times, eating three meals on time and in a fixed amount, and adding more meals as appropriate. The intake of various nutrients should be strictly managed again: (1) Carbohydrates: The daily intake of carbohydrates needs to be controlled at 175g. (2) Heat: The daily total fat intake of patients needs to be controlled at 20% of total calories. (3) Protein: The daily intake of protein should not be less than 80g, with high-quality protein as the main ingredient, and the intake of red meat should be minimized as much as possible. (4) Microbial and mineral intake: During pregnancy, it is necessary to increase the intake of mineral rich foods, including milk, poultry, shrimp, etc., and to consume mineral rich foods such as fruits and vegetables appropriately.

2.3. Observation indicators

(1) Blood sugar levels: To detect and compare fasting blood glucose levels, 2-hour postprandial blood glucose levels, and glycated hemoglobin levels between two groups of patients during pregnancy. (2) Inflammatory factor levels: Approximately 6ml of elbow vein blood was collected from two groups before and after treatment, and the upper serum was obtained through routine centrifugation. The levels of tumor necrosis factor-a, interleukin-6, and C-reactive protein were detected and compared during pregnancy. (3) Adverse pregnancy outcomes: Statistics were conducted on the incidence of postpartum hemorrhage, macrosomia, and ketoacidosis during pregnancy in both groups. (4) Stress response levels: To detect and compare the levels of superoxide dismutase, malondialdehyde, and peroxidase between the two groups during pregnancy. (5) Nutritional intake levels: Statistics were conducted on the proportion of total calorie, carbohydrate, protein, and fat intake for two groups.

2.4. Statistical methods

In this study, the data related to both groups were processed according to SPSS 20.0. The percentage was represented by counting data, chi square test, and the measurement data was represented by mean ± standard deviation. The t-test indicated that the P<0.05 shows difference was statistically significant.

3. Results

3.1. Comparison of blood glucose levels between two groups

Comparing the blood glucose levels before and after treatment between the two groups, there was no significant difference in fasting blood glucose levels, 2-hour postprandial blood glucose levels, and

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glycated hemoglobin levels between the two groups before treatment (P>0.05). After treatment, the blood glucose levels of the observation group was lower than those of the control group (P<0.05), as shown in Table 1 below:

Table 1: Comparison of fasting blood glucose levels, 2-hour postprandial blood glucose levels, and glycated hemoglobin levels between two groups($\bar{x} \pm s$)

Group	Cases	Fasting blood glucose levels (mmol/L)		2-hour postprandial blood glucose levels (mmol/L)		Glycated hemoglobin levels (%)	
		Before	After	Before	After	Before	After
Observation group	32	7.98±0.35	5.11±0.25	9.98±0.22	6.15±0.25	9.68±0.28	6.11±0.28
Control group	32	7.97±0.28	6.35±0.19	9.97±0.19	7.15±0.32	9.71±0.29	7.86±0.25
t	-	1.528	10.052	1.624	12.052	1.426	13.058
P	-	0.624	0.001	0.435	0.001	0.724	0.001

3.2. Comparison of inflammatory factor levels between two groups

Comparing the levels of tumor necrosis factor-a, interleukin-6, and C-reactive protein in patients, there was no difference between the two groups before treatment (P>0.05). After treatment, the inflammatory factor levels of the observation group was superior than those than the control group (P<0.05), as shown in Table 2 below:

Table 2: Comparison of levels of tumor necrosis factor-a, interleukin-6, and C-reactive protein between two groups($\bar{x} \pm s$)

Group	Cases	Tumor necrosis factor-a(pg/L)		Interleukin-6(pg/L)		C-reactive protein(ng/ml)	
		Before	After	Before	After	Before	After
Observation group	32	111.85±4.05	73.15±2.34	9.61±0.25	3.32±0.21	9.31±0.34	3.35±0.32
Control group	32	112.71±5.15	87.78±2.53	9.74±0.34	5.56±0.26	9.28±0.42	5.74±0.25
t	-	1.425	12.052	1.425	10.052	1.525	11.052
P	-	0.352	0.001	0.624	0.001	0.345	0.001

3.3. Comparison of the incidence of adverse pregnancy outcomes between two groups

Comparing the incidence of adverse pregnancy outcomes between the two groups, the incidence of postpartum hemorrhage, macrosomia, and ketoacidosis in the observation group was lower than that in the control group (P<0.05), as shown in Table 3 below:

Table 3: Comparison of the incidence of adverse pregnancy outcomes between two groups [n,(%)]

Group	Cases	Postpartum hemorrhage	Macrosomia	Ketoacidosis	Incidence
Observation group	32	1(3.13)	0(0.00)	1(3.13)	2(6.25)
Control group	32	2(6.25)	2(6.25)	3(9.38)	7(21.88)
$\chi 2$	-	-	-	-	11.042
P	-	-	-	-	0.001

3.4. Comparison of stress response levels between two groups of organisms

Comparing the levels of superoxide dismutase, malondialdehyde, and peroxidase between the two groups, there was no difference before treatment (P>0.05). After treatment, the indicators of the observation group was better than those of the control group (P<0.05), as shown in Table 4 below:

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Table 4: Comparison of levels of superoxide dismutase, malondialdehyde, and peroxidase between two groups($\bar{x} \pm s$)

Group	Cases	Superoxide dismutase (U/mL)		Malondialdehyde (umol/L)		Peroxidase (U/L)	
		Before	After	Before	After	Before	After
Observation group	32	85.78±3.25	103.25±5.44	10.75±1.34	5.42±1.25	115.85±6.48	185.78±5.15
Control group	32	86.15±3.35	92.25±4.45	10.62±1.62	8.78±1.42	115.91±7.14	151.86±6.15
t	-	1.585	12.054	1.425	11.052	1.425	15.052
P	-	0.425	0.001	0.234	0.001	0.624	0.001

3.5. Comparison of nutritional intake levels between two groups

According to the statistics of the proportion of total calories, carbohydrates, protein, and fat intake in the two groups, the observation group was lower than the control group in terms of carbohydrate intake, fat intake, and blood glucose generation index (P<0.05), as shown in Table 5 below:

Table 5: Comparison of nutrient intake levels between two groups($\bar{x} \pm s$)

Group	Cases	Total calories(kcal/d)	Carbohydrates (%)	Protein(%)	Fat intake(%)	Glycemic Index
Observation group	32	1786.58±325.45	58.63±4.25	19.56±2.45	23.42±3.45	61.04±2.75
Control group	32	1791.57±332.61	55.05±3.45	19.45±2.58	25.68±2.14	43.36±3.04
t	-	0.785	5.425	0.458	6.042	8.425
P	-	0.468	0.001	0.425	0.001	0.001

4. Discussion

Gestational diabetes is the most common complication of women during pregnancy, Insulin secretion deficiency is the main pathogenesis of this part of patients, which leads to an abnormal increase in blood sugar levels, which will have different degrees of impact on the health of pregnant women and fetus[7-8]. At the same time, combined with clinical practice, gestational diabetes will increase the incidence of adverse pregnancy outcomes, including premature delivery, dystocia, pre eclampsia and fetal malformations. In order to effectively protect the health of diabetes patients and their fetuses during pregnancy, and prevent adverse pregnancy outcomes, effective intervention measures should be taken in time to manage their blood sugar levels. Although the use of hypoglycemic drugs is the most effective way to improve the blood sugar level of patients, patients often have concerns about the use of insulin, resulting in poor clinical compliance. Non drug treatment is still the first choice for clinical treatment of gestational diabetes, of which nutrition treatment is the most important content[9-10]. Based on the comprehensive physical condition of the patient, the design is aimed at the nutritional requirements of the patient in their daily life and fetal growth and development process, which can ensure that the patient meets their own needs and fetal development needs in the daily diet process, avoid abnormal fluctuations in their blood sugar levels caused by improper drinking and eating, and achieve the goal of comprehensive regulation of various aspects of the body's state. However, combined with practical experience, it can be found that in the process of routine nutritional therapy, strict management of patients' daily nutritional intake can achieve the goal of controlling patients' blood sugar levels, but the long-term effect is not satisfactory, making it difficult to effectively improve patients' blood sugar levels and various aspects of the body's state.

Applying the low glycemic index diet to the nutritional treatment of diabetes patients during pregnancy can promote the patients to be more scientific in their daily diet. The hypoglycemia index is an important index in measuring the impact of food on human blood sugar levels in current clinical practice. Combined with controlling the hypoglycemia index of patients during pregnancy, it can more effectively manage their blood sugar levels and play an important role in stabilizing the condition, ensuring the health of the fetus and mother. During the process of consuming a low glycemic index diet, based on the patient's actual situation and changes in blood sugar levels, a scientific dietary intervention plan is developed to ensure that the patient maintains normal nutritional intake during pregnancy, and to correct their unreasonable dietary habits. In this way some abnormal fluctuations in the patient's blood sugar levels can be avoided and the incidence of common complications such as ketoacidosis and hypoglycemia can reduce[11]. At the same time, by guiding these patients to maintain a scientific diet plan

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during pregnancy, the goal of improving various aspects of the patient's body status can be achieved, avoiding abnormal increase in blood sugar levels and increasing the incidence of various stress reactions, which can indirectly achieve the goal of regulating the levels of inflammatory factors in the patient's body, avoiding abnormal increase in blood sugar levels that can lead to the patient's own body tissues and various systems organs and other negative effects[12]. According to the research of Mu Yan et al.[13], reasonable use of low glycemic index diet can regulate the level of inflammatory factors in patients during nutritional treatment of diabetes patients during pregnancy, which is consistent with this study. At the same time, Xifeng Liu et al.[14] pointed out that under the action of a low glycemic index diet, patients can increase their body adaptability, avoid stress reactions in various tissues and organs caused by abnormal fluctuations in blood sugar levels, increase the incidence of adverse events, and ensure the health of mothers and infants. In this study, the levels of superoxide dismutase, malondialdehyde and peroxidase in the observation group were significantly higher than those in the control group during the nutrition treatment, which confirmed the role of low glycemic index diet in improving the stress response symptoms of diabetes patients during pregnancy. In addition, based on this observation, it can be found that under the action of a low glycemic index diet, patients' blood sugar levels can be more effectively reduced, and adverse pregnancy outcomes can be prevented. At the same time, it can ensure that the patient's dietary structure is more reasonable during pregnancy, which is of great significance for ensuring the health of mother and baby.

The result of the study shows that we can use the low glycemic index diet during the nutritional treatment of patients with gestational diabetes to improve the blood sugar level of patients, reduce the level of inflammatory factors in the body, prevent adverse pregnancy outcomes, and ensure the rationality of the daily diet structure of patients.

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