Review Article

Review of the Screening Guidelines for Gestational Diabetes Mellitus: How to Choose Wisely

Ravleen Kaur Bakshi[1], Akshay Kumar[2], Vandana Gupta[3], A.G. Radhika[4], Puneet Misra[5], Pankaj Bhardwaj[6]

[1]Scientist C, Div. RCN, ICMR-HQ, New Delhi, [2]Dr. BR Ambedkar Institute of Medical Sciences, Mohali, Punjab, [3]Research Officer, AIIMS, New Delhi, [4]Senior Consultant, UCMS & GTB Hospital, Delhi, [5]Professor, Centre for Community Medicine, AIIMS, New Delhi, [6]Department of Community Medicine and Family Medicine, AIIMS, Jodhpur, Rajasthan, India

Abstract

Currently, there is no international unanimity regarding the timings, the optimal cut-off points, and standardized methods of screening or diagnosis of gestational diabetes mellitus (GDM). The screening guidelines and recommendations for GDM evolved over time; concise information has been presented here in the review. We searched electronic databases for various guidelines for screening of GDM in PubMed, Medical Literature Analysis and Retrieval System Online (MEDLINE), Embase, Cochrane, Google Scholar, Scopus, Guidelines International Network (GIN library), National Guidelines Clearinghouse (NGC); Web sites of relevant organizations; and trial registries. The mesh headings derived after reviewing the articles and were used to further search the articles are: ("Screening Guidelines GDM" or "Screening Criteria for GDM") and ("Glucose Intolerance in Pregnancy" or "Gestational Diabetes Mellitus"). The articles published from 1960 till December 2022 were included. Key outcomes included the prevalence of GDM is 14.6% according to the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria and 13.4% according to Diabetes in Pregnancy Study Group India (DIPSI) criteria, making the DIPSI criterion a cost-effective method for low-resource settings. The IADPSG) criterion diagnoses and treats GDM earlier, thus reducing the complications associated with GDM in the mother and newborn. The IADPSG criteria at a cut-off of ≥140 mg/dL have a sensitivity of 81% and specificity of 93%, whereas the World Health Organization (2013) criteria at the same cut-off has a lower sensitivity of 59% and specificity of 81%. The risk factors of having GDM are family history, history during past pregnancy, medical history, multiple current pregnancies, and raised hemoglobin A1c. The screening guidelines have been developed by different organizations and institutions over the years. The guidelines with the threshold values for screening and their standardization for detecting GDM in Indian mothers are yet to be established.

Keywords: Gestational diabetes mellitus (GDM), review, screening guidelines

Background

Gestational diabetes mellitus (GDM) is a variable degree of glucose intolerance with the onset during the pregnancy.[1] It is evident in the second half of the pregnancy due to the intense physiological insulin resistance due to the placental hormones.[2] In high-income countries, the prevalence of GDM is around 5 to 7%, whereas in India, being the diabetic capital of the world, the prevalence is from 4 to 18%.[3] Women who have GDM, are at an increased risk of adverse maternal outcomes such as hypertension during pregnancy, urinary tract infection, and hydramnios; and perinatal outcomes, such as macrosomia, trauma during birth, congenital anomalies, stillbirths, and metabolic abnormalities. They are at an increased risk of developing obesity and type II diabetes during their lifetime.[4,5] Therefore, it is essential to detect and diagnose GDM at the earliest, and appropriate treatment prevents further complications.

However, the current guidelines for the screening, diagnosis, and management of GDM are different between various medical institutes and among different countries. The global consensus regarding timing, last meal timing (fasting/nonfasting), method (calorimeter assay/enzyme assay),

Access this article online

Quick Response Code:

Website: www.ijcm.org.in

DOI: 10.4103/ijcm.ijcm_298_23

Address for correspondence: Dr. Ravleen Kaur Bakshi, Scientist C, Div. RCN, ICMR-HQ, New Delhi, India.
E-mail: drravleen01@gmail.com

How to cite this article: Bakshi RK, Kumar A, Gupta V, Radhika AG, Misra P, Bhardwaj P. Review of the screening guidelines for gestational diabetes mellitus: How to choose wisely. Indian J Community Med 2023;48:828-34.

Received: 08-05-23, **Accepted:** 26-09-23, **Published:** 01-12-23

glucose load (75 or 100 g), sample (venous/capillary), and the optimal cut-off points for screening are variable. Also, there are disputes regarding the cost-effectiveness, accuracy, and efficacy of an approach for screening GDM.

The Government of India recommends screening of all pregnant women for GDM as per the National Guidelines for Diagnosis and Management of GDM, which were updated in Dec 2014 and Feb 2018, respectively, where diagnosis is based on the recommendations given by the World Health Organization (WHO).[6] The other two most commonly used criteria in India are the Diabetes in Pregnancy Study Group of India criteria (DIPSI, 2004) and the International Association of Diabetes and Pregnancy Study Group (IADPSG, 2010). The current review of guidelines comprehensively collates recommendations of the various international and national societies and organizations for the screening of GDM.

Material and Methods

We searched electronic databases for various guidelines for screening of GDM in PubMed, Medical Literature Analysis and Retrieval System Online (MEDLINE), Embase, Cochrane, Google Scholar, Scopus, Guidelines International Library (GIN library), National Guidelines Clearinghouse (NGC); Web sites of relevant organizations; and trial registries. The mesh headings derived after reviewing the articles and were used to further search the articles are: ("Screening Guidelines GDM" OR "Screening Criteria for GDM") AND ("Glucose Intolerance in Pregnancy" OR "Gestational Diabetes Mellitus"). The articles which are published in the English language were included in the study, and the unpublished literature was excluded. The articles published from 1960 till December 2022 were included. We have reviewed all the studies that compared any screening test with the other screening tests available for GDM.

Results

Please refer to Tables 1-3 for the details of the results. See Figure 1 for the timeline of various screening and diagnostic criteria for GDM.

Discussion

The current review of the screening approaches for GDM includes 24 guidelines published to date. The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study done in 2008, was performed mainly in the Caucasian population and did not include the Asian countries, including India. This led to different opinions in the clinical practice.

The only outcome-based criterion is the IADPSG criteria, which is based on the results of the HAPO study. Waters *et al*., in a study done in 2016, found that the IADPSG criteria for GDM diagnosis is associated with an increased frequency of women being diagnosed with GDM compared to other criteria and had higher frequencies of adverse pregnancy outcomes compared to women with no GDM.[14] These adverse outcomes in mothers were an increase in lower segment cesarean section (LSCS) and preeclampsia, and neonates had higher birth weight and cord C-peptide levels.[31] The study done by Kim *et al*.,[32] 2019 reported increased maternal and neonatal complications in the women diagnosed with GDM by the IADPSG criteria. In the systematic review and meta-analysis done by Tehrani *et al.*, it has been reported that adverse maternal outcomes increase in women having GDM, irrespective of the screening approach or diagnostic classification used.[37]

Another preferred criterion is the DIPSI guideline, a simple and convenient method as it does not require overnight fasting or multiple blood glucose measurements. The DIPSI criteria for GDM diagnosis have been found to have lower sensitivity compared to the WHO (1999) criteria and the IADPSG criteria, according to Mohan *et al*.,[33] 2014. Only a small proportion of women diagnosed with GDM by the WHO 1999 criteria or the IADPSG criteria were identified by the DIPSI criteria. The potential differences in pregnancy outcomes for women with GDM screened by either the DIPSI criteria or the IADPSG criteria are evident.[34] According to Seshiah *et al*.,[18] the prevalence of GDM is 14.6% according to IADPSG criteria and 13.4% according to DIPSI criteria, with the conclusion that the DIPSI criterion is a cost-effective method for low-resource settings. These findings highlight the importance of considering the specific criteria used for GDM screening and diagnosis in order to accurately identify and manage women at risk for adverse pregnancy outcomes. There is a debate regarding the various harms, unnecessary interventions, and cost-effectiveness of diagnosing mild hyperglycemia and overdiagnosis of GDM.

The DIPSI criterion is a one-step screening with a 75 g oral glucose tolerance test (OGTT), while the Carpenter-Coustan criteria is a two-step process involving a 50 g glucose challenge test followed by a 100 g OGTT. The National Institutes of Health (NIH), American College of Obstetricians and Gynecologists (ACOG), and Society of Obstetricians and Gynaecologist of Canada (SOGC) guidelines are a two-step strategy. In the ACOG guideline, GCT with 50 g glucose is done in a nonfasting state, and if the value is more than 7.8 mmol/L, a confirmed diagnosis is made by 3-h OGTT.[14] The WHO recommends a fasting OGTT, while the American Diabetes Association (ADA) allows nonfasting OGTT. This inconsistency in screening guidelines can lead to variations in diagnosing GDM. For example, a pregnant woman with borderline fasting glucose levels might receive different recommendations based on which guideline is followed.

The timing of screening also varies. The ADA suggests early screening for women at risk and universal screening between 24–28 weeks, whereas the National Institute for Healthcare Excellence of the UK (NICE) recommends screening at 24–28 weeks. This inconsistency can affect when GDM is detected and treated. Different guidelines consider diverse risk factors. For example, the DIPSI criteria emphasize universal screening in India due to the high prevalence of GDM risk

Table 1: The tabulation of the various established guidelines for screening for GDM according to various dimensions offered by each of the screening tests

*Criteria	Scope of approach		Approach	Pregnancy Stage	Glucose Load
O' Sullivan and Mahan (1964)[7]	Screening	Diagnostic	2 Step	Screening at 24–28 weeks	50 gm GCT Followed by 100 g OGTT
NDDG, (1979)[8]	-	Diagnostic	2 Step	24–28 weeks	50 g GCT Followed by 100 g OGTT
WHO (Organización Mundial de la Salud) (OMS, 1980)	-	Diagnostic	1 Step	24–28 weeks	75 g
C-C criteria (1982)[9]	-	Diagnostic	2 Step	24–33 weeks	50 g GCT Followed by 100 g OGTT
ADIPS (1991)[10]	Screening	Diagnostic	2 Step	24–28 weeks	Initially, 50 g GCT followed by 75 g OGTT
WHO (1999)[11]	-	Diagnostic	2 Step	24–28 weeks	75 g OGTT
DIPSI (2004)[12]	Screening	Diagnostic	1 Step	All Pregnant	75 g GCT
HAPO (2008)[13]	-	Diagnostic	1 Step	24–32 weeks	75 g OGTT
IADPSG (2010)[14]	-	Diagnostic	1 Step	Screening for at-risk, Subsequently, at 24–28 weeks	75 g OGTT
WHO (2013)[15]	Screening	Diagnostic	1 Step	All pregnant or risk factor-based	75 g OGTT
NIH (2013)[16]	Screening	Diagnostic	2 Step	24–28 weeks	50 g GCT followed by 75 g OGTT.
Endocrine Society (2013)[17]	Screening	Diagnostic	1 Step	24–28 weeks	Fasting, 75 g OGTT
GDA (2014)[19]	Screening	Diagnostic	1 Step (during screening 2 Step)	24–27+6 week	75 g OGTT
USPSTF (2014)[20]	Screening	Diagnostic	Both 1 and 2 Step	24–28 weeks	50 g GCT followed by 100 g OGTT
EBCOG (2015)[21]	Screening	Diagnostic	1 Step	24–28 weeks	75 g OGTT
IFIGO (2015)[22]	Screening	Diagnostic	1 Step	24–28 weeks	75 g OGTT
ADA (2015)[23]	To do FPG, HbA1C, or RPG at first visit, risk-based screening	Diagnostic	1 Step, Endorses IADPSG	Risk-based screening, Screening at 24–28 weeks	75 g OGTT
	50 g GCT, irrespective of last meal	Diagnostic	2 Step	At 24–28 weeks	100 g OGTT
NICE (2015)[24]	Screening	Diagnostic	1 Step	24–28 weeks	75 g OGTT
HKCOG (2016)[25]	Screening	Diagnostic	2 Step	24–28 weeks	50 g GCT followed by 75 g OGTT
SOGC (2019)[26]	Screening	Diagnostic	2 Step	24–28 weeks	50 g GCT followed by 75 g OGTT. If<7.8 mmol/L, no further test is required
ACOG (2018)[27]	Screening	Diagnostic	2 Step	24–28 weeks	Fasting, 50 g GTT, followed by 100 g OGTT
CDA (2018)[28]	Screening	Diagnostic	2 Step	24–28 weeks	Fasting, 75 g OGTT
National guidelines by Government of India (2018)[6]	Screening	Diagnostic	1 Step	Early screening for women with risk factors and all ANC at 24–28 weeks	Fasting, 75 g OGTT
QCG (2021)[29]	Screening	Diagnostic	2 Step	24–28 weeks	50 g GCT followed by 75 g OGTT

*Criteria	Threshold values for diagnosis				Report of the guideline process given or not	Contains Guidelines for management
	Fasting/Nonfasting	1 h	2 h	3 h		
O' Sullivan and Mahan (1964)[7]	Fasting, ≥140 mg/dL (7.8 mmol/L). Whole Blood	≥165 mg/dL (9.2 mmol/L)	≥145 mg/dL (8.1 mmol/L)	≥125 mg/dL (6.9 mmol/L)	No	No
NDDG, (1979)[8]	Fasting, ≥105 mg/dL (5.8 mmol/L). Venous plasma	≥190 mg/dL (10.6 mmol/L)	≥165 mg/dL (9.2 mmol/L)	≥145 mg/dL (8.1.mmol/L)	No	No

Contd...

Table 1: Contd...

*Criteria	Threshold values for diagnosis				Report of the guideline process given or not	Contains Guidelines for management
	Fasting/Nonfasting	1 h	2 h	3 h		
WHO (Organización Mundial de la Salud) (OMS, 1980)	Fasting, ≥126 mg/dL (7.0 mmol/L). Venous plasma	-	≥140 mg/dL (≥7.8 mmol/L)	-	No	No
C-C criteria (1982)[9]	Fasting, ≥95 mg/dL (≥5.3 mmol/L). Venous plasma	≥180 mg/dL (10.0 mmol/L)	≥155 mg/dL (8.6 mmol/L)	≥140 mg/dL (7.8 mmol/L)	No	No
ADIPS (1991)[10]	Fasting, ≥100 mg/dL (≥5.5 mmol/L). Venous plasma	≥180 mg/dL (≥10.0mmol/L)	≥144 mg/dL (≥8.0 mmol/L)	Not required	Yes	No
WHO (1999)[11]	Fasting≥126 mg/dL (≥7.0 mmol/L). Venous plasma	Not required	≥140 mg/dL (7.8 mmol/L)	Not required	No	No
DIPSI (2004)[12]	Not required, Whole blood	Not required	≥140 mg/dL (7.8 mmol/L)	Not required	Yes	Yes
HAPO (2008)[13]	Fasting, 92 mg/dL (>5.8 mmol/L), Venous plasma	≥180 mg/dL	153 mg/dL (>11.1 mmol/L)	Not required	Yes	No
IADPSG (2010)[14]	Fasting, ≥92 mg/dL (5.1 mmol/L). Venous plasma	≥180 mg/dL 10 mmol/L)	≥153 mg/dL (8.5 mmol/L)	Not required	Yes	No
WHO (2013)[15]	92–125 mg/dL (>5.1 mmol/L)	180 mg/dL (>10.0mmol/L)	153–199 mg/dL (> 8.5 mmol/L)	Not required	Yes	Yes
NIH (2013)[16]	Fasting, ≥ 92 mg/dL (5.1 mmol/L	≥180 mg/dL (10.0 mmol/L)	≥153 mg/dL (8.5 mmol/L)	Not required	Yes	No
Endocrine Society (2013)[17]	Fasting, 92–125 mg/dL (5.1–6.9 mmol/L)	≥180 mg/dL (≥ 10 mmol/L)	153–199 mg/dL (8.5–11.0mmol/L)	Not required	Yes	Yes
GDA (2014)[19]	Fasting, ≥92 mg/dL (5.1 mmol/L)	≥180 mg/dL (10 mmol/L)	≥153 mg/dL (8.5 mmol/L)	Not required	Yes	Yes
USPSTF (2014)[20]	Fasting, According to C-C criteria ≥95 mg/dL (≥5.3 mmol/L)	≥180 mg/dL (≥10 mmol/L)	≥155 mg/dL (≥ 8.6 mmol/L)	≥140 mg/dL (≥7.8mmol/L)	No	Yes
EBCOG (2015)[21]	Fasting, ≥92 mg/dL (≥5.1 mmol/L)	≥180 mg/dL (≥10.0mmol/L)	≥153 mg/dL (≥8.5 mmol/L)	Not required	Yes	Yes
IFIGO (2015)[22]	Fasting, ≥92 mg/dL (≥5.1 mmol/L)	≥180 mg/dL (≥10.0mmol/L)	≥153 mg/dL (≥8.5 mmol/L)	Not required	Yes	Yes
ADA (2015)[23]	Fasting, ≥92 mg/dL (5.1 mmol/L) (FPG Diagnostic)	≥180 mg/dL (10.0 mmol/)	≥153 mg/dL (8.5 mmol/)	≥140 mg/dL	Yes	Yes
	≥95 mg/dL (5.5 mmol/L)	≥140 mg/dL (7.8 mmol/L)	≥155 mg/dL (8.6 mmol/L)	≥140 mg/dL (7.8 mmol/L)	Yes	Yes
NICE (2015)[24]	Fasting, ≥100 mg/dL (5.6 mmol/L)	not required	≥140 mg/dL (7.8 mmol/L)	Not required	No	Yes
HKCOG (2016)[25]	Fasting, ≥92 mg/dL (≥5.1 mmol/L)	≥180 mg/dL (≥10.0mmol/L)	≥153 mg/dL (≥8.5 mmol/L)	Not required	Yes	Yes
SOGC (2019)[26]	Fasting, ≥95 mg/dL (5.3 mmol/L)	≥191 mg/dL (≥10.6mmol/L)	≥162 mg/dL (≥9.0 mmol/L)	Not required	Yes	No
ACOG (2018)[27]	Nonfasting (First time) Second time, ≥95 mg/dL	≥180 mg/dL (10.0 mmol/L)	≥153 mg/dL (8.5 mmol/L)	≥140 mg/dL (7.8 mmol/L)	Yes	Yes
CDA (2018)[28]	≥95 mg/dL	≥191 mg/dL	≥160 mg/dL	Not required	Yes	Yes
National guidelines by Government of India (2018)[6]	Not required	Not required	≥140 mg/dL	Not required	Yes	Yes
QCG (2021)[29]	Fasting, ≥92 mg/dL (5.1 mmol/L)	≥180 mg/dL (10.0 mmol/L)	≥153 mg/dL (8.5 mmol/L)	Not required	Yes	Yes

* National Diabetes Data Group (NDDG, 1979), Carpenter-Coustan criteria (C-C, 1982), Australasian Diabetes in Pregnancy Society (ADIPS, 1991), World Health Organization (WHO, 1999), Diabetes in Pregnancy Study Group of India criteria (DIPSI, 2004), Hyperglycemia and Adverse Pregnancy Outcome (HAPO, 2008), International association of diabetes and pregnancy study group (IADPSG, 2010), World health organization (WHO-2013), National Institutes of Health (NIH, 2013), Endocrine Society Clinical Practice Guideline (Endocrine Society), 2013, German Diabetes Association/German Association for Gynecology and Obstetrics, 2014 (GDA), United States Preventive Services Task Force (USPSTF, 2014), European Board and College of Obstetrics and Gynecology (EBCOG, 2015), International Federation of Gynecology and Obstetrics (FIGO, 2015), American Diabetes Association (ADA, 2015), National Institute for Healthcare Excellence of the UK. (NICE, 2015), Hong Kong College of Obstetricians & Gynaecologist (HKCOG, 2016), Society of Obstetricians and Gynaecologist of Canada (SOGC, 2019), American College of Obstetricians and Gynecologist (ACOG, 2018), Canadian Diabetes Association (CDA, 2018), Queensland Clinical Guideline (QCG, 2021), fasting plasma glucose (FPG)

Table 2: The sensitivity and specificity at different thresholds for the established approaches of screening criteria for gestational diabetes mellitus

Index test	Criteria	Cut-off	Sensitivity	Specificity
50 g oral glucose				
	O'Sullivan and Mahan (1964)	130 mg/dL	79%	87%
	C-C criteria	>140 mg/dL	81.9%	81.8%
	NDDG, 1979	>140 mg/dL	85%	81.2%
	C-C criteria	>135 mg/dL	93.3%	78.9%
	IADPSG criteria	≥140 mg/dL	8%	93%
Fasting plasma glucose test				
	C-C criteria	85 mg/dL	88%	73%
	C-C criteria	90 mg/dL	81%	82%
	IADPSG criteria	80 mg/dL	>90%	-
100 g OGTT or 75 g OGTT				
	C-Coustan criteria, NDDG criteria, 1999 WHO criteria, or the CDA criteria	140 mg/dL	70–88%	69–89%
	C-Coustan criteria, NDDG criteria, WHO criteria (1999), or the CDA criteria	130 mg/dL	88–99%	66–77%
75 g OGTT	WHO criteria (2013) (IADPSG recommendation)	140 mg/dL	59.6%	81%
		135 mg/dL	66.2%	76.1%
		130 mg/dL	72.4%	70.2%
		125 mg/dL	77.6%	64.2%
	DIPSI criteria (2006)	≥40 mg/dL	79%	97%
Fasting plasma glucose	WHO South East Asian region	140 mg/dL	81.0%	70.0%
100 g OGTT	WHO South East Asian region	140 mg/dL	79.0%	74.0%
75 g OGTT	WHO South East Asian region	140 mg/dL	76.0%	97.0%

C-C=Carpenter-Coustan criteria, OGTT=oral glucose tolerance test , IADPSG=International Association of Diabetes and Pregnancy Study Groups, NDDG=National Diabetes Data Group, DIPSI=Diabetes in Pregnancy Study Group India, WHO=World Health Organization

Table 3: The comparison of potential differences in pregnancy outcomes for women with GDM screened by either the DIPSI criteria or the IADPSG criteria

Pregnancy Outcomes	DIPSI Screening	IADPSG Screening
Birth weight	Variable	May lead to macrosomia
Preterm birth	Variable	Slightly increased risk
Neonatal hypoglycemia	Possible	Possible
Cesarean delivery	Variable	Slightly increased risk
Gestational hypertension	Variable	Possible association
Intervention needed	Possibly lifestyle modification	Glucose control crucial

IADPSG=International Association of Diabetes and Pregnancy Study Groups, DIPSI=Diabetes in Pregnancy Study Group India, GDM=gestational diabetes mellitus

factors, including ethnic background and family history. In contrast, other guidelines might not prioritize the same factors.

While comparing the IADPSG criteria and the NICE criteria, it is observed that IADPSG has lower fasting glucose, an additional 1-h glucose level, and a higher 2-h glucose value.[24] In the study by Yuanying He, *et al*., comparing the IADPSG and NICE diagnostic criteria for GDM, the authors concluded that the IADPSG criterion is more favorable than NICE for identifying unfavorable pregnancy outcomes among Hispanic and Asian women.[30] Benhalima K *et al*., with a focus on diagnostic accuracy, show that GCT has moderate diagnostic accuracy in the two step screening for GDM using the 2013 WHO guidelines. The GCT threshold, when lowered to 130 mg/dL (7.2 mmol/L), the sensitivity rates are 70% and low specificity of 50 to 60%, leading to more false positives, thus overdiagnosing GDM.[35]

The strength, rigorousness of development, involvement of various stakeholders, and the independent editorial board to analyze the reliability of the recommendation by a screening guideline is important. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) was used to assess the quality of evidence, and the format was followed for the WHO, International Federation of Gynecology and Obstetrics (FIGO), NICE, and Endocrine Society (ES) guidelines. Some guidelines, such as the ADA, developed an ADA evidence-grading system to update their guidelines. NIH guidelines used the Agency for Healthcare Research and Quality to evaluate literature and build their guidelines. There was no clear description of the process of guideline development or assessment for the European Board and College of Obstetrics and Gynecology (EBCOG), Australasian Diabetes in Pregnancy Society (ADIPS), Hong Kong College of Obstetricians and Gynaecologist (HKCOG), and Queensland Clinical Guideline (QCG). Independent guidelines developing group or board members' details were shared by the IADPSG, WHO, and ADA guidelines.

The strongly recommended criteria are WHO-2013, NICE (2015), ADA (2018), SOGC (2016), ES (2013), FIGO (2015), the United States Preventive Services Task Force (USPSTF) (2014), IADPSG (2015), and ACOG (2018); which have been examined according to "Appraisal of

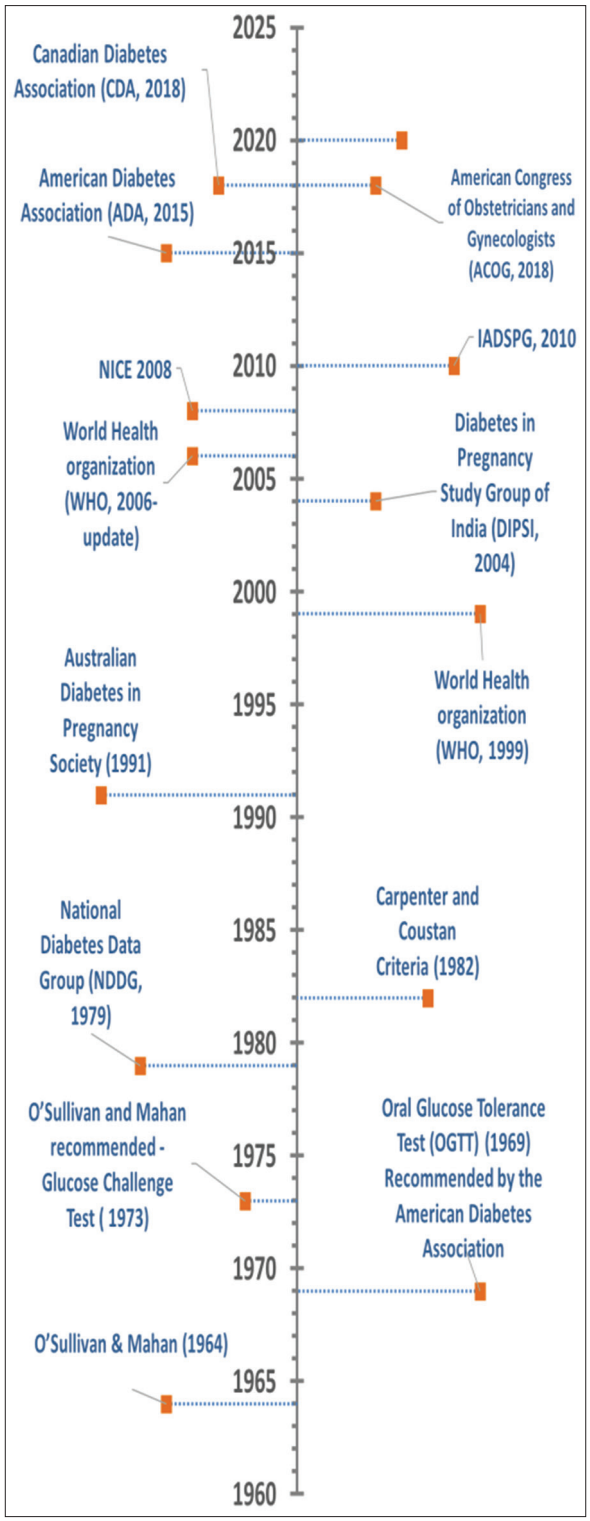

Figure 1: Timeline for screening and diagnostic criteria of GDM

Guidelines for Research and Evaluation (AGREE)" criteria in a study done by Liao Li zhen, *et al*., as they were evidence based and scientifically sound.[36] Most of these guidelines recommend identifying high-risk factors and a universal screening by one step, using a 75 g OGTT strategy as per the IADPSG guideline between 24 and 28 gestational weeks. The guidelines might not be universally applicable due to regional differences in healthcare infrastructure, prevalence of GDM, and cultural factors. For instance, the Australian guidelines by ADIPS might be tailored to the specific healthcare landscape in that country, leading to discrepancies when applied in other regions. As new research emerges, guidelines are updated, leading to further variations.

Limitations of the Present Study

1. The present review does not evaluate the therapy, monitoring, obstetric outcomes, etc., and its main focus is on the screening guidelines of GDM.
2. The guidelines published only in the English language were included in the present analysis.
3. The appraisal of the screening guidelines was not done.

Strength of the Study

1. The present review included an integrated list of screening tests and detailed insight into them.
2. The present study will help the treating clinicians to compare the overview of all the different screening guidelines at a glance.
3. The clinicians may refer to the present study to choose an adaptable and adequate screening approach for an individual according to the guidelines in their region.

Conclusion

An appropriate standardized generalization screening program for GDM is mandatory at the national level to prevent maternal and fetal complications. Regardless of any setting, the screening guidelines should be able to meet the needs and limitations of low-resource settings. The presence of inconsistencies in GDM screening guidelines is due to factors such as evolving evidence, regional variations, and differing expert opinions. Healthcare providers must navigate these inconsistencies to provide optimal care to pregnant women at risk of GDM. The evidence-based country-specific guidelines and standardization of screening threshold for gestational diabetes for Indian mothers are yet to be determined.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Metzger BE, Coustan DR. Summary and recommendations of the fourth international workshop-conference on gestational diabetes mellitus. The Organizing Committee. Diabetes Care 1998; 21(Suppl 2):B161-7.
2. Cho NH, Whiting D, Forouhi N, Guariguata L, Hambleton I, Li R, *et al*. IDF Diabetes Atlas. 7th ed. Brussels, Belgium: International Diabetes Federation (IDF); 2015.
3. International Diabetes Federation, Gestational Diabetes, 2015. Available from: http://www.idf.org/node/26045. [Last accessed on 2023 Feb 20].
4. Damm P. Gestational diabetes mellitus and subsequent development of

overt diabetes mellitus. Dan Med Bull 1998;45:495-509.
5. Casey BM, Lucas MJ, Mcintire DD, Leveno KJ. Pregnancy outcomes in women with gestational diabetes compared with the general obstetric population. Obstet Gynecol 1997;90:869-73.
6. Mishra S, Bhadoria AS, Kishore S, Kumar R. Gestational diabetes mellitus 2018 guidelines: An update. J Family Med Prim Care 2018;7:1169-72.
7. O'Sullivan JB, Mahan CM. Criteria for the oral glucose tolerance test in pregnancy. Diabetes 1964;13:278-85.
8. Classification and diagnosis of diabetes mellitus and other categories of glucose intolerance. National Diabetes Data Group. Diabetes 1979;28:1039-57.
9. Carpenter MW, Coustan DR. Criteria for screening tests for gestational diabetes. Am J Obstet Gynecol 1982;144:768-73.
10. Martin FIR, Vogue A, Dargaville R, Ericksen C, Oats J, Tippett C. The diagnosis of gestational diabetes. Med J Aust 1991;155:112.
11. World Health Organization. Definition, Diagnosis and Classification of Diabetes Mellitus and Its Complications: Report of a WHO Consultation. Part 1, Diagnosis and Classification of Diabetes mellitus. World Health Organization; 1999. Available from: https://apps.who.int/iris/handle/10665/66040. [Last accessed on 2023 Feb 20].
12. Seshiah V, Balaji V, Balaji MS, Sanjeevi CB, Green A. Gestational diabetes mellitus in India. J Assoc Physicians India (DIPSI) 2004;52:707-11.
13. Sacks DA, Hadden DR, Maresh M, Deerochanawong C, Dyer AR, Metzger BE, *et al*. Frequency of gestational diabetes mellitus at collaborating centers based on IADPSG consensus panel-recommended criteria: The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study. Diabetes Care 2012;35:526-8.
14. Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, Damm P, *et al*. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care 2010;33:676-82.
15. World Health Organization Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy: A World Health Organization guideline. Diabetes Res Clin Pract 2014;103:341-63.
16. Vandorsten JP, Dodson WC, Espeland MA, Grobman WA, Guise JM, Mercer BM, *et al*. NIH consensus development conference: Diagnosing gestational diabetes mellitus. NIH Consens State Sci Statements 2013;29:1-31.
17. Blumer I, Hadar E, Hadden DR, Jovanovic L, Mestman JH, Murad MH, *et al*. Diabetes and pregnancy: An endocrine society clinical practice guideline. J Clin Endocrinol Metab 2013;98:4227-49.
18. Seshiah V, Das AK, Balaji V, Joshi SR, Parikh MN, Gupta S*et al*. Gestational diabetes mellitus--guidelines. J Assoc Physicians India 2006;54:622-8.
19. Kleinwechter H, Schäfer-Graf U, Bührer C, Hoesli I, Kainer F, Kautzky-Willer A, *et al*. Gestational diabetes mellitus (GDM) diagnosis, therapy and follow-up care: Practice Guideline of the German Diabetes Association (DDG) and the German Association for Gynaecologyand Obstetrics (DGGG). Exp Clin Endocrinol Diabetes 2014;122:395-405.
20. The Guide to Clinical Preventive Services 2014: Recommendations of the U.S. Preventive Services Task Force. Rockville (MD): Agency for Healthcare Research and Quality (US); 2014.
21. Benhalima K, Mathieu C, Damm P, Van Assche A, Devlieger R, Desoye G, *et al*. A proposal for the use of uniform diagnostic criteria for gestational diabetes in Europe: An opinion paper by the European Board and College of Obstetrics and Gynaecology (EBCOG). Diabetologia 2015;58:1422-9.
22. 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. doi: 10.1016/S0020-7292 (15) 30033-3.
23. American Diabetes Association. Standards of medical care in diabetes-2015 abridged for primary care providers. Clin Diabetes 2015;33:97-111.
24. Bhatia M, Mackillop LH, Bartlett K, Loerup L, Kenworthy Y, Levy JC, *et al*. Clinical implications of the NICE 2015 criteria for gestational diabetes mellitus. J Clin Med 2018;7:E376. doi: 10.3390/jcm7100376.
25. The Hong Kong College of Obstetricians and Gynaecologists. Guidelines for the Management of Gestational Diabetes Mellitus. 2016. Available from: http://www.hkcog.org.hk/hkcog/Download/Guidelines_on_GDM_updated.pdf. [Last accessed 25 March 2023].
26. Berger H, Gagnon R, Sermer M, Basso M, Bos H, Brown RN, *et al*. Diabetes in pregnancy. J Obstet Gynaecol Can 2019;41:1814-25.
27. Committee on Practice Bulletins—Obstetrics. ACOG practice bulletin no. 190: Gestational diabetes mellitus. Obstet Gynecol 2018;131:e49-64. doi: 10.1097/AOG.0000000000002501.
28. Ivers NM, Jiang M, Alloo J, Singer A, Ngui D, Casey CG, *et al*. Diabetes Canada 2018 clinical practice guidelines. Can Fam Physician 2019;65:14-24.
29. Queensland Clinical Guidelines. Gestational diabetes mellitus (GDM). Guideline No. MN21.33-V6-R26. Queensland Health. 2022. Available from: http://health.qld.gov.au/qcg. [Last accessed 25 March 2023].
30. 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;45:2046-54.
31. Waters T, Dyer A, Scholtens D, Dooley S, Herer E, Lowe L, *et al*. Maternal and neonatal morbidity for women who would be added to the diagnosis of gdm using iadpsg criteria: A secondary analysis of the hyperglycemia and adverse pregnancy outcome study. Diabetes Care 2016;39:2204-10.
32. Kim E, Kwak S, Kim S, Hong J, Chung H, Choi S, *et al*. Pregnancy outcomes of women additionally diagnosed as gestational diabetes by the international association of the diabetes and pregnancy study groups criteria. Diabetes Metab J 2019;43:766. doi: 10.4093/dmj.2018.0192.
33. Mohan V, Mahalakshmi M, Bhavadharini B, Maheswari K, Kalaiyarasi G, Anjana R, *et al*. Comparison of screening for gestational diabetes mellitus by oral glucose tolerance tests done in the non-fasting (random) and fasting states. Acta Diabetol 2014;51:1007-13.
34. Meek CL, Lewis HB, Patient C, Murphy HR, Simmons D. Diagnosis of gestational diabetes mellitus: Falling through the net. Diabetologia 2015;58:2003-12.
35. Benhalima K, Van Crombrugge P, Moyson C, Verhaeghe J, Vandeginste S, Verlaenen H, *et al*. The sensitivity and specificity of the glucose challenge test in a universal two-step screening strategy for gestational diabetes mellitus using the 2013 World Health Organization criteria. Diabetes Care 2018;41:e111-2. doi: 10.2337/dc18-0556.
36. Li-Zhen L, Yun X, Xiao-Dong Z, Shu-Bin H, Zi-Lian W, Adrian Sandra D, *et al*. Evaluation of guidelines on the screening and diagnosis of gestational diabetes mellitus: Systematic review. BMJ Open 2019;9:e023014. doi: 10.1136/bmjopen-2018-023014.
37. Ramezani Tehrani F, Naz MSG, Yarandi RB, Behboudi-Gandevani S. The Impact of Diagnostic Criteria for Gestational Diabetes Mellitus on Adverse Maternal Outcomes: A Systematic Review and Meta-Analysis. J Clin Med. 2021;10:666.