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REVIEW

Impact of Gestational Diabetes on Maternal and Fetal Health: Prevalence, Risks and Interdisciplinary Treatment

Impacto de la Diabetes Gestacional en la Salud Materna y Fetal: Prevalencia, Riesgos y Tratamiento Interdisciplinario

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ABSTRACT

Introduction: Diabetes mellitus (DM) has established itself as a global epidemic, with increasing prevalence worldwide. In 2017, approximately 425 million people were diagnosed with DM, a figure that is expected to increase to 629 million by 2045. Among the main complications of DM, gestational diabetes (GD) is one of the most relevant, especially because of its long-term consequences for both the mother and the fetus. In this context, early identification and timely treatment of GD are crucial to avoid metabolic and obstetric complications.

Development: Gestational diabetes is one of the most frequent complications in pregnancy, with a worldwide prevalence ranging from 1 to 14%. In Argentina, 4.7% of pregnant women present GD. This condition increases the risk of complications such as preeclampsia, intrauterine growth retardation, fetal macrosomia and congenital malformations. In the long term, the mother may develop type II diabetes and cardiovascular disease, while the child is more likely to suffer from obesity, impaired glucose tolerance and diabetes later in life. Early care and proper management are essential to prevent these complications.

Conclusions: Gestational diabetes poses a significant risk to maternal and fetal health, both in the short and long term. Early diagnosis and timely treatment, supported by an interdisciplinary team, are essential to mitigate the adverse effects of this disease. The active participation of nursing is essential in the management of GD, ensuring the correct care and follow-up of patients. It is necessary to prioritize the prevention and adequate treatment of GD in public health, given its magnitude and long-term consequences for families.

Keywords: Gestational diabetes; Prevalence; Metabolic complications; Early diagnosis; Interdisciplinary treatment; Gestational diabetes.

RESUMEN

Introducción: La diabetes mellitus (DM) se ha consolidado como una epidemia global, con una prevalencia creciente en todo el mundo. En 2017, aproximadamente 425 millones de personas fueron diagnosticadas con DM, cifra que se espera incremente a 629 millones para 2045. Entre las principales complicaciones de la DM, la diabetes gestacional (DG) es una de las más relevantes, especialmente por sus consecuencias a largo plazo tanto para la madre como para el feto. En este contexto, la identificación temprana y el tratamiento oportuno de la DG son cruciales para evitar complicaciones metabólicas y obstétricas.
Desarrollo: La diabetes gestacional es una de las complicaciones más frecuentes en el embarazo, con una prevalencia mundial que varía entre el 1 y el 14%. En Argentina, el 4,7% de las embarazadas presentan DG. Esta condición aumenta el riesgo de complicaciones como preeclampsia, retardo del crecimiento intrauterino, macrosomía fetal y malformaciones congénitas. A largo plazo, la madre puede desarrollar diabetes tipo II y enfermedades cardiovasculares, mientras que el niño tiene mayores probabilidades de sufrir obesidad, tolerancia a la glucosa alterada y diabetes en etapas posteriores de la vida. La atención temprana y el control adecuado son esenciales para prevenir estas complicaciones.
Conclusiones: La diabetes gestacional representa un riesgo significativo para la salud materna y fetal, tanto a corto como a largo plazo. Un diagnóstico temprano y un tratamiento oportuno, apoyados por un equipo interdisciplinario, son fundamentales para mitigar los efectos adversos de esta enfermedad. La participación activa de Enfermería es esencial en el manejo de la DG, garantizando la correcta atención y seguimiento de las pacientes. Es necesario priorizar la prevención y el tratamiento adecuado de la DG en la salud pública, dada su magnitud y las consecuencias a largo plazo para las familias.

Palabras clave: Diabetes gestacional; Prevalencia; Complicaciones metabólicas; Diagnóstico temprano; Tratamiento interdisciplinario.

INTRODUCTION

Diabetes mellitus (DM) is a global epidemic and one of the leading causes of death. In 2017, around 425 million people were diagnosed. According to the latest study by the National Institute of Statistics and Census of Argentina (INDEC) in the 4th National Survey of Risk Factors, this figure will increase to 629 million worldwide by 2045.

According to Carvajal Andrade et al. (2019), the Pan American Health Organization (PAHO) carried out studies in association with the ministries of health of several countries to measure the impact of diabetes on the population, being able to determine how invaluable the medical costs generated by this disease are and the significant deterioration it causes in patients suffering from it. Among those affected worldwide, 90% suffer from type II diabetes as a result of gestational diabetes that does not receive timely and appropriate treatment, with consequences for the mother and her child.

In the research carried out by Costa and Costa Gil (2016), they stated that GD is the third major clinical category in the current classification of diabetes and the most frequent metabolic complication that can occur in pregnancy. The prevalence varies widely between 1 and 14%, depending on the population studied and the criteria used for diagnosis. Gorbán de Lapertosa et al. (2019) determined a prevalence in Argentina of 4.7% using the diagnostic criteria of the Latin American Diabetes Association (ALAD). It has been shown that GDM increases the risk of obstetric problems such as preeclampsia and intrauterine growth retardation, among others. In the long term, GDM indicates a significant risk of developing maternal diabetes and cardiovascular disease. In the fetus, it can cause fetal macrosomia, congenital malformation, and respiratory distress syndrome. The baby's high weight causes trauma during childbirth

and, occasionally, shoulder dystocia. Over the years, the child is at high risk of suffering long-term metabolic dysfunctions, such as obesity, impaired glucose tolerance (IGT), and diabetes in adolescence or early adulthood. The severity and importance of the pathology require early diagnosis and timely treatment provided by an interdisciplinary team, and nursing is one of the fundamental pillars of its treatment.

General objective

Analyze the prevalence, risks, and consequences of gestational diabetes (GD) in pregnant women and its long-term impact on maternal and fetal health, highlighting the importance of early diagnosis and timely treatment, with the support of an interdisciplinary team in which nursing plays a crucial role.

DEVELOPMENT

Diabetes: An ancient disease

Diabetes Mellitus is a disease as old as civilization. The first reference to diabetes comes from 1500 BC in the Ebers Papyrus (Egypt), a document found by the German Egyptologist George Ebers (1873), which is on display in the library of the University of Leipzig (Germany). It is one of the first medical writings. It dedicates a paragraph to the strange disease where sufferers lose weight, are continually hungry, urinate profusely, and "feel tormented by an enormous thirst" in what would appear to be a description of the severe symptoms of juvenile diabetes.

In Ayurvedic medicine from India, there is an older reference (3,000 years old) where it is mentioned as a urinary disorder (Madhumeha), madhu (sweet or honey), and meha (excess urine) in which the patient excretes astringent urine, especially sweet and concentrated. An important surgeon, Sushruta, documented that the disease usually affected several members of the same family in what could be a first description of the presentation of type II diabetes.

The ancient Hindu literature of the Vedas describes sticky honey-flavored urine that strongly attracts ants. Apollonius of Memphis, 250 BC, coined the term Diabetes (Dia = "through" Betes = "to pass") to define a state of extreme weakness, intense thirst, and polyuria, Apollonius believing it to be a form of dropsy. Others point to Aretaeus of Cappadocia (Turkey, 81-138 AD). What leaves no doubt is that the latter described the evolution and fatal outcome of the disease and makes a very personal reference to the symptomatology: "In these patients, the body gradually disintegrates and, as the waste products have to be eliminated dissolved in water, they need to urinate a lot. This lost water has to be replaced by drinking a lot. As the fat melts little by little, weight is lost, and the patient loses strength as the muscles break down. In the Roman Empire, Aulio Cornelio Celso (1st century BC) stood out, who gave a detailed description of the disease and was the first to advise physical exercise, and Galen (129 to 216) interpreted the disease as a consequence of kidney failure, unable to retain urine; an idea that lasted in the medical paradigm for centuries. Avicenna (Persia, 10th century) obtained a syrupy liquid by evaporating a patient's urine and managed to describe the complications of the disease. In the 13th century, Feliche discovered that the pancreas is an organ and not a piece of meat, as had been thought until then. Theophrastus Bombastus von Hohenheim (Switzerland, 1493), who adopted the pseudonym Paracelsus in honor of the Roman physician, challenged the prevailing paradigm and freed the kidney as responsible for the disease, arguing that diabetes was due to a blood disorder. In 1679, a story that is now legend took place when the doctor Thomas Willis (London) moistened his finger in the urine of diabetic patients, checking for the presence or absence of a sweet taste to inaugurate the terms Diabetes Mellitus and Diabetes Insipidus to differentiate between them. In 1752, Johann Frank (Germany) definitively determined that diabetes mellitus and diabetes insipidus were distinct diseases. In 1778, Thomas Cawley (London) found an atrophic pancreas and multiple stones implanted in the pancreatic tissue in the autopsy of a patient with diabetes. In 1867, Paul Langerhans (Germany) discovered scattered islets of cells with unknown function in the pancreas of a monkey. In 1889, Joseph Von Mering and Oscar Minkowsky (Germany) completely removed a dog's pancreas to see the effects of the absence of the organ on

digestion. They found the subsequent manifestation of thirst and frequent emission of urine with sugar content. Finally, they reach the conclusion that a severe case of diabetes has developed, which will lead to death in a few weeks, and they focus their research on a substance produced by the islets of Langerhans, which they will call Insulin. In 1921, Frederick Banting and Charles Best (Canada) obtained a liquid produced by the self-digestion of a monkey pancreas by ligating its excretory duct. Injected into a puppy with diabetes, they managed to reduce hyperglycemia within two hours: they had discovered Insulin. The famous puppy Marjorie was the first to survive a pancreatectomy while receiving insulin extract. These two researchers won the Nobel Prize in Medicine in 1923 and waived all rights to their discovery, selling them to the University of Toronto for the symbolic price of one dollar. On January 11, 1922, a 14-year-old patient with diabetes weighing 29 kilos (Leonard Thompson) began the first insulin treatment and managed to survive for 13 years. The use of insulin spread in the belief that it was a curative response and with very high production costs. In Spain, Rossend Carrasco (1922) began to obtain porcine Insulin at the municipal slaughterhouse in Barcelona. In 1923, Swedish colonel Eli Lilly founded a small Indianapolis (USA) laboratory that would market the pancreas hormone under Insulin. Methods of obtaining Insulin as a treatment for diabetes have advanced and have reached extraordinary levels. The life of a person with diabetes today, thanks to scientific advances, is entirely different from that of years ago. Health management can be carried out more efficiently, but there is still a long way to go in the history of this pathology. Furthermore, the work of Augusto Loubatiéres in Montpellier has made oral hypoglycaemic agents another pillar of diabetes treatment, in this case for type II diabetes (Asociación Valenciana de Diabetes, 2022).

Gestational diabetes, epidemiology

During pregnancy, a woman's body undergoes physiological and hormonal changes to ensure the fetus's growth and development while maintaining homeostasis. Pregnancy is associated with changes in insulin sensitivity due to the action of placental hormones. From the second trimester of pregnancy onwards, there is a decrease in insulin sensitivity, which leads to blood glucose levels and an inadequate response to carbohydrate loading that is different from what happens in non-pregnant women. Some pregnant women are unable to compensate for insulin resistance through the usual adaptive physiological responses and, therefore, develop gestational diabetes. Gestational diabetes mellitus (GDM) is any carbohydrate intolerance diagnosed during pregnancy. The prevalence of this disease has a close correlational association with the prevalence of type 2 diabetes mellitus (T2DM) (Medina-Pérez et al., 2017).

In recent years, several global events have converged, resulting in an increase in cases of diabetes mellitus (DM) in pregnancy: the increase in the prevalence of DM2 at younger ages, together with the increase in the prevalence of obesity and the shift in the average age of pregnant women towards older ages (Salzberg et al., 2016). The Ministry of Health of Argentina (2017a) recognizes the worldwide increase in the prevalence of diabetes (DBT) and its relationship with lifestyle changes, fundamentally a sedentary lifestyle and inadequate diet. It also reproduces the information from the International Diabetes Federation (IDF) that almost 200 million women in the world suffer from the disease, and it represents the ninth leading cause of death among women; that is, more than 2 million deaths a year due to the increased cardiovascular risk it entails.

Leta (2018) states that, according to WHO figures, the prevalence of gestational diabetes (GD) worldwide ranges from 1 to 14%, and in Argentina, it is approximately 5%. Medina-Pérez et al. (2017) report has found that the expression of prevalence in a vast percentage range reproduces the influence of environmental and hereditary factors, but fundamentally, the disparity of diagnostic criteria and strategies for screening the disease.

According to national data collected by PAHO (2016) on the prevalence of hyperglycemia in pregnancy (GDM, DM), only 14 countries submitted reports. Among the reporting countries, the frequency of GDM was lowest in Panama (0.01%) and El Salvador (0.3%), while the prevalence of diabetes in pregnancy reached 6.5% in Canada and 7.8% in Mexico.

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Epidemiology:

Medina-Pérez et al. (2017) list the risk factors associated with GDM:

- Maternal age (over 30 years).
- Multiparity.
- Obesity.
- Excessive weight gain during pregnancy (over 20 kg).
- Family history of diabetes and personal history of GD in previous pregnancies.
- Belonging to ethnic groups with a high prevalence of diabetes, such as Latin Americans, Native Americans, Asians, or African Americans.
- Polyhydramnios in a previous pregnancy.
- Gestational diabetes and previous miscarriages.
- Unexplained perinatal losses.
- Children with malformations.
- Birth of children with fetal macrosomia
- Macrosomia of the pregnant woman at birth

Random blood glucose >120 mg/dL.

On the other hand, Caiafa et al. (2010) affirm the need for a thorough investigation of risk factors at the first pregnancy check-up consultation and add other risk factors to be considered, such as dyslipidemia, short stature, history of high blood pressure, clinical characteristics, and personal lifestyle, such as sedentary lifestyle and type of diet.

In a descriptive, retrospective, and cross-sectional study of patients diagnosed with GD throughout 2012, Casas Lay et al. (2014) analyzed 37 patients on the variables age of the pregnant woman, gestational age, assessment of nutritional status at the onset of pregnancy according to body mass index (BMI), family and obstetric pathological history and the need for insulin treatment. They found the diagnosis was most frequently between 21 and 36 weeks of gestation. That risk was predominant in those with a history of abortions, fetal or neonatal mortality, preterm births, and previous congenital anomalies.

Regarding the ethnic issue, Goad (2019) disseminates information from the American Diabetes Association (ADA), according to which African-Americans, Hispanics, and Native Americans have an increased risk of T2DM compared to Caucasians. Black people have double the risk for middle age than white people. Moreover, they are more likely to experience complications than their white counterparts. However, recent studies question this assertion and suggest that obese white and black people have the same biological risk of developing DM2. Millett et al. (2008) confirm a genetic tendency in black and Asian people but found a high prevalence of DM2 in abdominal fat circumference in obese people, regardless of race.

The diagnostic problem

Due to the complications that it can generate in the mother and the fetus, GD should be diagnosed, mainly in the embryogenic period. The Latin American Diabetes Association (ALAD) is an international benchmark that generates and coordinates working groups to update the recommendations on the controversies regarding the diagnostic criteria, the safety of oral antidiabetics during pregnancy, and insulin therapy guidelines. The recommendations are suggestions for proceeding that respond to the clinical questions that arise in the face of the disease. These recommendations have been methodologically processed and have been shown to possess scientific evidence such that they can be offered as recommendations once their impact, as a result, is known. In addition to the aforementioned status of evidence, the recommendations take into account the clinical experience of the referents in the activity and the cultural adaptation according to the regions where the described recommendations will be implemented. Generally, the triad of scientific evidence, clinical experience, and cultural practice constitutes the golden standard for recommendations (Salzberg et al., 2016).

Belmar et al. (2004) have addressed the diagnostic problem and cite the first description of GD by O'Sullivan and Mahan, which included "the presence of two or more blood glucose measurements greater than two standard deviations above the mean, carried out after an oral glucose tolerance test (OGTT) of 100 grams of glucose, with fasting blood glucose measurements, one hour, two hours and three hours after ingestion". When O'Sullivan and Mahan studied the population of pregnant women subjected to the test, they found a statistically significant relationship between the patients' results and an increased risk of developing T2D in the medium to long term. O'Sullivan's method or test has been used to make the diagnosis because it has this strength of diagnostic anticipation between GD and T2D. However, in the last decade, led by the World Health Organization (WHO), the search for new methods has been made for more universal, simplified, and widely accepted methods. The World Health Organization (WHO) established the diagnosis of GD with a provocative SOG test that allows the study of the body's efficiency in metabolizing 75 g of glucose and determining basal blood glucose levels and levels after 2 hours. A third criterion proposes using the identification of risk factors to establish the diagnosis, the most commonly used being maternal age (30 to 35 years), obesity, history of GD in previous pregnancies, family history of diabetes, previous fetal macrosomia, and unexplained third-trimester fetal deaths. This position lacks sufficient evidence to support it, as 50% of cases of GD would occur in people without risk factors.

A study carried out by Belmar et al. (2004) compared two different diagnostic techniques on more than 7000 patients and found that the scheme proposed by the American Diabetes Association (ADA), similar to the traditional O'Sullivan method, established a half incidence of GD diagnoses (3.18%) compared to the innovative scheme proposed by the WHO (7.72%). However, the incidence of complications such as large-for-gestational age fetuses, neonatal hypoglycemia, and pregnancy-induced hypertension were better detected according to ADA criteria. The authors concluded that the findings are insufficient to determine clinical evidence favoring the new proposal.

Fasting glucose levels should be measured in all pregnant women at the first prenatal consultation. However, to highlight pre-gestational diabetes, a 75 g glucose tolerance test (p75) should be requested at the beginning of the pregnancy in patients with several risk factors.

All pregnant women who are obese or have a history of GDM, especially if they have a fasting blood glucose level of between 85-99 mg/dl at the first check-up, should be closely monitored with a diet and physical activity plan without receiving pharmacological treatment, to prevent gestational diabetes.

Regarding the ALAD diagnostic recommendations, the 2007 recommendations are still in force:

- Fasting plasma glucose level between 100 and 125 mg/dl repeated in two determinations within the same week.
- Plasma glucose level greater than or equal to 140 mg/dl at 2 hours post-stimulus with 75 grams of glucose.
- The p75 glucose overload test or Sullivan test should be carried out in the morning after an 8 to 12-hour fast, with no restrictions on a diet for the three days prior, and the patient should not be taking any medication that could modify the test results, such as corticoids and beta-adrenergic. After a blood sample has been taken while the patient is fasting, she ingests a solution at room temperature of 75 grams of anhydrous sugar in 375 cc of water over 5 minutes before the blood sample is taken, in which the plasma value will be quantified. Anhydrous sugar or anhydrous dextrose is a free and simple form of glucose present in fruit and honey.

Salzberg et al. (2016) state that it is advisable to indicate the determination of fasting blood glucose of p75 in the first consultation to all pregnant women with several risk factors. The risk factors to be considered according to the recommendation are age over 35, history of first-degree family diabetes (T2D), obesity determined by a body mass index (BMI) greater than 30 kg/m2, fasting blood glucose more significant than 85 mg/dl, history of GDM in a previous pregnancy, history of previous macrosomia greater

than 4,000 kg. Fetal weight, pregestational signs of insulin resistance, history of low or high birth weight of the pregnant woman (between 2,500 to 4,000 kg), and the ethnic origin of the high prevalence of GDM.

Pathogenesis, classification

The Pan American Health Organization (2016) recognizes the presentations of O'Sullivan and Mahan (60 years ago) as the first description of GD. Regarding pathogenesis, Medina-Pérez et al. (2017) call for consideration of the magnitude of the changes that must occur in maternal metabolism to create optimal conditions for embryogenesis, growth, and fetal development. In pregnant women who are not suffering from obstetric pathologies, from the beginning of the second trimester, an increase in insulin resistance and, secondarily, a decrease in glucose tolerance develop. The etiology of the change in insulin sensitivity during pregnancy has not been demonstrated. The most widely accepted hypothesis is that this diabetogenic situation may be related to increased peripheral insulin resistance.

Some pregnant women are unable to compensate for insulin resistance through the usual adaptive physiological responses and develop diabetes during pregnancy. Some may present with undiagnosed DM prior to pregestational pregnancy (PGP), so GDM can be defined as any degree of glucose intolerance with onset or first recognition during pregnancy or also as that which appears or is recognized for the first time during the current pregnancy regardless of whether it may have existed previously (Salzberg et al., 2016). The physiology of pregnancy follows the logic that the fetus must have the permanent availability of nutrients assured despite the mother ingesting them at regular intervals. To achieve this result, the nutrients from the intake must be maintained for a more extended period in the maternal circulation. They must be mobilized from the tissues when fasting. "These phenomena, which have been called facilitated anabolism and accelerated fasting, aim to ensure the fetus's utilization of glucose and amino acids." Then, in the face of functional resistance to the action of Insulin during pregnancy, the pregnant woman should be able to respond with a compensatory increase in insulin production.

During pregnancy, the mother ingests food periodically but must supply it to the fetus continuously. To ensure this supply, changes occur in maternal metabolism, aimed at keeping nutrients after ingestion for a longer time in the maternal circulation and mobilizing them from tissues when fasting. These phenomena, which have been called facilitated anabolism and accelerated fasting, aim to ensure the fetus's utilization of glucose and amino acids. In response to this situation of insulin resistance, there is an increase in insulin secretion, but some pregnant women do not achieve an adequate compensatory response and, therefore, develop GD. In pregnant women with this pathology, both postprandial hyperglycemia and fasting hypoglycemia are characteristic. GD appears as a consequence of this incapacity, characterized by postprandial hyperglycemia and fasting hypoglycemia. "Most of the hormones referred to (cortisol, placental lactogen) have their maximum peak during pregnancy around week 26, while progesterone, which has a high diabetogenic potency, shows a maximum increase around week 32, which has implications for the assessment of the most suitable period for making the diagnosis" (Cabero Roura, 2007).

A non-pathological pregnancy is, by nature, a diabetogenic state that builds up reserves available to the mother and the fetus that will be necessary for the more advanced stages of pregnancy, at the time of delivery, and at the start of breastfeeding. In addition, there is a functional increase in insulin resistance and the consequent glucose intolerance that will worsen as the pregnancy progresses with "increased body mass index, with a predominance of central obesity, and hyperlipidemia, among other characteristics, which together can cause, in addition to transient gestational diabetes mellitus, permanent metabolic alterations." It has been proposed that this resistance is a response to placental hormones such as placental human lactogen, progesterone, cortisol, growth hormone, and prolactin, which are involved in the increase in placental size; this position is consistent because a rapid remission of gestational diabetes mellitus has been observed after placental delivery.

Classification:

The GDPS Network Foundation (2022) publishes a classification of the disease with an etiological criterion focused on the beta cells of the pancreas (insulin-producing) because it allows treatment to be directed at the specific dysfunctions of which these cells are mediators. It is a fact that beta alterations represent the primary defect of DM due to the interaction of genetics, functional insulin resistance, and environmental factors. Therefore, the following may occur:

a) Type 1 Diabetes Mellitus: autoimmune destruction of beta cells with absolute insulin deficiency due to primary autoimmune pathogenesis or associated with other autoimmune diseases. The pancreatic reserve of Insulin is greatly diminished or absent, meaning that the patient is insulin-dependent. Physically thin individual. Diagnosed before maturity (under 30 years of age).

b) Type 2 Diabetes Mellitus: progressive loss of insulin secretion from ß cells, with probable baseline insulin resistance. Non-autoimmune pathogenesis and preserved pancreatic insulin reserve. The patient is overweight or obese and not prone to ketosis. Pre-pregnancy treatment with diet and exercise, with or without oral hypoglycaemic drugs and/or Insulin.

c) Gestational diabetes mellitus (GDM): diagnosed during the second or third trimester of pregnancy, not present before pregnancy.

d) Other specific types of diabetes: monogenic diabetes syndromes, exocrine pancreatic diseases such as cystic fibrosis, diabetes induced by drugs or chemical products (glucocorticoids), treatments for HIV/AIDS or following organ transplants, and genetic defects of the beta-cell DM type MODY of mitochondrial origin.

A more orthodox classification proposes to incorporate pregestational diabetes, defined as any diabetes diagnosed before the onset of pregnancy. Medina-Pérez et al. (2017) propose an exclusive classification of diabetes in pregnancy, which incorporates the category of pregestational diabetes and includes the following complications:

a) Pregestational diabetes.
b) Type 1 diabetes. Complicated with nephropathy.
Complicated with retinopathy.
Complicated with ischemic heart disease.
c) Type 2 diabetes. Complicated with nephropathy.
Complicated with retinopathy.
Complicated with ischemic heart disease.
d) Gestational diabetes. Controlled with diet.
Controlled with Insulin.

Treatment, control, and complications

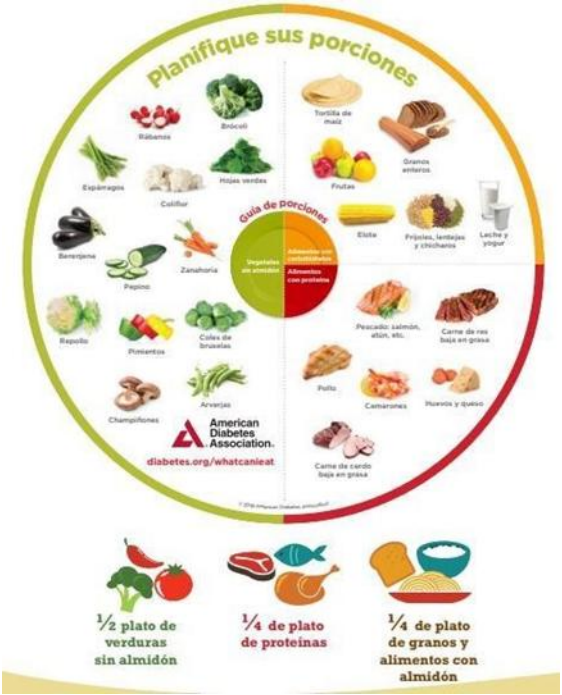
The Centers for Disease Control (CDC) (2022a) proposes five axes for the adequate treatment of GD: an adequate diet, regular physical activity, regulated blood glucose monitoring, insulin therapy (if prescribed), and reclassification for BTD in the postpartum period.

A diet appropriate for GD consists of following a food plan of a certain quality and at a specific frequency to control stabilized glycemia (blood sugar level) at a concentration sufficient to supply fetal nutrition without producing inappropriate increases in size and weight (macrosomia). All recommendations suggest the inclusion of a nutrition specialist when the diagnosis of GD is confirmed (CDC, 2022a).

In a second quote from the CDC (2022b), the quality of food is considered to control the presence of carbohydrates that generate significant, rapid increases in blood glucose, such as added sugar, sweets, and refined flour. Adequate foods are non-starchy vegetables such as carrots, cabbage, aubergine, cauliflower, broccoli, spinach, lettuce, tomatoes, and peppers; whole grains: whole grain rice, quinoa, whole wheat pasta, fresh fruit, especially whole fruit, low-fat or non-fat dairy products, a variety of protein-rich foods such as lean meats, eggs, and soy products. Other energy sources, such as fat from meat, dairy products, and poultry skin, should be avoided. Another recommendation is to control the

amount of food and portion control, as the nutritionist indicates. To do this, practical resources are used, such as household measurements (spoons and cups) and even anatomical ones (the fist itself).

Figure 1. American Diabetes Association (ADA) method for planning portions in glycemic control in DM.



Source: Centers for Disease Control and Prevention, Office of Noncommunicable Diseases, Injury, and Environmental Health (2022b). Rich recipes for people with diabetes and their families.

A strategy can be observed for the pregnant woman to put together her own plate. The colors show that half of the plate should contain vegetables, a quarter should be lean meats on one side, and carbohydrates on the other. The drawings with permitted foods allow her to vary the combinations according to personal taste and availability of food resources.

To maintain adequate blood sugar levels, recommendations have been made regarding the quality of carbohydrates and fats in the food ingested and the appropriate portions; the interval between meals should be added, including at least four formal daily meals plus two intermediate snacks (Centers for Disease Control and Prevention Office of Noncommunicable Diseases, Injury, and Environmental Health, 2022b). The objective is to avoid ketosis (the appearance of products of fat catabolism secondary to the deprivation of carbohydrates) as a consequence of prolonged periods of fasting; in practice, the four main meals and snacks are distributed in such a way as not to exceed a daytime fast of 3 hours and an overnight fast of 8 hours (Neuquén Ministry of Health, 2017).

Regular physical activity controls blood glucose, which complements the diet plan because it consumes circulating energy. In addition, it can be an important resource when the pregnant woman cannot avoid inadequate intake. A regular intensity of half an hour's exercise five days a week, such as walking, swimming, or playing actively with the children, can be prescribed (CDC, 2022a).

A third control is the frequent monitoring of capillary blood glucose, which arises as a need to check for dynamic changes in the metabolic requirements of the pregnant woman's body. The ALAD recommendation aims to maintain fasting blood glucose levels between 70 and 90 mg/dl, one-hour postprandial blood glucose levels between 85 and 140 mg/dl, and two-hour postprandial blood glucose

levels between 80 and 120 mg/dl. Resources will condition the medical indication for the daily monitoring frequency. However, it is recommended that at least one measurement on an empty stomach and two postprandial measurements after lunch and dinner, respectively (Salzberg et al., 2016).

Self-monitoring of capillary blood glucose at home or in an institution replaces the measurements made by blood extraction. It is done with a device that can read the blood glucose level when a test strip is inserted and soaked by capillary action in a drop of blood.

Figure 2. Commercial models of capillary blood glucose monitors/meters in the control of glycemia in DM.

Source: Accu-chek (2022). Glucose meters.

The blood sample consists of a drop obtained by pricking the fingertip with a sterile, disposable metal lancet. Although the technique is simple, the technical resources are very costly and depend on the supply and delivery capacity of public health services. In addition, it requires the patient to be able to self-inject by pricking her finger.

The fourth guideline for controlling blood glucose in GD is insulin application. Insulin is a hormone, and like any active ingredient (capable of generating changes in homeostasis), it is used under strict medical prescription. It is a medication that the patient administers herself in everyday life, so its prescription is associated with an educational task in several areas that the pregnant patient must carry out: identifying the type of insulin to be used, its correct dosage, the technique for subcutaneous administration, the puncture sites and their rotation, the expected effects and the complications. In this study, the problem will be limited to the management of the pregnant woman concerning medical prescription.

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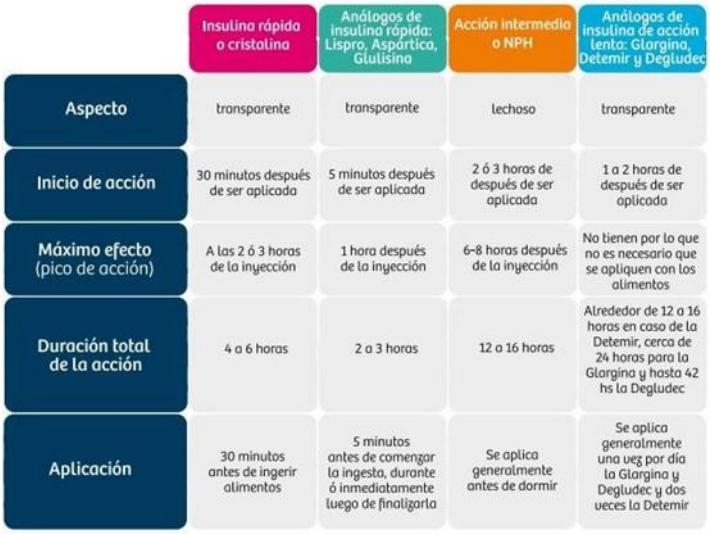
Figure 3. Domains in insulin therapy in the control of glycemia in GD.



	Insulina rápida o cristalina	Análogos de insulina rápida: Lispro, Aspártica, Glulisina	Acción intermedia o NPH	Análogos de insulina de acción lenta: Glargina, Detemir y Degludec
Aspecto	transparente	transparente	lechoso	transparente
Inicio de acción	30 minutos después de ser aplicada	5 minutos después de ser aplicada	2 ó 3 horas de después de ser aplicada	1 a 2 horas de después de ser aplicada
Máximo efecto (pico de acción)	A las 2 ó 3 horas de la inyección	1 hora después de la inyección	6-8 horas después de la inyección	No tienen por lo que no es necesario que se apliquen con los alimentos
Duración total de la acción	4 a 6 horas	2 a 3 horas	12 a 16 horas	Alrededor de 12 a 16 horas en caso de la Detemir, cerca de 24 horas para la Glargina y hasta 42 hs la Degludec
Aplicación	30 minutos antes de ingerir alimentos	5 minutos antes de comengar la ingesta, durante ó inmediatamente luego de finalizarla	Se aplica generalmente antes de dormir	Se aplica generalmente una veg por día la Glargina y Degludec y dos veces la Detemir

Source: Ministry of Health of Argentina (2017b). Insulinization at the Primary Care Level.

Finally, the last point in glycemic control refers to the postpartum period. A favorable resolution of the diabetic condition is ordinary after hormonal reorganization. When this does not occur, the patient has DM2, and the incidence of this disease is significant (up to 50%); therefore, it is advisable to continue with the recommended diet and physical activity to request a diabetes test again between 6 and 12 weeks after the birth of the baby and to continue with annual check-ups (CDC, 2022a). Ríos-Martínez et al. (2014) reviewed the results found in the HAPO (Hyperglycemia and Pregnancy Outcome) study of the International Association of Diabetes and Pregnancy Study Groups (IADPSG). The HAPO study looked for a correlation between the degree of glucose intolerance as a diagnostic criterion for GDM and perinatal morbidity. The study involved 23,316 pregnant women with a mean age of 29.2 years and mean blood glucose levels during fasting, one and two hours after the glucose load of 80.9 mg/dL, 134.1 mg/dL, and 111.0 mg/dL, respectively. From this information, the risk of an adverse pregnancy outcome associated with an increase in standard deviations of glycemia was calculated. The results showed that (in the therapeutic objective of maintaining maternal glycemia at acceptable levels, especially postprandial) a low-carbohydrate diet is effective in reducing birth weight, avoiding subsequent obesity, and reducing complications and perinatal death. As for physical activity, a lower GI index has been shown to correlate. Exercises in which arm activity predominates for periods of between 30 and 45 minutes, at least three times a week, are recommended. Abdominal and leg exercises have a higher risk of triggering contractions or decreasing oxygenation of the uterus. It should be borne in mind that the glycemic values of each pregnant woman should be adjusted to her physical activity to avoid hypoglycaemic events. Arizmendi et al. (2012) state that poor glycaemic control and gestational diabetes complicated by nephropathy and retinopathy are the most important risk factors for neonatal complications that determine the need for hospitalization at birth, congenital malformation, and perinatal death. When the pregnant woman who arrives at the first obstetric check-up has poor glycaemic control but adheres to the control treatment (even at week 28), the favorable effects are seen in the growth of the fetus, the increase in gestational age at birth, adequate weight and the reduction of injury at birth. Insulin treatment is indicated in patients with DM1 or DM2 who are not controlled by diet, so the impact of low adherence to treatment can be inferred.

Pregnant women with diabetes have a higher risk of developing hypertensive disorders of pregnancy, cesarean deliveries, and morbidities associated with diabetes. In addition, in 50% of patients with

gestational diabetes, there is an increased risk of developing type 2 diabetes within a 10-year window period. The perinatal consequences will depend on the timing of the initiation of TDD, with the levels of increase and duration of the hyperglycaemic periods of the pregnant woman with consequences that include fetal macrosomia, neonatal hypoglycaemia, hyperbilirubinemia, an increase in the number of births by cesarean section or instrumental delivery, shoulder dystocia, fetal trauma during birth and fetal-neonatal death (Vigil-De Gracia & Olmedo, 2017).

CONCLUSIONS

Diabetes mellitus (DM) is one of the leading global epidemics, with an alarming increase in the number of cases diagnosed worldwide, especially type II diabetes, which represents the vast majority of those affected. In this context, gestational diabetes (GD) has been identified as one of the most frequent metabolic complications during pregnancy, with a prevalence that varies between 1 and 14% depending on the population and the diagnostic criteria used. The prevalence of GD in Argentina is 4.7%, according to the Latin American Diabetes Association (ALAD).

Gestational diabetes not only affects maternal and fetal health during pregnancy but also entails long-term risks. For the mother, it can increase the likelihood of developing type II diabetes and cardiovascular disease in the future. In the case of the fetus, GD can cause complications such as fetal macrosomia, congenital malformations, and respiratory distress syndrome, as well as an increased risk of long-term metabolic dysfunctions such as obesity and diabetes in adolescence or early adulthood.

Early diagnosis and appropriate treatment are essential to minimize the risks associated with GD. A multidisciplinary approach, with the active participation of nursing staff, is crucial to ensure timely and effective care, guaranteeing a better prognosis for mothers and their children. The implementation of programs for the prevention and control of gestational diabetes should be a public health priority, considering the significant impact of this condition at both the individual and collective levels.

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FINANCING

None.

CONFLICT OF INTEREST

None.