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Pilates Method as a physical therapy treatment for the prevention of Gestational Diabetes Mellitus

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ABSTRACT
Pregnancy is a physiological process that requires transformations in the female body, due to anatomical and hormonal changes. The body can understand that these changes, initially physiological, predispose to different pathological states, such as Gestational Diabetes Mellitus (GDM) which is characterized as maternal insulin resistance caused by the increase in diabetes hormones, such as progesterone, cortisol, prolactin and placental prolactin (GANDOLFI et al., 2019). Another definition is carbohydrate intolerance of varying severity, which begins during pregnancy, affects 3 to 25% of pregnant women (ZAJDENVERG et al., 2022).

Keywords: Pilates, Gestational Diabetes Mellitus, Hyperglycemia.

INTRODUCTION

Pregnancy is a physiological process that requires transformations in the female body, due to anatomical and hormonal changes. The body can understand that these changes, initially physiological, predispose to different pathological states, such as Gestational Diabetes Mellitus (GDM) which is characterized as maternal insulin resistance caused by the increase in diabetes hormones, such as progesterone, cortisol, prolactin and placental prolactin (GANDOLFI et al., 2019). Another definition is carbohydrate intolerance of varying severity, which begins during pregnancy, affects 3 to 25% of pregnant women (ZAJDENVERG et al., 2022).

The Brazilian Society of Diabetes (SBD) considers diabetes not to be a single disease, but a heterogeneous group of metabolic disorders whose common characteristic is hyperglycemia, resulting from effects on insulin action, insulin secretion, or both. Hyperglycemia manifests as symptoms of polyuria, polydipsia, weight loss, polyphagia, and blurred vision, or as acute and life-threatening complications: diabetic ketoacidosis and hyperosmolar hyperglycemic nonketotic syndrome (FERDANDES; BEZERRA, 2020).

Physical exercise during the gestational cycle has lower risk and benefits for most women with GDM, as it improves blood glucose control, which is a key factor in reducing the risks of overweight or obesity and increasing Systemic Arterial Hypertension (SAH). Regular exercise should be an integral component, as GDM can be prevented (American College of Gynecology and Obstetrics, 2020).

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In addition, exercise in GDM has the primary purpose of reducing glucose intolerance through cardiovascular conditioning, which provides increased binding and affinity of insulin to its receptor through a decrease in intra-abdominal fat, an increase in insulin-sensitive glucose transporters in muscle, increased blood flow in insulin-sensitive tissues, and a reduction in free fatty acid levels (FERDANDES; BEZERRA, 2020).

During pregnancy, preventive interventions for GDM initiated may be limited for the following reasons: low-intensity interventions, short intervention of GDM before diagnosis, and exercise for women with GDM, which shows more promise in reducing risk factors for diabetes (OLIVEIRA; SILVA; VENTURA, 2022).

Effective prevention and control of GDM plays a key role in promoting a healthy pregnancy and minimizing the risks associated with this condition. In this context, non-pharmacological treatments have been gaining prominence, and therefore, the Pilates® Method emerges as a promising intervention. Created and described by Joseph Hubertus Pilates in the early 1920s, its purpose is to provide the individual with respect and self-knowledge of the body, acting on physical preparation, including the quality of breathing, strengthening, stretching of body structure and body proprioception (CARNEIRO et al., 2022).

Through Pilates, it is possible to perform an exercise system that prioritizes the improvement of postural control, promotes the Quality of Life (QoL) of women before, during and after the pregnancy phase and promotes the reduction of glycemic oxidative stress. Although its health benefits are widely recognized, its specific use during pregnancy, especially in the context of the prevention of GDM, continues to be a growing area of research (CORDEIRO; BRASIL; GONÇALVES, 2018).

OBJECTIVE

To analyze the effectiveness of the Pilates® Method in the prevention of gestational Diabetes Mellitus.

METHODOLOGY

This is a literature review study on the Pilates® Method in the prevention of Gestational Diabetes Mellitus. Searches were conducted in the main databases such as *Scientific Electronic Library Online* (SciELO), Latin American and Caribbean Health Sciences Literature (LILACS), *Physiotherapy Evidence Database* (PEDro), *PubMed* (National Library of Medicine) and VHL (Virtual Health Library). Articles in Portuguese and English were included, referring to the years 2018 to 2023. Which address topics such as: pregnant women with diabetes mellitus, physical exercise interventions in GDM and Pilates in diabetes mellitus. The searches were performed using combinations of Health Descriptors (DeC's) in Portuguese:

"Diabetes Mellitus", "Gestational Diabetes", "Exercise and Movement Techniques", "Primary Prevention" and "Pregnant Women". Mellitus Diabetes, Gestational Diabetes, Exercise and Movement Techniques, Primary Prevention, and Pregnant Woman. This is a literature review that does not require data collection with human beings, therefore, submission to the Research Ethics Committee (REC) is not required.

DEVELOPMENT

Gestation lasts approximately 40 weeks (280 days), during which physiological, anatomical and biochemical changes occur in the woman's body. The understanding of these changes provides basic health professionals with the opportunity to intervene and improve the daily routine, well-being and QoL of pregnant women, in addition to understanding the hormonal and physical changes that occur during the gestational period (CORDEIRO; BRASIL; GONÇALVES, 2018).

Physiological and biochemical changes encompass cardiovascular, respiratory, and hormonal changes that alter blood flow, respiratory, and hormone production. This hormonal change can trigger a variety of conditions, including gestational diabetes, which, if left unchecked, can be fatal to both the pregnant woman and her baby (LAMB; BRASIL; GONÇALVES, 2018).

DM is characterized by a set of signs and symptoms in which the metabolism of lipids, proteins, and carbohydrates is impaired, caused by different mechanisms depending on the type of DM. As a result, blood glucose levels increase and cells use less glucose. As a consequence, the use of proteins and lipids increases considerably, leading to weight loss (FONSECA; ABI, 2019).

In developing countries such as Brazil, DM has become an important public health issue. It accounts for approximately 30% to 40% of morbidity in adults, mainly due to vascular complications (DE CASTRO et al., 2021). DM is classified as type 1 or type 2, and it can show up at various stages of an individual's life. Type 1 diabetes mellitus (T1D) is a chronic disease caused by the inability of the pancreas to produce insulin. T1D is an autoimmune disease in which cytotoxic CD8 T lymphocytes attack and destroy pancreatic islets. When a patient is insulin deficient, glucose cannot enter the body's cells that require insulin-mediated glucose uptake. This can lead to extremely high blood glucose levels and diabetic ketoacidosis, which can be fatal. This information suggests that children with T1D have a more intense autoimmune response (CHOUDHURY; RAJESWARI, 2021).

In type 2 diabetes mellitus (DM2), metabolic disorders of multiple etiologies are present, manifesting disturbances in the metabolism of carbohydrates, proteins and lipids caused by peripheral tissue resistance or absence of insulin response associated with a relative decrease in insulin, which contribute to the development of hyperglycemia (ANTUNES et al., 2021). DM2 has a high chance of developing in people who are overweight, obese, have an unbalanced diet, do not practice physical

activities and have a genetic predisposition or acquire insulin resistance and pancreatic β cell dysfunction resulting in a persistent hyperglycemic state (ANTUNES et al., 2021).

GDM, on the other hand, is a systemic disease that involves alterations in the metabolism of carbohydrates, thus indicating their relatively high levels in the blood during pregnancy. It is also a pathological disease that usually affects maternal and fetal health. It is a common disorder in pregnancy, accounting for approximately 7% of all pregnancies and varies between 1% and 14% according to the population. In Brazil, it is estimated that 2.4% to 7.2% of all pregnant women develop GDM, which means more than 200,000 new cases per year (FERNANDES; BEZERRA, 2020).

Pregnancy is a hyperinsulinemic state qualified by a reduction in insulin sensitivity due in part to the presence of diabetogenic hormones, such as progesterone, cortisol, prolactin and placental lactogenic hormone. In the pregnant period, fasting glycemic levels tend to be lower, however, postprandial values are higher, especially in those in which there is no adequate increase in insulin release. Women with GDM express a more intense decrease in peripheral insulin sensitivity, as in DM2, in addition to decreased insulin secretion, explaining the postprandial peaks (FERNANDES; BEZERRA, 2020).

GDM strikes pregnant patients who have had symptoms of the disease early in pregnancy or during the gestational period, and sometimes ends after delivery. It is recommended that at the beginning of the 24th week of pregnancy, pregnant women measure their fasting glycemic values. Care and search for the disease should continue even after childbirth, since women who had increased glucose levels during pregnancy tend to develop DM2. Due to the severe maternal-fetal problems caused by GDM, early screening is increasingly recommended (SALVADORI; SILVA, 2022).

The safe performance of physical exercise in patients with metabolic syndrome, especially due to the continuous breathing work performed, is related to the reduction of tension, in obtaining the relaxation of the body. Therefore, the practice of resistance and strength exercises, such as Pilates, increases the force of blood ejection in the vascular wall, generating nitric oxide and enabling a vasodilator effect. In addition, the Pilates® Method integrates the treatment of diabetic patients by improving blood glucose control and lowering lipids. The regulation of insulin receptors makes muscle fibers sensitive to insulin, reducing it, reducing the risk of developing other associated diseases (LOPES; ARAÚJO, 2020).

The Pilates® Method provides benefits in the prevention of GDM, which occurs during pregnancy, given that the exercises aim to improve physical, mental and motor function, consisting of a series of low-pressure activities that enhance the body's flexibility and strength (CARNEIRO et al., 2022).

This method helps in the changes that are caused by pregnancy, in addition to offering comfort and benefits for natural childbirth, because these exercises, in addition to generating strengthening, contribute to the relief of pain at the time of delivery and the changes that happen. Improving the circulation of the

body and especially of the abdomen, making the future mother have a smoother postpartum period (PEREIRA et al., 2020).

The practice of the Pilates® Method emphasizes the importance of proper blood circulation. During the gestational period, blood circulation can be affected due to the extra demands of the body of the pregnant woman and the fetus. The Pilates Method, with its focus on controlled, resistance and breathing exercises®, promotes more efficient blood flow. This is especially relevant to ensure that the fetus receives sufficient oxygen and nutrients, reducing the risk of complications during pregnancy (CORDEIRO; BRASIL; GONÇALVES, 2018).

Oxidative stress, which occurs when there is an imbalance between free radicals produced in the body and their ability to neutralize them, has been linked to the development of GDM. During the gestational period, oxidative stress can be even more pronounced. The regular practice of exercises such as the Pilates® Method have been shown to be effective in reducing this oxidative stress, protecting the body's cells, including those that play an important role in glucose regulation (LUSTOSA; SILVA; ANDRADE, 2023).

Insulin resistance is a common feature of GDM and can lead to increased blood sugar levels. Consistent practice of the Pilates® Method has been associated with improved insulin sensitivity. This means that the body's cells become more responsive to insulin, allowing for better regulation of blood glucose levels. This effect is particularly important in the prevention of GDM, since insulin resistance is one of the main risk factors (LOPES; ARAÚJO, 2020).

Proper glycemic control plays a crucial role in the prevention of GDM. Regular practice of the Pilates® Method can be beneficial during pregnancy, as it improves blood flow, reduces oxidative stress, and increases insulin sensitivity. These benefits can help maintain healthy blood glucose levels, which reduces not only the risk of developing GDM but also promotes the overall health of the mother (OLIVEIRA; SILVA; VENTURA, 2022).

In the early stages of pregnancy, this method should be practiced with care and attention. The best time to start the practice of PM is from the 16th week or 4th month of pregnancy, and the average duration of each practice is 1 hour, when the pregnancy is already safe. It is emphasized that pregnant women should be carefully evaluated and monitored by the physiotherapist during exercise (FELIX et al., 2021).

Aiming at the prevention of GDM, Pilates comprises a wide grid that meets metabolic needs, this practice is one of the most sought after tools for containing less physical strength and greater conditioning, in addition to providing a feeling of relaxation and well-being. It is recommended to perform 15 to 30 minutes of daily resistance physical activity, with self-monitoring of fetal activity and, what would be ideal, monitoring of capillary glucose before and after activity. Physical activity is recommended to

maintain normal glycemic levels in pregnant women who have GD in the late stages of pregnancy (CARNEIRO et al., 2022).

FINAL THOUGHTS

It is expected that the Pilates® Method will provide improvement in insulin sensitivity, allowing a better regulation of blood glucose levels preventing the onset of GDM.

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