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OBSTETRIC AND NEONATAL COMPLICATIONS RELATED TO GESTATIONAL DIABETES MELLITUS: AN INTEGRATIVE REVIEW

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Lucas Manoel Oliveira Costa[1], Raimunda Delfina de Oliveira Rocha Neta[2], Zenaide Pereira da Silva[3], Marcus Vinicius de Carvalho Souza[4], Anna Paula Piovez[5], Izane Luisa Xavier Carvalho Andrade[6], João Victor Moura Lins[7] and Brenda Nascimento Peruhype Soares[8]

ABSTRACT

This study aims to identify the main obstetric and neonatal complications associated with gestational diabetes mellitus through an integrative literature review. The methodology involved a comprehensive search in the LILACS, BDENF and SciELO databases, using the descriptors: gestational diabetes, pregnancy complications and maternal and child health, as well as their alternative terms. The inclusion criteria permeated studies published between 2019 and 2024, in Portuguese, English, and Spanish, discarding literature reviews, experience reports, dissertations, and theses, as well as research that did not meet the objective of the study. It began with an initial sample of 28,198 articles and after applying the filters and other methodological criteria, 10 studies were selected to compose

[1] Resident in Obstetric Nursing
School of Public Health of Maranhão
E-mail: enflucasmocosta@gmail.com
Orcid: https://orcid.org/0000-0001-7184-2318
[2] Bachelor of Science in Nursing
Multiple Higher Education Institute
E-mail: raimunda.delfina@hotmail.com
[3] Bachelor of Science in Nursing
Multiple Higher Education Institute
E-mail: zennahsilva@gmail.com
[4] Post-Graduate Program in Health Science
University of Southern Santa Catarina
E-mail: marcarvalhosouza@ufpi.edu.br
Orcid: https://orcid.org/0000-0002-9625-769X
[5] Post-Graduate Program in Health Science
University of Southern Santa Catarina
E-mail: anna.piovezan@unisul.br
Orcid: https://orcid.org/0000-0001-8817-3552
[6] Master of Science in Nursing
Children's State Hospital – HEC
E-mail: izaneluizac@hotmail.com
Orcid: https://orcid.org/0000-0002-4693-1033
[7] Graduating in Medicine
Unifacid University Center
E-mail: joao14102002victor@gmail.com
Orcid: https://orcid.org/0000-0002-8040-3541
[8] Nurse Specialist in Midwifery
Multiple Higher Education Institute
E-mail: breh_peruhype@hotmail.com
Orcid: https://orcid.org/0009-0003-6451-6647

the final sample and analysis. The results obtained revealed that the most frequent complications in neonates of mothers with GDM include neonatal hypoglycemia, macrosomia, and respiratory distress syndrome. In addition, fetal macrosomia represented a risk factor for traumatic births, shoulder dystocia, and bleeding complications. It was noticed that strict glycemic control and adequate follow-up during pregnancy are essential to reduce complications associated with GDM. The contributions of this study strengthen clinical practice by providing subsidies for the development of protocols for the management of GDM in the obstetric and neonatal context.

Keywords: Pregnancy Complications. Gestational Diabetes. Maternal And Child Health.

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is one of the most frequent metabolic complications during pregnancy, characterized by carbohydrate intolerance of varying severity that leads to hyperglycemia of varying intensity, commonly diagnosed during the first prenatal consultations (Brasil, 2022).

In addition, its global prevalence ranges from 7% to 14%, in the context of care provided in the Unified Health System (SUS), approximately 18% of pregnant women are diagnosed with GDM. This condition has been widely studied due to its significant impact on both maternal and fetal health (American Diabetes Association, 2024).

That said, it is recommended that all pregnant women should undergo glycemic monitoring, such as the assessment of fasting glucose at the first prenatal visit, if the result is between 92 mg/dL and 125 mg/dL, an indication of GDM is verified. In cases with values ≥126 mg/dL, the existence of previous diabetes is understood (Tsakiridis *et al*., 2024).

Still in the first trimester, at values < 92 mg/dL, it is recommended to perform the Oral Glucose Tolerance Test (OGTT) with 75 g, between 24 and 28 weeks of gestation, so fasting plasma glucose levels are checked 1 and 2 hours after ingestion of the oral glucose load. The diagnosis of GDM occurs when the fasting measure is ≥ 92 mg/dL, 1h ≥ 180 mg/dL or 2h ≥ 153 mg/dL, thus, for the diagnosis, one or more of these values must be reached (Brasil, 2022).

According to a review by Gontijo and Silva (2024), the following can be listed among the main complications of GDM: fetal macrosomia, shoulder dystocia, severe and extensive perineal lacerations, gestational hypertension, preeclampsia, neonatal hypoglycemia, prolonged labor, polyhydramnios, instrumental deliveries, and in some cases the need to terminate the pregnancy by discharge.

Corroborating Gontijo and Silva (2024), a review study carried out by Junqueira *et al*., (2021), signaled that maternal repercussions associated with gestational diabetes include: hypertensive syndromes (affecting about 25% of cases), polyhydramnios in about 25% to 30% of cases, in addition to urinary infections, pyelonephritis, and candidiasis.

Other complications include preterm labor, hypoglycemia, ketoacidosis, need for surgical intervention, and risk of developing diabetes mellitus after pregnancy. In addition, the occurrence of renal or retinal vascular lesions should be considered, as well as the metabolic changes related to hyperglycemia increase the risk of miscarriage in affected pregnant women (Junqueira *et al*., 2021).

In view of this, early identification and proper management of GDM are crucial to minimize the risks of maternal and neonatal complications. However, despite advances in

the diagnosis and treatment of the condition, the morbidity and mortality rates associated with obstetric complications remain significant, especially in developing countries, where access to quality prenatal care is limited or scarce (Brazilian Diabetes Society, 2024).

In Brazil, the incidence of GDM varies from 2.4% to 7.2% of pregnancies, and can reach up to 17.8% in other regions of the world. In addition, a Brazilian ecological study investigated the rates of maternal deaths from complications related to GDM, between 2016 and 2019, in the regions of Brazil. The survey noted the occurrence of 50 deaths, with the highest incidence in the Southeast (48%) and Northeast (32%) regions, warning about the seriousness of this reality in the country (Martins; Brati, 2021; Azevedo; Galvão, 2022).

The relevance of this research lies in the scarcity of current studies that guide clinical conducts regarding the repercussions of diabetes during pregnancy. In view of this scenario, this article aims to analyze, through the integrative review method of the current scientific literature, the main obstetric and neonatal complications related to gestational diabetes mellitus.

METHODOLOGY

This research is an Integrative Literature Review, which was conducted in order to identify, analyze and synthesize the main results of primary studies, with different designs, thus offering a broad and deep view of the topic addressed about the objective of the study. Review studies contribute to the identification of existing gaps in current scientific knowledge. Thus, for the validation of this methodology, a systematic, analytical and rigorous process was used, capable of being replicated by readers (Mendes; Scott; Galvão, 2019).

The recommendation was adopted that this type of study be structured in six stages, namely: 1) elaboration of the review question; 2) search and selection of primary studies; 3) extraction of data from studies; 4) critical evaluation of the primary studies included in the review; 5) synthesis of the results of the review and 6) presentation of the method (Mendes; Scott; Galvão, 2019).

To guide this article, the following guiding question was elaborated: "What is the available scientific evidence about the main obstetric and neonatal complications related to Gestational Diabetes Mellitus?". To assist in the elucidation of this question, the acronym PICo was used, in which the P- refers to the patient or problem; I- studied intervention or interest and Co-context.

That said, to fill in the aforementioned acronym, the Health Sciences Descriptors (DeCS) and *the Medical Subject Headings* (MeSH) were adopted, using, respectively: P-

Gestational Diabetes Mellitus/*Gestational Diabetes*; I- Pregnancy Complications; Co-Maternal/Maternal Health *and Child Health*.

It should be noted that in order to enable a greater capture of articles, the authors chose to add to the search strategy the alternative terms linked in DeCS and the *Entry Term(s)* linked in MeSH, to expand the search for searches, shown in tables 01 and 02.

Table 01: Presentation of DeCS descriptors and alternative terms.

PICo Strategy	DeCS	Alternative Terms
P	Gestational Diabetes	Diabetes, Induced by Pregnancy; Pregnancy-Induced Diabetes; Diabetes Mellitus Gestacional.
I	Pregnancy Complications	Pregnancy Complications; Adverse Birth Outcomes; Adverse Birth Outcomes.
Co	Maternal and Child Health	Maternal and Child Health

Source: Health Sciences Descriptors, 2024.

Table 02: Presentation of MeSH descriptors and Entry Terms.

PICo Strategy	MeSH	Entry Terms
P	Gestational Diabetes	Pregnancy-Induced Diabetes; Gestational Diabetes Mellitus.
I	Pregnancy complications	Pregnancy; Complications Adverse; Birth Outcomes;
Co	Maternal and Child Health	Maternal and Child Health.

Fonte: Medical Subject Headings, 2024.

Primary studies published between 2019 and 2024 were included in the review to capture recent articles, in Portuguese, English, and Spanish, that addressed obstetric and neonatal complications related to GDM, available in recognized scientific databases, such as Latin American and Caribbean Literature on Health Sciences (LILACS), Nursing Database (BDENF), *Bibliographic Index Español em Ciencias de la Salud* (IBECS), via Virtual Health Library (VHL), *Medical Literature Analysis and Retrieval System Online* (MEDLINE) via PUBMED and *Scientific Electronic Library Online* (SciELO).

In addition, any review articles, doctoral theses, master's dissertations, monographs, experience reports, guidelines, manuals or any informative means of government agencies, such as the Ministry of Health (MS), were discarded.

In order to align the descriptors and alternative terms of the DeCS and MeSH platforms in the databases, search strategies were developed using the Boolean operators OR and AND. These operators were combined in different ways to expand the retrieval of articles pertinent to the topic, maximizing the number of relevant studies found, as shown in Table 3.

Table 3 - Search strategies employed in the databases.

Database	Search strategies used
Lilacs, Bdenf and Ibecs (via VHL)	(Gestational Diabetes) OR (Pregnancy-Induced Diabetes) OR (Gestational Diabetes Mellitus) AND (Pregnancy Complications) OR (Adverse Birth Outcomes) AND (Maternal and Child Health)
SciELO	(Gestational Diabetes) AND (Pregnancy Complications) AND (Maternal and Child Health)
Medline (via Pubmed)	*(Gestational Diabetes) OR (Pregnancy-Induced Diabetes) OR (Gestational Diabetes Mellitus) AND (Pregnancy Complications) OR (Adverse Birth Outcomes) AND (Maternal and Child Health*)

Source: authors, 2024.

To methodologically describe the process of identification, selection, analysis, and inclusion of articles in this review, the modified PRISMA method was used, as shown in Figure 1. The *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* or PRISMA strategy refers to a checklist with 27 items and a flowchart divided into four stages.

Thus, its main contribution is to help authors improve the conduct of reviews, in addition to being a useful tool for the evaluation of interventions (Tricco *et al*., 2018). It is essential to emphasize that the PRISMA flowchart was adjusted by the researchers to better visualize the discarded and included studies.

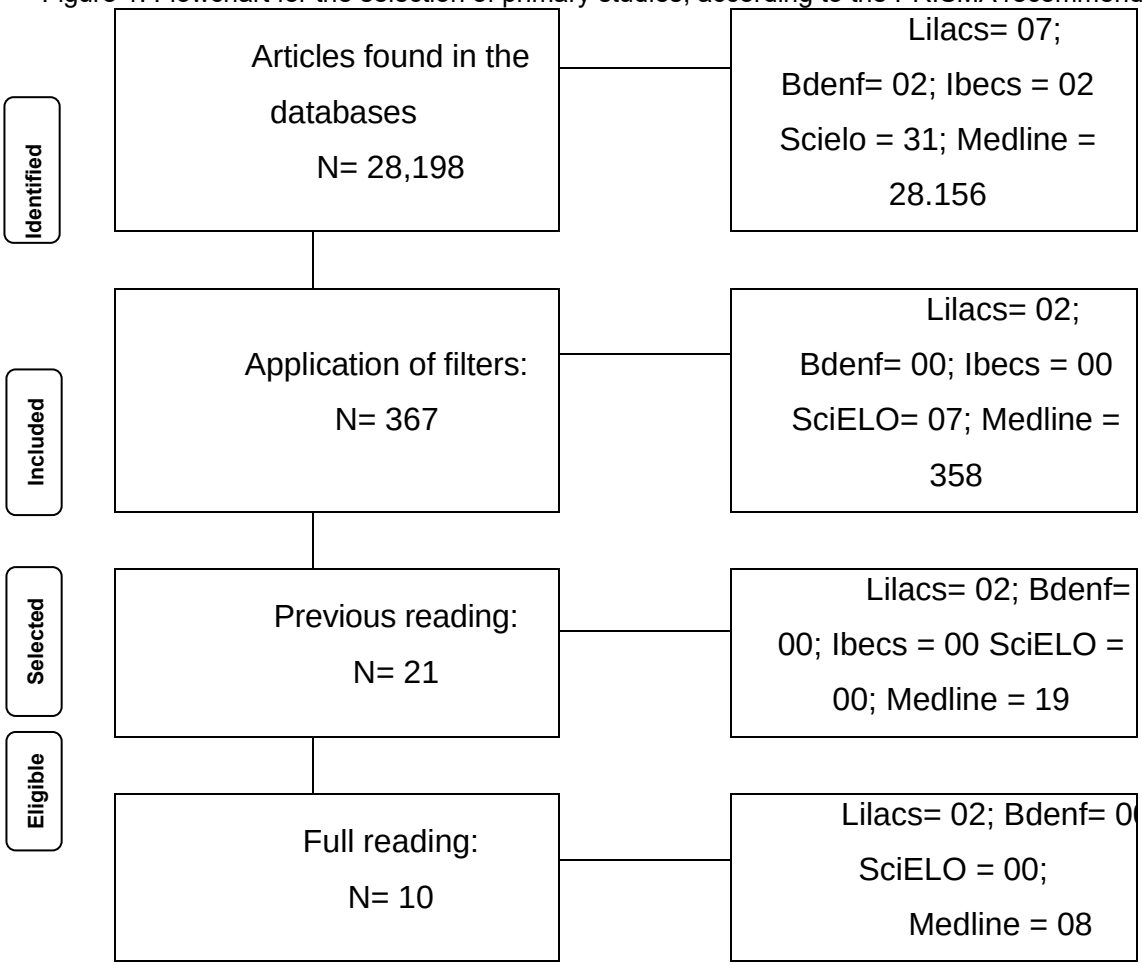
It is noteworthy that this methodology was developed in accordance with the guidelines published by *the Enhancing the Quality and Transparency of Health Research* (EQUATOR) Network, which guides the development of standards for the preparation of scientific reports, aiming to ensure greater quality and transparency in health research (Page *et al*., 2022).

The evaluation of the articles included in this review was conducted independently and in parallel by two reviewers using the Rayyan method, with the purpose of reducing possible biases in this phase of the process. The syntheses carried out by each evaluator were later compared to identify and resolve any divergences in the method applied.

Rayyan is a computational platform developed specifically to support the production of systematic reviews, optimizing processes such as article screening and duplicate identification (Escaldelai *et al*., 2023).

The selection of eligible articles was carried out based on search strategies, associated with the application of previously defined inclusion criteria. Initially, the titles and abstracts were analyzed, and, after excluding the studies that did not meet the research question, the remaining articles were read in full. Only after this full reading were the final articles chosen, highlighting that the quality of the articles was evaluated using the Critical *Appraisal Skills Programme* (CASP) evaluation tool. The final product of this methodology is illustrated in Figure 01.

Figure 1. Flowchart for the selection of primary studies, according to the PRISMA recommendation.



Source: authors

RESULTS

Among the 28,198 articles identified in the first search, only 367 were selected based on the application of the pre-established inclusion and exclusion criteria because they did not fit the time frame, established language, and type of study.

Therefore, following the previous reading of the titles and abstracts of the selected articles, discarding the duplicate studies and aligning the others with the guiding question of this review, 21 articles proceeded to final analysis. That said, after reading the full text of the articles, 11 studies were discarded, in which the main context focused on the clinical scope of prenatal care or childcare is observed, making up the final sample in 10 articles.

Thus, it is observed that only 0.04% of the initial studies were suitable for the present study, of these, 20.00% are available in the Lilacs database (n=2) and 80.00% in Medline (n=8). Regarding the years of publication, 30.00% of the included studies were published in 2023 (n= 3), the other data were available in the years 2024, 2020 and 2019, with an absolute frequency of 2 articles per year, in addition, the year 2022 did not present articles aligned with the criteria of this study. The data mentioned above are shown in table 04.

Table 04: Distribution of absolute and relative frequency of the years of publication of articles (2019 to 2024).

Years of publication	Absolute frequency	Relative frequency (%)
2024	02	20,00
2023	03	30,00
2021	01	10,00
2020	02	20,00
2019	02	20,00
Total	10	100,00

Source: authors, 2024.

Most of the articles included in this review were published in Brazil and the United States (n= 2 for each country), representing a total of 20.00% each. Regarding the database, it was noticed that 80.00% of the searches were found in Medline, as observed in table 05, in addition, there was no repetition of journals.

Table 05: Distribution of absolute and relative frequency of the selected articles by database.

Databases	Absolute frequency	Relative frequency (%)
Medline	08	80,00
Lilacs	02	20,00

Source: authors, 2024.

Regarding the language of publication, 70.00% of the studies were in English, 20.00% in Portuguese, and only 1 study was published in Spanish. It is also noteworthy that there was no presence of experimental studies, however, 50.00% of the studies were characterized as retrospective studies, the others were: prospective, comparative, cross-sectional research, and cohort, in addition, all studies were built with a quantitative design.

In view of this, in order to ensure the transparency of the quality of the studies included in this review, the selected articles were analyzed and the extracted data were organized in a synthesis matrix that included information such as: authorship, year, place of publication, journal, database, objective, methodological aspects and article design, as can be seen in Chart 1.

Chart 1 - Characterization of the articles included in the review.

Title	Authorship, year and place of publication.	Journal and database	Objective, methodological aspects and design
Association between diabetes in pregnancy and shoulder dystocia by infant birth weight in an era of cesarean delivery for suspected macrosomia	Abdelwahab *et al*., (2023) Ohio – United States	American Journal of Perinatology (Medline)	This study aimed to investigate the association between gestational diabetes and the occurrence of shoulder dystocia during labor, analyzing complications and causal factors. This was a retrospective, quantitative study.
Maternal and foetal complications of pregestational and gestational diabetes: a descriptive,	Ruiz *et al*., (2024) Lleida - Spain	Scientific Reports (Medline)	This study carried out in the health region of Spain aimed to analyze the prevalence of pre-gestational and gestational diabetes, in the context of high risk and on the main

retrospective cohort study			complications in the Neonatal Hospital. This was a retrospective observational and cohort, quantitative study conducted between 2012 and 2018.
Materno-fetal and neonatal complications of diabetes in pregnancy: a retrospective study	Capobianco *et al*., (2020). Sassari from Italy	Journal of Clinical Medicine (Medline)	The aim of this study was to evaluate the maternal-fetal and neonatal clinical outcomes of patients diagnosed with GDM, evaluating possible neonatal complications. This was a retrospective and quantitative study, carried out between 2017 and 2018.
Prediction of pre-eclampsia in diabetic pregnant women	Kumar *et al*., (2023). New Delhi - India,	Indian Journal of Medical Research (Medline)	This study analyzed the clinical risk factors of preeclampsia and biochemical markers in early pregnancy of women with gestational diabetes mellitus. Quantitative research, Prospective and comparative cohort study.
Adverse neonatal outcomes and associated factors among pregnant women with gestational and recurrent risk diabetes mellitus	Marano *et al.,* (2024), Rio de Janeiro - Brazil	Demeter (Lilacs)	This study aimed to evaluate adverse neonatal outcomes and associated factors between pregnant women with gestational diabetes mellitus and patients at habitual gestational risk. This is a cross-sectional and quantitative study
Gestational diabetes is associated with postpartum hemorrhage in Indigenous Australian women in the pandora study: a prospective cohort	Lucas *et al*., (2021). Darwin– Austrália	International Journal of Gynecology & Obstetrics (Medline)	This study aimed to evaluate the associations of GDM with the risk of postpartum hemorrhage. This is a prospective and comparative, quantitative cohort study, carried out with indigenous and non-indigenous women, in comparison with normoglycemic pregnant women.
Fetal vascular malperfusion score is linked with developing preeclampsia in women with gestational diabetes mellitus: a retrospective cohort study	Afsar *et al*., (2023) Balikesir – Turquia.	Journal of the Brazilian Medical Association (Medline)	The aim of this study was to determine the association between vascular poor perfusion score and the development of preeclampsia in women with gestational diabetes mellitus. This is a retrospective, quantitative cohort study.
Prevalence and risk factors of gestational diabetes mellitus: findings from a universal screening feasibility program in Lima, Peru	Larrabure-Torrealva *et al*., (2019) Lima – Peru.	BMC Pregnancy and Childbirth (Medline)	The study was designed to estimate the prevalence of GDM and identify maternal risk factors among Peruvian women. This was a cross-sectional and quantitative study.
Hyperglycemia and adverse pregnancy outcome follow-up study (hapo fus): maternal gestational diabetes mellitus and childhood glucose metabolism	Scholtens *et al*., (2019). Chicago – United States.	Diabetes Care (Medline)	The research sought to understand the neonatal repercussions in the context of gestational diabetes mellitus. Quantitative cohort study.
Gestational diabetes in the population served by brazilian public health care. Prevalence and risk factors	Santos *et al*., (2020). Caxias do Sul – Brazil.	Brazilian Journal of Gynecology and Obstetrics (Lilacs)	This study aims to evaluate the prevalence of gestational diabetes mellitus and the main associated risk factors in a population using the Unified Health System in Caxias do Sul-RS.

			This is a descriptive, cross-sectional and retrospective, quantitative study.

Source: authors

DISCUSSION

It is understood, from the studies, that gestational diabetes presents itself as a multifactorial condition, in which genetic, behavioral and environmental factors play a significant role in its development. Early identification of risk factors allows the implementation of effective interventions to prevent or delay the development of GDM, contributing to better maternal and neonatal outcomes.

Thus, in order to better expose the contributions of the articles, it was decided to organize 3 thematic categories - Category 1: Main risk factors and epidemiology of GDM; Category 2 - Obstetric Complications of Gestational Diabetes Mellitus; Category 3: Main neonatal repercussions of Gestational Diabetes Mellitus.

MAJOR RISK FACTORS AND EPIDEMIOLOGY OF GDM

The prevalence of gestational diabetes varies among populations, being influenced by socioeconomic, environmental, and genetic factors. In developed countries, the prevalence of GDM reaches about 5% to 10%, while in developing countries, this number can be considerably higher, especially in urban areas suffering from nutritional transition and increased obesity. As in Brazil, whose prevalence is above 6% to 15%, with higher rates observed among Afro-descendant and indigenous populations (Capobianco *et al*., 2020; Marano *et al*., 2024).

The risk factors most often associated with the development of GDM include advanced maternal age, family history of type 2 diabetes, obesity, and excessive weight gain during pregnancy. In addition, women over the age of 35 are at increased risk of developing the condition, since insulin responsiveness decreases with greater age. The literature has shown that the incidence of GDM is higher in pregnant women aged 35 years > years, compared to pregnant women < 35 years (Kumar *et al*., 2023; Larrabure-Torrealva *et al*., 2019).

Nevertheless, pregestational obesity and excessive weight gain during pregnancy have been associated with the development of insulin resistance. Visceral fat has been identified as an important risk factor, as it directly interferes with insulin signaling processes and raises blood glucose levels (Scholtens *et al*., 2019). In addition, a study conducted by Santos *et al*., (2020) observed that women with a body mass index (BMI) greater than 30kg/m² had a higher risk of developing GDM compared to those with a BMI up to 25kg/m².

In addition to obesity, ethnicity played a relevant role in the incidence of GDM among the studies. Afro-descendant, Latin American, Asian, and indigenous women had a higher risk of developing GDM, even when adequate for factors such as BMI and age. That said, a comparative study conducted in Brazil showed that Afro-descendant women were 1.5 times more likely to develop GDM compared to white women, as well as women with a family history of type 2 diabetes were classified as more likely to develop GDM, due to genetic predisposition to insulin resistance (Santos *et al*., 2020).

In this perspective, another fundamental risk factor for prior evaluation is the history of gestational diabetes. Pregnant people, who have already been diagnosed with GDM in the past, were at high risk of experiencing the condition in subsequent pregnancies. The literature indicates that up to 50% of women who have had GDM previously will develop the condition in a new pregnancy, reinforcing the importance of early screening (Larrabure-Torrealva *et al*., 2019)

In the nutritional context, a Spanish study by Ruiz *et al*., (2024) and Rocha *et al.*, (2024) highlighted that diets high in refined carbohydrates, sedentary lifestyle, and smoking have been widely associated with the development of insulin resistance. The adoption of healthy habits, including a balanced diet and regular physical exercise, was recommended as a preventive measure to minimize the risk of developing gestational diabetes.

OBSTETRIC COMPLICATIONS OF GESTATIONAL DIABETES MELLITUS

GDM is a significant risk factor for obstetric complications, especially in labor, and is sometimes a decisive factor in the mode of delivery. According to Abdelwahab *et al*., (2023), GDM increases the chance of shoulder dystocia in deliveries with suspected macrosomia, especially in infants weighing more than 4,000 grams, which requires close monitoring to avoid emergency interventions, this being an obstetric emergency with a significant impact on the outcome of delivery.

Also according to Abdelwahab *et al*., (2023), the need for well-designed protocols and trained professionals for the management of this complication is highlighted, such as variations in maternal position for the expulsive period, application of specific and safe maneuvers, fetal and maternal monitoring, in addition to precise neonatal care after delivery. The research also flags the associated risks of 3rd and 4th degree perineal lacerations, postpartum hemorrhages, or increased exposure to obsolete practices, such as the use of episiotomies, forceps and Kristeller maneuver.

The prevalence of cesarean deliveries among pregnant women with GDM is high. Capobianco *et al*., (2020) identified that 37% of pregnant women with diabetes required

elective cesarean section, usually associated with hypertension and preeclampsia. These findings reflect the need for specific protocols in the management of GDM to prevent adverse outcomes.

In the context of hypertensive syndromes, Kumar *et al*., (2023), investigated the relationship between GDM and preeclampsia, identifying that about 30% of the pregnant women in the study with diabetes progressed to gestational hypertension and premature births. The study emphasizes that preeclampsia aggravates maternal and fetal morbidity, and adequate monitoring of these patients is essential, such as the use of antepartum and intrapartum cardiotocography.

In a cross-sectional Peruvian study, it was observed that labor induction was recurrent in patients with GDM. The research indicates that approximately 40% of parturients had their labors induced through prostaglandins or analogues, or the use of oxytocin to accelerate labor. The study highlights that the conduct adopted by the professionals was based on the reduction of risks related to prolonged deliveries such as maternal exhaustion, cephalopelvic disproportion, recurrent cervical dilation assessments, and risks of instrumentalized deliveries (Larrabure-Torrealva *et al*., 2019).

A cohort study conducted in 2023 in Turkey discussed placental dysfunction as a condition in which the placenta cannot distribute oxygen correctly to the baby, leading to hypoxia or fetal anoxia, as a result of some risk factors, such as gestational diabetes, especially when associated with gestational hypertensive syndromes, in addition to smoking and urinary tract infections without treatment and without cure control, compromising placental functioning (Afsar *et al*., 2023)

Another risk factor in women with GDM is placental insufficiency, such as poor fetal vascular perfusion, analyzed by Afsar *et al*., (2023). According to the research, this type of complication is associated with intrauterine growth restriction, fetal distress and increased need for emergency cesarean sections, due to the impairment of blood flow evidenced in changes in the fetal heartbeat pattern (BCF), reduction in fetal movement or proven through Doppler velocimetric evaluation of the umbilical artery.

The research by Rocha *et al.*, (2024) highlights that premature rupture of membranes (RPM) as a relevant obstetric complication, occurring in approximately 8-10% of pregnancies diagnosed with GDM. The study highlights that factors such as vaginal and urinary infections, smoking, and cases of isthmocervical incompetence potentiate its incidence. In lines of maternal complications, the study points to an increased risk of chorioamnionitis, which can impact both maternal and fetal health, requiring close monitoring and, in some cases, interventions to avoid adverse outcomes.

NEONATAL REPERCUSSIONS OF GESTATIONAL DIABETES MELLITUS

It should be noted that the study by Marano *et al*. (2024) discusses the risks of hypoglycemia, macrosomia, and respiratory disorders in newborns (NB's) of women with gestational diabetes mellitus (GDM). Neonatal hypoglycemia is approached as a common complication, caused by fetal hyperinsulinemia, an adaptation to excess maternal glucose. Macrosomia is characterized by the excessive growth of the fetus, being another repercussion of GDM and a potentiator of traumatic births and neonatal complications.

Also according to the aforementioned research, Respiratory Distress Syndrome (RDS) is described as a significant condition for neonatal health, attributed to lung immaturity due to failures in surfactant synthesis, influenced by fetal hyperglycemia and hyperinsulinemia. The authors highlight that RDS requires immediate neonatal interventions, such as positive pressure ventilation (PPV) to stabilize Spo2 and heart rate, in addition to reducing the risk of long-term respiratory complications (Marano *et al*., 2024).

In this perspective, fetal macrosomia is pointed out as a complication commonly associated with gestational diabetes, maternal obesity and excessive weight gain during pregnancy. This picture corroborates the risks of obstetric and neonatal complications, such as severe postpartum hemorrhage associated with uterine hyperdistension, laborious expulsive period, shoulder dystocia and poor labor conduction. It is also noteworthy that macrosomia increases the probability of neonatal hypoglycemia, brachial plexus lesions, jaundice and breathing difficulties, in addition to contributing to a higher risk of obesity and metabolic diseases in childhood.

Still on this assumption, a study from Italy points out that in addition to the perinatal complications of macrosomia, such as difficult deliveries and shoulder dystocia, these NB's are more likely to develop obesity and metabolic syndrome in childhood and adolescence. Such outcomes reflect the influence of hyperinsulinemia and increased fat accumulation, consequences of GDM. The authors emphasize the importance of strict glycemic control during pregnancy to mitigate these risks, in addition to the need for prolonged follow-up of children born to mothers with GDM.

Notwithstanding this, the study by Scholtens *et al*., (2019) highlight GDM as a risk factor for preterm labor, which, in the analysis of the research, required routine care and checks of capillary glucose in the first hours of life, associated with neonatal hypoglycemia. The authors point out that some NBs required care in Neonatal Intensive Care Units due to metabolic disorders, extreme prematurity and respiratory distress syndrome due to pulmonary immaturity, a condition aggravated by intrauterine glycemic instability.

A 2023 retrospective study found that poor fetal vascular perfusion associated with GDM has been understood as a crucial factor in the development of adverse pregnancy outcomes, such as low birth weight. This identifies that GDM compromises maternal and fetal endothelial functioning, leading to impairment of blood circulation. The authors highlight that the disorder results from a combination of factors, such as chronic inflammation, oxidative stress, and insulin resistance (Afsar *et al*., 2023).

In this sense, it is perceived that poor vascular perfusion corroborates the insufficient distribution of oxygen and nutrients to the fetus, impairing proper growth and development. The literature points out that this deficiency in blood flow is exacerbated in cases of decompensated and unaccompanied GDM, associated with the incidence of intrauterine growth restriction (IUGR) and, consequently, low birth weight, especially in pregnancies in which monitoring and glycemic control are limited (Afsar *et al*., 2023).

In addition, Scholtens *et al*., (2019) observed that children exposed to GDM, without effective management, are at risk of developing childhood obesity, insulin resistance, and, in the long term, metabolic diseases, such as type 2 diabetes. In addition, the mechanisms involved in these outcomes include altered fetal programming through epigenetic changes in genes related to glucose metabolism and body weight regulation.

In this context, a prospective cohort study highlighted that exposure to maternal hyperglycemia influenced body composition and fat storage in NBs, predisposing them to an increase in BMI during childhood, which contributed to the persistence of metabolic changes throughout life (Lucas *et al*., 2021).

In line with the above, in addition to the immediate neonatal risks, a study from Turkey indicates that neonatal hypoglycemia can cause changes in neurological development, especially if there is no rapid intervention to stabilize the newborn's glucose levels. This risk requires continuous monitoring in the first hours of life to avoid cognitive and neurological deficits that may impact child development (Afsar *et al*., 2023).

In terms of neuropsychological development, exposure to GDM is associated with delays in cognitive and behavioral development in some children, resulting from structural and functional changes in the brain resulting from gestational metabolic dysfunction. The literature suggests that hyperglycemia and poor vascular perfusion during pregnancy compromise adequate oxygen and nutrient delivery to the developing fetal brain (Marano *et al*., 2024).

In addition, such a context, also according to (Marano *et al*., 2024), can result in changes in neural connectivity and brain maturation, especially in the frontal lobe, limbic system, and motor cortex. Thus, exposure to GDM requires close monitoring of child growth

and development and reinforces the need for effective perinatal interventions that minimize the long-term metabolic and cognitive implications, promoting better outcomes for children exposed to this condition.

FINAL CONSIDERATIONS

The study achieved its objective of analyzing the main obstetric and neonatal complications associated with gestational diabetes mellitus. This review found that GDM increases the risk of significant complications in pregnancy, such as neonatal hypoglycemia, macrosomia, and respiratory distress syndrome, highlighting the importance of monitoring and appropriate management during pregnancy. These findings support the need for effective glycemic control strategies to mitigate the impacts of GDM on maternal and fetal health. The main contributions of the study involve the consolidation of evidence on the adverse outcomes of GDM, providing relevant insights for obstetric and neonatal practice.

Among the main results, in addition to identifying the risks of neonatal complications, the research highlights the impact of specific obstetric complications on the labor of patients with GDM. These results reinforce the urgency and need for evidence-based practices to minimize the risks associated with the aforementioned gestational context.

As limitations, the retrospective and observational nature of the included studies may influence the similarity of the results, since the methodological variability of the available data may compromise the consistency of the findings. Future research should explore experimental methodologies that evaluate the efficacy of specific interventions for the management of GDM, as well as investigate the long-term impact of neonatal complications in childhood and adolescence.

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