Revista ARACÊ
ISSN: 2358-2472

GESTATIONAL DIABETES MELLITUS: IMPLICATIONS FOR MATERNAL-FETAL HEALTH, INTERGENERATIONAL RISKS AND PREVENTIVE APPROACHES

https://doi.org/10.56238/arev7n1-221

Submission date: 12/28/2024 **Publication date:** 01/28/2025

Igor Marcel Caffarena Jorge[1], Larissa Zepka Baumgarten Rodrigues[2], Elijalma Augusto Beserra[3], Maria Jaciane de Almeida Campelo[4], Andreia Rocha Dias[5], Karen Leticia Rocha Antonio[6], Giovanna de Moura Frutuoso[7], Júlia Lodigiani Rodrigues Bragança[8], Nuhara Hamad Pereira Gomes Cavalcante[9] and Marcelo Pereira de Magalhães Filho[10]

[1] Graduate in Medicine, Postgraduate in MFC
UFSC
E-mail: drigorcaffarena@gmail.com
ORCID: https://orcid.org/0000-0001-6709-0571
[2] Graduate in Nursing
Fees
E-mail: enflarissazb@gmail.com
ORCID: https://orcid.org/0009-0001-1462-3298
[3] Doctor student in Agroecology and Territorial Development
Federal University of Vale do São Francisco (UNIVASF)
E-mail: elijalma@gmail.com
ORCID: https://orcid.org/0000-0001-6445-347X
[4] Doctor in Plant Biology
Federal University of Pernambuco (UFPE)
E-mail: jaciane.campelo@univasf.edu.br
ORCID: https://orcid.org/0000-0003-2152-0948
[5] Doctor Student in Sciences
University of São Paulo (USP)
E-mail: andreia_rocha@usp.br
ORCID: https://orcid.org/0009-0002-7785-0831
[6] Undergraduate in Medicine
Unic- University of Cuiabá
E-mail: karenleticia.rocha@hotmail.com
ORCID: https://orcid.org/0009-0000-4729-8930
[7] Undergraduate in Medicine
UniEvangélica
E-mail: gio.mouraf649@gmail.com
ORCID: https://orcid.org/0009-0005-3721-9721
[8] Undergraduate in Nursing
Federal University of São João Del Rei, Dona Lindu Central West Campus (UFSJ)
E-mail: julia.lodigiani2@gmail.com
ORCID: https://orcid.org/0009-0009-8772-5533
[9] Undergraduate in Medicine
Famene
E-mail: hamadnuhara@gmail.com
ORCID: https://orcid.org/0009-0001-4909-7101
[10] Undergraduate in Medicine
Famene/Facene
E-mail: marcelinhobebidas@gmail.com
ORCID: https://orcid.org/0009-0007-5360-0914

Revista ARACÊ
ISSN: 2358-2472

ABSTRACT

Diabetes mellitus is a condition with a global impact, responsible for millions of deaths annually and affecting a significant portion of the world's adult population. Among its manifestations, gestational diabetes mellitus (GDM) stands out as a growing public health concern due to its high prevalence, maternal-fetal complications, and potential intergenerational risks. This condition, characterized by hyperglycemia induced by insulin resistance during pregnancy, presents global variations in incidence, influenced by diagnostic factors and population characteristics. In addition to compromising maternal-fetal health, GDM is associated with high rates of perinatal morbidity and mortality, reinforcing the need for preventive strategies, such as early screening and encouraging healthy habits during prenatal care. In the context of global challenges, such as the increase in obesity and the search for reducing maternal and infant mortality, GDM emerges as a priority problem. Early detection and effective management of this condition are essential to mitigate its complications and promote better short- and long-term outcomes for mothers and children. This study aims to analyze gestational diabetes mellitus, with an emphasis on its implications for maternal-fetal health, intergenerational risks, and preventive approaches. This is a broad integrative literature review, carried out in 2024, based on consultations on the MEDLINE, PubMed, and SciELO platforms. Furthermore, in the last two decades, there has been a significant increase in the incidence of GDM, driven by factors such as maternal aging, sedentary lifestyle, and obesity. GDM is associated with maternal metabolic alterations, including insulin resistance, which, although necessary to meet fetal demands, can lead to significant complications. Approximately 40% of women with GDM develop type 2 diabetes within 10 years after delivery, especially obese women. Risk factors include advanced age, family history of type 2 diabetes, obesity, and sedentary lifestyle. The coexistence of GDM and obesity increases risks such as preeclampsia, premature birth, and neonatal complications, as well as mental health repercussions such as postpartum depression. On the other hand, preventive interventions such as weight control, a balanced diet, and physical exercise have been shown to reduce the incidence of GDM and its complications. From a neonatal perspective, children of mothers with GDM have a higher risk of macrosomia, hypoglycemia, and long-term metabolic complications such as obesity and diabetes in adulthood. GDM is also associated with epigenetic alterations, reinforcing the impact of the intrauterine environment on future health. Early diagnosis is essential, with strategies based on glycemic tests and international criteria, while pharmacological therapies such as insulin and metformin play a fundamental role in management. In addition, emerging technologies such as continuous monitoring devices and artificial intelligence have revolutionized care, promoting greater effectiveness and personalization. Finally, we highlight the importance of multidisciplinary approaches in the management of GDM, combining clinical interventions, health education, and public policies to mitigate the impacts of the condition and ensure better maternal-fetal outcomes. We conclude that GDM has significant impacts on maternal-fetal and intergenerational health, contributing to complications during pregnancy and increasing the predisposition to chronic diseases in affected women and their offspring. Factors such as macrosomia, neonatal hypoglycemia, and metabolic disorders highlight the need for effective interventions. Preventive strategies, such as early screening, a balanced diet, physical exercise, and pharmacological therapies, play an important role in reducing the risks associated with GDM. Awareness of preconception care and multidisciplinary management are essential to improve maternal and child health, reduce economic costs, and mitigate the burden on health systems.

Revista ARACÊ
ISSN: 2358-2472

Keywords: Gestational Diabetes. Risk Factors. Risk Controls. Public Health.

Revista ARACÊ
ISSN: 2358-2472

INTRODUCTION

Diabetes is a disease with a global impact, responsible for more than 4 million deaths annually and affecting 537 million adults between the ages of 20 and 79, which is equivalent to 1 in 10 individuals in this age group. In 2021, the disease caused 6.7 million deaths, one death every five seconds, and projections indicate that cases could reach 643 million by 2030 and 783 million by 2045. Given this alarming scenario, countries and territories must adopt effective, proven actions to prevent and manage diabetes, reducing its impacts on global public health (International Diabetes Federation, 2021).

Thus, gestational diabetes mellitus (GDM), recognized as a public health problem, is a pathology that affects women during pregnancy and can persist in the postpartum period. This condition results from pancreatic dysfunction of varying severity, which can range from a mild reduction in the function of the endocrine pancreas to the total inability to produce insulin. It is characterized by hyperglycemia resulting from resistance to the action of insulin, whose pathophysiology is related to the elevation of counter-regulatory hormones due to the physiological stress of pregnancy, in addition to genetic and environmental influences. The global prevalence of GDM varies between 1% and 28%, depending on the diagnostic criteria and population characteristics (Batista et al., 2021; MENDONÇA et al., 2024).

Pregnancy associated with GDM is considered high-risk, making early diagnosis essential. The lack of timely detection contributes to the increase in perinatal morbidity and mortality rates. In this context, screening and active search are crucial tools, allowing the identification of GDM through glycemia and glucose overload tests during prenatal care. Preventive measures are essential to avoid maternal and fetal complications and promote a safer and healthier pregnancy (Ribeiro et al., 2022).

In addition, improving maternal health and reducing infant mortality are among the eight Millennium Development Goals (MDGs) established by the United Nations, representing significant challenges for health professionals on a global scale. In this context, the global trend of increasing obesity observed between 1975 and 2016 increased the incidence of GDM, as well as complications related to pregnancy and the perinatal period. It is estimated that one in six pregnancies worldwide is associated with hyperglycemia, with 84% of cases classified as GDM (Nobre et al., 2023).

Therefore, screening for GDM is a public health priority at a global level, considering that early detection can prevent several complications during and after pregnancy, both for

Revista ARACÊ
ISSN: 2358-2472

the woman and the child. Furthermore, adopting healthy habits before and during pregnancy, combined with adequate treatment monitoring, contributes significantly to positive short- and long-term outcomes for the mother-fetus binomial (Ribeiro, 2022).

The clinical condition known as gestational diabetes mellitus represents a highly relevant issue for public health due to its significant impacts on maternal-fetal health and potential intergenerational consequences. Its association with obstetric, metabolic, and neonatal complications highlights the need for effective preventive and diagnostic strategies. In addition, the risks of developing chronic diseases in mothers and offspring reinforce the importance of integrated approaches that promote early detection, adequate management, and health education, aiming to improve immediate and future outcomes.

Therefore, the present study aims to analyze gestational diabetes mellitus, with an emphasis on its implications for maternal-fetal health, intergenerational risks, and preventive approaches.

METHODOLOGY

This study consists of an integrative literature review, a methodology that aims to gather and synthesize, in a systematic and organized manner, the results of research related to a specific topic or issue. This approach contributes to the deepening of knowledge on the topic investigated, by allowing the analysis and synthesis of multiple published studies, enabling the formulation of comprehensive conclusions on a given area of study (Mendes; Silveira; Galvão, 2008).

The guiding question of this article was elaborated based on the PICo strategy, which includes the elements of Population, Interest, and Context. Through this approach, the following question was defined: "What are the implications of gestational diabetes mellitus for maternal-fetal health and intergenerational risks, and how can preventive interventions during prenatal care mitigate these effects?"

The articles selected for this study were identified through searches performed in the Medical Literature Analysis and Retrieval System Online (MEDLINE) and PubMe databases. d Central (PMC) and Scientific Electronic Library Online (SCIELO). The descriptors used were (Gestational Diabetes) AND (Risk Factors) AND (Risk Controls) AND (Public Health). Data collection was conducted in December 2024.

The inclusion criteria established for this study included: experience reports, case studies, and quantitative, qualitative, or mixed approach studies, as long as they were

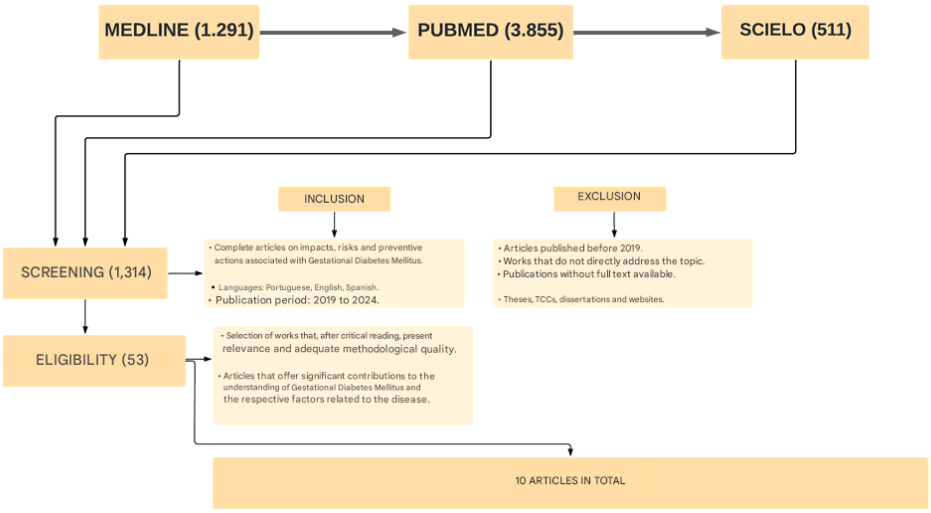
Revista ARACÊ
ISSN: 2358-2472

available in full; published in Portuguese, English, or Spanish; published in national or international journals in the last five years (2019-2024); and with abstracts accessible in the selected databases.

The exclusion criteria defined for the analysis included articles whose full version was not available, publications before the year 2019, works that did not directly address the topic in question, as well as course completion works (TCCs), dissertations, theses, and content from websites.

Thus, after applying the inclusion and exclusion criteria, 1,314 articles were identified. Of these, 53 were selected for full reading, resulting in the inclusion of 10 studies that fully met the established criteria and comprised the final sample, as demonstrated in the flowchart presented in Figure 1.

Figure 1 - Flowchart representing the articles selected for the research



Source Authors

After completing the bibliometric analysis, the results were organized into a synoptic table, highlighting the main findings. The selected articles were subjected to a thorough reading and carefully reviewed to extract their most relevant content, followed by an in-depth analysis.

RESULTS AND DISCUSSION

The results of this research are presented in a table, followed by a concise analysis of the obtained data, as shown below in Table 1.

Revista ARACÊ
ISSN: 2358-2472

Table 1 - Summary of the studies included in the review, organized according to title, authors, year of publication, database, and main findings

TITLE	AUTHOR/YEAR/DATABASE	MAIN FINDINGS
Analysis of risk factors of neonatal hypoglycemia and its correlation with blood glucose control of gestational diabetes mellitus: A retrospective study	(Cao et al., 2023) PUBMED	In pregnant women with gestational diabetes, prolonged exposure to hyperglycemia affects not only maternal blood glucose levels but also the fetus, which is subjected to high glucose levels. This condition stimulates the hyperactivity of fetal pancreatic islet cells, leading to increased insulin secretion. After umbilical cord clamping, with the interruption of maternal glucose supply, newborns maintain high insulin levels, which can cause neonatal hypoglycemia.
Association of gestational diabetes mellitus with overall and type-specific cardiovascular and cerebrovascular diseases: systematic review and meta-analysis	(Xie et al., 2022) PUBMED	Women with a history of gestational diabetes have an increased risk of cardiovascular and cerebrovascular diseases, including myocardial infarction, heart failure, stroke, and venous thromboembolism. These risks remain significant even after adjusting for factors such as ethnicity, sociodemographic characteristics, educational level, conventional risk factors, and incident diabetes.
Functional genetic variants and susceptibility and prediction of gestational diabetes mellitus	(Huang et al., 2024) MEDLINE	Single nucleotide polymorphisms (SNPs), the primary form of human genome variation, are essential for understanding genetic susceptibility to gestational diabetes mellitus. These SNPs, located in different functional gene regions, can influence promoter and enhancer activity, alternative splicing, mRNA conformation, and post-transcriptional levels, as well as protein function and structure, potentially altering individual biological characteristics. They are widely used in disease risk prediction and prognosis.
Gestational diabetes mellitus - A metabolic and reproductive disorder	(Choudhury; Devi Rajeswari, 2021) PUBMED	Gestational diabetes significantly impacts maternal health and fetal development, increasing the risk of miscarriages, preterm births, and infant mortality. During pregnancy, metabolic state alterations affect insulin action and sensitivity, with intensified resistance in the second half of gestation, resulting in hyperglycemia.

Revista ARACÊ
ISSN: 2358-2472

Gestational diabetes mellitus and adverse pregnancy outcomes: systematic review and meta-analysis	(Ye et al., 2022) PUBMED	The global rise in obesity, currently at epidemic levels, has contributed to the increasing incidence of gestational diabetes in pregnant women, elevating the risk of pregnancy complications. Identifying and quantifying the risks of adverse phases are essential for prevention, risk assessment, and patient education.
Gestational diabetes mellitus and developmental programming	(Chu; Godfrey, 2020) PUBMED	Exposure to GDM increases the predisposition of both mother and child to the development of non-communicable diseases (NCDs) throughout life. Commonly associated with adult lifestyles, NCDs represent a significant public health challenge, with a multifactorial etiology involving interactions between genetic, environmental, and various risk pathways.
Influencing factors for postpartum depression in women with gestational diabetes mellitus	(Tan et al., 2024) MEDLINE	The adverse effects of gestational diabetes mellitus on maternal and neonatal health can intensify stress and concern in pregnant women, especially those with inadequate plasma glucose control. Additionally, GDM is associated with an increased risk of postpartum depression (PPD) and the development of type 2 diabetes mellitus in the post-pregnancy period.
Dietary patterns of pregnant women, maternal overweight, and gestational diabetes	(Zuccolotto et al., 2019) SCIELO	The significant increase in obesity is partially related to changes in eating habits, with the replacement of traditional meals with processed foods. During pregnancy, body fat accumulation, associated with placental hormonal changes, can intensify insulin resistance and increase the risk of GDM.
Prevalence, Prevention, and Lifestyle Intervention of Gestational Diabetes Mellitus in China	(Juan; Yang, 2020) PUBMED	Lifestyle interventions, such as adopting a balanced diet and engaging in regular physical exercise, are fundamental and first-line preventive strategies for both the prevention and management of gestational diabetes mellitus. These interventions can also reduce the risk of progression to GDM in predisposed individuals. It is recommended that all pregnant women maintain healthy eating habits and an active lifestyle throughout pregnancy.

Revista ARACÊ
ISSN: 2358-2472

The Role of Lifestyle Interventions in the Prevention and Treatment of Gestational Diabetes Mellitus	(Zakaria et al., 2023) PUBMED	The development of gestational diabetes mellitus is associated with both modifiable and non-modifiable risk factors. Non-modifiable factors include genetic predisposition, race, advanced maternal age, family history of type 2 diabetes, and polycystic ovary syndrome (PCOS). On the other hand, modifiable factors, such as lifestyle and environmental conditions, also influence its occurrence. Maternal glycemic control is affected by physiological pregnancy changes, pathological conditions, and diet, with carbohydrate type being a key determinant of blood glucose levels. Additionally, physical activity improves glycemic control by increasing glucose uptake in skeletal muscles.

Source: Authors, 2024.

During pregnancy, the maternal body undergoes various physiological and hormonal changes to support fetal development. However, in gestational diabetes mellitus, the increase in placental lactogen hormone interferes with insulin action, resulting in hyperglycemia. Additionally, metabolic disorders may occur, compromising gestational balance and making GDM one of the most prevalent conditions during this period (Vincensi et al., 2024).

In this scenario, maternal metabolism adapts to meet fetal demands, with glucose being essential for fetal development. An important adaptation is the reduction in insulin sensitivity, which facilitates glucose supply to the fetus and the accumulation of maternal adipose tissue. However, some pregnant women develop glucose intolerance, characterized by GDM, resulting from a further reduction in insulin sensitivity and the inability to compensate with increased insulin secretion. Although insulin resistance and GDM are generally reversible after childbirth, about 40% of women with a history of GDM, especially those who are obese, develop type 2 diabetes within 10 years (Reis; Vivan; Gualtieri, 2019).

Moreover, the onset of GDM is associated with a series of risk factors, both modifiable and non-modifiable. Among the non-modifiable factors are advanced maternal age (≥30 years), a previous history of GDM, belonging to ethnic groups with a high prevalence of type 2 diabetes mellitus (T2DM), family history of T2DM, polycystic ovary

Revista ARACÊ
ISSN: 2358-2472

syndrome, and a history of delivering a baby with a birth weight ≥4000g (macrosomia). On the other hand, modifiable risk factors include a sedentary lifestyle, a diet high in glucose, obesity (BMI ≥30 kg/m²), and excessive weight gain during pregnancy (Souza; Iser; Malta, 2023).

However, the relationship between obesity and diabetes is complex, with obesity being one of the main risk factors for GDM due to the greater propensity for insulin resistance in overweight women. The global increase in obesity, especially among women of reproductive age, has contributed to the rising incidence of GDM. The coexistence of obesity and GDM intensifies the risk of complications such as preeclampsia, preterm birth, and a higher likelihood of cesarean delivery. Additionally, there are repercussions on mental health, including stress, anxiety, and depression (Nunes et al., 2024).

Recent studies indicate that between 10% and 15% of women suffer from postpartum depression (PPD) in developed countries, while these rates can reach up to 24% in developing nations. PPD is often associated with episodes of anxiety, which tend to occur within the first six months after childbirth, with an incidence of 14% to 16% (Zeng et al., 2023).

Nevertheless, children of women with gestational diabetes face an elevated risk of various complications, including macrosomia (20–30%), intrauterine growth restriction with small-for-gestational-age birth (7–10%), shoulder dystocia, neonatal hypoglycemia, hyperbilirubinemia, respiratory distress syndrome, and even stillbirth. Moreover, survivors are more likely to develop childhood obesity and diabetes in adulthood (Resende et al., 2022).

In this sense, there is significant concern that these children, upon reaching their reproductive years, may develop chronic diseases and expose the next generation to unfavorable intrauterine environments, triggering a vicious and continuous cycle (Sauder; Ritchie, 2021).

Given this, fetal programming is a crucial mechanism through which the intrauterine environment exerts a profound influence on an individual's health and development throughout life. In the context of gestational diabetes, chronic maternal hyperglycemia and resulting fetal hyperinsulinemia can promote epigenetic and metabolic changes, predisposing the fetus to a higher risk of chronic diseases in adulthood, including cardiovascular diseases. These changes affect the expression of genes related to cell growth, glucose and lipid metabolism, and inflammatory response (Naves et al., 2024).

Revista ARACÊ
ISSN: 2358-2472

Single nucleotide polymorphisms (SNPs) are the most common form of human genetic variation, characterized by the substitution of a single nucleotide in DNA at specific positions in the genome. These genetic markers influence gene expression, messenger RNA stability, and protein translation, potentially contributing to the development of diseases such as diabetes. Risk alleles related to diabetes have been identified in genes that regulate pancreatic beta-cell functions and insulin deficiency. Additionally, the frequencies of these alleles vary among ethnic groups, explaining differences in disease susceptibility. Early detection and genetic evaluation are essential for preventing associated complications (Shoily et al., 2021).

Beyond its direct impacts on individual and collective health, diabetes also generates significant and serious economic consequences. These repercussions extend beyond healthcare systems and include family economic losses, reduced national productivity, and increased burdens on social security systems. The growing prevalence of the disease amplifies direct costs, such as treatment and hospitalizations, and indirect costs, such as the loss of an active workforce and increased dependence on social benefits. These impacts not only compromise the family economy of those affected but also profoundly affect public and private budgets, perpetuating economic challenges that will extend for decades (Satler et al., 2021).

On the other hand, the diagnosis of GDM is based on glycemic changes observed in tests conducted during prenatal care, such as fasting blood glucose, oral glucose tolerance test (OGTT), and glycemic curve. International criteria, based on the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study and the guidelines of the International Association of Diabetes and Pregnancy Study Groups (IADPSG), correlate elevated maternal blood glucose levels with maternal, fetal, and neonatal complications. Pregnant women with fasting blood glucose between 92 mg/dL and 125 mg/dL are diagnosed with GDM, while values above 126 mg/dL or casual blood glucose above 200 mg/dL indicate diabetes mellitus during pregnancy. Re-evaluation with OGTT between 24 and 28 weeks is recommended for initially inconclusive cases. The Fourth International Workshop-Conference on Gestational Diabetes Mellitus suggests selective screening for women over 30 years or with risk factors and universal screening in ethnic groups with a high prevalence of the disease, highlighting the relevance of early diagnosis in preventing complications (Neves, 2022).

Revista ARACÊ
ISSN: 2358-2472

In agreement, moderate and personalized lifestyle interventions are indicated as preventive measures to reduce the incidence of gestational diabetes, especially in high-risk pregnancies, to mitigate maternal-fetal complications. Among the main preventive measures is regular physical exercise, started early and maintained during pregnancy, with benefits in reducing excess weight and the risk of GDM. When combined with dietary changes, such as adopting dietary patterns based on the Mediterranean diet or Nordic nutrition recommendations, including fruits, vegetables, and whole grains, the results are even more significant. This combination, especially if initiated in the pre-gestational period, offers a comprehensive and effective approach to preventing GDM and promoting a healthy pregnancy (Barros et al., 2021).

Furthermore, GDM can be improved, and its complications prevented through strategies such as the use of insulin therapy when necessary and daily monitoring of capillary blood glucose during pregnancy, selecting the ideal monitoring pattern to maintain glycemic levels within appropriate values (Fernandes; Bezerra, 2020).

Additionally, pharmacological therapy plays an essential role in the management of GDM, especially when lifestyle changes are insufficient for adequate glycemic control. Among the therapeutic options, oral hypoglycemic agents, such as metformin, stand out for their effectiveness in reducing blood glucose levels to near-normal values. Metformin can be used alone or in combination with other oral antidiabetic agents, depending on the patient's response. However, insulin is widely recognized as the first-line therapy in the treatment of GDM, offering precise and safe glycemic control during pregnancy. Its importance is even greater in cases of significant insulin resistance or persistent hyperglycemia, ensuring better outcomes for maternal and fetal health (Fernandes et al., 2023).

In this aspect, the role of a multidisciplinary team is complementary and fundamental for GDM, contributing to the reduction of maternal-fetal morbidity and mortality risks. Through actions based on national guidelines, such as those of the Ministry of Health, the team promotes health interventions that include early disease screening, and continuous blood glucose monitoring, among others. Additionally, it provides psychosocial support and educates pregnant women about recognizing signs of hypo and hyperglycemia, encouraging self-care. Trained professionals ensure a systematic and dynamic approach, guided by scientific evidence, with a focus on preventing future complications, and ensuring the best for the health of those affected (Silva Carvalho et al., 2022).

Revista ARACÊ
ISSN: 2358-2472

Undoubtedly, reproductive planning and preconception care play an essential role in promoting health before pregnancy, significantly reducing the risk of complications during the gestational period. Preconception strategies, such as early prenatal care, multidisciplinary follow-up, clear and accessible guidance, adoption of balanced eating habits, regular physical activity, health education, and lifestyle changes when necessary, have proven effective in preventing GDM, contributing to the overall health of women and better maternal-fetal outcomes (Lana, 2020; Silva; Priscila Busch Furlan, 2021).

A meta-analysis and systematic review involving 5,903 women with pre-gestational diabetes mellitus highlighted the relevance of preconception care in reducing gestational complications. The results showed a 71% reduction in the risk of malformations, a 54% reduction in perinatal mortality, and a 5% reduction in prematurity. These care measures include strict glycemic control with insulin, diet, and oral antidiabetic agents; guidance on gestational complications and the importance of self-monitoring of blood glucose; screening and treatment of chronic complications before conception; use of effective contraceptive methods until optimal glycemic control is achieved; folic acid supplementation; physical exercise, and weight control (Wahabi et al., 2020).

Thus, early screening and diagnosis of GDM are crucial to reducing maternal-fetal complications and ensuring the health of the pregnant woman and the newborn. Due to the severity of possible consequences, early screening is recommended at the first prenatal visit, allowing the immediate development of therapeutic strategies. Rapid initiation of treatment after diagnosis is essential to prevent or minimize fetal sequelae associated with GDM, promoting positive clinical impacts for both mother and child (Salvadori; Pereira Silva, 2022).

In recent years, significant advances in diabetes-related technologies have played an essential role in the treatment and management of the disease. These advancements include continuous glucose monitoring devices and insulin pumps, which reduce the need for frequent capillary punctures, making glycemic control more efficient and less invasive. Additionally, tools based on artificial intelligence (AI) and internet connectivity have driven the development of new technological solutions, expanding the possibilities for personalized care and improving patients' quality of life (Azevedo, 2023).

AI has revolutionized this aspect, promoting updated advancements in diabetes management. Connected devices, such as continuous glucose sensors and mobile applications, allow patients to monitor their blood sugar levels in real time. These data are

Revista ARACÊ
ISSN: 2358-2472

processed by AI algorithms, which identify patterns and provide actionable insights, aiding in informed decision-making about health. Furthermore, the integration of sensors with AI algorithms enables automated decisions in insulin administration through systems that include insulin pumps or connected smart pens, optimizing glycemic control and promoting greater treatment efficacy (Krakauer; Malerbi, 2024).

Jatobá, Simões, and Nakamura (2023) are developing the "Glicase" project, an app and website aimed at serving patients with type 1, type 2, gestational diabetes, and prediabetes, to clarify doubts and improve users' quality of life. The initiative will include a specific care routine, educational information about diabetes, the location of pharmacies providing free medications, adapted recipes for diabetics, and interactive features such as chats with healthcare professionals and community members, promoting support and integration.

Health-focused apps are fundamental in promoting quality of life, treatment adherence, and facilitating communication between healthcare professionals and patients. Silva (2021) highlights the existence of approximately 250 apps focused on self-care and diabetes management, offering diverse functionalities. An example is mySugr: Diabetes Diary, which allows efficient disease monitoring through features such as blood glucose, food, carbohydrate, and medication logging, report generation, and alerts for blood glucose checks. The app also enables the storage and analysis of user routine information, tracking treatment progress, and the possibility of sharing data with healthcare professionals, optimizing care and diabetes prevention.

Remote monitoring, conducted through portable devices and apps, allows pregnant women to maintain continuous vigilance even outside the clinical environment. This approach favors a more agile response to changes in specific maternal and fetal parameters, contributing to the prevention of complications and real-time monitoring of maternal-fetal health (Pedroni et al., 2023).

To improve maternal-infant outcomes in high-risk pregnancies, such as in gestational diabetes mellitus, the application of artificial intelligence in medical data analysis has proven essential. AI contributes to the identification of patterns and the prediction of possible complications, allowing a more proactive and personalized approach to the management of high-risk pregnancies. This results in greater efficacy in care and the mitigation of adverse outcomes (Pedroni et al., 2023).

Revista ARACÊ
ISSN: 2358-2472

Similarly, pharmacological management is one of the most important interventions in the treatment of GDM. Pharmacists play an essential role in educating pregnant women about the importance of glycemic control, including regular blood glucose checks and insulin dose adjustments as needed. They also guide the correct use of medications and identify possible adverse effects that may compromise treatment efficacy or safety (COSTA et al., 2024).

Adjustments in pharmacological therapy for pregnant women with GDM and pre-gestational diabetes mellitus should be made regularly, with a minimum frequency of every 15 days until the 30th week of pregnancy and weekly thereafter. These adjustments should preferably be personalized, considering the results of capillary or interstitial glucose monitoring, to ensure effective glycemic control and reduce risks (Zajdenverg et al., 2022a).

Parallelly, GDM management strategies require a multidisciplinary approach, including community health education programs that promote treatment adherence and encourage healthy behaviors. Collaboration between healthcare professionals and community initiatives is fundamental for the development of successful approaches in GDM management. In this context, public policies that provide clinical support and dissemination of accessible information to women and pregnant women play an essential role in promoting comprehensive care and reducing the risks associated with GDM (Costa et al., 2024).

In summary, awareness of GDM is essential, especially during the prenatal period, which plays a fundamental role in early detection and disease management. Women with diabetes are advised to plan their pregnancy and adopt preconception care to achieve better perinatal outcomes. GDM, characterized by its manifestation exclusively during pregnancy, presents significant risks, even for those without prior symptoms of the condition. Early diagnosis, ideally performed at the beginning of pregnancy, enables control strategies that promote maternal health and ensure a safe delivery, reducing risks for the baby. Therefore, the dissemination of information and health education are fundamental to minimizing the impacts of GDM (Ministério da Saúde, 1999; Zajdenverg et al., 2022b).

CONCLUSION

GDM has significant implications for both maternal-fetal health and intergenerational risks, reflecting complications during pregnancy and increasing the predisposition to

Revista ARACÊ
ISSN: 2358-2472

chronic diseases, such as type 2 diabetes, in affected women. Its effects on fetal development include macrosomia, neonatal hypoglycemia, and metabolic disorders that can trigger a vicious cycle of chronic diseases in subsequent generations.

However, the implementation of preventive measures during prenatal care, such as early screening, adoption of a balanced diet, regular physical exercise, and, when necessary, the use of pharmacological therapies, can significantly reduce the risks associated with GDM, promoting maternal-fetal health and preventing long-term complications. Awareness and education about preconception care also play a fundamental role in the prevention and effective management of the disease.

The results obtained underscore the importance of early diagnosis and a multidisciplinary approach in the control of GDM, which can reduce economic costs and improve the quality of life of affected women and children. With the increasing number of gestational diabetes cases, these strategies have the potential to mitigate the economic burden on healthcare systems and improve public health in the long term.

In conclusion, it is essential that future research further explores the interaction between genetic, environmental, and behavioral factors in the development of GDM, in addition to evaluating the effectiveness of new technologies, such as artificial intelligence, in the monitoring and management of the disease. Investigations into innovative preventive interventions and their future impact on subsequent generations are also necessary to enhance care for pregnant women and reduce the risks of intergenerational chronic diseases.

Revista ARACÊ
ISSN: 2358-2472

REFERENCES

1. AZEVEDO, A. SANTOS. Uso de tecnologias em saúde voltada para o diabetes mellitus. Trabalho de Conclusão de Curso – Monografia), Curso de Bacharelado em Farmácia, Centro de Educação e Saúde, Universidade Federal de Campina Grande, Cuité – Paraíba – Brasil, 2023.

2. BARROS, B. DA S. *et al*. A importância do pré-natal na prevenção de complicações materno-fetais do diabetes mellitus gestacional. Revista Eletrônica Acervo Científico, v. 27, p. e7588, 30 maio 2021.

3. BATISTA, M. H. J. *et al*. Diabetes gestacional: Origem, prevenção e riscos / gestational diabetes: origin, prevention and risks. Brazilian Journal of Development, v. 7, n. 1, p. 1981–1995, 2021.

4. CAO, Y. *et al*. Analysis of risk factors of neonatal hypoglycemia and its correlation with blood glucose control of gestational diabetes mellitus: A retrospective study. Medicine, v. 102, n. 35, p. e34619, 1 set. 2023.

5. CHOUDHURY, A. A.; DEVI RAJESWARI, V. Gestational diabetes mellitus - A metabolic and reproductive disorder. Biomedicine & Pharmacotherapy, v. 143, p. 112183, nov. 2021.

6. CHU, A. H. Y.; GODFREY, K. M. Gestational Diabetes Mellitus and Developmental Programming. Annals of Nutrition and Metabolism, v. 76, n. Suppl. 3, p. 4–15, 2020.

7. COSTA, R. P. *et al*. Impacto da intevenção farmacêutica no manejo de pacientes com diabetes mellitus gestacional. Revista Multidisciplinar do Nordeste Mineiro, v. 12, n. 1, 1 nov. 2024.

8. FERNANDES, C. N.; BEZERRA, M. M. M. O Diabetes Mellitus Gestacional: Causa e Tratamento / The Managemental Diabetes Mellitus: Cause And Treatment. ID on line REVISTA DE PSICOLOGIA, v. 14, n. 49, p. 127–139, 28 Feb. 2020.

9. FERNANDES, W. G. DE S. *et al*. Assistência farmacêutica em mulheres grávidas com Diabetes mellitus gestacional. Research, Society, and Development, v. 12, n. 5, p. e29212541893, 29 Maio 2023.

10. FUNDAÇÃO OSWALDO CRUZ. Diabetes Mellitus na Gestação: classificação e diagnóstico. Disponível em: <https://portaldeboaspraticas.iff.fiocruz.br/atencao-mulher/diabetes-mellitus-na-gestacao-classificacao-e-diagnostico/>. Acesso em: 5 jan. 2025.

11. HUANG, G. *et al*. Functional genetic variants and susceptibility and prediction of gestational diabetes mellitus. Scientific Reports, v. 14, n. 1, p. 18123, 5 ago. 2024.

12. INTERNATIONAL DIABETES FEDERATION. IDF diabetes atlas. Disponível em: <https://diabetesatlas.org/data/en/world>. Acesso em: 4 jan. 2025.

Revista ARACÊ
ISSN: 2358-2472

13. JATOBÁ, B. C. DE O.; SIMÕES, M. H.; NAKAMURA, T. T. H. Glicase: aplicativo e site para bem-estar de diabéticos tipo 1, 2, gestacional e pré-diabetes. Trabalho de conclusão de curso (Curso Técnico em Desenvolvimento de Sistemas Integrado ao Médio) - Escola Técnica Estadual “Rodrigues de Abreu”, Bauru, 2023.

14. JUAN, J.; YANG, H. Prevalence, Prevention, and Lifestyle Intervention of Gestational Diabetes Mellitus in China. International Journal of Environmental Research and Public Health, v. 17, n. 24, p. 9517, 18 dez. 2020.

15. KRAKAUER, M.; MALERBI, F. Inteligência Artificial Revoluciona o Tratamento do Diabetes. Em: Diretriz da Sociedade Brasileira de Diabetes. [s.l.] Conectando Pessoas, 2024.

16. LANA, T. C. Prevalência, fatores associados e desfechos relacionados ao ganho de peso gestacional excessivo: estudo nascer em Belo Horizonte. Universidade Federal de Minas Gerais, 2020.

17. MENDES, K. D. S.; SILVEIRA, R. C. DE C. P.; GALVÃO, C. M. Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. Texto & Contexto - Enfermagem, v. 17, n. 4, p. 758–764, dez. 2008.

18. MENDONÇA, P. H. P. *et al*. Diabetes gestacional: atualização em critérios diagnósticos e terapêutica. Brazilian Journal of Health Review, v. 7, n. 2, p. e69035, 18 abr. 2024.

19. MINISTÉRIO DA SAÚDE. Diabetes e gravidez: controle pré-natal é muito importante. Disponível em: <https://bvsms.saude.gov.br/bvs/publicacoes/diabetes_gravidez.pdf>. Acesso em: 5 jan. 2025.

20. NAVES, I. C. P. *et al*. Função cardíaca fetal e desenvolvimento no diabetes gestacional: avaliação clínica e estratégias de manejo. Revista Ibero-Americana de Humanidades, Ciências e Educação, v. 10, n. 8, p. 90–101, 2 ago. 2024.

21. NEVES, T. R. Atenção à gestante com diabetes Mellitus gestacional e a atuação do enfermeiro: revisão de literatura. Pontifícia Universidade Católica de Goiás, 2022.

22. NOBRE, C. F. *et al*. Diabetes Mellitus Gestacional. Revista Eletrônica Acervo Médico, v. 23, n. 7, p. e13272, 23 jul. 2023.

23. NUNES, M. E. E. *et al*. Perfil obstétrico das gestantes com diabetes mellitus gestacional submetidas ao parto cesárea em um hospital de cascavel, paraná de 2021 a 2023. Revista Ibero-Americana de Humanidades, Ciências e Educação, v. 10, n. 11, p. 402–419, 4 nov. 2024.

24. PEDRONI, J. L. *et al*. Gestão de Gravidez de Alto Risco: Estratégias Clínicas e Resultados Materno-Infantis. Brazilian Journal of Implantology and Health Sciences, v. 5, n. 5, p. 6244–6268, 24 dez. 2023.

Revista ARACÊ
ISSN: 2358-2472

25. REIS, M. G. V.; VIVAN, R. H. F.; GUALTIERI, K. DE A. Diabetes mellitus gestacional: aspectos fisiopatológicos materno-fetais. Revista Terra & Cultura: Cadernos De Ensino E Pesquisa, 2019.

26. RESENDE, R. S. F. DE *et al*. Atualizações sobre a influência da obesidade no surgimento do diabetes gestacional e suas complicações para mãe e para concepto. Research, Society and Development, v. 11, n. 17, p. e185111738952, 24 dez. 2022.

27. RIBEIRO, G. DA S. *et al*. Diabetes gestacional: aspectos relacionados ao diagnóstico, risco e tratamento. Research, Society and Development, v. 11, n. 16, p. e294111638457, 8 dez. 2022.

28. RIBEIRO, N. B. Prevalência de diabetes mellitus gestacional no Brasil: uma revisão integrativa. Trabalho de Conclusão de Curso (Bacharelado em Enfermagem) - Campus A.C. Simões, Escola de Enfermagem, Curso de Enfermagem, Universidade Federal de Alagoas, Maceió, 2022.

29. SALVADORI, V.; PEREIRA SILVA, D. Diabetes mellitus gestacional – Revisão da literatura. REVISTA SAÚDE MULTIDISCIPLINAR, v. 11, n. 1, 23 maio 2022.

30. SATLER, L. D. *et al*. Fatores associados à prevalência de diabetes mellitus tipo 2: uma revisão de literatura. Anais do Seminário Científico do UNIFACIG, 2021.

31. SAUDER, K. A.; RITCHIE, N. D. Reducing intergenerational obesity and diabetes risk. Diabetologia, v. 64, n. 3, p. 481–490, 6 mar. 2021.

32. SHOILY, S. S. *et al*. Common genetic variants and pathways in diabetes and associated complications and vulnerability of populations with different ethnic origins. Scientific Reports, v. 11, n. 1, p. 7504, 5 abr. 2021.

33. SILVA CARVALHO, G. DA *et al*. Cuidados da equipe multiprofissional na prevenção da diabetes mellitus gestacional. RECIMA21 - Revista Científica Multidisciplinar - ISSN 2675-6218, v. 3, n. 6, p. e361626, 26 jun. 2022.

34. SILVA, D. R. Moglie: protótipo de aplicação mobile para autogerenciamento da Diabetes Mellitus. rabalho de Conclusão de Curso (Graduação em Engenharia Biomédica) - Universidade Federal de Uberlândia, Uberlândia, 2021.

35. SILVA, M.; PRISCILA BUSCH FURLAN, C. Avaliação da percepção das gestantes diabéticas sobre o diabetes gestacional. Revista Ensaios Pioneiros, v. 4, n. 2, p. 28–39, 18 ago. 2021.

36. SOUZA, C. M.; ISER, B. M.; MALTA, D. C. Diabetes gestacional autorreferido - uma análise da Pesquisa Nacional de Saúde. Cadernos Saúde Coletiva, v. 31, n. 3, 2023.

37. TAN, J. *et al*. Influencing factors for postpartum depression in women with gestational diabetes mellitus. Frontiers in Endocrinology, v. 15, 4 set. 2024.

Revista ARACÊ
ISSN: 2358-2472

38. VINCENSI, T. S. *et al*. Diabetes Mellitus Gestacional: diagnóstico e tratamento para o controle glicêmico durante a gravidez. Brazilian Journal of Health Review, v. 7, n. 5, p. e73521, 10 out. 2024.

39. WAHABI, H. A. *et al*. Systematic review and meta-analysis of the effectiveness of pre-pregnancy care for women with diabetes for improving maternal and perinatal outcomes. PLOS ONE, v. 15, n. 8, p. e0237571, 18 ago. 2020.

40. XIE, W. *et al*. Association of gestational diabetes mellitus with overall and type-specific cardiovascular and cerebrovascular diseases: systematic review and meta-analysis. BMJ, p. e070244, 21 set. 2022.

41. YE, W. *et al*. Gestational diabetes mellitus and adverse pregnancy outcomes: systematic review and meta-analysis. BMJ, p. e067946, 25 maio 2022.

42. ZAJDENVERG, L. *et al*. Tratamento farmacológico do diabetes na gestação. Em: Diretriz Oficial da Sociedade Brasileira de Diabetes. [s.l.] Conectando Pessoas, 2022a.

43. ZAJDENVERG, L. *et al*. Planejamento, metas e monitorização do diabetes durante a gestação. Em: Diretriz Oficial da Sociedade Brasileira de Diabetes. [s.l.] Conectando Pessoas, 2022b.

44. ZAKARIA, H. *et al*. The Role of Lifestyle Interventions in the Prevention and Treatment of Gestational Diabetes Mellitus. Medicina, v. 59, n. 2, p. 287, 1 fev. 2023.

45. ZENG, X. *et al*. A correlation analysis on the postpartum anxiety disorder and influencing factors in puerperal with gestational diabetes mellitus. Frontiers in Endocrinology, v. 14, 27 Nov. 2023.

46. ZUCCOLOTTO, D. C. C. *et al*. Dietary patterns of pregnant women, maternal excessive body weight, and gestational diabetes. Revista de Saúde Pública, v. 53, p. 52, 26 jun. 2019.