Gestational Diabetes Mellitus: Screening, Diagnosis, and Therapeutic Management, Integrative Literature Review

Diabetes Mellitus Gestacional: Rastreio, Diagnóstico e Manejo Terapêutico, Revisão Integrativa da Literatura

Diabetes Mellitus Gestacional: Tamizaje, Diagnóstico y Manejo Terapéutico, Revisión Integradora de la Literatura

RESUMO

Objetivo: Analisar criticamente e sintetizar as evidências científicas atuais sobre rastreio, diagnóstico e manejo terapêutico do diabetes mellitus gestacional (DMG). **Método:** Revisão integrativa da literatura, com buscas nas bases PubMed, Biblioteca Virtual em Saúde (BVS) e SciELO, realizadas entre 6 e 13 de janeiro de 2026, incluindo publicações de 2021 a 2026. Após triagem por dois revisores independentes, com apreciação de divergências por um terceiro pesquisador, 9 estudos foram incluídos na análise final. **Resultados:** O teste oral de tolerância à glicose permanece o principal método diagnóstico, embora estratégias diagnósticas mais sensíveis nem sempre se traduzam em melhora proporcional dos desfechos clínicos. No tratamento, a insulina segue como referência, mas a metformina, outros agentes orais e terapias adjuvantes, como probióticos e simbióticos, mostram-se alternativas promissoras para o manejo individualizado. **Conclusão:** O cuidado da DMG deve ser compreendido como um continuum, no qual perfil glicêmico, características clínicas maternas e parâmetros fetais orientam a intensidade terapêutica, ainda que a heterogeneidade metodológica dos estudos disponíveis limite conclusões definitivas.

DESCRITORES: Diabetes Gestacional; Diagnóstico Pré-Natal; Insulina; Metformina; Cuidado Pré-Natal.

ABSTRACT

Objective: To critically analyze and synthesize current scientific evidence on the screening, diagnosis, and therapeutic management of gestational diabetes mellitus (GDM). **Method:** An integrative literature review was conducted using the PubMed, Virtual Health Library (VHL), and SciELO databases, searched between January 6 and 13, 2026, including publications from 2021 to 2026. After screening by two independent reviewers, with a third reviewer resolving disagreements, 9 studies were included in the final analysis. **Results:** The oral glucose tolerance test remains the main diagnostic method, although more sensitive diagnostic strategies do not always translate into proportional improvement in clinical outcomes. Regarding treatment, insulin remains the reference therapy, but metformin, other oral agents, and adjuvant therapies such as probiotics and synbiotics appear to be promising alternatives for individualized management. **Conclusion:** GDM care should be understood as a continuum in which glycemic profile, maternal clinical characteristics, and fetal parameters guide therapeutic intensity, although methodological heterogeneity among available studies limits definitive conclusions.

DESCRIPTORS: Diabetes, Gestational; Prenatal Diagnosis; Insulin; Metformin; Prenatal Care.

RESUMEN

Objetivo: Analizar críticamente y sintetizar la evidencia científica actual sobre el tamizaje, diagnóstico y manejo terapéutico de la diabetes mellitus gestacional (DMG). **Método:** Revisión integradora de la literatura, con búsquedas en las bases PubMed, Biblioteca Virtual en Salud (BVS) y SciELO, realizadas entre el 6 y el 13 de enero de 2026, incluyendo publicaciones de 2021 a 2026. Tras el cribado por dos revisores independientes, con un tercer investigador para resolver discrepancias, se incluyeron 9 estudios en el análisis final. **Resultados:** La prueba de tolerancia oral a la glucosa continúa siendo el principal método diagnóstico, aunque estrategias diagnósticas más sensibles no siempre se traducen en una mejora proporcional de los resultados clínicos. En cuanto al tratamiento, la insulina sigue siendo la referencia, pero la metformina, otros agentes orales y terapias adyuvantes, como probióticos y simbióticos, se presentan como alternativas prometedoras para el manejo individualizado. **Conclusión:** El cuidado de la DMG debe entenderse como un continuo, en el que el perfil glucémico, las características clínicas maternas y los parámetros fetales orientan la intensidad terapéutica, aunque la heterogeneidad metodológica de los estudios disponibles limita conclusiones definitivas.

DESCRIPTORES: Diabetes Gestacional; Diagnóstico Prenatal; Insulina; Metformina; Atención Prenatal.

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INTRODUCTION

Gestational diabetes mellitus (GDM) is currently recognized as one of the main metabolic disorders of pregnancy, associated with significant maternal and fetal risks [1] . Its increased incidence reflects changes in the profile of women of reproductive age, including a higher prevalence of obesity, physical inactivity, and metabolic syndrome—factors that contribute to gestational hyperglycemia [1,2] . Globally, approximately one in six pregnancies is affected by maternal hyperglycemia [2,3] ; in Brazil, recent studies indicate a prevalence ranging from 3% to 25%, depending on the screening methodology used [4,5] .

Clinically, GDM presents with nonspecific signs, fatigue, polyuria, or no symptoms at all, which underscores the need for prenatal monitoring, since physiological insulin resistance combined with an inadequate pancreatic response can lead to maternal and neonatal complications [2,6,7] . Elevated blood glucose levels increase the risk of macrosomia, cesarean delivery, and neonatal hypoglycemia [7,8] , and intrauterine exposure to hyperglycemia is associated with a higher risk of future metabolic disorders in the child [7] . For women, gestational diabetes mellitus (GDM) is also a marker of metabolic risk: a significant proportion experience persistent blood glucose abnormalities after delivery, progressing to prediabetes or diabetes [9] , which underscores the importance of postpartum follow-up.

Screening and early diagnosis are essential for mitigating risks and guiding treatment. According to the guidelines of the Brazilian Diabetes Society [10] , GDM can be identified as early as the beginning of prenatal care through fasting blood glucose testing, or between 24 and 28 weeks via the oral glucose tolerance test (OGTT). However, there are still variations in protocols, the tests used, cutoff values, and the timing of screening, which directly impact prevalence and clinical management [1] ; added to this is the fact that some women

Some women have hyperglycemia prior to pregnancy, while others develop it only as the pregnancy progresses [1,6] , and intrapartum glycemic control also influences the risk of neonatal hypoglycemia [8] .

Regarding treatment, the approach involves nutritional interventions, physical activity, and, when necessary, medications, with lifestyle modification forming the basis of initial management [7,11,12] . When these measures are insufficient for glycemic control, drug therapy becomes necessary [2] : insulin is traditionally the first-line treatment due to its favorable maternal-fetal safety profile [1,10], but recent studies have investigated oral agents such as metformin, with promising results in glycemic control and adherence [13,14] . The choice of therapy should be based on an individualized assessment, considering the severity of the glycemic condition and the risks associated with each option[1,5,6,11–13].

Given this diversity of criteria and approaches, and considering the high prevalence of GDM as a public health issue, this study aims to conduct an integrative literature review to critically analyze and synthesize the main protocols and current evidence regarding screening, diagnosis, and therapeutic management of GDM, thereby contributing to the standardization and improvement of clinical care.

METHOD

An integrative literature review was conducted using a structured process of search, selection, and synthesis of studies, with the objective of mapping the diagnostic and therapeutic strategies described in the literature on gestational diabetes mellitus. This approach was chosen due to the breadth of the topic and the heterogeneity of the available studies, allowing for the organization of the main concepts, practices, and evidence related to the diagnosis and management of the condition.

The literature search was conducted between January 6 and 13, 2026, in the PubMed, Virtual Health Library (BVS), and SciELO databases, using controlled keywords related to diagnosis, screening, and therapeutic management (diagnostic criteria, TOTG, IADPSG, WHO, ADA, insulin therapy, metformin, oral agents, and nutritional intervention), identifying 1,474 records.

Scientific articles or clinical guidelines, original articles, systematic reviews, scoping reviews, and meta-analyses published between 2021 and 2026 in Portuguese, English, or Spanish were included. Letters to the editor, editorials, reviews, narrative reviews, preclinical studies, and publications without a full text available were excluded.

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After excluding duplicates, the selection process occurred in two stages: a review of titles/abstracts and a review of the full texts, conducted by two independent researchers, with disagreements resolved by a third party. The analysis was based on a data extraction matrix, and the synthesis was descriptive and narrative, organized by thematic clusters; given the heterogeneity of study designs, populations, diagnostic criteria, and therapeutic approaches, no meta-analysis was performed. The studies were organized into two categories: screening/diagnosis and therapeutic management of GMD.

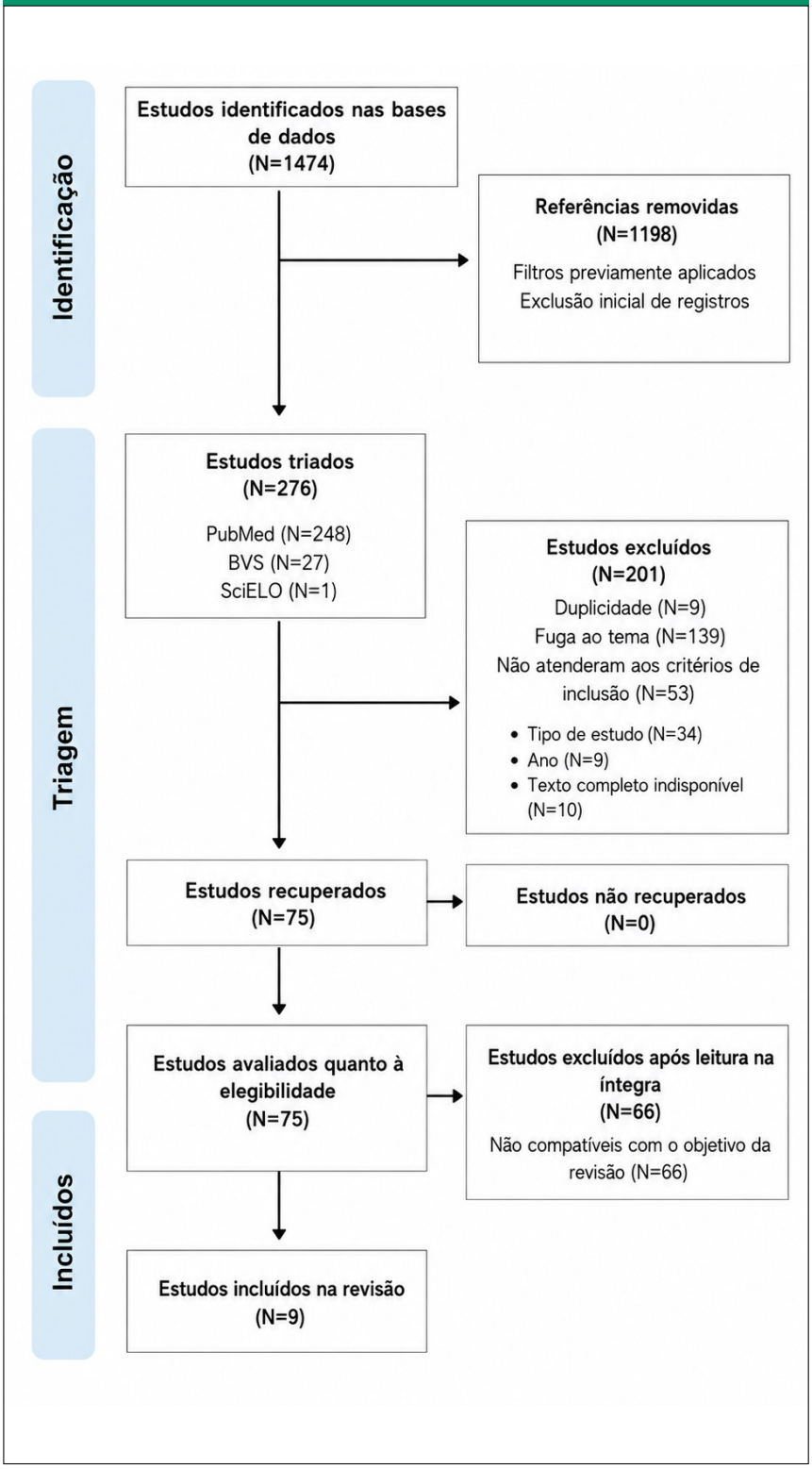
Since this was a bibliographic review, without the direct involvement of human subjects as participants, there was no need for submission to a Research Ethics Committee, although peer review and standardized selection and analysis criteria were adopted to ensure scientific rigor.

RESULTS

The literature search identified 1,474 records (248 from PubMed, 27 from BVS, and 1 from SciELO). After screening by title and abstract, and excluding duplicates, off-topic studies, and those that did not meet the inclusion criteria, 75 studies were read in full; of these, 66 were excluded for failing to meet the eligibility criteria, primarily because they did not simultaneously address screening, diagnosis, and therapeutic management of DMG. The final set included in this review consisted of 9 studies.

The nine included studies featured distinct methodological designs: three randomized clinical trials, two systematic reviews (one with a meta-analysis), one standalone systematic review, one prospective cohort study, and one cross-sectional study nested within a cohort study and a clinical guideline, published between 2021 and 2026, and organized into two thematic areas: screening/diagnosis [14–17] and therapeutic management [18–22] of GDM.

Figure 1 - PRISMA flowchart for the screening and selection of studies.



Source: prepared by the authors, 2026.

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Table 1. Methodological characteristics and main findings of the included studies.

Author/Year	Study Design	Population	Main Results
Tartaglione et al., 2021	Prospective cohort	99 pregnant women, 53 with normal OGTT and 46 with GDM	Continuous glucose monitoring identified glycemic abnormalities in some women with normal OGTT results. During follow-up, some of these patients required dietary intervention or insulin therapy, suggesting the usefulness of this method as a complementary tool to conventional diagnostic assessment.
Benham et al., 2023	Systematic review and meta-analysis	Not applicable	Clinical markers such as BMI, previous history of GDM, and blood glucose levels at diagnosis showed potential for predicting the need for therapeutic escalation. However, the authors emphasize that evidence remains limited for the widespread application of precision medicine in GDM.
Fernández-López et al., 2023	Randomized clinical trial	260 pregnant women with GDM diagnosed before 34 weeks	A fetal growth-adjusted therapeutic strategy (glycemic targets adjusted according to fetal abdominal circumference) reduced the need for insulin therapy and the occurrence of neonatal hypoglycemia, without increasing maternal or neonatal complications, suggesting that it is a safe and effective approach.
Kattini et al., 2023	Systematic review	Not applicable	The study reinforces diet and exercise as the initial approach and insulin as the standard treatment, while highlighting metformin as a viable alternative in specific settings, particularly in contexts with limited resources. It also demonstrates heterogeneity among diagnostic and therapeutic guidelines.
Suastika et al., 2023	Systematic review and meta-analysis	Not applicable	The use of probiotics and synbiotics was associated with improvements in metabolic parameters, such as fasting blood glucose, HOMA-IR, and insulin sensitivity, suggesting potential benefits as adjunctive therapy in the management of GDM.
Zaccara et al., 2023	Cross-sectional study nested within a cohort	869 pregnant women with GDM diagnosed by a 75-g OGTT between 24 and 32 weeks	Maternal age, pre-pregnancy BMI, previous history of GDM, and higher values at all three OGTT time points were independent predictors of the need for insulin therapy.
American Diabetes Association, 2024	Clinical guideline	Not applicable	The document standardizes diagnostic and classification criteria for diabetes, including GDM, reinforcing the role of the OGTT, early screening in high-risk patients, and appropriate identification of pregnant women to reduce adverse maternal-fetal outcomes.
Rademaker et al., 2024	Randomized clinical trial	820 pregnant women with GDM and singleton pregnancies, between 16 and 34 weeks, with inadequate glycemic control after dietary intervention	The proportion of newborns large for gestational age was 23.9% in the oral treatment group and 19.9% in the insulin group. The strategy using oral hypoglycemic agents, initiated with metformin and followed by sequential addition of glyburide when necessary, did not demonstrate non-inferiority to insulin for the primary outcome. Nevertheless, 79% of participants in the oral treatment group did not require insulin therapy.
Turgay et al., 2026	Randomized clinical trial	1,439 pregnant women screened between 24 and 28 weeks, randomized to a one-step or two-step diagnostic strategy	The one-step strategy using the 75-g OGTT increased the number of GDM diagnoses without improving short-term clinical outcomes. Two-hour glucose levels showed greater prognostic utility among the parameters analyzed.

Source: prepared by the authors.

Legend: GDM = gestational diabetes mellitus; OGTT = oral glucose tolerance test; BMI = body mass index; HOMA-IR = homeostasis model assessment for insulin resistance.

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Screening and Diagnosis

The oral glucose tolerance test (OGTT) remains central to the diagnostic approach for GDM, but its use alone does not settle the clinical debate. In the single-step strategy, the OGTT is performed with 75 g of glucose (fasting, 1 h, and 2 h), and a diagnosis is established when at least one value reaches or exceeds 92, 180, and 153 mg/dL, respectively. In the two-step strategy, a 50-g screening test (non-fasting) precedes the confirmatory 100-g test, generally requiring two or more abnormal values [14] . Other studies have shown, however, that the clinical interpretation of the test may be more complex than a dichotomous distinction between "normal" and "abnormal" [15–17] .

Continuous glucose monitoring has been shown to detect abnormal glycemic profiles in some pregnant women with initially normal TOTG, some of whom went on to require dietary management or insulin therapy, suggesting that metabolically significant changes may not be detected by conventional screening [15] . Diabetes, and elevated scores on all three TOTG items were independently associated with the subsequent need for insulin therapy, indicating that the test plays a stratification role in addition to its diagnostic function [16] . A comparison between the one-step (75g OGTT) and two-step diagnostic strategies showed a higher number of diagnoses with the former, with no differences in short-term clinical outcomes; the 2-hour glucose level demonstrated greater predictive power for polyhydramnios and the need for insulin therapy among the parameters evaluated [17] .

Taken together, these findings suggest that the contemporary diagnostic debate is not limited to increasing the number of detected cases but also requires consideration of the actual clinical utility of the parameters and the potential of each strategy to distinguish severity and therapeutic risk[14–17] .

Treatment

Currently, there is a trend toward refining established therapeutic approaches. A sequential strategy using oral hypoglycemic agents—starting with metformin and adding glibenclamide when necessary—was not inferior to insulin in terms of the outcome of large-for-gestational-age newborns (23.9% vs. 19.9%); nevertheless, 79% of participants on oral therapy maintained glycemic control without the need for insulin, suggesting room for pharmacological alternatives in selected subgroups, although insulin remains the therapeutic standard [18] .

Metformin has been discussed primarily in settings with limited access to, high costs of, or poor adherence to insulin therapy: while insulin remains the standard of care, metformin has demonstrated efficacy in glycemic control and may be a viable alternative in specific contexts. Relevant limitations include the drug's placental transfer, the need for long-term follow-up, and the possibility of supplemental insulin therapy in some patients; furthermore, the available studies were conducted primarily in urban centers, which limits the generalizability of the findings to rural populations or those with limited access to specialized care [19] .

The adjunctive use of probiotics and synbiotics was associated with improvements in fasting blood glucose, insulin resistance, lipid profile, and inflammatory markers, suggesting a complementary role possibly related to the modulation of the gut microbiota and maternal metabolism. However, the heterogeneity among studies, strains, doses, duration, and outcomes analyzed limits the clinical standardization of these interventions, which should be considered adjunctive until larger, standardized trials define their actual utility [20] .

Recent literature also emphasizes therapeutic individualization: clinically accessible characteristics—such as BMI, a history of DMG, and blood glucose levels at diagnosis—can aid in the early identification of pregnant women who are more likely to require pharmacological escalation, given the narrow therapeutic window during pregnancy. Although they do not propose a specific medication algorithm, these markers show potential for use in predictive models that guide earlier treatment intensification, representing an advance in risk stratification and personalized care, provided they are prospectively validated [21] .

Supporting this perspective, adjusting maternal glycemic targets to fetal growth—the so-called "flexible treatment"—based on fetal abdominal circumference measured by ultrasound reduced the need for insulin therapy and the incidence of neonatal hypoglycemia, without increasing maternal or fetal complications. When the abdominal circumference was below the 75th percentile, more permissive targets were adopted (fasting <120 mg/dL, 1-hour postprandial <180 mg/dL); when it was at or above the 75th percentile, more intensive targets were adopted (fasting <80 mg/dL, 1-hour postprandial <120 mg/dL). The study suggests that incorporating fetal parameters into glycemic targets can individualize management, directing therapeutic intensification toward higher-risk pregnant women [22] .

Thus, rather than establishing a dichotomy between insulin therapy and pharmacological alternatives, the studies point toward a progressively more stratified model of care, in which clinical markers, metabolic response, and fetal parameters guide individualized therapeutic decisions[18–22] .

DISCUSSION

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A joint analysis of the included studies indicates that the current management of DMG continues to be guided by the TOTG as the primary diagnostic framework and by lifestyle interventions and insulin therapy as the traditional therapeutic foundations [14,18,19], but both diagnosis and treatment have become progressively more complex. In screening, different strategies can increase case identification without resulting in a proportional improvement in clinical outcomes, reinforcing the need to assess the prognostic relevance of glycemic parameters, and not just their diagnostic capacity [14–17] . In treatment, although insulin remains the standard of care, there is growing scope for the judicious use of metformin, oral agents, adjunctive therapies, and decision models based on clinical markers, metabolic response, and fetal parameters [18–22] . The current challenge, therefore, lies not only in identifying more cases, but in recognizing which pregnant women are at higher risk and adjusting the intensity of treatment accordingly.

With regard to screening and diagnosis, DMG continues to be characterized by conceptual and operational heterogeneity, particularly due to the coexistence of different criteria and screening strategies [24,26,27,32] . The TOTG remains the primary diagnostic method [23–25] , particularly in the single-step approach using 75 g, which is associated with higher sensitivity and a greater number of diagnoses [26–28] ; however, studies do not consistently demonstrate that increased detection leads to improved short-term outcomes [27,28] , shifting the discussion from a quantitative logic to a perspective focused on each strategy's ability to distinguish maternal-fetal risk. The TOTG has also shown potential as a prognostic tool; the 2-hour post-load glucose level was associated with polyhydramnios and the need for insulin therapy [17,26–29], and the identification of abnormalities through continuous monitoring in pregnant women with normal TOTG suggests that conventional screening may not detect all present metabolic dysfunction [30,31] . Gestational diabetes mellitus (GDM) should thus be understood as a metabolic spectrum, not merely as a dichotomous condition defined by fixed cutoff points.

In the clinical setting, the findings reinforce a stepwise approach: lifestyle modification as the initial step and insulin therapy as the standard of care in cases of inadequate control or increased risk [18,19], but the decision must take into account a broader assessment of the pregnant woman, including pre-pregnancy BMI, prior history of gestational diabetes, blood glucose levels at diagnosis, and fetal parameters [16,21,22,33] , given the narrow therapeutic window during pregnancy. Metformin and other oral agents emerge as alternatives for selected groups facing difficulties with adherence or access [18,19] , without advocating for universal replacement of insulin, but rather judicious use within an individualized treatment model [34,35] . Adjuvant therapies such as probiotics and synbiotics have been associated with improvements in metabolic parameters, but the heterogeneity of the studies still prevents their routine incorporation; they should therefore be interpreted as promising and contingent upon more robust evidence [20,36,37] .

The included studies thus point toward a transition from rigid, protocol-based models to a more stepwise and individualized approach; the heterogeneity of protocols directly influences the observed prevalence, the intensity of follow-up, and therapeutic choices [14–22]; contemporary management should balance glycemic control, fetal safety, maternal adherence, obstetric risk, and therapeutic availability according to the characteristics of each pregnant woman.

Among the strengths of this review are the structured search across three databases, the predefined eligibility criteria, and the screening by two independent reviewers with review by a third. Limitations include the absence of a formal assessment of risk of bias and the heterogeneity of study designs, populations, and approaches, which limit direct comparisons and require caution in interpreting the findings.

CONCLUSION

This integrative review analyzed the main strategies for screening, diagnosis, and therapeutic management of gestational diabetes mellitus, highlighting that the oral glucose tolerance test remains the primary method for diagnosing the condition. However, heterogeneity among criteria and protocols still limits the standardization of clinical practice, and more sensitive diagnostic strategies, although increase case detection, they are not always associated with a proportional improvement in maternal-fetal outcomes.

In the therapeutic realm, the findings confirm that lifestyle changes and insulin therapy remain the cornerstones of treatment, but they also indicate a growing role for metformin, other oral agents, adjunctive therapies, and individualized approaches. Thus, the management of GDM should be understood as a continuum of care, in which glycemic profile, metabolic risk, maternal clinical characteristics, and fetal parameters help define the intensity of therapy.

Despite the heterogeneity of the included studies and the absence of a formal assessment of risk of bias, this review reinforces the importance of prenatal care that is more context-specific and tailored to mater-

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nal-fetal risk. Future research should compare one- or two-step diagnostic strategies with a focus on clinical outcomes, validate prognostic markers, and evaluate—with greater methodological rigor—the role of metformin, oral agents, probiotics, and other individualized approaches in the management of GDM.

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