Analysis on the Effects of Whole-process Exercise Combined with Dietary Nutrition Intervention in the Treatment of Gestational Diabetes

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Abstract: **Objective:** To investigate the effect of whole-process exercise combined with dietary nutrition intervention in the treatment of gestational diabetes mellitus. **Methods:** A total of 84 patients with gestational diabetes admitted to our hospital within 1 year from 2022.05 to 2023.05 were selected as research subjects, and they were divided into control group (42 cases, using conventional intervention) and observation group (42 cases, using whole-process exercise combined with dietary nutrition intervention) according to the random number table method. The treatment effects of the two groups were analyzed. **Results:** Both groups achieved certain results after receiving the intervention, but the blood glucose level, weight gain level, maternal and infant outcomes of the observation group after the whole process of exercise combined with dietary nutrition intervention were better than those in the control group, and the differences were statistically significant (P<0.05). **Conclusion:** The use of whole-process exercise combined with dietary nutrition intervention in patients with gestational diabetes mellitus can effectively reduce their blood glucose level, control their weight gain, and reduce the risk of adverse maternal and infant outcomes.

Keywords: Gestational Diabetes; Whole Process Movement; Dietary Nutrition; Application Effects

Introduction

Gestational diabetes refers to diabetes that is first detected or developed during pregnancy, that is, the pregnancy comes first, and diabetes manifests later. The disease is often asymptomatic, and abnormally elevated blood glucose is usually found during prenatal examination or self-measurement of blood glucose in pregnant women. Some pregnant women may have symptoms such as dry mouth, polydipsia, polyuria, and polyphagia [1]. Pregnancy can make recessive diabetes dominant, make GDM occur in pregnant women who have not had diabetes before, and aggravate the condition of patients with original diabetes; The impact and extent of diabetes mellitus in pregnancy on the mother and child depends on the condition of diabetes and the level of glycaemic control. Patients with severe disease or poor glycemic control have a great impact on the mother and child, and the near and long-term complications of the mother and child are still high [2]. Therefore, effective interventions for gestational diabetes to control glycaemic are needed to reduce the risk of adverse maternal and infant outcomes. This article examines the effects of whole-process exercise combined with dietary nutrition interventions in the treatment of gestational diabetes mellitus, and is reported as follows:

1. Objects and methods

1.1 Object

84 patients with gestational diabetes admitted to our hospital within 1 year from 2022.05 to 2023.05 were selected as research subjects, and they were divided into control groups (42 cases, age 23-38 years, average 27.47±3.58 years; gestational age 20-35 weeks, mean 27.04±6.29 weeks; Body mass index 20-30kg/m^2, average 24.33±5.06kg/m^2; 24 cases of

nulliparous women and 18 cases of multiparous women) and observation groups (42 cases, age 22-37 years, mean 27.54±3.63 years; gestational weeks 20-36 weeks, mean 27.12±6.36 weeks; Body mass index 20-30kg/m^2, average 24.27±5.05kg/m^2; There were 23 cases of nulliparous birth and 19 cases of multiparous birth). There was no significant difference in general data between the two groups (P>0.05).

Inclusion criteria: Both groups of patients and their families were aware of the study and had signed an informed consent form; All of them meet the relevant diagnostic criteria in the *International Federation of Obstetrics and Gynecology (FIGO) Guidelines for the Diagnosis and Treatment of Gestational Diabetes* (2017); All were confirmed by 75g oral glucose tolerance test (OGTT); All are singleton pregnancies; Clinical data are complete.

Exclusion criteria: presence of preconception diabetes mellitus; Patients with heart, liver, kidney and other organ dysfunction; Patients with hyperthyroidism and hypertension during pregnancy; Multiple pregnancies; presence of severe malnutrition; People with mental disorders; those with cognitive impairments; Drop out of the investigator halfway.

1.2 Method

The control group used routine interventions, including health education, dietary guidance, exercise guidance, etc. The observation group used whole-process exercise combined with dietary nutrition interventions, specifically:

1.2.1 Dietary nutrition interventions

Professional dietitians should formulate personalized diet plans and nutrition plans according to the actual situation of pregnant women, such as BMI, weight, age, etc. Combined with the formula, total calories = 25-35 × (height -105), calculate the total daily caloric intake of pregnant women. In early pregnancy, the daily calorie intake should be the same as before pregnancy to avoid starvation; In the second trimester, total daily caloric intake increased by 700 kJ; In the later stages of pregnancy, total daily caloric intake increases by 1200 kJ. Rational distribution of nutrients, control protein 15-20%, fat 25-30%, carbohydrate 50-60%. The principle of dining is to follow small and frequent meals, add one meal between three meals, and maintain a nutritional ratio of 2:1:3:1:1:2:1 for one meal. The food is mainly composed of fruits, vegetables and staple foods, among which fruits are selected grapefruit, preserved fruit and low-sugar cherries; Choose vegetables that have a hypoglycemic effect, such as onions, spinach, bitter melon, and cucumbers; Choose high-fiber whole grains such as oats and buckwheat as staple foods. Prenatal doctors carefully record the daily diet of pregnant women, adjust unreasonable diets in time, supervise and guide family members and pregnant women to check blood glucose levels regularly, and measure blood sugar levels 2 hours after meals on the day of prenatal examination.

1.2.2 Whole-process exercise intervention

All patients will develop a personalized exercise plan during pregnancy based on age, gestational age, body mass index, and blood glucose level, including exercise method, duration of each exercise, and frequency of exercise per week. In terms of exercise mode, walking (slow walking and brisk walking), swimming, water aerobics, leisure, and appropriate physical activities were the main ones in the early stage; In the medium term, it is mainly suitable for walking, cycling, swimming, pregnant women's sports, and yoga; The later stage is mainly suitable for jogging, yoga and other sports. In terms of exercise time, the duration of each exercise should be controlled within 30 minutes. If it is high-intensity exercise, such as swimming, brisk walking, etc., the duration of a single exercise can be appropriately reduced. If GDM is severe in pregnant women, high-intensity exercise should continue for more than 25 minutes when it is safe to do so. In terms of frequency of exercise, exercise 3-4 times a week and choose 1 hour after meals. In order to prevent the occurrence of hypoglycemia during exercise, pregnant women should carry candy with them when exercising. After exercise, check the heart rate, according to the formula (220 - age) ×65%, to make sure that it is higher than the calculated result.

1.3 Observation indicators

Blood glucose levels in two groups were compared, including fasting blood glucose (FBG) and 2 h postprandial blood

glucose (2 h PG); The weight gain levels of the two groups were evaluated, and all patients were measured using a uniform weight scale, and their weight was measured before pregnancy, 12 weeks gestation, 24 weeks gestation, 36 weeks gestation, and before delivery, and each time was weighed 3 times, and the average value was taken. Preconception weight is based on the average of the patient's self-reported weight and measured weight at 6-8 weeks; Two maternal and infant outcomes were compared, including caesarean section, postpartum haemorrhage, polyhydramnios, fetal distress, macrosomia, and low body mass.

1.4 Statistical analysis

The SPSS20.0 software was used to statistically analyze the data, and the " $\bar{x} \pm s$ " was used to indicate the measurement data, and the *t*-test was used for the intergroup comparison results. "n,%" was used to indicate the measurement data, and the x^2 test was used for the between-group comparisons. $P<0.05$ indicates that the data difference is statistically significant.

2. Results

2.1 Comparison of blood glucose levels between the two groups

The blood glucose level in the observation group was significantly lower than that in the control group, and the difference was statistically significant ($P<0.05$). As shown in Table 1:

Table 1 Comparison of blood glucose levels between the two groups ($\bar{x} \pm s$, mmol/L)

Groups	Number of cases	FBG	2hPG
Observation group	42	4.35±0.47	5.63±1.40
Control group	42	5.47±0.53	6.45±1.85
t	-	10.247	2.291
P	-	0.001	0.025

2.2 Comparison of weight gain levels between the two groups

The weight gain level of the observation group was significantly lower than that of the control group, and the difference was statistically significant ($P<0.05$). As shown in Table 2:

Table 2 Comparison of weight gain levels between the two groups ($\bar{x} \pm s$, kg)

Groups	Number of cases	25-36 weeks gestation	36 weeks to before delivery
Observation group	42	3.06±0.89	0.87±0.13
Control group	42	4.55±1.27	1.23±0.23
t	-	6.227	8.831
P	-	0.001	0.001

2.3 Comparison of maternal and infant outcomes between the two groups

The maternal and infant outcomes in the observation group were significantly better than those in the control group, and the differences were statistically significant ($P<0.05$). As shown in Table 3:

Table 3 Comparison of maternal and infant outcomes between the two groups (n,%)

Groups	Number of	Cesarean	Postpartum	Hydramnio	Fetal	Fetal	Low

	cases		hemorrhage	s	distress	macrosomia	body mass
Observation group	42	3（7.14）	2（4.76）	2（4.76）	2（4.76）	4（9.52）	2（4.76）
Control group	42	10(23.81)	8(19.05)	9(21.43)	8(19.05)	11(26.19)	10(23.81)
x^2	-	4.459	4.087	5.126	4.087	3.977	6.222
P	-	0.035	0.043	0.024	0.043	0.046	0.013

3. Discussion

In the first and second trimesters, the mother's need for glucose often increases due to increased fetal glucose acquisition from the mother, increased maternal utilization of glucose by estrogen and progesterone. By the second and third trimesters, the increase in antagonism of insulin-like substances in pregnant women, such as tumor necrosis factor, leptin, placental prolactin, estrogen, progesterone, cortisol and placental insulinase, can reduce the sensitivity of pregnant women to insulin with increasing gestational age. In order to maintain normal glucose metabolism levels, pancreatic β cell function is compensatory during pregnancy, promoting insulin secretion. Gestational diabetes mellitus can occur in pregnant women with limited insulin secretion, and gestational diabetes mellitus may occur if the physiological change during pregnancy does not compensate for this physiological change and the blood glucose rises [3]-[4]. The disease adversely affects both mother and baby, so effective interventions are needed to control blood sugar.

In this study, the blood glucose level, weight gain level, and maternal and infant outcomes of the observation group were significantly better than those in the control group by taking whole-process exercise combined with dietary nutrition intervention for patients with gestational diabetes mellitus ($P<0.05$). It was stated that it was effective in reducing blood glucose levels, controlling weight gain, and reducing the risk of adverse maternal and infant outcomes. This is because whole-process exercise combined with dietary nutrition intervention is the main way to treat and intervene in gestational diabetes, which can be achieved by adjusting the diet of pregnant women and improving the exercise of pregnant women, which is also an individualized intervention [5]. Dietary nutrition interventions continued throughout pregnancy. At each stage, professional dietitians formulate a diet plan according to the actual situation, scientifically adjust the diet of pregnant women, reasonably match nutrients, and improve the scientificity and effectiveness of diet [6]-[7]. Exercise is an important indicator of personal health. Giving scientific exercise guidance to patients with gestational diabetes, choosing reasonable exercise projects based on the actual situation, and exercising under the condition of ensuring their safety are conducive to improving insulin sensitivity and reducing blood sugar levels [8].

In summary, the use of whole-process exercise combined with dietary nutrition intervention in patients with gestational diabetes mellitus can effectively reduce their blood glucose levels, control their weight gain, and reduce the risk of adverse maternal and infant outcomes.

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