The Journal of Medical Research

Review Article

JMR 2022; 8(3):120-125
May- June
ISSN:2395-7565

www.medicinearticle.com
Received:14-05-2022
Accepted:13-06-2022

Clinical Updates on Screening and Diagnosis Criteria for Gestational Diabetes Mellitus Patients, as well as Therapeutic Management

Balaji Vijayam[1], Taarika Balaji[2], Madhuri S Balaji[1], Seshiah Veerasamy[1], Vinoth Kumar Ganesan[3]

[1]Department of Diabetology, Dr. V Balaji Diabetes Care and Research Institute, Aminjikarai, Chennai, Tamil Nadu, India

[2]Department of Medicine, Saveetha Institute of Technical and Medical Sciences, Chennai, Tamil Nadu, India

[3]Department of Medical Research, Dr. V Balaji Diabetes Care and Research Institute, Aminjikarai, Chennai, Tamil Nadu, India

Abstract

The most prevalent metabolic and endocrine perinatal issue is gestational diabetes mellitus (GDM), which is an increasing health problem worldwide. It is a controversial entity, with conflicting guidelines and treatment protocols. In the United States, most doctors utilise a two-step strategy, first with a 50-g non fasting oral glucose challenge test at 24 to 28 weeks and then a 100-g fasting test for women who have a positive screening result. Alternatively, Clinicians take a one step Diabetes in Pregnancy Study Group India (DIPSI) method and perform simply a 75-g two hour fasting oral glucose tolerance test. The DIPSI approach of antenatal GDM screening has been demonstrated to be straightforward, cost effective, easy to use, patient friendly, and convenient. When comparing the findings to the gold standard of the International Association of Diabetes and Pregnancy Study Group (IADPSG), DIPSI shows high specificity and acceptable sensitivity. To maintain euglycemia, glucose monitoring, dietary changes, exercise, and, if necessary, medicines are used. Although insulin therapy is the most common treatment, glyburide and metformin may become more popular. Prenatal testing with nonstress tests and amniotic fluid indices, commencing in the third trimester, is commonly used to assess foetal well-being in women undergoing medication. The delivery technique and time are contentious. Women who have gestational diabetes are at a significant risk of developing type 2 diabetes later in life. As a result, along with routine diabetes screening, lifestyle adjustment should be recommended.

Keywords: Gestational Diabetes Mellitus; Type 2 Diabetes Mellitus; Medical Nutrition Therapy; Physical Activity.

INTRODUCTION

Gestational diabetes mellitus (GDM) is a serious pregnancy complication, in which women without previously diagnosed diabetes develop chronic hyperglycemia during gestation [1]. According to the most recent (2017) estimates from the International Diabetes Federation (IDF), GDM affects over 14% of pregnancies worldwide, accounting for an estimated 18 million new-borns each year [2]. Overweight/obesity, a westernised diet deficient in micronutrients, advanced maternal age, and a family history of insulin resistance and/or diabetes are all risk factors. While GDM normally goes away after delivery, it can have long-term health effects for the mother, such as an increased risk of type 2 diabetes (T2DM) and cardiovascular disease (CVD), as well as future obesity, CVD, T2DM, and/or GDM in the child. This contributes to a vicious intergenerational cycle of obesity and diabetes, which has a negative influence on the general public's health. Unfortunately, there is no widely acknowledged treatment or preventative strategy for GDM at this time, with the exception of lifestyle management (diet and exercise) and, on rare occasions, insulin therapy, which is only of limited effectiveness due to the common presence of insulin resistance. While new oral antidiabetics like glyburide and metformin appear to be promising, questions about their long-term safety for the mother and child remain [3-5]. As a result, new treatments must be safe, effective, and simple to administer. In order to develop such treatments, a thorough understanding of the diagnosis criteria of GDM is required. This review will discuss what is known about the screening and diagnosis criteria for GDM patients, as well as therapeutic management and what has yet to be elucidated.

***Corresponding author:**
Dr. Balaji Vijayam
Department of Diabetology, Dr. V Balaji Diabetes Care and Research Institute, Aminjikarai, Chennai, Tamil Nadu, India
Email:
balajivijayam@gmail.com

Maternal diabetes screening and diagnosis criteria

At the initial antenatal appointment, women at risk of preexisting diabetes should be assessed using the American Diabetes Association's diagnostic criteria for non-pregnant persons. Early screening is recommended if your BMI is 25 kg per m2 or more, and you have another risk factor [6]. The United States Preventive Services Task Force amended its 2008 statement in 2014, recommending that asymptomatic pregnant women be tested for GDM after 24 weeks of pregnancy. In the United States, most doctors utilise a two-step strategy, first with a 50-g non fasting oral glucose challenge test at 24 to 28 weeks and then a 100-g fasting test for women who have a positive screening result [7]. Alternatively, Clinicians take a one step Diabetes in Pregnancy Study Group India (DIPSI) method and perform simply a 75-g two hour fasting oral glucose tolerance test [7-9]. The DIPSI approach of antenatal GDM screening has been demonstrated to be straightforward, cost effective, easy to use, patient friendly, and convenient. When comparing the findings to the gold standard of the International Association of Diabetes and Pregnancy Study Group (IADPSG), DIPSI shows high specificity and acceptable sensitivity [10].

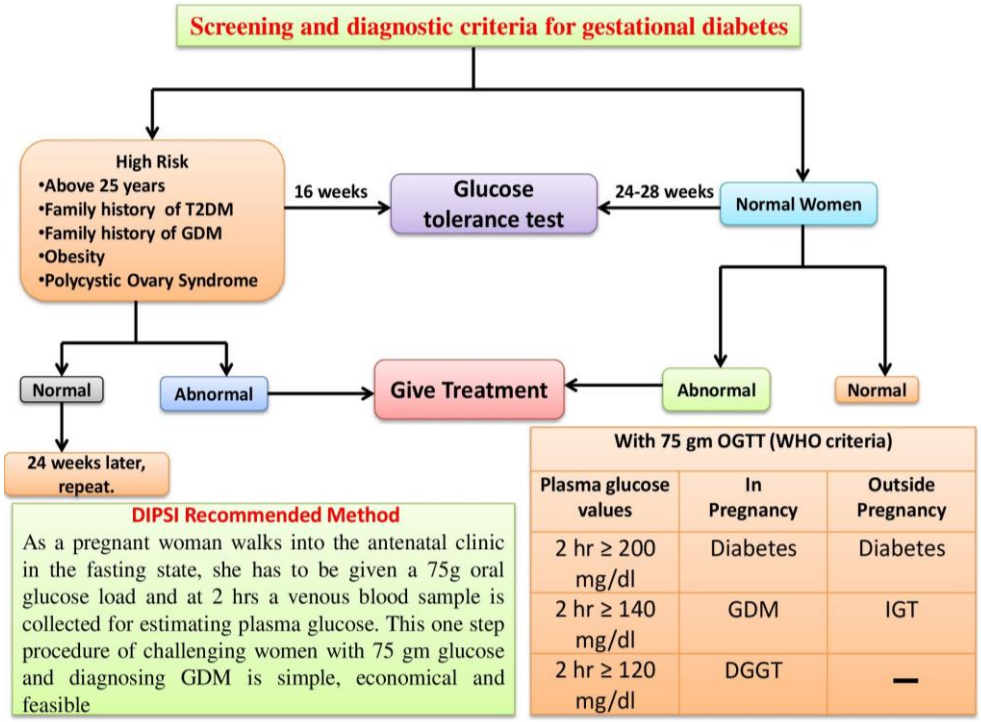

Figure 1: Maternal diabetes screening and diagnosis criteria

Therapeutic management of gestational diabetes

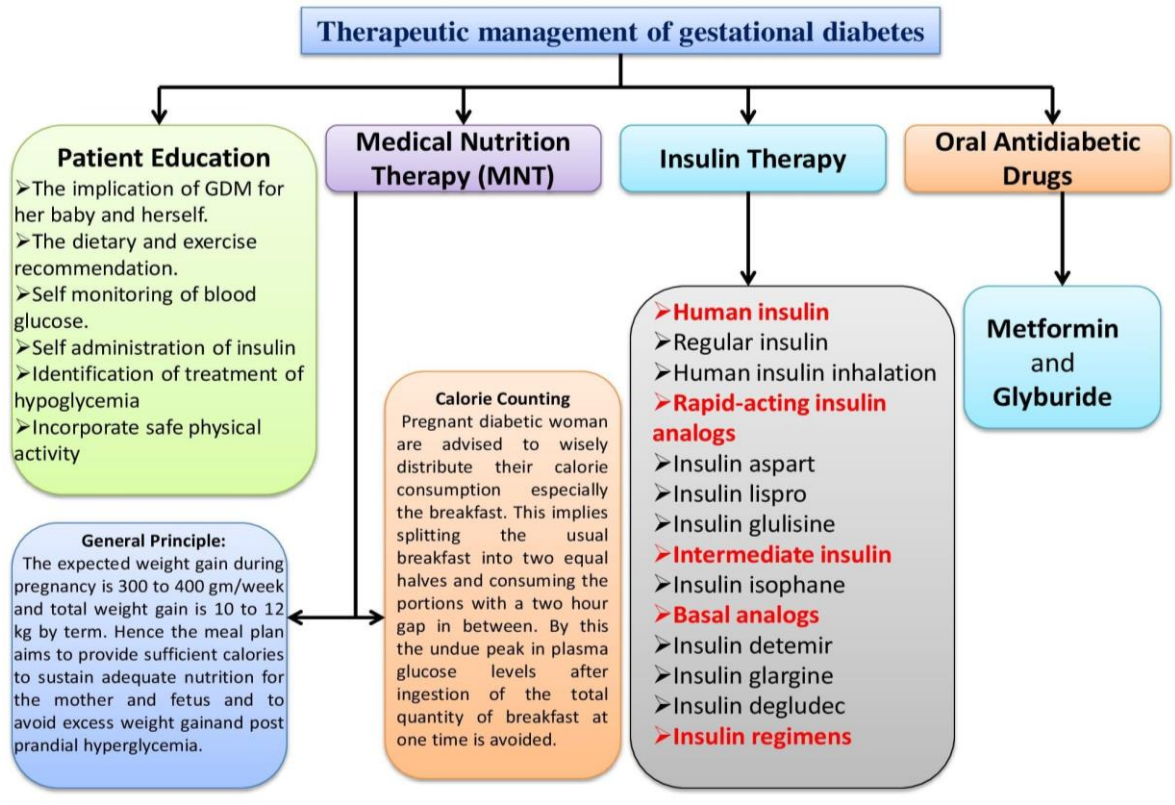

Figure 2: Therapeutic management of gestational diabetes mellitus

Medical Nutrition Therapy (MNT)

General Principles

The meal plan should include enough calories and nutrients to suit the demands of the pregnant woman. Weight gain throughout pregnancy is predicted to be 300 to 400 grammes per week, with a total weight rise of 10 to 12 kg by term. As a result, the meal plan seeks to supply enough calories for the mother and fetus to maintain adequate nutrition while avoiding excessive weight gain and postprandial hyperglycemia. Calorie needs vary depending on age, activity, pre-pregnancy weight, and pregnancy stage. It is necessary to consume approximately 30 to 40 kcal/kg ideal body weight or a 300 kcal/day increase over the basal need. Obesity treatment is not recommended during pregnancy. Admission is required for underweight subjects or those who are not gaining weight as predicted, especially in the third trimester, to guarantee appropriate nutrition and prevent low birth weight newborns [3].

Calorie Counting

Pregnant diabetic women are recommended to distribute their calorie intake appropriately, particularly at breakfast, as part of their medical nutrition therapy. This entails dividing a typical meal into two equal halves and eating each half separately over a two-hour period. This prevents an unnecessarily high peak in plasma glucose levels after eating the entire breakfast at once. For example, if 4 idlis / chappathi / slices of bread are consumed for breakfast at 8 a.m. and two hours' plasma glucose at 10 a.m. is 140 mg, the same quantity divided into two equal portions, one at 8 a.m. and the remaining after 10 a.m., results in a 20 – 30 mg reduction in two hours post prandial plasma glucose at 10 a.m. Breakfast has a higher plasma glucose peaking rate than lunch and dinner, thus this suggestion is scientifically sound. In addition, insulin secretion is higher at breakfast than at lunch or dinner in a healthy person [11]. GDM mothers have a shortage in first-phase insulin production, and the challenge of eating a large amount of food at once should be reduced to compensate for this insulin deficiency.

Oral anti diabetic medication

Metformin

National Institute for Health and Care Excellence (NICE) guidelines indicate that persons with GDM take metformin if lifestyle changes fail to meet the glycemic target [12]. Metformin is a category B medicine, meaning there is no indication of toxicity or teratogenicity in animals or fetuses. Metformin appears to be a safe alternative to insulin in the treatment of GDM, however it does cross the placenta and may be present in higher concentrations in the foetal circulation than in the maternal circulation [13]. Metformin exposure in pregnancy was investigated in a series of studies. There is no evidence that metformin has an effect on the fetus's early motor, linguistic, social, metabolic, or neurodevelopmental outcomes [14,15], but long-term follow-up studies are needed. Two systematic evaluations found that metformin was linked to a decreased risk of newborn hypoglycemia and less maternal weight gain than insulin [16,17]. Almost half of GDM patients treated with metformin need insulin to achieve satisfactory glucose control [18]. Metformin is still an option as a second line treatment for GDM women who refuse or are unable to safely inject insulin.

Glyburide

Glyburide (glibenclamide) has been linked to higher birth weight, macrosomia, and neonatal hypoglycemia when compared to insulin [17], and it penetrates the placenta similarly to metformin [19]. Glyburide medication should not be used as a first- or second-line treatment during pregnancy, but it can be used as a third-line treatment if insulin is refused and metformin is either refused or insufficient to achieve targeted glycemic control [13]. There is no human evidence that any other antihyperglycemic medicine can be used to treat GDM (DPP-4 inhibitors, GLP-1 receptor agonists or SGLT2 inhibitors) [13]. Oral treatment patients should be aware that they will cross the placenta. There have been no negative effects on the fetus, but long-term researches are needed [20].

Insulin Therapy

Insulin is the first-line antihyperglycemic medication for GDM. No evidence has been found that any of the currently available insulins can pass through the placenta [20]. Insulin medication should be started if glycemic control is not obtained after 1–2 weeks of lifestyle management [13]. Insulin is still the gold standard treatment for GDM women who don't achieve their glycemic goals with lifestyle changes, as various guidelines prescribe. Insulin use is associated with lower fetal and maternal morbidity [21,22].

Human Insulin

Regular insulin

Regular insulin (U-100, U-500) is mealtime insulin that covers postprandial hyperglycemia. It takes about 30 minutes (10–75 minutes) to begin, 3 hours (2.5–5 hours) to reach peak effect, and about 8 hours to complete the effect (up to 24 hours for U500). Pregnancy category B according to the FDA [23].

Human insulin inhalation

Human insulin inhalation (nasal insulin) is similar to insulin lispro unit for unit. It has a 15-minute onset period and a 50-minute peak activity time. The action lasts nearly two hours. Bronchospasms in chronic lung disease patients are a boxed warning for inhaled human insulin. It's a medicine classified as a category C during pregnancy [23].

Rabid acting insulin analogs

Insulin aspart, made by the yeast *Saccharomyces cerevisiae*, is another human insulin analogue. 5–10 minutes before a meal, take Aspart. It can be used for numerous subcutaneous injections or in insulin pumps, among other things. It has a peak action time of 40–50 minutes and a 3–5-hour action duration. Insulin aspart causes significantly less hypoglycemia than normal insulin [24]. The FDA pregnancy category is B, which means it is safe to use during pregnancy. When compared to human insulin, data from two clinical trials (349 exposed pregnancies) show no negative effects on pregnancy or fetal/neonatal health [25].

Insulin apart

Insulin aspart was launched to the market with the excipients nicotinamide and L-arginine hydrochloride to improve absorption. Despite the fact that the active molecule is identical, there is no information about its use during pregnancy or its excretion in human milk [23].

Insulin lispro

Insulin lispro (U-100 and U-200) is an *escherichia coli* produced derivative of insulin. It takes 10–15 minutes to start working. Its activity lasts 3–4 hours and peaks at 30–90 minutes. Insulin pumps and pens can also benefit from it. The bioequivalence and pharmacokinetics of U-100 and U-200 formulations are the same. The FDA pregnancy category is B, which means it's safe to take while pregnant. The results of a large number of exposed pregnancies show that there is no negative impact on pregnancy or fetal/neonatal health [23].

Insulin glulisine

Insulin glulisine (glulisine insulin) is recombinant insulin. *Escherichia coli* are used to create it. It works in around 10–15 minutes. It takes 55 minutes to install at its peak, and it takes 4–5 hours to complete. Although it is compatible with some insulin pumps, it is not compatible with all brands. The FDA classifies pregnancy as a C. In this scenario,

caution should be exercised when administering glulisine to pregnant women, with the medicine being used only if the potential benefit outweighs the danger to the fetus. The use of insulin glulisine in pregnant women has yielded minimal results (fewer than 300 pregnancy outcomes) [23].

Intermediate insulin

Insulin isophane

Intermediate-acting insulin is known as insulin isophane (NPH). It's also made in *Escherichia coli.* It's a liquid suspension that's identical to human insulin. It takes up to 2 hours to take effect, with an average peak time of 4 hours. NPH has a complete activity time of 10–20 hours. There are no limits on using it during pregnancy or gestational diabetes; it does not penetrate the placental barrier. The FDA pregnancy classification is B [23].

Basal analogs

Insulin determir

Insulin detemir (U-100) is a long-acting insulin analogue made by *Saccharomyces cerevisiae.* Detemir insulin does not have a distinct peak and can last up to 24 hours, with a 1–2-hour duration to action. In pregnant women, detemir insulin causes less hypoglycemia than NPH [25]. The FDA's pregnancy category is B, which means it's safe to use while pregnant. The potential benefit must be weighed against the possibility of a higher risk of complications during pregnancy. There was no maternal or fetal harm in another 250 pregnant women who were given insulin detemir [23]. When compared to isophane insulin, one clinical trial reveals a probable increased risk of very bad maternal outcomes, but data from another 250 outcomes from pregnant women exposed to insulin detemir suggest no maternal or neonatal toxicity.

Insulin glargine

Insulin glargine (U-100) is a long-acting insulin analogue made in *Escherichia coli*. The acidic solution is neutralised in subcutaneous tissue, resulting in the formation of micro precipitates. Over the course of 24 hours, these micro precipitates gradually release glargine. It has a 1–2 hour start of effect, a 24-hour duration of activity, and no peak. Previously, the FDA pregnancy category was C, meaning there was no human pregnancy data. If necessary, may be considered during pregnancy, although no clinical evidence on exposed pregnancies from controlled clinical research is currently available. There were no deleterious effects on pregnancy, deformities, or feto-neonatal toxicity based on data from pregnant women (between 300 and 1000 pregnancy outcomes) [23].

Insulin degludec

Long-acting insulin glargine (U-300) although it does not have the same bioequivalence as glargine U-100, it has the similar structure and was approved in February 2015. *Escherichia coli* are used to make Glargine U-300. It reaches its maximal action after 6 hours and lasts for 24 hours. After 16–36 hours, the serum concentrations drop. Once a day, it is taken. Until now, no clinical experience with insulin glargine (U-300) in pregnant women has been reported [23].

Insulin regimen

Several insulin regimens have been designed to treat hyperglycemia, but multiple daily injections (MDI) is by far the most effective and adaptable [26]. Based on the blood glucose profile, the insulin regimen should be selected. Basal insulin should be started if fasting glycemia is higher than 90–95 mg/dl. It could be a long-acting insulin analogue or Hagedorn, a neutral protamine. The basal insulin dose is 0.2 units/kg/day and can be estimated based on weight. If hyperglycemia occurs after a meal, rapid-acting or regular insulin should be started prior to the meal. When both fasting and postprandial glycemia are raised, MDI: 3 mealtime insulin and basal insulin are required. The total daily insulin demand in the first trimester is 0.7 units/kg/day, 0.8 units/kg/day in the second trimester, and 0.9–1.0 units/kg/day in the third trimester. This may or may not apply to all pregnancies. The total insulin dose in pregestational diabetes is usually up to twice that of GDM. To combat the combined IR of pregnancy and obesity, the initial dosages of insulin can be raised to 1.5–2.0 units/kg in the event of morbid obesity [27]. The calculated total daily dose of insulin for type 1 and type 2 diabetes should be split into two parts: 50% as basal insulin before bedtime, and 50% divided into three meals and administered as rapid-acting, or regular insulin before meals. Insulin doses must be adjusted on a regular basis; therefore, self-monitoring blood glucose is critical. In pregnancy, rapid-acting insulin analogues are favoured over conventional insulin because they reduce the risk of hypoglycemia and improve postprandial blood glucose control [22,26].

Monitoring Glycemic Control

Glycated hemoglobin (HbA1c)

HA1c is a glycated haemoglobin measurement that is used as a routine indicator of blood glucose control over the last three months. It could pave the door for earlier detection of women at risk of developing GDM. In the non-pregnant population, worldwide recommendations (American Diabetic Association and International Expert Committee on Diabetes) recommend using HA1c for diabetes diagnosis rather than fasting or postprandial plasma glucose measurements [27]. Furthermore, if HbA1c testing is done early in pregnancy, it may be useful in detecting diabetes that has already developed [28-30]. HbA1c values in women with GDM have been found to be higher in a number of studies [31-34]. In addition, high HbA1c levels during pregnancy have been linked to poor neonatal outcomes [35]. HbA1c's reliability and accuracy in diagnosing GDM have been demonstrated in numerous researches recently. While some studies have found that HbA1c is unreliable in detecting GDM [36], others have found that it is reliable in diagnosing GDM [34]. If glucose intolerance is discovered early in pregnancy, the HbA1c level can assist distinguish between a pre-gestational diabetic and a gestational diabetic. She is most likely pre-diabetic if her HbA1c level is more than 6%. HbA1c can be used to assess glucose control during pregnancy, but not for day-to-day management. The amount of HbA1c in the blood can be used as a prognostic indicator [3].

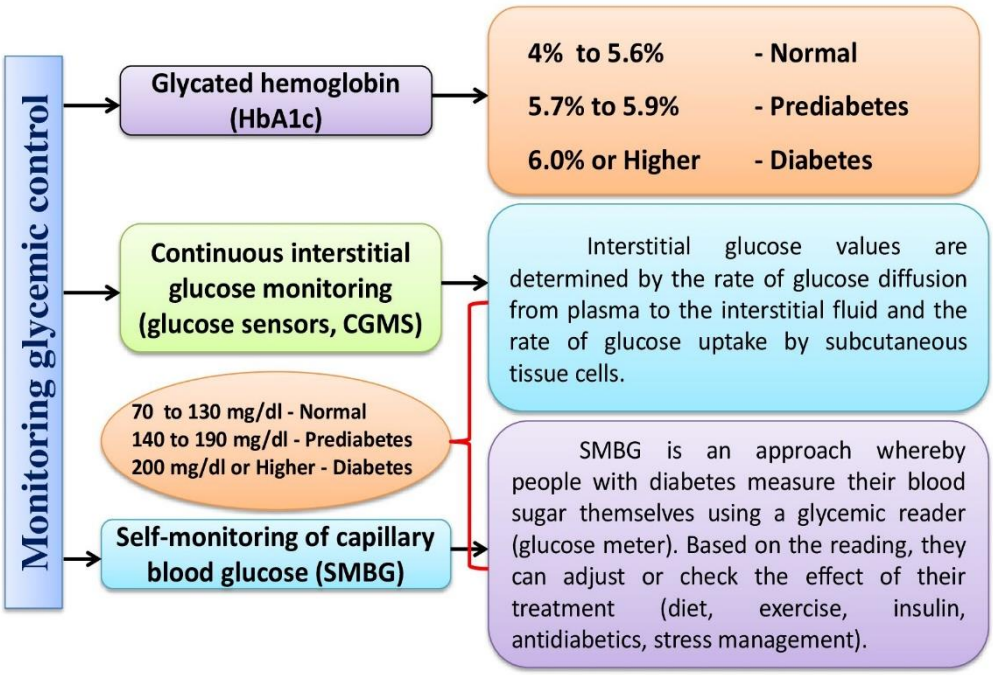

Figure 3: Monitoring glycemic control

Self-monitoring of capillary blood glucose (SMBG)

Self-monitoring of blood glucose (SMBG) is a useful method for managing diabetes during pregnancy. However, knowing the applications and limitations of SMBG in pregnant women is necessary for proper deployment. SMBG is an essential component of routine diabetic treatment [37]. It enables pregnant women and their healthcare professionals to decide the most effective therapy method for controlling glucose levels and reducing the risk of diabetic complications. The number of daily tests required to appropriately monitor blood glucose levels varies by patient and is determined by the practitioner's advice [38]. Furthermore, because it enables for early detection of hypoglycemia symptoms, SMBG makes patients feel more confident and comfortable utilising insulin [39]. In pregnant women who are not using insulin, the indications for and frequency of SMBG must be tailored to the individual. Patients must be taught to match their food intake to the frequency, intensity, and timing of their physical activity. It's uncertain whether SMBG alone improves glycemic control in type 2 diabetes patients who aren't taking insulin. There is also no data in women with GDM [40].

Continuous glucose monitoring in the interstitial space (glucose sensors, CGMS)

Women with GDM can benefit from continuous glucose monitoring to track their progress and adapt their diabetic treatment. Intermittent blood glucose monitoring may miss high postprandial blood glucose levels and nocturnal hypoglycemia episodes. To evaluate the clinical consequences of this new monitoring technology, a substantial prospective study on maternal and neonatal outcome is needed.

CONCLUSION

In an obesogenic environment, the prevalence of GDM has virtually doubled in the last decade. Perinatal morbidity and mortality are twice as likely with GDM. GDM should be checked in all pregnant women, and the most common method is a single-step screening. Although lifestyle changes are the first-line treatment, medication will be required for approximately one in every four women. Although insulin is typically the first-line pharmacotherapy, more research into the efficacy and safety of oral medicines, particularly metformin, is needed. Antenatal testing is usually started in the late third trimester, and delivery is usually advised by the 39th week. Following up on their 75-g oral GTT findings, all women with GDM should be tested for glucose intolerance and T2DM in the postpartum period.

To summarise, GDM poses a significant short- and long-term problem. GDM identification and therapy are definitely beneficial in improving outcomes in the immediate pregnant environment. The links to mothers' and newborns' long-term health are also obvious, but the best therapeutic option has yet to be determined. This is a worldwide issue! To lower the noncommunicable disease (NCD) burden of GDM as manifest for affected mothers and their offspring, prevention and intervention are critically needed both during and after pregnancy. Despite advances in this field, the actual use of proven solutions is still limited.

Conflicts of interest

None declared.

Financial support

None declared.

REFERENCES

1. American Diabetes Association. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes—2018. Diabetes Care. 2018;41:13–27.
2. Federation ID. IDF diabetes atlas 8th edition. International diabetes federation. 2017:905-11.
3. Seshiah VSB, Das AK, Balaji V, Shah S, Banerjee S, Muruganathan A, *et al.* Diagnosis and management of gestational diabetes mellitus: Indian guidelines. editors. Munjal YP, Sharma SK, Agarwal AK, Gupta P, Kamath SA, Nadkar MY, et al. API Textbook of Medicine. Mumbai: JayPee Brothers. 2013:201–4.
4. Feig DS, Moses RG. Metformin Therapy during Pregnancy Good for the goose and good for the gosling too? Diabetes Care. 2011;34:2329–30.
5. Camelo Castillo W, Boggess K, Stürmer T, Brookhart MA, Benjamin DK, Jonsson Funk M, *et al.* Association of Adverse Pregnancy Outcomes with Glyburide vs Insulin inWomen with Gestational Diabetes. JAMA Pediatr. 2015;169:452–58.
6. American Diabetes Association. Standards of medical care in diabetes—2014. Diabetes Care. 2014;37(1):14-80.
7. Moyer VA. U.S. Preventive Services Task Force. Screen¬ing for gestational diabetes mellitus: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2014;160(6):414-20.
8. Hillier TA, Ogasawara KK, Pedula KL, Vesco KK. Mark¬edly different rates of incident insulin treatment based on universal gestational

diabetes mellitus screening in a diverse HMO population. Am J Obstet Gynecol. 2013;209(5): 440.e1-440.e9.
9. Carpenter MW, Coustan DR. Criteria for screening tests for gestational diabetes. Am J Obstet Gynecol. 1982;144(7): 768-73.
10. Rudra S, Yadav A. Efficacy of diabetes in pregnancy study group India as a diagnostic tool for gestational diabetes mellitus in a rural setup in North India. Journal of SAFOG (South Asian Federation of Obstetrics and Gynaecology). 2019;11(6):349-52.
11. Polonsky KS, Given BD, Van Cauter E. Twenty-four-hour profiles and pulsatile patterns of insulin secretion in normal and obese subjects. The Journal of clinical investigation. 1988;81(2):442-8.
12. Diabetes in Pregnancy: Management from Preconception to the Postnatal Period NICE Guideline. 2015.
13. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada: Clinical practice guidelines for the prevention and management of diabetes in Canada. Canadian Journal of Diabetes. 2018;42 (1):1-325.
14. Ijäs H, Vääräsmäki M, Saarela T, Keravuo R, Raudaskoski T. A follow-up of a randomised study of metformin and insulin in gestational diabetes mellitus: growth and development of the children at the age of 18 months. BJOG: An International Journal of Obstetrics & Gynaecology. 2015;122(7):994-1000.
15. Rowan JA, Rush EC, Obolonkin V, Battin M, Wouldes T, Hague WM, *et al*. Metformin in gestational diabetes: the offspring follow-up (MiG TOFU) body composition at 2 years of age. Diabetes care. 2011;34(10):2279-84.
16. Balsells M, García-Patterson A, Sola I, Roqué M, Gich I, Corcoy R, *et al*. Glibenclamide, fmetformin, and insulin for the treatment of gestational diabetes: A systematic review and meta-analysis. BMJ. 2015;350:102.
17. Jiang Y-F, Chen X-Y, Ding T, Wang X-F, Zhu Z-N, Su S-W, *et al*. Comparative efficacy and safety of OADs in management of GDM: Network metaanalysis of randomized controlled trials.The Journal of Clinical Endocrinology and Metabolism. 2015;100:2071-80.
18. Rowan JA, Hague WM, Gao W, Battin MR, Moore MP. Metformin versus insulin for the treatment of gestational diabetes. New England Journal of Medicine. 2008;358(19):2003-15.
19. Hebert MF, Ma X, Naraharisetti SB, Krudys KM, Umans JG, Hankins GD, *et al*. Are we optimizing gestational diabetes treatment with glyburide? The pharmacologic basis for better clinical practice. Clinical Pharmacology & Therapeutics. 2009;85(6):607-14.
20. American Diabetes Association. Management of diabetes in pregnancy: Standards of medical care in diabetes. Diabetes Care. 2018;41(1):137-43.
21. Hadden DR. When and how to start insulin treatment in gestational diabetes: A UK perspective. Diabetic Medicine. 2001;18:960-64.
22. Mecacci F, Carignani L, Cioni R, Bartoli E, Parretti E, La Torre P, *et al*. Maternal metabolic control and perinatal outcome in women with gestational diabetes treated with regular or lispro insulin: comparison with non-diabetic pregnant women. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2003;111(1):19-24.
23. European Medicines Agency.European Medicines Agency. Available from: http://www.ema.europa.eu/ema/
24. Mathiesen ER, Kinsley B, Amiel SA, Heller S, McCance D, Duran S, *et al*. Insulin Aspart Pregnancy Study Group. Maternal glycemic control and hypoglycemia in type 1 diabetic pregnancy: a randomized trial of insulin aspart versus human insulin in 322 pregnant women. Diabetes care. 2007;30(4):771-6.
25. Herrera KM, Rosenn BM, Foroutan J, Bimson BE, Al Ibraheemi Z, Moshier EL, *et al*. Randomized controlled trial of insulin detemir versus NPH for the treatment of pregnant women with diabetes. American journal of obstetrics and gynecology. 2015;213(3):426-e1.
26. Pettitt DJ, Ospina P, Kolaczynski JW, Jovanovic L. Comparison of an insulin analog, insulin aspart, and regular human insulin with no insulin in gestational diabetes mellitus. Diabetes care. 2003;26(1):183-6.
27. Jovanovic L. Role of diet and insulin treatment of diabetes in pregnancy. Clinical Obstetrics and Gynecology. 2000;43:46-55.
28. International Expert Committee TIE. International Expert Committee report on the role of the A1C assay in the diagnosis of diabetes. Diabetes Care. 2009;32(7):1327-34.
29. Hughes RCE, Moore MP, Gullam JE, Mohamed K, Rowan J. An early pregnancy HbA1c≥5.9% (41mmol/mol) is optimal for detecting diabetes and identifies women at increased risk of adverse pregnancy outcomes. Diabetes Care. 2014;37(11).2953–59.
30. Gold AE, Reilly R, Little J, Walker JD. The effect of glycemic control in the pre-conception period and early pregnancy on birth weight in women with IDDM. Diabetes Care. 1998;21(4):535-38.
31. Kerssen A, de Valk HW, Visser GHA. Sibling birthweight as a predictor of macrosomia in women with type 1 diabetes. Diabetologia. 2005;48(9):1743-48.
32. Renz PB, Cavagnolli G, Weinert LS, Silveiro SP, Camargo JL. HbA1c test as a tool in the diagnosis of gestational diabetes mellitus. PLoS One. 2015;10(8):e0135989.
33. 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.
34. Kwon SS, Kwon JY, Park YW, Kim YH, Lim JB. HbA1c for diagnosis and prognosis of gestational diabetes mellitus. Diabetes Res Clin Pract. 2015;110(1):38-43.
35. Evers IM, De Valk HW, Mol BW, Ter Braak EW, Visser GHA. Macrosomia despite good glycaemic control in Type I diabetic pregnancy; results of a nationwide study in The Netherlands. Diabetologia. 2002;45(11):1484-1489.
36. Sevket O, Sevket A, Ozel A, Dansuk R, Kelekci S. The use of HbA1c as an aid in the diagnosis of gestational diabetes mellitus. J Obstet Gynaecol (Lahore). 2014;34(8):690-92.
37. Bergenstal RM, Gavin JR III: Global consensus conference on glucose monitoring panel. the role of self-monitoring of blood glucose in the care of people with diabetes: report of a global consensus conference. Am J Med. 2005;118(9A):1–6.
38. National Diabetes Information Clearing House: A Service of National Institute of Diabetes and Digestive and Kidney Disease. National Diabetes Statistics; 2003 [http://diabetes.niddk.nih.gov/dm/pubs/statistics].
39. American Diabetes Association: Testing of glycemia in diabetes. Diabetes Care. 2003;26:106–108.
40. Welschen LM, Bloemendal E, Nijpels G, Dekker JM, Heine RJ, Stalman WA, Bouter LM: Self-monitoring of blood glucose in patients with type 2 diabetes who are not using insulin: a systematic review. Diabetes Care. 2005;28:1510–17.