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Review

Diabetes and pregnancy: A call for terminology standardization in clinical practice

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ABSTRACT

Currently, there is no unified consensus on the terminology used to describe diabetes in the context of pregnancy, leading to confusion among clinicians and challenges in research. This review article proposes a set of terms to classify diabetes during pregnancy based on timing and diagnostic criteria, whether before or during pregnancy. A review of previous documents addressing terminology and classification was conducted, identifying four main terms: (1) pregestational diabetes mellitus, referring to diabetes diagnosed before pregnancy; (2) early gestational diabetes mellitus, diagnosed before 24 weeks of gestation; (3) late gestational diabetes mellitus, diagnosed at or after 24 weeks of gestation; and (4) diabetes in pregnancy, diagnosed at any gestational age. This proposal does not include an analysis of hyperglycemia's pathophysiological mechanisms or specific diagnostic criteria. The proposed classification could serve as a foundation for a global initiative to establish a consensus on terminology for diabetes in pregnancy. A universally accepted terminology would reduce clinical confusion, provide a framework for defining diagnostic criteria, facilitate research on maternal and fetal complications, and support studies exploring the postpartum progression of diabetes.

1. Introduction

The combination of diabetes mellitus and pregnancy represents one of the greatest challenges in maternal-fetal health, with implications that extend beyond the gestational period [1]. Gestational diabetes mellitus, in particular, is the most common medical and metabolic complication during pregnanc [1,2], highlighting the importance of timely detection and management. Similarly, while there is a constant call to establish globally accepted screening and diagnostic strategies [3–5], we consider it equally essential to achieve consensus on terminology.

This article explores four key categories that define the relationship between diabetes mellitus and pregnancy: pregestational diabetes, diabetes in pregnancy, early gestational diabetes, and late gestational diabetes. Furthermore, it provides a comprehensive framework for understanding and addressing these categories both clinically and in research contexts.

2. Material and methods

A comprehensive literature search was conducted to gather relevant studies for this article review. The search was performed in major databases, including PubMed, Web of Science and Scopus, using the following key terms: "Diabetes","Pregestational Diabetes", "Gestational Diabetes", "Early Gestational Diabetes", "Late Gestational Diabetes" and "Diabetes Classification". The inclusion criteria focused on review articles, clinical practice guidelines, research studies, consensus and statements of medical organizations published within the last decade. Articles addressing diagnostic criteria, prevalence, and clinical outcomes of gestational diabetes were prioritized. Studies discussing terminology, pathophysiology, and global recommendations for diabetes management during pregnancy were also considered.

Exclusion criteria included conference abstracts, case reports, opinion pieces, and studies lacking robust clinical or research data. Articles that did not specifically address the relationship between diabetes and pregnancy or those that were outdated or irrelevant to the

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diagnostic and clinical focus of this review were excluded. This selection process ensured that the review included only the most relevant and evidence-based literature for the discussion of diabetes in pregnancy.

3. Definition of gestational diabetes mellitus

One of the current definitions of gestational diabetes mellitus describes it as glucose intolerance that does not meet the diagnostic thresholds for overt diabetes mellitus in the nonpregnant population and is first diagnosed during the second or third trimester of pregnancy (typically between weeks 24 and 28) in women without a prior diagnosis of any type of diabetes mellitus before this period [6–10]. This definition remains valid regardless of whether blood glucose levels return to normal or persist as diabetes or prediabetes after pregnancy. However, the term "gestational diabetes mellitus" may also be applied before 24 weeks of gestation according to some recommendations [11–14].

On the other hand, some definitions describe gestational diabetes mellitus as glucose intolerance first detected during pregnancy, without being restricted to a specific gestational age [11–16]. Consequently, there is no universally accepted definition of gestational diabetes mellitus, leading to uncertainty, particularly regarding the gestational age from which the diagnosis can be established.

4. Diabetes and pregnancy: Definition of terms

The following is a list of four terms proposed to standardize the language used when discussing diabetes and pregnancy (Fig. 1 **and** Table 1). These terms have been identified and described in the reviewed literature.

It is essential to emphasize that the term "diabetes mellitus" encompasses all subtypes of this condition, including type 1 diabetes mellitus, type 2 diabetes mellitus, MODY (Maturity Onset Diabetes of the Young), and others [6]. The diagnosis of diabetes mellitus outside the context of pregnancy is traditionally based on the criteria established by the American Diabetes Association and the World Health Organization [6,17–20] (Table 2**).**

Terminology:

4.1. Late gestational diabetes mellitus

It is defined as glucose intolerance diagnosed during the second or third trimester of pregnancy, typically between weeks 24 and 28 of gestation, in women without a prior diagnosis of diabetes mellitus before week 24, and who do not meet the diagnostic criteria for diabetes mellitus in nonpregnant women [2] (Table 2). However, some guidelines, such as those proposed by the US Preventive Services Task Force (USPSTF) [9], suggest that the diagnosis may be considered from week 24 onward, extending the time window for detection, including the possibility of diagnosing it after week 28.

Table 1
Synonyms for Diabetes Terminology in Pregnancy. * In this manuscript, we have chosen to use the term 'Diabetes in Pregnancy,' as it is the term used in the latest TOBOGM Summit Report, and by the WHO.".

Pregestational Diabetes Mellitus	Preexisting diabetes mellitus [24,25]
Early Gestational Diabetes Mellitus	Early-onset gestational diabetes [26,27]
Diabetes in Pregnancy*	Overt diabetes during pregnancy [12]
Late Gestational Diabetes Mellitus	Standard gestational diabetes [28,29] Conventional gestational diabetes [11]

4.2. Early gestational diabetes mellitus

It is defined as glucose intolerance diagnosed before 24 weeks of gestation, which does not meet the criteria for diabetes mellitus outside of pregnancy [11] (Table 2). However, some proposals suggest considering the diagnosis of early gestational diabetes specifically when it is made before 20 weeks of gestation [8].

4.3. Diabetes in pregnancy

It is defined as hyperglycemia detected for the first time during pregnancy, which meets the diagnostic criteria for diabetes mellitus established for the nonpregnant population [10,21–23] (Table 2). The diagnosis is typically made when one or more of these criteria are met. The determination of HbA1c may have limited diagnostic utility during the second and third trimesters of pregnancy [23].

4.4. Pregestational diabetes mellitus

Diabetes mellitus diagnosed before pregnancy using the diagnostic

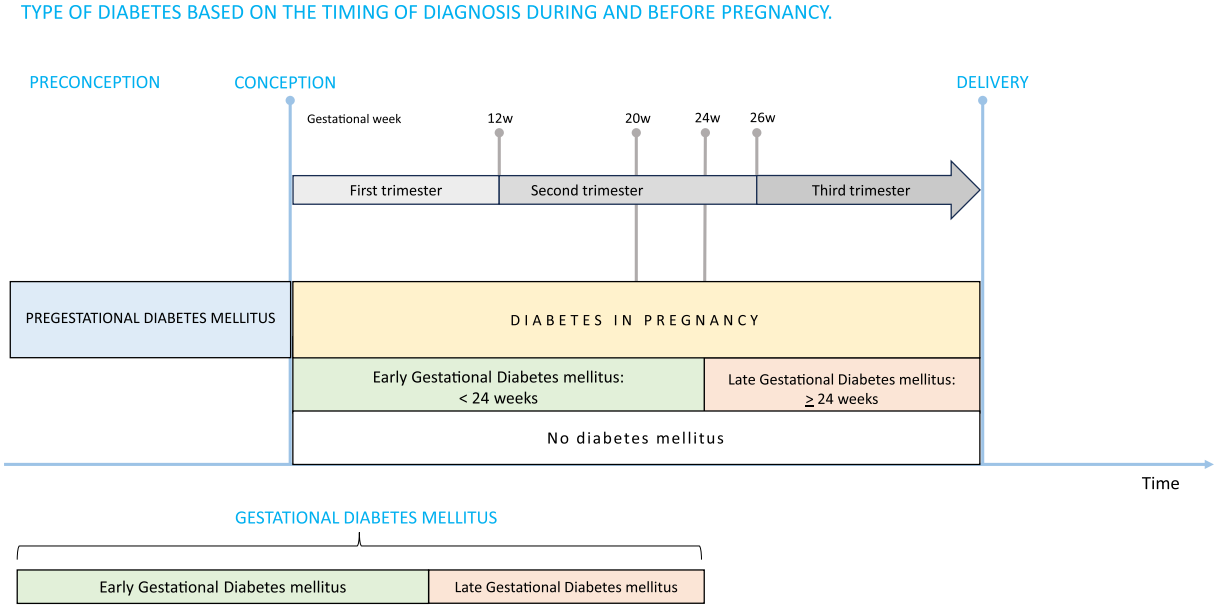

Fig. 1. Illustrative Diagram of the Proposed Terminology for Diabetes in Pregnancy.

Table 2
Criteria for Diagnosing Diabetes Mellitus (Overt) in the Nonpregnant Population.

Fasting serum glucose ≥ 126 mg/dL.
Serum glucose 2 h after a 75 g oral glucose load ≥ 200 mg/dL. Glycated hemoglobin (HbA1c) ≥ 6.5 %. Random serum glucose ≥ 200 mg/dL with clinical manifestations of severe hyperglycemia or a hyperglycemic crisis.

criteria for diabetes mellitus in the nonpregnant population [13] (Table 2).

5. Prevalence and clinical importance

The prevalence of gestational diabetes (without specifying whether it is late or early) varies depending on the different diagnostic criteria [30] and geographic location. For example, in a secondary analysis published in 2022 from five medical centers participating in the HAPO study, the prevalence of gestational diabetes (late) varied according to the application of two different diagnostic criteria: IADPSG 2010 at 18.7 % vs NICE 2015 at 14.6 % [31]. Additionally, a 2021 *meta*-analysis [32] reported a global prevalence of gestational diabetes (late) of 14.7 %, based on the IADPSG 2010 diagnostic criteria. Another important point is that, according to the IDF [33], in 2021, 16.7 % of live births were from mothers who had some form of hyperglycemia during pregnancy. Finally, the significant prevalence of diabetes during pregnancy underscores its impact on maternal and neonatal health, highlighting the need for effective strategies for its prevention and management.

6. Diagnostic

6.1. Diagnostic Laboratory tests during pregnancy

6.1.1. Oral glucose tolerance test (OGTT)

The OGTT in pregnancy is traditionally used for the diagnosis of gestational diabetes mellitus, especially late gestational diabetes, and is considered the gold standard test [34]. The OGTT can be performed with 75 g (OGTT 75 g) or 100 g (OGTT 100 g) of anhydrous glucose, depending on the diagnostic criteria to be used.

Usually, when the OGTT 100 g is used, it must be preceded by a screening test known as the O'Sullivan Test [35]. If the O'Sullivan Test is positive, the OGTT 100 g can then be performed. In this case, the O'Sullivan Test is referred to as "Step One," and the OGTT 100 g as "Step Two." It is important to note that the Canadian Diabetes Association uses the OGTT 75 g as "Step Two," instead of the OGTT 100 g [7].

The O'Sullivan Test involves an oral glucose load of 50 g of anhydrous glucose, with or without fasting, followed by a blood glucose measurement one hour later. If the blood glucose level reaches or exceeds a specified threshold, the test is considered positive, and the definitive diagnostic test, the OGTT 100 g, is then performed. The glucose threshold for a positive result in the O'Sullivan Test varies. For example, the American Diabetes Association (ADA) provides three possible threshold values: >130, 135, or 140 mg/dL. On the other hand, the Canadian Diabetes Association (CDA) uses a threshold range between 140 and 198 mg/dL. The Spanish Society of Gynecology and Obstetrics (SEGO), through the Spanish Group of Diabetes and Pregnancy (GEDE), considers a blood glucose level > 140 mg/dL as the threshold in the O'Sullivan Test [36].

The OGTT can be applied through the so-called "Strategies or Approaches." These include the "One-Step Strategy" and the "Two-Step Strategy." Based on these diagnostic strategies, the different diagnostic criteria for classic gestational diabetes are traditionally presented (Table 3).

6.1.2. Fasting serum glucose

If we analyze some diagnostic proposals (e.g., ADA 2025, WHO 2013), fasting glucose could have diagnostic value on its own in pregnancy in certain cases, such as for diagnosing late gestational diabetes or diabetes in pregnancy.

For example, if a 10-week pregnant woman presents a fasting glucose of 137 mg/dL, diabetes in pregnancy would be diagnosed. Similarly, a 28-week pregnant woman with a reliable fasting glucose of 92 mg/dL would meet the diagnostic criteria for late gestational diabetes according to IADPSG 2010, even before performing the oral glucose load.

However, although fasting serum glucose could be used alone for the diagnosis of gestational diabetes (late or early), there is a risk of missing cases if the oral glucose load is not completed during an OGTT [39].

Finally, fasting serum glucose is not usually used alone to diagnose gestational diabetes but is integrated into the oral glucose tolerance test (OGTT).

6.1.3. Hemoglobin A1c (HbA1c)

HbA1c is not sufficiently sensitive and cannot be used to detect gestational diabetes early or late, nor some pregnancy complications, regardless of the healthcare setting, even in resource-limited environments [6,40]. On the other hand, there are recommendations that suggest its use to diagnose diabetes in pregnancy early (<20 weeks) in

Table 3
Diagnostic strategies for gestational diabetes mellitus. IADPSG: International Association of Diabetes and Pregnancy Study Groups. WHO: World Health Organization. ADA: American Diabetes Association. ADIPS: Australasian Diabetes in Pregnancy Society [37]. CDA: Canadian Diabetes Association. NICE: National Institute for Health and Care Excellence (UK) [38]. ALAD: Latin American Diabetes Association. NDDG: National Diabetes Data Group (USA). SEGO: Spanish Society of Gynecology and Obstetrics. GEDE: Spanish Group of Diabetes and Pregnancy. *: CDA Alternative screening approach, **: CDA Preferred screening approach.

DIAGNOSTIC STRATEGY TYPE	ONE-STEP STRATEGY		TWO-STEP STRATEGY		
DIAGNOSTIC CRITERIA	−IADPSG −OMS −ADA −ADIPS −CDA*	−NICE −ALAD	Carpenter y Coustan (ADA)	CDA**	NDDG (SEGO/GEDE)
O'SULLIVAN TEST	No	No	Yes	Yes	Yes
FASTING GLUCOSE THRESHOLD	≥92 mg/dL	≥100 mg/dL	≥95 mg/dL	≥95 mg/dL	≥105 mg/dL
GLUCOSE LOAD	75 g	75 g	100 g	75 g	100 g
1-HOUR POST-LOAD GLUCOSE THRESHOLD	≥180 mg/dL	Not used	≥180 mg/dL	≥190 mg/dL	≥190 mg/dL
2-HOUR POST-LOAD GLUCOSE THRESHOLD	≥153 mg/dL	≥140 mg/dL	≥155 mg/dL	≥162 mg/dL	≥165 mg/dL
3-HOUR POST-LOAD GLUCOSE THRESHOLD	Not required	Not required	≥140 mg/dL	Not required	≥145 mg/dL
NUMBER OF GLUCOSE MEASUREMENTS	Three	Two	Four	Three	Four
NUMBER OF GLUCOSE THRESHOLDS REACHED OR EXCEEDED FOR DIAGNOSIS	One	One	Two	Two	Two

women who were not previously diagnosed, for example, with type 2 diabetes mellitus [13].

Physiologically, during pregnancy, HbA1c levels tend to be slightly lower than in non-pregnant women. This decrease is explained by the increased turnover and reduced lifespan of red blood cells [11,41]. The decrease begins in the first trimester and reaches its lowest point at the beginning of the second [11]. Additionally, iron deficiency, a common condition during pregnancy, can prolong the lifespan of red blood cells and, consequently, elevate HbA1c levels [40,42,43].

6.2 Recommendations for the use of laboratory tests (OGTT, fasting glucose, and HbA1c) based on gestational age for the diagnosis of: Early gestational diabetes, classic gestational diabetes, and diabetes in pregnancy (Table 4).

6.1.4. Diabetes in pregnancy (any gestational week)

As previously explained, for this case, the diagnostic criteria for diabetes mellitus in non-pregnant populations (Table 2) are used, and the diagnosis can be made at any time during pregnancy, always considering the previously described diagnostic limitations of HbA1c.

6.1.5. Early gestational diabetes (< 24 weeks)

There is no universal consensus on how to make the diagnosis. However, some diagnostic proposals exist:

6.1.5.1. OGTT. The World Health Organization (WHO) in 2013 [21] and the International Federation of Gynecology and Obstetrics (FIGO) in 2015 [10] recommended the possibility of using the oral glucose tolerance test (OGTT) with the IADPSG 2010 cutoff points to diagnose gestational diabetes at any time during pregnancy, although they did not mention the term "early gestational diabetes", which would imply the period before 24 weeks.

At the IADPSG TOBOGM Summit, the results of the TOBOGM trial were presented, where the majority of delegates supported the use of the 75 g oral glucose tolerance test (OGTT) in a single-step approach, adopting the Canadian Diabetes Association criteria (95 mg/dL fasting, 190 mg/dL at 1 h, 162 mg/dL at 2 h) to diagnose early gestational diabetes (< 20 weeks). Additionally, the importance of considering resources, costs, equity, and the perspective of patients when applying the study findings in clinical practice was emphasized [44].

Table 4
Diagnostic Methods for Different Types of Diabetes in Pregnancy. a: The serum glucose values for diagnosis are those recommended by the diagnostic criteria for diabetes mellitus in non-pregnant populations according to the ADA and WHO (Table 2).

DIAGNOSTIC TESTS	OGTT	FASTING GLUCOSE	HBA1C
DIABETES MELLITUS MANIFEST IN PREGNANCY	Yes [a]	Yes [a]	Yes [a]
EARLY GESTATIONAL DIABETES	Possible use [b]	±Possible use [c]	No
LATE GESTATIONAL DIABETES	Yes [a]	±Possible use [d]	No

b: According to WHO 2013 and FIGO 2015, it is possible to use the OGTT with the IADPSG 2010 cutoff points to diagnose diabetes mellitus early in pregnancy, although the term "early gestational diabetes" is not mentioned. Additionally, as previously stated, IADPSG later indicated that a fasting glucose of 92 mg/dl is not a recommended threshold for diagnosing early gestational diabetes. On the other hand, at the TOBOGM Summit of IADPSG, most delegates supported the use of the 75 g OGTT in a single step, adopting CDA criteria for diagnosing early gestational diabetes (<20 weeks).c: According to ALAD 2016, fasting serum glucose can be used for diagnosing "early gestational diabetes" if two glucose values are between 100 and 125 mg/dl. However, the term used in these recommendations is "gestational diabetes." ± Fasting glucose is generally not used alone for diagnosing gestational diabetes (early or late). The term used by ALAD is "gestational diabetes." Additionally, ALAD considers that "diabetes in pregnancy," diagnosed before 24 weeks (during the first prenatal visit in the first trimester), should be classified as pregestational diabetes.

6.1.5.2. Fasting serum glucose. According to the IADPSG 2010 criteria, a reliable fasting glucose of 92 to 125 mg/dL before 24 weeks could be used to diagnose gestational diabetes. However, later, IADPSG suggested that the use of a fasting glucose threshold of 92 mg/dL to identify gestational diabetes in the early stages of pregnancy was not supported by current evidence [43]. It is known that there is a physiological decrease in fasting plasma glucose during the first trimester, and the 92 mg/dL threshold has limited predictive capacity for late gestational diabetes [45,46].

According to ALAD (Asociación Latinoamericana de Diabetes) 2016, two glucose readings between 100 to 125 mg/dL before 24 weeks are used to diagnose gestational diabetes.

It is worth noting that the term used by IADPSG and ALAD is "gestational diabetes mellitus" to refer to what is called "early gestational diabetes" in this manuscript. This could create terminology confusion and thus supports the use of the terms "early gestational diabetes" and "late gestational diabetes," depending on whether the diagnosis is made before or after 24 weeks of gestation.

In conclusion, as previously mentioned, fasting glucose is not usually used alone for the diagnosis of early gestational diabetes.

6.1.5.3. HbA1c. It is not recommended for the diagnosis of early gestational diabetes [6]. However, women with higher HbA1c levels in the first trimester are at a greater risk of developing classic gestational diabetes [47–49].

6.1.6. Late gestational diabetes (from week 24 onwards)

It is important to emphasize that the usual and ideal period for diagnosing classic gestational diabetes is between 24 and 28 weeks. However, a less confusing and broader approach, as mentioned earlier, would be to state that the diagnosis can be made from week 24 onwards, as mentioned by the US Preventive Services Task Force (USPSTF) [9].

6.1.6.1. OGTT. It is the conventional diagnostic test for making the diagnosis, and there are various diagnostic criteria, such as those mentioned in Table 3.

6.1.6.2. Fasting serum glucose. Although not explicitly mentioned as part of the diagnostic criteria, for example, if there is a single reliable fasting glucose value of 92 to 125 mg/dL after the 24th week of pregnancy, according to the IADPSG 2010 criteria, as previously mentioned, this result alone would be sufficient to make the diagnosis, without the need to perform the glucose load of the OGTT.

As stated, fasting glucose is not used in isolation for the diagnosis of early gestational diabetes.

6.1.6.3. HbA1c. It is not recommended for the diagnosis of late gestational diabetes [50,51], and it does not perform as well as the OGTT [6,52].

Below, Table 4 and Fig. 2 summarize the use of diagnostic tests according to the type of diabetes during pregnancy.

6.2. Universal screening or risk-based screening

There is no global consensus on whether universal screening for classic gestational diabetes should be performed on all pregnant women or only on those with risk factors (Table 5). Nor is there a universal recommendation on whether diabetes (early gestational diabetes) should be diagnosed before 24 weeks of gestation. Below is a summary of the recommendations from some of the most important medical organizations:

We have created a figure that summarizes the criteria used for diabetes diagnosis during pregnancy according to different medical organizations (Fig. 2).

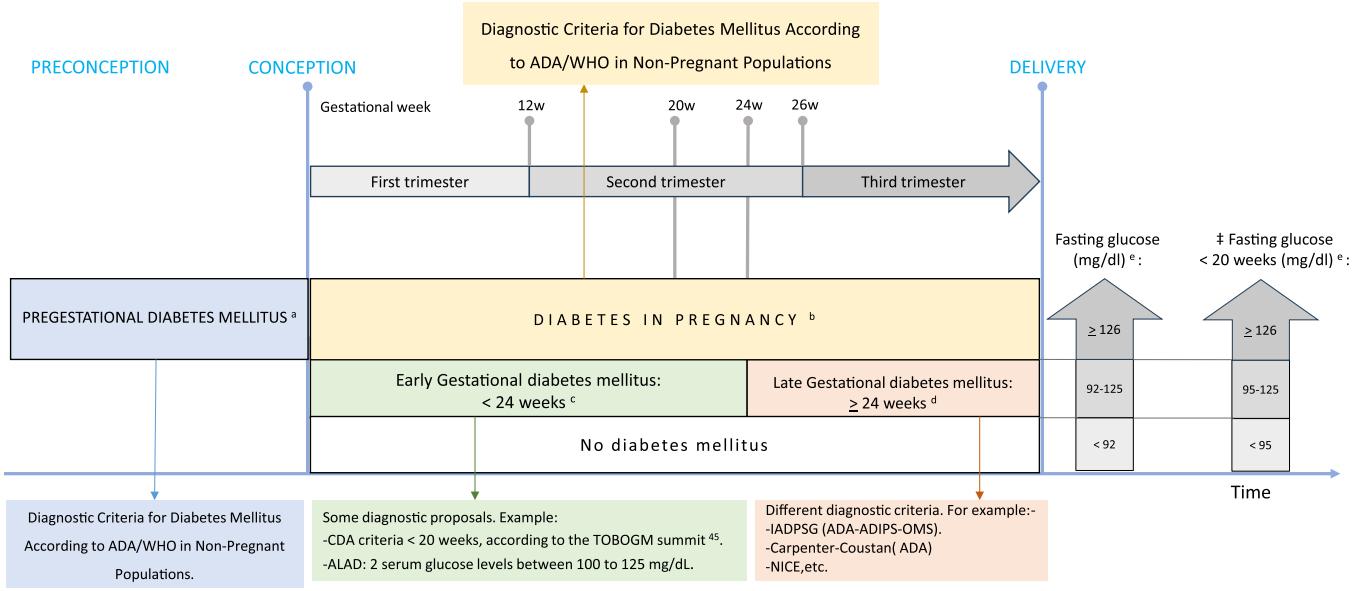

Fig. 2. Proposed Framework for the Diagnosis of the Four Main Types of Diabetes During Pregnancy. a: Type 1 DM, Type 2 DM, or other types. b: The diabetes is likely pregestational [53]; however, its diagnosis occurs during pregnancy and not before, indicating the timing of its detection but not necessarily its origin. c: Early gestational diabetes is diagnosed before 24 weeks. However, in the TOBOGM trial, the diagnosis is made before 20 weeks [54]. d: > 24 weeks: According to the USPSTF. e: Cut-off points based on the initial recommendations of IADPSG 2010 and WHO 2013 for the diagnosis of gestational diabetes mellitus. Later, IADPSG indicated that a glucose level of 92 mg/dl is not a recommended threshold for diagnosing gestational diabetes in early pregnancy. It is important to note that these values may change depending on future research and globally relevant recommendations, ‡ for example, based on the results of the TOBOGM trial, the diagnostic threshold before 20 weeks could be set at 95 mg/dl [54,55].

Table 5
Recommendations from various medical organizations on gestational diabetes screening. *: It is not specified whether hyperglycemia refers to early gestational diabetes or diabetes during pregnancy.

MEDICAL ORGANIZATION	UNIVERSAL SCREENING (FROM WEEK 24)	SCREENING IN PREGNANT WOMEN WITH RISK FACTORS (FROM WEEK 24)	*SCREENING FOR HYPERGLYCEMIA DURING THE FIRST TRIMESTER (BEFORE WEEK 24)
ADA 2025 [6]	Yes	No	Yes, if there are risk factors.
USPSTF 2021 [9]	Yes	No	No
SEGO 2021 [36]	Yes	No	Yes, if there are risk factors.
IDF — ATLAS 2021 [33]	Yes	No	Yes, if there are risk factors.
NICE 2020 [38]	No	Yes	Yes, if there are risk factors
CDA 2018 [7]	Yes	No	Yes, if there are risk factors.
ACOG 2018 [13]	Yes	No	Yes, if there are risk factors.
ALAD 2016 [14]	Yes	No	Yes
FIGO 2015 [10]	Yes	No	Yes
ADIPS 2014 [37]	Yes	No	Yes, if there are risk factors.
OMS 2013 [21]	Yes	No	Yes
IADPSG 2010 [12]	Yes	No	Yes, if there are risk factors.

7. Recent advances and future research

Studies on diabetes and pregnancy have often focused on late gestational diabetes. However, recent research has shifted attention toward early gestational diabetes, as demonstrated by the TOBOGM trial [52]. This randomized clinical trial showed that screening and treatment for gestational diabetes before 20 weeks reduces the risk of neonatal complications in women with risk factors. In the context of this article, a key aspect for future research will be improving diagnostic strategies for early gestational diabetes. Another important area is the role of continuous glucose monitoring in the diagnosis and management of gestational diabetes and the prevention of complications [56].

8. Conclusions

It is undeniable that diabetes mellitus, in any form, during pregnancy is associated with perinatal complications. However, there is still no uniformity in the terminology of global acceptance. In this regard, this work could serve as a basis for an initiative aimed at establishing a global consensus on the terminology of diabetes during pregnancy, which wehave summarized in four terms: pre-gestational diabetes, diabetes in pregnancy, early gestational diabetes, and late gestational diabetes. This consensus would help reduce the confusion generated by the lack of a clear classification of hyperglycemia during pregnancy and contribute to improving diagnostic strategies, the study of pathophysiology according to this classification, and the evaluation of postpartum diabetes progression.

CRediT authorship contribution statement

Edwin Augusto Acho Carranza: Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Julio Alberto Leey Casella:** Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Marcio José Concepción-Zavaleta:** Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

[1] Thong EP, Codner E, Laven JSE, Teede H. Diabetes: a metabolic and reproductive disorder in women. Lancet Diabetes Endocrinol 2020;8(2):134–49. https://doi.org/10.1016/S2213-8587(19)30345-6.

[2] Hivert MF, Backman H, Benhalima K, Catalano P, Desoye G, Immanuel J, et al. Pathophysiology from preconception, during pregnancy, and beyond. Lancet 2024;404(10448):158–74. https://doi.org/10.1016/S0140-6736(24)00827-4.

[3] McIntyre HD, Catalano P, Zhang C, Desoye G, Mathiesen ER, Damm P. Gestational diabetes mellitus. Nat Rev Dis Primers. 2019;5(1):47. Published 2019 Jul 11. doi: 10.1038/s41572-019-0098-8.

[4] Simmons D, Wolmarans L, Cutchie W, Johnson E, Haslam A, Roodt C, et al. Gestational diabetes mellitus: time for consensus on screening and diagnosis. N Z Med J 2006;119(1228):U1807.

[5] Hs K, Yh C. Diagnosis and treatment of gestational diabetes mellitus. J Korean Med Assoc 2024;67(11):686–94. https://doi.org/10.5124/jkma.2024.67.11.686.

[6] American Diabetes Association Professional Practice Committee. 2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes—2025. Diabetes Care. 2025;48(Suppl 1): S27-49. doi:10.2337/dc25-S002.

[7] Diabetes Canada. Screening for gestational diabetes mellitus. Available from: https://guidelines.diabetes.ca/cpg/chapter3.

[8] Simmons D, Sweeting A. Defining gestational diabetes: not just about cutoffs. Lancet Diabetes Endocrinol 2023;11(5):303–4.

[9] US Preventive Services Task Force. Screening for Gestational Diabetes: US Preventive Services Task Force Recommendation Statement. JAMA. 2021;326(6): 531-8. doi:10.1001/jama.2021.11922.

[10] Hod M, Kapur A, Sacks DA, Hadar E, Agarwal M, Di Renzo GC, et al. The International Federation of Gynecology and Obstetrics (FIGO) Initiative on gestational diabetes mellitus: A pragmatic guide for diagnosis, management, and care. Int J Gynaecol Obstet 2015;131(Suppl 3):S173–211. https://doi.org/10.1016/S0020-7292(15)30033-3.

[11] Bhattacharya S, Nagendra L, Krishnamurthy A, Lakhani OJ, Kapoor N, Kalra B, et al. Early Gestational Diabetes Mellitus: Diagnostic Strategies and Clinical Implications. Med Sci 2021;9(4):59. https://doi.org/10.3390/medsci9040059.

[12] International Association of Diabetes and Pregnancy Study Groups Consensus Panel, Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care. 2010;33(3):676-682. doi:10.2337/dc09-1848.

[13] ACOG Practice Bulletin No. 190: CGestational Diabetes Mellitus. Obstet Gynecol. 2018;131(2): e49-e64. doi:10.1097/AOG.0000000000002501.

[14] Rev ALAD 2021;6(4):155–69. Available from: https://www.revistaalad.com/files/alad_v6_n4_155-169.pdf.

[15] Metzger BE, Nelson L, Niznik C, Dooley SL. Update on Gestational Diabetes: 5th International Workshop–Conference on Gestational Diabetes. Women's Health. 2006;2(2):211-6. doi:10.2217/17455057.2.2.211.

[16] Quintanilla Rodriguez BS, Vadakekut ES, Mahdy H. Gestational Diabetes. Available from: In: StatPearls [Internet] Treasure Island (FL): StatPearls Publishing 2024. https://www.ncbi.nlm.nih.gov/books/NBK545196/.

[17] Who. Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia: report of a WHO/IDF consultation. Available from: Geneva: WHO 2006. https://iris.who.int/handle/10665/43588.

[18] Diabetes Res Clin Pract 2011;93(3):299–309.

[19] Mbanya JC, Henry RR, Smith U. Presidents' statement on WHO recommendation on HbA1c for diabetes diagnosis. Diabetes Res Clin Pract 2011;93(3):310–1. https://doi.org/10.1016/j.diabres.2011.06.026.

[20] Who. Classification of diabetes mellitus. Geneva: WHO; 2019.

[21] Diabetes Res Clin Pract 2014 Mar;103(3):341–63. https://doi.org/10.1016/j.diabres.2013.10.012. PMID: 24847517.

[22] Queensland Health. Gestational Diabetes Mellitus (GDM) guidelines. Available from: https://www.health.qld.gov.au/_data/assets/pdf_file/0022/950503/g-gdm.pdf.

[23] Goyal A, Gupta Y, Tandon N. Overt Diabetes in Pregnancy. Diabetes Ther 2022;13(4):589–600. https://doi.org/10.1007/s13300-022-01210-6.

[24] Chivese T, Hoegfeldt CA, Werfalli M, Yuen L, Sun H, Karuranga S, et al. IDF Diabetes Atlas: The prevalence of pre-existing diabetes in pregnancy - A systematic reviewand meta-analysis of studies published during 2010-2020. Diabetes Res Clin Pract 2022;183:109049. https://doi.org/10.1016/j.diabres.2021.109049.

[25] Instituto Mexicano del Seguro Social (IMSS). Management of gestational diabetes: Clinical practice guideline [Article in Spanish]. 2020. Available from: http://www.imss.gob.mx/sites/all/statics/guiasclinicas/320GER.pdf.

[26] González-González NL, González-Dávila E, Megía A, Pintado P, Vega B, Padrón E, et al. The NDDG criteria versus the IADPSG or the ADA criteria for diagnosing early-onset gestational diabetes mellitus or abnormal glucose tolerance. Int J Gynaecol Obstet 2023;160(3):906–14. https://doi.org/10.1002/ijgo.14453.

[27] Zaccara TA, Paganoti CF, Mikami FCF, Francisco RPV, Costa RA. Early vs. Late Gestational Diabetes: Comparison between Two Groups Diagnosed by Abnormal Initial Fasting Plasma Glucose or Mid-Pregnancy Oral Glucose Tolerance Test. Int J Environ Res Public Health. 2022;19(21):13719. doi:10.3390/ijerph192113719.

[28] Mustafa M, Bogdanet D, Khattak A, Carmody LA, Kirwan B, Gafnney G, et al. Early gestational diabetes mellitus (GDM) is associated with worse pregnancy outcomes compared with GDM diagnosed at 24–28 weeks gestation despite early treatment. QJM 2021;114(1):17–24. https://doi.org/10.1093/qjmed/hcaa167.

[29] Sweeting AN, Ross GP, Hyett J, Molyneaux L, Tan K, Constantino M, et al. Baseline HbA1c to Identify High-Risk Gestational Diabetes: Utility in Early vs Standard Gestational Diabetes. J Clin Endocrinol Metab 2017;102(1):150–6. https://doi.org/10.1210/jc.2016-2951.

[30] Mazumder T, Akter E, Rahman SM, Islam MT, Talukder MR. Prevalence and Risk Factors of Gestational Diabetes Mellitus in Bangladesh: Findings from Demographic Health Survey 2017-2018. Int J Environ Res Public Health 2022;19(5):2583. https://doi.org/10.3390/ijerph19052583.

[31] He Y, Ma RCW, McIntyre HD, Sacks DA, Lowe J, Catalano PM, et al. Comparing IADPSG and NICE Diagnostic Criteria for GDM in Predicting Adverse Pregnancy Outcomes. Diabetes Care 2022;45(9):2046–54. https://doi.org/10.2337/dc22-0579.

[32] Saeedi M, Cao Y, Fadl H, Gustafson H, Simmons D. Increasing prevalence of gestational diabetes mellitus when implementing the IADPSG criteria: A systematic review and meta-analysis. Diabetes Res Clin Pract 2021;172:108642. https://doi.org/10.1016/j.diabres.2020.108642.

[33] International Diabetes Federation. IDF Diabetes Atlas. 10th edn. Brussels, Belgium: International Diabetes Federation; 2021.

[34] Saravanan P, Deepa M, Ahmed Z, Ram U, Surapaneni T, Kallur SD, et al. Early pregnancy HbA_{1c} as the first screening test for gestational diabetes: results from three prospective cohorts. Lancet Diabetes Endocrinol 2024;12(8):535–44. https://doi.org/10.1016/S2213-8587(24)00151-7.

[35] O'Sullivan JB, Mahan CM, Charles D, Dandrow RV. Screening criteria for high-risk gestational diabetic patients. Am J Obstet Gynecol 1973;116(7):895–900. https://doi.org/10.1016/s0002-9378(16)33833-9.

[36] Sociedad Española de Ginecología y Obstetricia (SEGO), Grupo Español de Diabetes y Embarazo (GEDE). Diabetes mellitus and pregnancy: Updated clinical practice guideline 2021 [Article in Spanish]. Progresos de Obstetricia y Ginecología. 2022; 65:35-41.

[37] Nankervis A, McIntyre HD, Moses R, Ross GP, Callaway L, Porter C, et al. ADIPS consensus guidelines for the testing and diagnosis of gestational diabetes mellitus in Australia. NSW: Australasian Diabetes in Pregnancy Society; 2014.

[38] Diabetes in pregnancy: management from preconception to the postnatal period. London: National Institute for Health and Care Excellence (NICE); December 16, 2020.

[39] González González NL, González Dávila E, Bugatto F, Vega-Guedes B, Pintado P, Tascón L, et al. Fasting glucose for the diagnosis of gestational diabetes mellitus (GDM) during the COVID-19 Pandemic. Nutrients 2022;14(16):3432. https://doi.org/10.3390/nu14163432.

[40] Sweeting A, Hannah W, Backman H, Catalano P, Feghali M, Herman WH, et al. Epidemiology and management of gestational diabetes. Lancet 2024;404(10448): 175–92. https://doi.org/10.1016/S0140-6736(24)00825-0.

[41] Carlsen EØ, Harmon Q, Magnus MC, Meltzer HM, Erlund I, Stene LC, et al. Glycated haemoglobin (HbA1c) in mid-pregnancy and perinatal outcomes. Int J Epidemiol 2022;51(3):759–68. https://doi.org/10.1093/ije/dyab270.

[42] Coban E, Ozdogan M. Aysen Timuragaoglu; Effect of Iron Deficiency Anemia on the Levels of Hemoglobin A1c in Nondiabetic Patients. Acta Haematol 2004;112(3): 126–8. https://doi.org/10.1159/000079722.

[43] Cheung KW, Au TS, Lee CH, Ng YWY, Wong FC-K, Chow W-S, et al. Hemoglobin A1c in early pregnancy to identify preexisting diabetes mellitus and women at risk of hyperglycemic pregnancy complications. AJOG Glob Rep. 2024;4(1):100315. Published 2024 Jan 19. doi: 10.1016/j.xagr.2024.100315.

[44] Sweeting A, MacMillan F, Simmons D; TOBOGM Summit attendees. The first International Association of Diabetes and Pregnancy Study Groups summit on the diagnosis of gestational diabetes in early pregnancy: TOBOGM Summit Report. Aust N Z J Obstet Gynaecol. 2024;64(5):519-523. doi:10.1111/ajo.13823.

[45] McIntyre HD, Sacks DA, Barbour LA, Feig DS, Catalano PM, Damm P, et al. Issues with the diagnosis and classification of hyperglycemia in early pregnancy. Diabetes Care 2016;39(1):53–4. https://doi.org/10.2337/dc15-1887.

[46] Mills JL, Jovanovic L, Knopp R, Arons J, Conley M, Park E, et al. Physiological reduction in fasting plasma glucose concentration in the first trimester of normal pregnancy: the diabetes in early pregnancy study. Metabolism 1998;47(9):1140–4. https://doi.org/10.1016/s0026-0495(98)90290-6.

[47] Valadan M, Bahramnezhad Z, Golshahi F, Feizabad E. The role of first-trimester HbA1c in the early detection of gestational diabetes. BMC Pregnancy Childbirth. 2022;22(1):71. Published 2022 Jan 27. doi:10.1186/s12884-021-04330-2.

[48] Benaiges D, Flores-Le Roux JA, Marcelo I, Mañé L, Rodríguez M, Navarro X, ¿et al. Is first-trimester HbA1c useful in the diagnosis of gestational diabetes? Diabetes Res Clin Pract. 2017; 133:85-91. doi: 10.1016/j.diabres.2017.08.019.

[49] Mañé L, Flores-Le Roux JA, Benaiges D, Rodríguez M, Marcelo I, Chillarón JJ, et al. Role of First-Trimester HbA1c as a Predictor of Adverse Obstetric Outcomes in a Multiethnic Cohort. J Clin Endocrinol Metab 2017;102(2):390–7. https://doi.org/10.1210/jc.2016-2581.

[50] Rayis DA, Ahmed ABA, Sharif ME, ElSouli A, Adam I. Reliability of glycosylated hemoglobin in the diagnosis of gestational diabetes mellitus. J Clin Lab Anal 2020;34(10):e23435. https://doi.org/10.1002/jcla.23435.

[51] Calhoun B, Bush S, Bracero L, Seybold DJ, RamsCer B, Broce M. Hemoglobin A1C as a Diagnostic Test for Gestational Diabetes. Obstet Gynecol. 2016 May;127:31S. doi: 10.1097/01.AOG.0000483366.11122.78.

[52] Khalafallah A, Phuah E, Al-Barazan AM, Nikakis I, Radford A, Clarkson W, et al. Glycosylated haemoglobin for screening and diagnosis of gestational diabetes mellitus. BMJ Open 2016;6(4):e011059. https://doi.org/10.1136/bmjopen-2016-011059. Published 2016 Apr 4.

[53] Nankervis A, Price S, Conn J. Gestational diabetes mellitus: A pragmatic approach to diagnosis and management. Aust J Gen Pract 2018 Jul;47(7):445–9. https://doi.org/10.31128/AJGP-01-18-4479. PMID: 30114871.

[54] Simmons D, Immanuel J, Hague WM, Teede H, Nolan CJ, Peek MJ, et al. Treatment of gestational diabetes mellitus diagnosed early in pregnancy. N Engl J Med 2023; 388(23):2132–44. https://doi.org/10.1056/NEJMOA2214956.

[55] Benhalima K, Geerts I, Calewaert P, Rijsselberghe MV, Lee D, Bochanen N, et al. The 2024 Flemish consensus on screening for gestational diabetes mellitus early and later in pregnancy. Acta Clin Belg 2024;79(3):217–24. https://doi.org/10.1080/17843286.2024.2384258.

[56] American Diabetes Association Professional Practice Committee; 15. Management of Diabetes in Pregnancy: Standards of Care in Diabetes—2025. Diabetes Care 1 January 2025; 48 (Supplement_1): S306–S320. https://doi.org/10.2337/dc25-S015.