EFFECT OF AEROBIC EXERCISE ON LIMB MOTOR FUNCTION IN DIABETIC PATIENTS

EFEITO DO EXERCÍCIO AERÓBICO SOBRE A FUNÇÃO MOTORA DOS MEMBROS EM PACIENTES DIABÉTICOS

EFECTO DEL EJERCICIO AERÓBICO EN LA FUNCIÓN MOTORA DE LAS EXTREMIDADES EN PACIENTES DIABÉTICOS

Original Article
Artigo Original
Artículo Original

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ABSTRACT

Introduction: Gestational Diabetes is a group of metabolic disorders that result in glucose intolerance during pregnancy. Among the range of treatments are diet, continuous use of medication, and psychological monitoring. Since it is a multidisciplinary treatment, a proper protocol is vital for a favorable outcome. In addition, there are questions about the benefits of physical activity as a complementary therapy. Objective: To verify the impact of adding exercise to the hospital protocol for patients with gestational diabetes, both on the risks of type 2 diabetes in pregnant women and on the obesity of their offspring. Methods: Sixty pregnant women diagnosed with Gestational Diabetes were randomly divided into control and intervention groups. Both groups received specific treatment and intervention, and the experimental group practiced controlled moderate-intensity physical activity (125-146bpm). Morning blood samples were collected from both groups to check fasting glucose and insulin levels, indicators of lipid metabolism, low and high-density lipoprotein cholesterol, apolipoprotein B. The Brog scale measured the fatigue level. In addition, the premature rupture of membranes, postpartum hemorrhage, neonatal asphyxia, macrosomia, and others was checked. Results: The peripheral blood total cholesterol levels were 5.93, 5. 38, low-density lipoprotein cholesterol levels were 2.95 before versus 2.64 after, and apolipoprotein B levels were 1.84 versus 1.59 in the control group, high-density lipoprotein cholesterol content increased from 1.74 to 1.88, blood cholesterol, and apolipoprotein B levels after the intervention in the experimental group were lower than those in the control group, with an elevation of high-density lipoprotein cholesterol. Conclusion: Aerobic exercise proved to be more appropriate for patients with gestational diabetes in the later stages of pregnancy and may also be adapted for bedridden patients refractory to traditional drugs. ***Evidence Level II; Therapeutic Studies - Investigating the result.***

Keywords: Aerobic Exercise; Diabetes, Gestational; Pregnancy Complications.

RESUMO

Introdução: O Diabetes Gestacional é um grupo de desordens metabólicas que resultam na intolerância à glicose durante a gravidez, dentre o leque de tratamentos está a dieta, o uso continuo de medicamentos, e acompanhamento psicológico. Por ser um tratamento multidisciplinar, é importante que haja um protocolo adequado para um desfecho favorável. Há questionamentos quanto aos benefícios de atividades físicas como terapia complementar. Objetivo: Verificar o impacto da adição de exercícios ao protocolo hospitalar para pacientes com diabetes gestacional, tanto nos riscos de diabetes tipo 2 em grávidas quanto na obesidade de seus descendentes. Métodos: Sessenta mulheres grávidas que foram diagnosticadas com Diabetes Gestacional foram aleatoriamente divididas em grupos controle e intervenção. Ambos grupos receberam tratamento e intervenção específicos e o grupo experimental praticou atividade física de intensidade moderada controlada (125-146bpm). Amostras de sangue em jejum matinal foram coletados em ambos os grupos para verificar níveis de glicose e insulina em jejum, indicadores de metabolismo lipídico, colesterol lipoproteico de baixa e alta densidade, apolipoproteína B. Verificou-se também o nível de fadiga pela escala Brog, ruptura prematura de bolsa, hemorragia pós-parto, asfixia neo-natal, macrossomia entre outros. Resultados: Os níveis de colesterol total no sangue periférico foram de 5,93, 5.38, os níveis de colesterol lipoproteico de baixa densidade foram 2,95 antes contra 2,64 depois e os níveis de apolipoproteína B foram 1,84 contra 1,59 no grupo controle, o conteúdo de colesterol lipoproteico de alta densidade aumentou de 1,74 para 1,88, os níveis de colesterol, e apolipoproteína B sanguíneos depois da intervenção no grupo experimental foram menores que os do grupo controle, com elevação do colesterol lipoprotéico de alta densidade. Conclusão: O exercício aeróbico mostrou-se mais adequado para pacientes com diabetes gestacional nos estágios posteriores da gravidez, podendo ser adaptado inclusive para as pacientes acamadas refratárias aos fármacos tradicionais. ***Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.***

Descritores: *Exercício Aeróbico; Diabetes Gestacional; Complicações na Gravidez.*

RESUMEN

Introducción: La diabetes gestacional es un grupo de trastornos metabólicos que dan lugar a una intolerancia a la glucosa durante el embarazo. Entre la gama de tratamientos se encuentra la dieta, el uso continuado de medicamentos y el seguimiento psicológico. Al tratarse de un tratamiento multidisciplinar, es importante contar con un protocolo adecuado para obtener un resultado favorable. Existen dudas sobre los beneficios de la actividad física como

terapia complementaria. Objetivo: Comprobar el impacto de añadir el ejercicio al protocolo hospitalario para pacientes con diabetes gestacional, tanto en los riesgos de diabetes tipo 2 en las mujeres embarazadas como en la obesidad de su descendencia. Métodos: Sesenta mujeres embarazadas a las que se les diagnosticó diabetes gestacional fueron divididas aleatoriamente en grupos de control y de intervención. Ambos grupos recibieron un tratamiento y una intervención específicos y el grupo experimental practicó una actividad física controlada de intensidad moderada (125-146bpm). Se tomaron muestras de sangre en ayunas por la mañana de ambos grupos para comprobar los niveles de glucosa e insulina en ayunas, los indicadores del metabolismo de los lípidos, el colesterol de lipoproteínas de baja y alta densidad, la apolipoproteína B. También se comprobó el nivel de fatiga según la escala de Brog, la rotura prematura de bolsa, la hemorragia posparto, la asfixia neonatal y la macrosomía, entre otros. Resultados: Los niveles de colesterol total en sangre periférica fueron de 5,93, 5. 38, los niveles de colesterol de lipoproteínas de baja densidad eran de 2,95 antes frente a 2,64 después y los niveles de apolipoproteína B eran de 1,84 frente a 1,59 en el grupo de control, el contenido de colesterol de lipoproteínas de alta densidad aumentó de 1,74 a 1,88, el colesterol en sangre y los niveles de apolipoproteína B después de la intervención en el grupo experimental fueron inferiores a los del grupo de control, con una elevación del colesterol de lipoproteínas de alta densidad. Conclusión: El ejercicio aeróbico resultó ser más apropiado para las pacientes con diabetes gestacional en las últimas fases del embarazo, y puede adaptarse incluso a las pacientes encamadas y refractarias a los fármacos tradicionales. ***Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.***

Descriptores: *Ejercicio Aeróbico; Diabetes Gestacional; Complicaciones del Embarazo.*

DOI: http://dx.doi.org/10.1590/1517-8692202228052022_0069 Article received on 01/28/2022 accepted on 02/11/2022

INTRODUCTION

Gestational diabetes mellitus (GDM) is a disease caused by the combined action of many factors. It refers to the phenomenon of abnormal glucose metabolism during pregnancy, which is a high-risk pregnancy.[1] Epidemiological surveys show that diabetes patients are increasing rapidly in the world, and the current incidence of GDM is 1%-5%. Gestational diabetes has a greater impact on the health of mothers and babies, often leading to an increase in perinatal morbidity and mortality, in addition to the increased incidence of shoulder dystocia, giant babies, fetal distress, and fetal malformations, the chance of mothers and children suffering from type 2 diabetes will increase significantly in the future.[2] Therefore, good health care during pregnancy, strengthening the management of gestational diabetes, and reasonable control of blood glucose during pregnancy can reduce mother and child complications, ensure the safety of mother and child, and improve the quality of life of mother and child in the future, therefore, it is of great significance to deepen the understanding of gestational diabetes, and timely detection and intervention treatment.[3] As people's living standards gradually rise, according to incomplete statistics, the incidence of gestational diabetes is about 3%, the disease is very harmful to the parturient and fetus, without scientific and effective treatment, patients will suffer from pregnancy-induced hypertension, infection, premature rupture of membranes, premature delivery, and polyhydramnios, even worse, ketoacidosis will occur, threatening the safety of mothers and babies.[4] Diet intervention plays an important role in the treatment of diabetes. Diet intervention is an important basis for effective treatment and care for diabetic patients, it has a wide range of applications and is more applicable to patients with gestational diabetes. Studies have shown that strengthening weight management of diabetic pregnant women during pregnancy, with scientific and reasonable diet, nutritional guidance, exercise control, etc., has high safety and can reduce the occurrence of related complications.[5]

METHOD

Information

A total of 60 pregnant women who were diagnosed with GDM at a Second People's Hospital from September 2015 to December 2016 were selected as the research objects, they were divided into a routine group and an exercise intervention group by a random number table, with 30 cases in each group. The pregnant women in the routine group were 23-37 years old, with an average of (29.71±5.43) years, parity 1-4, with an average of (1.79±0.64), delivery times are 1-2 times, with an average of (1.35+0.59) times, and the gestational week at delivery is 37-40 weeks, with an average of (38.94+1.42) weeks; The pregnant women in the exercise intervention group were 22-38 years old, with an average of (29.63+5.77) years, parity 1-3, with an average of (1.72+0.66), the births were 1-2 times, with an average of (1.37+0.61) times, and the gestational week at delivery was 38-40 weeks, with an average of (38.98+1.51) weeks. There was no statistically significant difference between the two groups of parturients in terms of age, parity and parity.

Intervention methods

After GDM was confirmed by pregnancy test and glucose tolerance screening, both groups started specific treatment and intervention. In addition to drug treatment, pregnant women in the routine group also cooperated with health education, as follows.[6] Distribute GDM-related health education materials, instruct pregnant women and their family members to read together, and give key explanations for the parts that they cannot understand. GDM-related lectures are held regularly to improve pregnant women's awareness of diseases, improve the predictability of treatment adverse events, and clarify precautions during pregnancy.[7] The exercise intervention group added exercise intervention measures in addition to the same drug treatment plan and health education.

Observation indicators

Before and after the intervention, the morning fasting peripheral blood samples of the two groups of parturients were collected, placed in anticoagulant sterile EP tubes, and cryopreserved in a cryogenic environment for later use. Use an automatic biochemical analyzer to determine the levels of fasting blood glucose (FPG) and fasting insulin (FINS) in blood samples; Lipid metabolism indicators total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), apolipoprotein B (ApoB) content. The occurrence of adverse pregnancy outcomes of the two groups of pregnant women were recorded, including premature rupture of membranes, postpartum hemorrhage, neonatal asphyxia, macrosomia, etc.

Intensity of exercise

For GDM patients who sit for a long time before pregnancy, the exercise intensity should be mild or moderate; For pregnant

women who exercise regularly before pregnancy, the exercise intensity should be moderate or high; the guidelines for exercise during pregnancy recommend that GDM patients exercise moderate intensity during pregnancy.[8] For moderate-intensity exercise, pregnant women over 30 years old should control their heart rate at 121-141 beats/min, while those under 30 years old should control it at 125-146 beats. /min. The subjective fatigue level scale designed by Brog is used to evaluate the difficulty of exercise perceived by pregnant women, so as to measure the intensity of exercise. Moderate intensity is suitable for a little fatigue. The "talk test" is used to evaluate exercise intensity, that is, the ability of pregnant women to have a conversation during exercise is regarded as medium intensity, if they cannot have a conversation, it means that the exercise intensity is too high. It should be noted that the intensity of sports training needs to be gradual.[9]

RESULTS

Comparison of blood glucose metabolism indexes between the two groups

Before the intervention, there was no significant difference in the levels of FPG and FINS in the peripheral blood glucose metabolism indexes between the two groups of pregnant women; After the intervention, the levels of FPG and FINS in the peripheral blood of the two groups of pregnant women were lower than before the intervention, and the levels of FPG and FINS in the peripheral blood of the pregnant women in the exercise intervention group were lower than those in the routine group. (Table 1)

Comparison of lipid metabolism indexes between the two groups

Before the intervention, there was no significant difference in the levels of lipid metabolism indexes TC, LDL-C, HDL-C, and ApoB in the peripheral blood of the two groups of pregnant women; After the intervention, the levels of TC, LDL-C, and ApoB in the peripheral blood of the two groups of pregnant women were lower than before the intervention, and the levels of HDL-C were higher than before the intervention, in addition, the levels of TC, LDL-C, and ApoB in the peripheral blood of pregnant women in the exercise intervention group were lower than those in the routine group, and the content of HDL-C was higher than that in the routine group, the difference was statistically significant. (Tables 2 and 3)

Table 1. Comparison of blood glucose metabolism index levels before and after intervention between the two groups.

Group	Number of cases	FPG		FINS	
		Before intervention	After the intervention	Before intervention	After the intervention
Regular group	30	7.86	5.80	3.51	2.61
Sports intervention group	30	8.12	4.95	3.49	1.95

Table 2. Comparison of TC and LDL-C indicators before and after intervention between the two groups.

Group	Number of cases	TC		LDL-C	
		Before intervention	After the intervention	Before intervention	After the intervention
Regular group	30	5.93	5.38	2.95	2.64
Sports intervention group	30	5.97	5.13	2.93	2.39

Comparison of adverse pregnancy outcomes between the two groups

The incidence of premature rupture of membranes and macrosomia in the exercise intervention group was lower than that in the conventional group. There was no significant difference in the incidence of postpartum hemorrhage and neonatal ventricular discharge between the two groups. (Figure 1)

Table 3. Comparison of HDL-C and ApoB indexes before and after intervention between the two groups.

Group	Number of cases	HDL-C		ApoB	
		Before intervention	After the intervention	Before intervention	After the intervention
Regular group	30	1.74	1.88	1.84	1.59
Sports intervention group	30	1.76	1.99	1.72	1.48

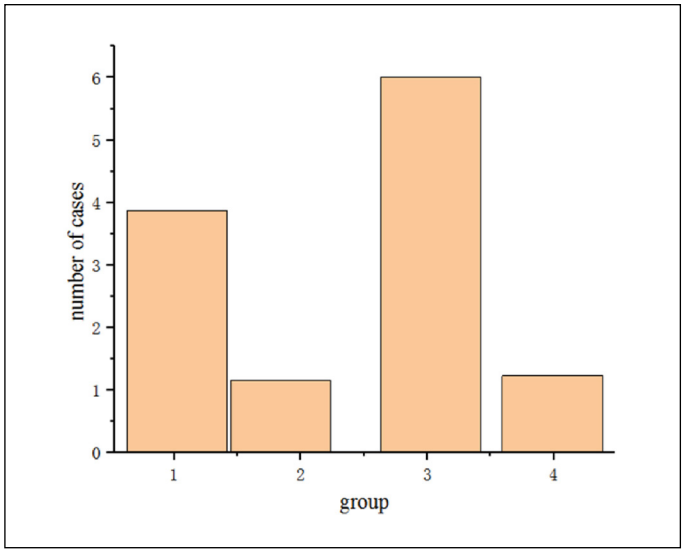

Figure 1. Comparison of adverse maternal and infant outcomes between the two groups of pregnant women.

DISCUSSION

GDM is one of the most important pregnancy comorbidities in my country, which is directly related to decreased physiological insulin sensitivity and relatively restricted insulin secretion during pregnancy, the degree of its impact on mothers and babies directly depends on the condition of GDM and the level of blood sugar control, how to maximize the condition of GDM has become the focus and hotspot of current obstetric research. GDM's hypoglycemic program is relatively mature, but some pregnant women still have significant abnormalities in glucose and lipid metabolism and adverse pregnancy outcomes. Health education during pregnancy has been recognized as an important measure to improve the condition of GDM. The traditional concept that pregnant women should not be hyperactive may increase the difficulty of treatment of GDM, and proper physical activity during pregnancy.[10] At present, the impact of exercise intervention on the condition of pregnant women with GDM is not yet conclusive. In this study, exercise intervention was used in clinical GDM pregnant women, and the differences in prenatal glucose and lipid metabolism indexes and pregnancy outcomes between the two groups were compared, in order to clarify the clinical significance of exercise intervention in GDM pregnant women. Abnormal glucose metabolism is the basis for the diagnosis of GDM and the main clinical manifestation.

CONCLUSION

The levels of TC, LDL-C, and ApoB in the peripheral blood of the exercise intervention group were lower than those of the conventional group, and the content of HDL-C was higher than that of the control group, it is proved that adding exercise intervention to hypoglycemic therapy and health education can more effectively reduce the hyperlipidemia of pregnant women with GDM. However, the duration and frequency of interventions are still inconclusive, the effect of different resistance exercise programs on GDM patients can be explored in the future.

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. HW: writing and performing surgeries. LW: data analysis and performing surgeries, article review and intellectual concept of the article.

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