



Gestational Diabetes

MCT2D

May 1st, 2026

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Disclosures

I have no conflicts of interest.

Learning Objectives

1. Describe Scope and Causes of GDM
2. Review Screening and Diagnostic Criteria for GDM
3. Review Treatment Targets and Goals in GDM
4. Describe Risks of GDM
5. Discuss Treatment Options in GDM
6. Describe Postpartum Care after GDM

Initial Survey of Physician Practices related to GDM

1 Do you provide obstetric care? Yes No

2 Do you provide medical management for gestational diabetes? Yes No

Case: GDM

37 yo G2P1001 @ 26w0d c Hashimoto's thyroiditis calls to report a new diagnosis of GDM.

OBHx: NSVD at 40 wks 5 yrs ago, No GDM/GHTN, BW 3458 gm (7lbs10oz)

FH: Father c DM2 diagnosed in his mid 60s. Mother A+W in mid 60s.

2 Older sisters- no GDM, no DM. 1 c Celiac disease

SH: Married, No Substance use. Accountant.

Meds: PNV , Levothyroxine 125 mcg daily TSH 1.2

Case: GDM – Cont.

Labs 6 mos ago- A1C 5.5% Normal LFTs

Her midwife is referring her to Maternal Fetal Medicine.

She wants to discuss with you first!

	Weight	BMI
Prior to last Pregnancy 5 yrs ago	160 lbs	26
Prior to this Pregnancy 7 mos ago	190 lbs	30.7
Now	220 lbs	35.5

75 gm IADPSG- one step	
Fasting	118 (mg/dl)
1 hour	236 (mg/dl)
2 hour	197 (mg/dl)

“Neither of my sisters had GDM.”

Patients often feel really isolated by this diagnosis. Helping them realize they are not alone, and that this is common can be reassuring to some.

What can you tell her?

Select all that apply.

- A. Gestational Diabetes complicates ~2-4% of pregnancies in the US.
- B. Gestational Diabetes complicates ~5-7% of pregnancies in the US.
- C. Gestational Diabetes complicates ~8-12% of pregnancies in the US.
- D. Gestational Diabetes rates have almost doubled in the last 30 years.
- E. Gestational Diabetes rates have more than tripled in the last 30yrs.
- F. Her risk factors include Older age, Sedentary Lifestyle, Rapid Maternal Weight Gain, Obesity, Family history of Type 2 Diabetes.

Contribution of Comorbidities and Pregnancy Complications to Severe Maternal Morbidity in the United States

Kawakita, Tetsuya; Jones, Sora A.; Furukawa, Natsume; Saade, George
Obstetrics & Gynecology : February 26, 2026
doi: 10.1097/AOG.0000000000006214

>25 million pregnancies (60% of US) between 2016-2022 in AHRQ's Nationwide Readmissions Database.
GDM increased from 3% to 8-9%.

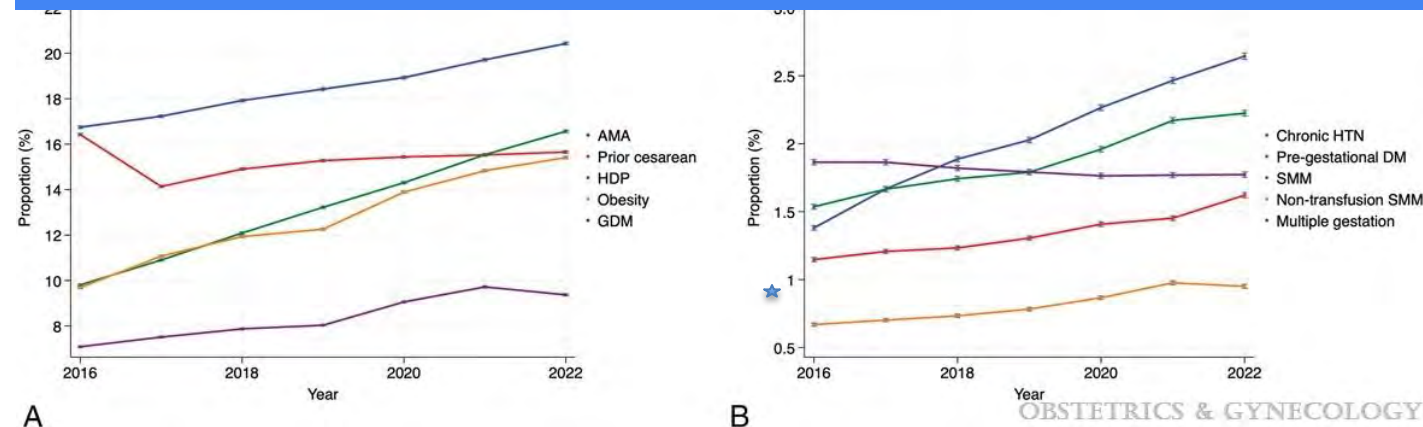


Fig. 2. Temporal trends in severe maternal morbidity (SMM) and maternal clinical characteristics among delivery hospitalizations, 2016–2022. A. Trends in maternal demographic and clinical characteristics, including advanced maternal age (AMA), prior cesarean delivery, hypertensive disorders of pregnancy (HDP), obesity, and gestational diabetes mellitus (GDM). B. Trends in SMM, nontransfusion SMM, chronic hypertension (HTN), pregestational diabetes, and multiple gestation. Between 2016 and 2022, the prevalence of SMM, nontransfusion SMM, AMA, obesity, pregestational diabetes, GDM, chronic HTN, and HDP increased significantly (all $P < .001$), whereas the prevalence of prior cesarean delivery remained relatively stable ($P = .14$). The prevalence of multiple gestation decreased significantly ($P < .001$).

Risk factors for GDM

1. Overweight and Obesity
2. Rapid Maternal Weight Gain
3. Previous history of GDM
4. Prediabetes
5. PCOS
6. Family history of Type 2 diabetes
7. Previous history of Macrosomia
8. Sedentary Lifestyle
9. HTN
10. Twin pregnancy
11. Etc.



Case: GDM

She says they used a new 1-step OGTT this time, unlike last pregnancy. She read that more GDM is diagnosed with the new diagnostic criteria.

Is this why she has GDM now?

75 gm IADPSG- one step	
Fasting	118 (mg/dl)
1 hour	236 (mg/dl)
2 hour	197 (mg/dl)

What can you tell her?

Select all that apply.

- A. The use of IADPSG criteria increases the rate of GDM diagnosis.
- B. The use of IADPSG criteria decreases the rate of GDM diagnosis.
- C. She would have met criteria regardless of which criteria were used.
- D. She might not have been diagnosed if older diagnostic criteria were used.
- E. IADPSG criteria are based on prediction of neonatal outcomes, whereas older criteria were based on prediction of maternal risk of developing Type 2 diabetes.
- F. It is not clear if IADPSG criteria are superior or not to Carpenter Coustan criteria.

Gestational Diabetes Criteria

	O'Sullivan and Mahan 1964	National Diabetes Data Group 1979	Carpenter & Coustan 1982	World Health Organization (prior to 2013, now IADPSG)	IADPSG criteria 2010	NICE 2015
	Whole blood	Plasma	Plasma	Plasma	Plasma	Plasma
	2step: 50 gm glucose load test-1 abnl value 100gm-2 abnormal values			75gm- 1 abnl value		
Fasting (mg/dl)	90	105	95	126	92	101
1 hour	165	190	180	x	180	x
2 hour	145	165	155	200	153	140
3 hour	125	145	140	x	x	x
			ADA ACOG* USPSTF		ADA* ACOG USPSTF	

ACOG Practice bulletin NO 30 Sept 2001; Obstet Gynecol 2001; 98(3): 525-538.

1. Diabetes Care. 2012 Jan;35 Suppl 1:S11-63. doi: 10.2337/dc12-s011

Gestational Diabetes – Evolving Diagnostic Criteria

Hyperglycemia and Adverse Pregnancy Outcomes (HAPO)

- 25,505 women at 15 centers in 9 countries
- 75 gm OGTT between 24 and 32 wks
- ~8.6% were excluded due to fasting > 105 mg/dl or 2hpp> 200 mg/dl

The HAPO Study Cooperative Research Group NEJM 2008;358:1991-2002.

Your patient still can't believe that she has GDM.

She wants to know why?
What can you tell her?

Select all that apply.

- A. Insulin Resistance increases steadily beginning around 8 weeks gestation.
- B. Insulin Resistance increases steadily beginning around 20 weeks gestation.
- C. In normal pregnancy, the pancreas increases insulin production to compensate for increased insulin demand.
- D. In pregnancies complicated by GDM, the pancreas is unable to increase insulin production to meet increased demand.

Insulin Resistance in GDM – It's complicated!

↓ **GLP-1** and **GIP**

↑ **TNF- α** and **IL-6**

↑ **Leptin** and ↓ **Adiponectin**

*Human placental lactogen (**hPL**) induce lipolysis, increasing circulating free fatty acids.

*Placental 11 β -hydroxysteroid dehydrogenase type 1 (**11 β -HSD1**) overactivity elevates cortisol levels, which activate glucocorticoid receptors.

Mittal R, Prasad K, Lemos JRN, Arevalo G, Hirani K. Unveiling Gestational Diabetes: An Overview of Pathophysiology and Management. Int J Mol Sci. 2025;26(5). Epub 20250305. doi: 10.3390/ijms26052320. PubMed PMID: 40076938; PubMed Central PMCID: PMCPMC11900321.

Insulin Deficiency – It's also complicated!

“ Gestational diabetes mellitus (GDM) is characterized by an inadequate pancreatic β -cell response to pregnancy-induced insulin resistance, resulting in hyperglycemia.”

↓ pancreatic duodenal homeobox 1 (PDX1) expression,
↑ endoplasmic reticulum stress markers (CHOP, GRP78),
mitochondrial dysfunction leading to ↓ATP production and ↓insulin secretion.

Genetic predisposition to Type 2, but also some unique genetics....

Mittal R, Prasad K, Lemos JRN, Arevalo G, Hirani K. Unveiling Gestational Diabetes: An Overview of Pathophysiology and Management. Int J Mol Sci. 2025;26(5). Epub 20250305. doi: 10.3390/ijms26052320. PubMed PMID: 40076938; PubMed Central PMCID: PMCPMC11900321.

Case: GDM

She now wants to know
“What’s wrong with my
pancreas? Why me?”

37 yo G2P1001 @ 26w0d c Hashimoto’s thyroiditis,
who you follow as a PCP, calls to report a new
diagnosis of GDM.

What might you consider testing for?

Select all that apply.

- A. Screening for Antibodies associated with Type 1 diabetes
- B. Screening for MODY
- C. Screening for Cystic Fibrosis
- D. None of the above

Diabetes – Differential Diagnosis

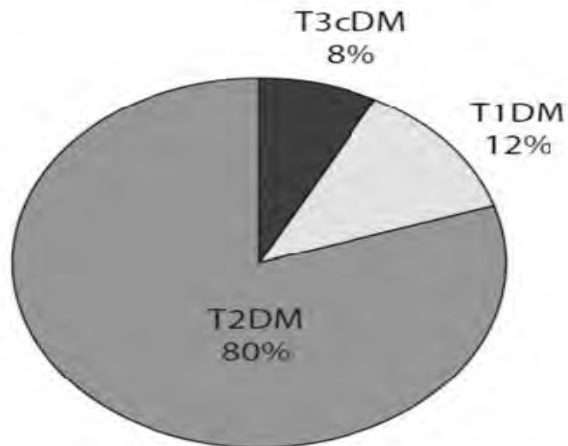
- Type 1 diabetes
 - Autoimmune Polyglandular Syndromes
 - Drugs- Check point inhibitors, etc.
 - Down's syndrome
- Other Autoimmunity
 - POEMS (Peripheral Neuropathy, Organomegaly, Endocrinopathies, Monoclonal Gammopathy, Skin Changes)
 - Type A+B insulin resistance
- Type 3c Diabetes (Pancreas)
 - Pancreatitis
 - Cystic Fibrosis
 - Pancreatic Cancer
 - Hemochromatosis
 - Persistent Neonatal Diabetes (PNDM)
 - Wolfram's disease (DIDMOAD)
 - Monogenic/ Maturity Onset Diabetes of the Young
 - Ketosis Prone Type 2 diabetes

Diabetes – Differential Diagnosis – Cont.

- Endocrinopathies
 - Cushing's
 - Pheochromocytoma
 - Acromegaly
 - Glucagonoma
 - Somatostatinoma
- Brain
 - Leptin deficiency/ resistance
 - POMC or MC4R mutations, etc.
 - Prader-Willi, Bardet-Biedl, etc.
- Medications and Toxins
- Liver disease
 - Hemochromatosis
 - Wilson's disease
 - Hepatitis B/C
- Lipodystrophies
 - Familial and Genetic forms of Lipodystrophy
 - Autoimmune/ Acquired Lipodystrophy

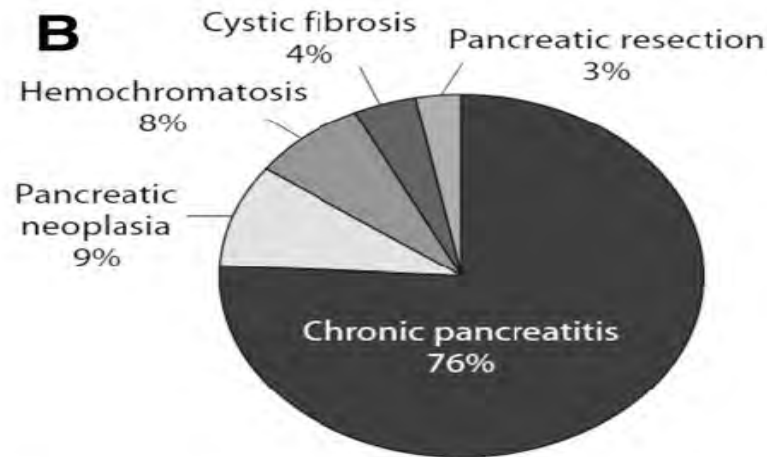
Diabetes – Differential Diagnosis

A



Distribution of T1DM, T2DM and T3cDM

B



Distribution of causes of T3cDM

Diabetes 2017;66:1103–1110 | DOI: 10.2337/db16-1477

MODY and LADA

Maturity Onset Diabetes of the Young

1-2% of GDM is MODY. (6% in Denmark.)

GCK and HNF1A

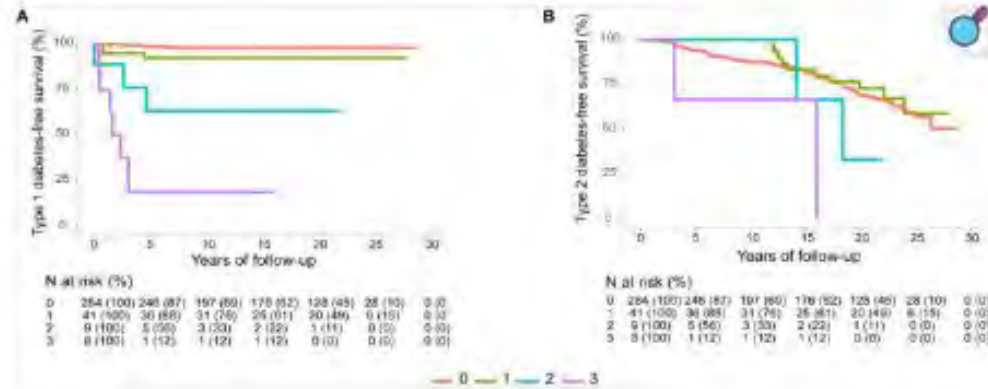
Autoimmune Diabetes

3-12% of patients with GDM will have antibodies for Type 1 diabetes.

Majewska A, Stanirowski P, Wielgoś M, Bomba-Opoń D. Maturity-onset Diabetes of the Young (MODY) in Pregnancy: A Review. *Curr Diabetes Rev.* 2023;19(1):e280122200657. doi: 10.2174/1573399818666220128124043. PubMed PMID: 35088675.1. Gjesing AP, Rui G, Lauenborg J, Have CT, Hollensted M, Andersson E, et al. High Prevalence of Diabetes-Predisposing Variants in MODY Genes Among Danish Women With Gestational Diabetes Mellitus. *J Endocr Soc.* 2017;1(6):681-90. Epub 20170427. doi: 10.1210/js.2017-00040. PubMed PMID: 29264522; PubMed Central PMCID: PMC5686663.1.1. Jørgensen IL, Thuesen ACB, Clausen TD, Ringholm L, Mathiesen ER, Hansen T, et al. Glycemia, management and outcomes of pregnant women with maturity-onset diabetes of the young - a single-center case series. *J Diabetes Complications.* 2026;40(1):109206. Epub 20251024. doi: 10.1016/j.jdiacomp.2025.109206. PubMed PMID: 41187526.

Significance of Antibodies in GDM

391 c GDM. Tested for GAD (6%), IAA(1.2%), ICA (12.5%), IA-2(4.9%).
 IAA did not predict T1D. # of antibodies predicted disease free survival.



(A) Mean (95% CI) T1DM free survival time of women with no autoantibodies, 28.3 (27.9-28.7) years; one positive autoantibody, 26.8 (24.6-29.0) years; two positive autoantibodies, 19.2 (10.5-27.9) years; and three autoantibodies, 6.76 (-1.5-15.1) years. **(B)** Mean (95% CI) T2DM free survival time of women with no autoantibodies, 22.8 (21.7-23.8) years; one positive autoantibody, 24.2 (21.8-26.5) years; two positive autoantibodies, 20.5 (13.5-27.4) years; and three autoantibodies, 11.7 (4.8-18.6) years. Log rank $P < 0.0001$ in both figures.

1. Luro K, Auvinen AM, Auvinen J, Jokelainen J, Järvelä I, Knip M, et al. Autoantibodies predict type 1 diabetes after gestational diabetes - a 23-year cohort study. *Front Endocrinol (Lausanne)*. 2023;14:1286375. Epub 20231220. doi: 10.3389/fendo.2023.1286375. PubMed PMID: 38192417; PubMed Central PMCID: PMCPCMC10773701.

Which of the following is true?

Select one.

- A. GDM increases the risk of obesity, Type 2 diabetes and HTN in offspring.
- B. GDM increases the risk of “Severe Maternal Morbidity” by 20%.
- C. Treatment for GDM reduces the risk of preeclampsia.
- D. Treatment for GDM reduces the risk of obesity in offspring.
- E. All of the above.

Contribution of Comorbidities and Pregnancy Complications to Severe Maternal Morbidity in the United States

Kawakita, Tetsuya; Jones, Sora A.; Furukawa, Natsume; Saade, George

Obstetrics & Gynecology : February 26, 2026

doi: 10.1097/AOG.0000000000006214

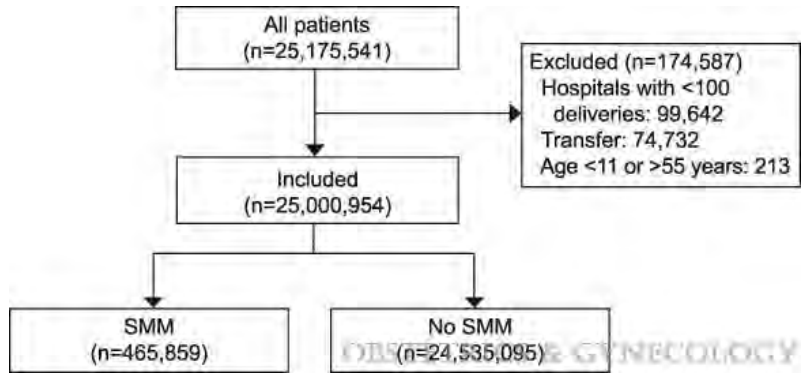


Fig. 1. Weighted cohort diagram. SMM, severe maternal morbidity.

Nationwide Readmissions Database, developed by the Agency for Healthcare Research and Quality. The Nationwide Readmissions Database is an all-payer, deidentified administrative claims database that captures approximately 60% of U.S. hospitalizations 2016-2022.

Severe Maternal Morbidity Indicator
Acute Myocardial Infarction
Aneurysm
Acute Renal Failure
Acute Respiratory Distress Syndrome
Amniotic Fluid Embolism
Cardiac Arrest / Ventricular Fibrillation
Conversion of Cardiac Rhythm
Disseminated Intravascular Coagulation
Blood Transfusion*
Eclampsia
Heart Failure / Arrest During Surgery or Procedure
Puerperal Cerebrovascular Disorders
Pulmonary Edema / Acute Heart Failure
Severe Anesthesia Complications

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Table 2. Maternal Clinical Risk Factors Associated With Severe Maternal Morbidity and Nontransfusion Severe Maternal Morbidity

Risk Factor	Crude OR (95% CI)	Adjusted OR (95% CI)*
SMM		
Advanced maternal age	1.38 (1.36–1.40)	1.41 (1.40–1.43)
Obesity	1.50 (1.47–1.53)	1.37 (1.35–1.39)
Pregestational diabetes	2.62 (2.54–2.69)	2.35 (2.28–2.41)
Gestational diabetes	1.15 (1.13–1.17)	1.11 (1.09–1.13)
Chronic hypertension	3.69 (3.60–3.77)	3.30 (3.23–3.38)
HDP	3.22 (3.18–3.27)	3.09 (3.05–3.13)
Nontransfusion SMM		
Advanced maternal age	1.68 (1.65–1.70)	1.72 (1.69–1.75)
Obesity	1.87 (1.83–1.91)	1.74 (1.70–1.77)
Pregestational diabetes	3.83 (3.70–3.96)	3.50 (3.39–3.62)
Gestational diabetes	1.24 (1.21–1.27)	1.20 (1.17–1.22)
Chronic hypertension	5.84 (5.68–6.00)	5.34 (5.20–5.49)
HDP	4.70 (4.61–4.79)	4.57 (4.48–4.65)

OR, odds ratio; SMM, severe maternal morbidity; HDP, hypertensive disorders of pregnancy.

* Adjusted for hospital characteristics (bed size, teaching status, and ownership), payer type, median household income quartile by ZIP code, multiple gestation, prior cesarean delivery, and calendar year. All analyses incorporated the complex survey design of the National Readmissions Database, with hospitals treated as primary sampling units and variance estimation accounting for within-hospital correlation.

OBSTETRICS & GYNECOLOGY

Adverse Pregnancy Outcomes with Diabetes (US data 2004-2011)

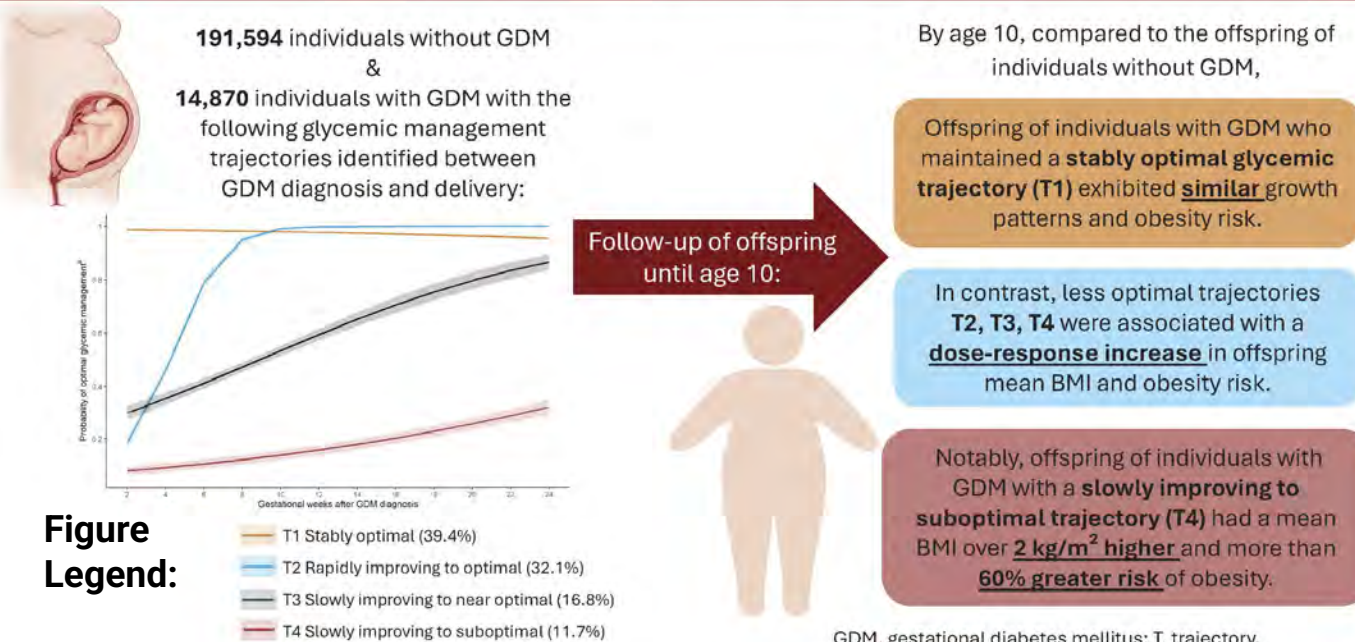
Adverse Event	No Diabetes N=773,751	Type 1 Diabetes N=1125	Type 2 Diabetes N=10136	GDM N=52,848	GDM Progressing N=1932
Any congenital heart defect % RR[95%CI]	3.2%	8.9% 2.80 [2.10,3.73]	6.9% 2.16 [1.92, 2.41]	3.8% 1.19 [1.12,1.26]	6.2% 1.95[1.52,2.50]
Hypertensive disorders of pregnancy % RR[95%CI]	28.2%	47.4% 1.68[1.56,1.81]	55.4% 1.97[1.92,2.01]	38.3% 1.36 [1.34,1.38]	50.1% 1.78 [1.69,1.87]

BOLD- Indicates statistical significance compared to no diabetes. (Modified from Jovanovic 2015.)

Jovanović L, Liang Y, Weng W, Hamilton M, Chen L, Wintfeld N. Trends in the incidence of diabetes, its clinical sequelae, and associated costs in pregnancy. Diabetes/metabolism research and reviews. 2015;31(7):707-16. Epub 2015/04/23. doi: 10.1002/dmrr.2656. PubMed PMID: 25899622; PubMed Central PMCID: PMC4676929.

Early and Sustained Glycemic Management After Gestational Diabetes Diagnosis May Mitigate the Risk of Childhood Obesity in the Offspring

Diabetes Care. Published online March 04, 2026.
doi:10.2337/dc25-1643



**Figure
Legend:**

- T1 Stably optimal (39.4%)
- T2 Rapidly improving to optimal (32.1%)
- T3 Slowly improving to near optimal (16.8%)
- T4 Slowly improving to suboptimal (11.7%)

Date of Download:
4/1/2026

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Association. All rights
reserved, including those
for text and data mining,
AI training, and similar
technologies.

Glycemic Targets and Goals

Targets:

- Fasting glucose < 95 mg/dl
- 1hr postprandial glucose <140 mg/dL
- 2hr postprandial glucose < 120 mg/dL

Metrics: A1C and TIR

Goals:

- A1C < 6.5% (<6.0% in pregnancy)

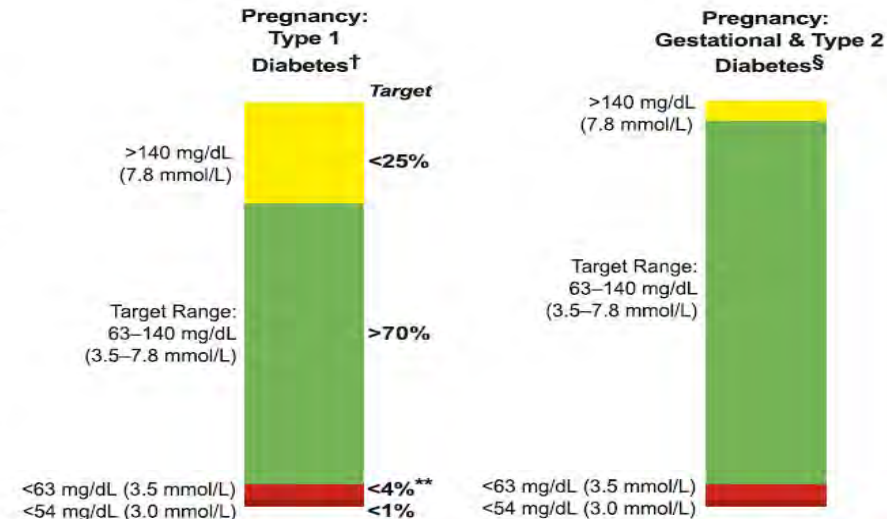
A1C Drops 0.5% on average in pregnancy due to hemodilution etc.

- Pregnancy specific TIR (63-140 mg/dL)
 - >70% in T1DM
 - >90% In T2DM

Clinical Targets for Continuous Glucose Monitoring Data Interpretation: Recommendations from the International Consensus on Time In Range. Battelino et al.

“Because of the lack of evidence on CGM targets for women with gestational diabetes ... or type 2 diabetes in pregnancy, percentages of time in range, below range, and above range have not been included in this report.”

Recent data suggest that even more stringent targets and greater attention to overnight glucose profiles may be required to normalize outcomes in pregnant women with GDM.”

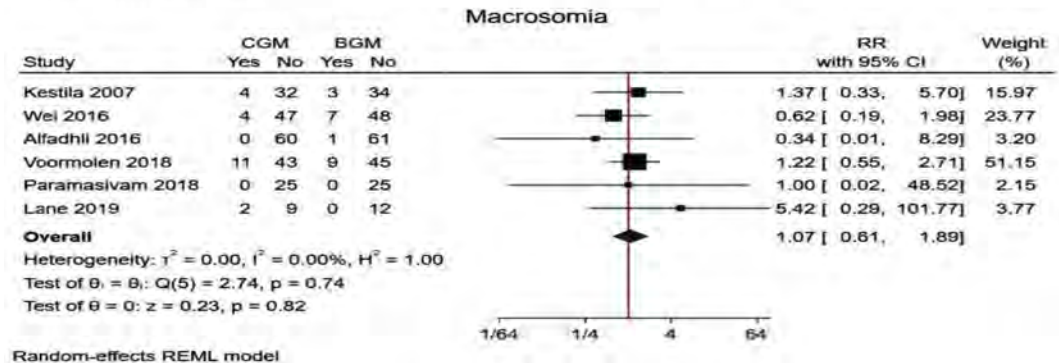
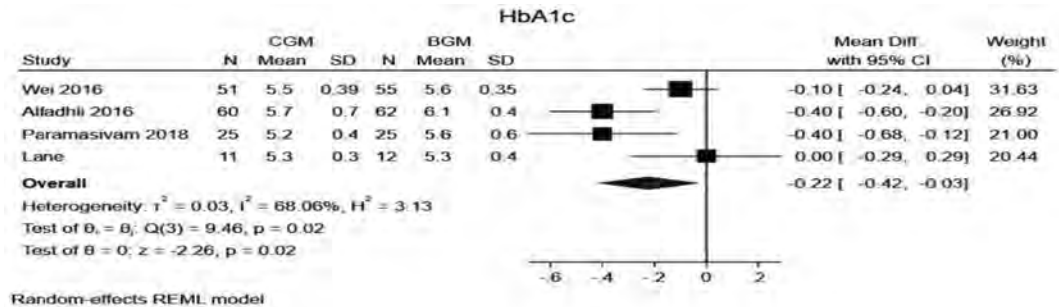


Diabetes Care. 2019 Aug;42(8):1593-1603. doi: 10.2337/dci19-0028. Epub 2019 Jun 8.

Efficacy of continuous glucose monitoring on maternal and neonatal outcomes in gestational diabetes mellitus: a systematic review and meta-analysis of randomized clinical trials

CGM was associated with –

- lower HbA1c levels (mean difference: -0.22; 95%CI -0.42 to -0.03)
- less gestational weight gain (mean difference: -1.17, 95%CI -2.15 to -0.19)
- lower birth weight (mean difference: -116.26, 95%CI -224.70 to -7.81)



Recommendation #7 - Preexisting Diabetes and Pregnancy: An Endocrine Society and European Society of Endocrinology Joint Clinical Practice Guideline.

Wyckoff JA, Lapolla A, Asias-Dinh BD, Barbour LA, Brown FM, Catalano PM, et al. Preexisting Diabetes and Pregnancy: An Endocrine Society and European Society of Endocrinology Joint Clinical Practice Guideline. The Journal of clinical endocrinology and metabolism. 2025;110(9):2405-52. doi: 10.1210/clinem/dgaf288. PubMed PMID: 40652453; PubMed Central PMCID: PMCPMC12342393.

In individuals with pre-existing diabetes mellitus (PDM) using a continuous glucose monitor (CGM), we suggest against the use of single 24 hour continuous glucose monitor (CGM) target < 140 mg/dl (7.8mmol/L) in place of standard of care pregnancy glucose targets of fasting <95 mg/dl (5.3 mmol/L), 1 hr. post prandial <140 mg/dl(7.8 mmol/L), 2hr post prandial < 120 md/dl (6.7mmol/L)

CGM Coverage

Medicaid				
	For Type 2 Diabetes	For Pregnancy	Send CGM Order to:	
			Pharmacy	DME
Michigan Traditional	On basal insulin	Not specified		<input checked="" type="checkbox"/>
Molina	On basal insulin	Not specified	<input checked="" type="checkbox"/>	
Blue Cross Complete	On basal insulin or with non-insulin antihyperglycemic medication (along with documentation (see MCT2D Coverage Guide)	Not specified	<input checked="" type="checkbox"/>	

Adapted from MCT2D Coverage Guide - www.mct2d.org/resource-library/medications-and-cgm-coverage-by-state-in-michigan-quick-reference-guide

Commercial			
For Type 2 Diabetes	For Pregnancy	Send CGM Order to:	
		Pharmacy	DME
No specific requirements <i>(Spotty coverage/ VERY plan specific - per H. Diez)</i>	Not specified	<input checked="" type="checkbox"/>	
On basal insulin	Postprandial hyperglycemia (as defined by ACOG)	<input checked="" type="checkbox"/>	
On basal insulin or 3 ORAL Meds (at least; failure of in last 120 days)	Not specified	<input checked="" type="checkbox"/>	
On basal insulin	Not specified	<input checked="" type="checkbox"/>	
On 3x daily insulin	Not specified		<input checked="" type="checkbox"/>

Adapted from MCT2D Coverage Guide - www.mct2d.org/resource-library/medications-and-cgm-coverage-by-state-in-michigan-quick-reference-guide

Case: GDM

She now wants to know
“What should I eat?”

	Weight	BMI
Prior to last Pregnancy 5 yrs ago	160 lbs	26
Prior to this Pregnancy 7 mos ago	190 lbs	30.7
Now	220 lbs	35.5

What would you tell her?

Select all that apply.

- A. She should not gain more than 0.5 lb per week for the remainder of the pregnancy.
- B. She should aim to lose 0.5 lb per week.
- C. The American Diabetes Association recommends ~175 g of carbohydrates and 70 g of protein daily.
- D. She should consume ~50 g of carbohydrates and >70 g of protein daily.
- E. Carbohydrate intake < 100 g/daily increases the risk of neural tube defects.
- F. You are referring her to a Dietitian.

Nutrition

Table 1. Institute of Medicine Weight Gain Recommendations for Pregnancy ↵

Prepregnancy Weight Category	Body Mass Index*	Recommended Range of Total Weight (lb)	Recommended Rates of Weight Gain† in the Second and Third Trimesters (lb) (Mean Range [lb/wk])
Underweight	Less than 18.5	28–40	1 (1–1.3)
Normal Weight	18.5–24.9	25–35	1 (0.8–1)
Overweight	25–29.9	15–25	0.6 (0.5–0.7)
→ Obese (includes all classes)	30 and greater	11–20	0.5 (0.4–0.6)

*Body mass index is calculated as weight in kilograms divided by height in meters squared or as weight in pounds multiplied by 703 divided by height in inches.

†Calculations assume a 1.1–4.4 lb weight gain in the first trimester.

Modified from Institute of Medicine (US). Weight gain during pregnancy: reexamining the guidelines. Washington, DC: National Academies Press; 2009. ©2009 National Academy of Sciences.

ACOG Guideline 548 1/2013- reaffirmed 2023. based on IOM recommendations.

How much weight should women gain or lose in Pregnancy?

OBSTETRICS

Inadequate weight gain in overweight and obese pregnant women: what is the effect on fetal growth?

Patrick M. Catalano, MD; Lisa Mele, ScM; Mark B. Landon, MD; Susan M. Ramin, MD; Uma M. Reddy, MD, MPH; Brian Casey, MD; Ronald J. Wapner, MD; Michael W. Varner, MD; Dwight J. Rouse, MD; John M. Thorp Jr, MD; George Saade, MD; Yoram Sorokin, MD; Alan M. Peaceman, MD; Jorge E. Tolosa, MD, MSCE; for the Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network

OBJECTIVE: We sought to evaluate inadequate gestational weight gain and fetal growth among overweight and obese women.

STUDY DESIGN: We conducted an analysis of prospective singleton term pregnancies in which 1053 overweight and obese women gained >5 kg (14.4 ± 6.2 kg) or 188 who either lost or gained ≤ 5 kg (1.1 ± 4.4 kg). Birthweight, fat mass, and lean mass were assessed using anthropometry. Small for gestational age (SGA) was defined as ≤ 10 th percentile of a standard US population. Univariable and multivariable analysis evaluated the association between weight change and neonatal morphometry.

RESULTS: There was no significant difference in age, race, smoking, parity, or gestational age between groups. Weight loss or gain ≤ 5 kg was associated with SGA, 18/188 (9.6%) vs 51/1053 (4.9%); (adjusted odds ratio, 2.6; 95% confidence interval, 1.4–4.7; $P = .003$). Neonates of women who lost or gained ≤ 5 kg had lower

birthweight (3258 ± 443 vs 3467 ± 492 g, $P < .0001$), fat mass (403 ± 175 vs 471 ± 193 g, $P < .0001$), and lean mass (2855 ± 321 vs 2995 ± 347 g, $P < .0001$), and smaller length, percent fat mass, and head circumference. Adjusting for diabetic status, pre-pregnancy body mass index, smoking, parity, study site, gestational age, and sex, neonates of women who gained ≤ 5 kg had significantly lower birthweight, lean body mass, fat mass, percent fat mass, head circumference, and length. There were no significant differences in neonatal outcomes between those who lost weight and those who gained ≤ 5 kg.

CONCLUSION: In overweight and obese women weight loss or gain ≤ 5 kg is associated with increased risk of SGA and decreased neonatal fat mass, lean mass, and head circumference.

Key words: fetal anthropometry, gestational diabetes, gestational weight loss

Nutrition – ADA guidelines

A minimum of 175 g of carbohydrates (~35% of a 2000 calorie diet).

(Dietary Reference Intakes: The Essential Guides to Nutrient Requirements. The National Academy Press 2006.)

Nutrition

- Nutrition data is poor. Few RCTs.
- Severe carb restriction (<100 gm of carbs/day) is associated with Neural Tube Defects (AOR=1.3 95%C 1.02-1.67).

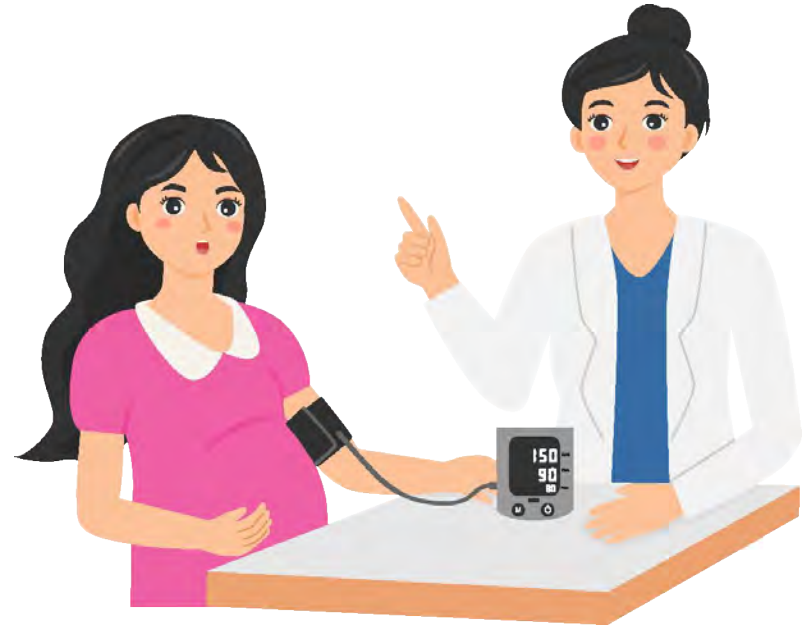
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Case: GDM – WEEK 1 of testing WHY?

Fasting	92, 97, 94, 93, 105
2h post Breakfast	121,125,119,142, 99
2h post Lunch	128,120,124,132, 84
2h post Dinner	118, 116, 109, 113, 145

Ask....

1. What do you eat?
2. When do you eat?
3. What do you drink?
4. Does it have caffeine?
5. Exercise? When, How much, How often?
6. Sleep?
7. Stress?
8. Pain?
9. What are you doing?



Case: GDM – WEEK 1 of testing- WHY?

	T, W, TH, F	S
Fasting	92, 97, 94, 93 6am	105 10am
2h post Breakfast	121,125,119,142 Coffee in car	99 Errands/Chores
2h post Lunch	128,120,124,132 Office job	84 Errands/Chores
2h post Dinner	118, 116, 109, 113 Walk	145 Ate out/ Movie/Popcorn

Case: GDM – WEEK 2

	T, W, TH, F	S
Fasting	93, 98, 95, 94 6am	98 6am
2h post Breakfast	111,115,109,122 No Coffee- Changed parking lot	100
2h post Lunch	123,117,119,120 Walking after lunch	84
2h post Dinner	118, 116, 109, 113 Walk	121 Ate out / Movie / No popcorn

Insulin – The Sweet Success Algorithm

California Diabetes and Pregnancy Program (CDAPP) 2013/2015

INSULIN DOSE AND REGIMEN, CONTINUED

For women with GDM, initiate insulin therapy with mild hyperglycemia when 1/3 of post-meal values are ≥ 130 and <180 , or 1/3 of fasting values are ≥ 90 and <120 . Consider the following:

Insulin for GDM ¹⁹	
Glucose Value	Insulin Dose
Fasting (FPG) >90 mg/dl, <120 mg/dl	Start with 8 - 20 NPH or levemir @ bedtime using 0.2 units/kg actual body weight.
1-hour post breakfast >130 mg/dl, <180 mg/dl	2 - 4 units of rapid acting analog (i.e. Novolog, Humalog, Apidra) pre-breakfast
1-hour post lunch >130 mg/dl, <180 mg/dl	2 - 4 units rapid acting analog pre-lunch OR Add 4 - 6 units NPH to pre-breakfast injection (and eat lunch 4 - 5 hrs after breakfast)
1-hour post dinner >130 mg/dl, <180 mg/dl	2 - 4 units rapid acting analog pre-dinner.



DO NOT USE POST MEAL SLIDING SCALE^{20, 21} insulin as this practice leads to over treatment without avoiding fetal exposure to hyperglycemia. Use a premeal insulin correction algorithm to adjust rapid acting insulin when premeal glucoses are not within target.

For persistent hyperglycemia at all times of day- Start a basal/bolus regimen at 0.7–1.0 units of insulin/kg total daily dose

Metformin – Use only as a last resort

- Decrease LGA (but increase SGA)
- Human RCTs suggest an increase offspring risk for Obesity
- Animal data show renal dysmorphology



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Postpartum Medical Care for GDM

- Postpartum Care needs to be intentional.
- Postpartum OGTT
- Postpartum Hypertension
- **Breast Feeding**
- Postpartum care is Preconception Care!
- Screen for pregnancy intent
- Contraception
- Treatment of DM, Prediabetes, Obesity, PCOS
- Reduction of long term risks.

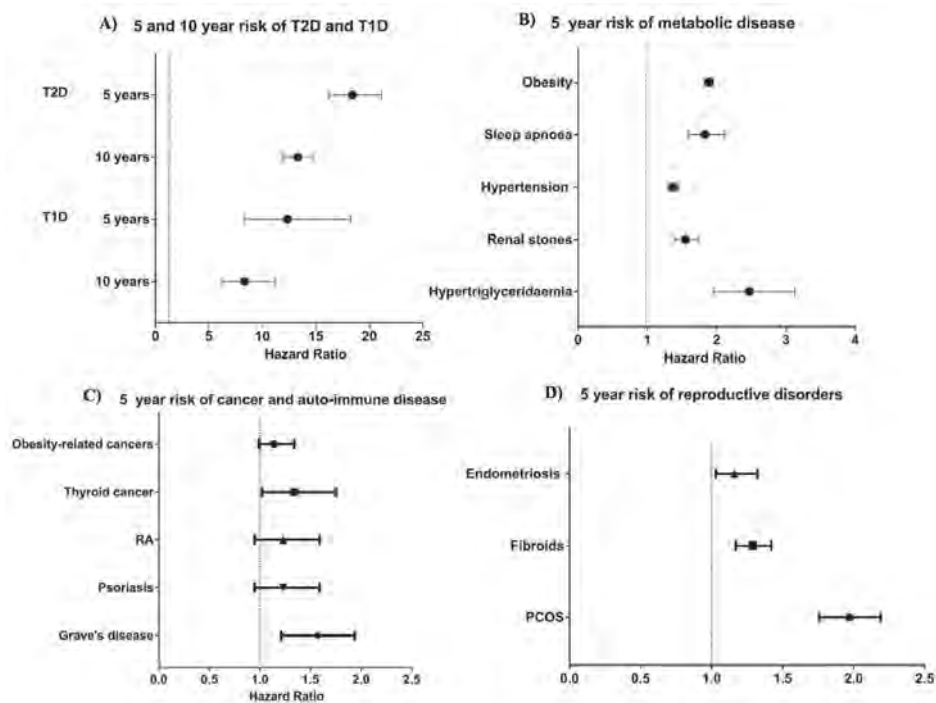
More frequent postpartum care (which included glucose management) in high-risk patients showed decreased hospitalizations within 30 day.

Only about ½ of women will re-establish care with primary care in the first year postpartum.

PCC reduces Congenital Malformations in PDM
7.2% versus 2.0%

PLoS One. 2020 Aug 18;15(8):e0237571. 2020. J Clin Endocrinol Metab 101: 1598-1605, 2016 Am J Obstet Gynecol 2023;229:160.e1-8. And AmJ Obstet Gynecol MFM 2021;3:100363 Diabetes Care 2023;46(12):2258-2266. Diabet Med 33,17-24 (2016) And BMC Pregnancy and Childbirth (2023) 23:309. And BMC Women's Health 2011, 11:10.. Diabet Med. 2013 Sep;30(9):1094-101 Am J Obstet Gynecol MFM 2021;3:100363 Maternal Child Health J (2019) 20:S22-S27. Circulation 2015; 132(18) 1726-1733. Wahabi HA, Fayed A, Esmail S, Elmorshedy H, Titi MA, Amer YS, Alzeidan RA, Alodhayani AA, Saeed E, Bahkali KH, Kahili-Heede MK, Jamal A, Sabr Y. Systematic review and meta-analysis of the effectiveness of pre-pregnancy care for women with diabetes for improving maternal and perinatal outcomes. PLoS One. 2020 Aug 18;15(8):e0237571. doi: 10.1371/journal.pone.0237571. PMID: 32810195; PMCID: PMC7433888.

Retrospective, observational study using anonymised data from TriNetX (TriNetX LLC, Cambridge, MA, USA), a global federated health research network with access to over 135 million electronic medical records from international healthcare organisations in North America and Western Europe



A history of GDM is a risk factor for lots of bad long-term outcomes.

Heague MO, Henney AE, Riley DR, Anson M, Meek CL, Alam U, et al. Long-term adverse multi-system health outcomes of gestational diabetes mellitus: an analysis of real-world cohort data. *Diabetes Research and Clinical Practice*. 2026;234:113171. doi: <https://doi.org/10.1016/j.diabres.2026.113171>.

Breastfeeding and GLP-1s

- Most GLP-1s are Large molecules.
- Semaglutide (oral and injectable) not detected in Breast Milk, but unclear impact on breast milk nutrients. Not approved.
- Cannot use oral semaglutide. SNAC (salcaprozate sodium), a component in the oral Semaglutide formulation is present in breast milk.
- Newly approved Orforglipron is a small molecule. May be in breast milk! Do not use!



Case: GDM – Postpartum

39 yo G2P2002 c Hashimoto's thyroiditis and a history of GDM and obesity, who you follow as a PCP, calls to report a + pregnancy test.

What is your next step?

- A. Check A1C and fasting glucose and if normal, get OGTT now.
- B. Check A1C and fasting glucose and if normal, get OGTT at 24 weeks
- C. Check OGTT and if normal, no need to repeat at 24 weeks.
- D. Check OGTT at 24 weeks.

Does Treatment of Early GDM Matter?

TOBOGM

Simmons D, Immanuel J, Hague WM, Teede H, Nolan CJ, Peek MJ, et al. Treatment of Gestational Diabetes Mellitus Diagnosed Early in Pregnancy. The New England journal of medicine. 2023;388(23):2132-44. Epub 20230505. doi: 10.1056/NEJMoa2214956. PubMed PMID: 37144983.

Treatment of Gestational Diabetes Mellitus Diagnosed Early in Pregnancy

D. Simmons, J. Immanuel, W.M. Hague, H. Teede, C.J. Nolan, M.J. Peek, J.R. Flack, M. McLean, V. Wong, E. Hibbert, A. Kautzky-Willer, J. Harreiter, H. Backman, E. Gianatti, A. Sweeting, V. Mohan, J. Enticott, and N.W. Cheung, for the TOBOGM Research Group*

ABSTRACT

BACKGROUND

Whether treatment of gestational diabetes before 20 weeks' gestation improves maternal and infant health is unclear.

METHODS

We randomly assigned, in a 1:1 ratio, women between 4 weeks' and 19 weeks 6 days' gestation who had a risk factor for hyperglycemia and a diagnosis of gestational diabetes (World Health Organization 2013 criteria) to receive immediate treatment for gestational diabetes or deferred or no treatment, depending on the results of a repeat oral glucose-tolerance test [OGTT] at 24 to 28 weeks' gestation (control). The trial included three primary outcomes: a composite of adverse neonatal outcomes (birth at <37 weeks' gestation, birth trauma, birth weight of ≥ 4500 g, respiratory distress, phototherapy, stillbirth or neonatal death, or shoulder dystocia), pregnancy-related hypertension (preeclampsia, eclampsia, or gestational hypertension), and neonatal lean body mass.

RESULTS

A total of 802 women underwent randomization; 406 were assigned to the immediate-treatment group and 396 to the control group; follow-up data were available for 793 women (98.9%). An initial OGTT was performed at a mean (\pm SD) gestation of 15.6 ± 2.5 weeks. An adverse neonatal outcome event occurred in 94 of 378 women (24.9%) in the immediate-treatment group and in 113 of 370 women (30.5%) in the control group (adjusted risk difference, -5.6 percentage points; 95% confidence interval [CI], -10.1 to -1.2). Pregnancy-related hypertension occurred in 40 of 378 women (10.6%) in the immediate-treatment group and in 37 of 372 women (9.9%) in the control group (adjusted risk difference, 0.7 percentage points; 95% CI, -1.6 to 2.9). The mean neonatal lean body mass was 2.86 kg in the immediate-treatment group and 2.91 kg in the control group (adjusted mean difference, -0.04 kg; 95% CI, -0.09 to 0.02). No between-group differences were observed with respect to serious adverse events associated with screening and treatment.

CONCLUSIONS

Immediate treatment of gestational diabetes before 20 weeks' gestation led to a modestly lower incidence of a composite of adverse neonatal outcomes than no immediate treatment; no material differences were observed for pregnancy-related hypertension or neonatal lean body mass. (Funded by the National Health and Medical Research Council and others; TOBOGM Australian New Zealand Clinical Trials Registry number, ACTRN12616000924459.)

The authors' full names, academic degrees, and affiliations are listed in the Appendix. Dr. Simmons can be contacted at da.simmons@westernsydney.edu.au or at the School of Medicine, Western Sydney University, Locked Bag 1797, Campbelltown, NSW 2751, Australia.

*The investigators in the TOBOGM Research Group are listed in the Supplementary Appendix, available at [NEJM.org](https://www.nejm.org).

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DOI: 10.1056/NEJMoa2214956
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Table 2. Primary and Secondary Pregnancy Outcomes.*

Outcome	Immediate Treatment (N=400)	Control (N=393)	Adjusted Treatment Effect†	
			Difference in Value (95% CI)	Relative Risk (95% CI)
Primary Pregnancy Outcomes				
Adverse neonatal outcomes — no./total no. (%)‡	94/378 (24.9)	113/370 (30.5)	-5.6 (-10.1 to -1.2)	0.82 (0.68 to 0.98)
Pregnancy-related hypertension — no./total no. (%)§	40/378 (10.6)	37/372 (9.9)	0.7 (-1.6 to 2.9)	1.08 (0.85 to 1.38)
Maternal Secondary Pregnancy Outcomes¶				
Median maternal gestational weight gain from first to final predelivery visit (IQR) — kg	6.0 (2.0 to 9.5)	6.9 (3.4 to 10.0)	-1.2 (-3.2 to 0.8)	NA
Cesarean delivery — no./total no. (%)	144/377 (38.2)	146/368 (39.7)	0.2 (-4.2 to 4.6)	1.00 (0.90 to 1.13)
Induction of labor — no./total no. (%)	187/377 (49.6)	177/372 (47.6)	1.0 (-8.3 to 10.3)	1.02 (0.84 to 1.23)
Perineal injury — no./total no. (%)	3/375 (0.8)	13/365 (3.6)	-2.8 (-4.1 to -1.5)	0.23 (0.10 to 0.51)
Median EQ-5D score at 24 to 28 wk of gestation (IQR)	0.83 (0.76 to 1.00)	0.81 (0.73 to 1.00)	0.02 (0.01 to 0.04)	1.03 (1.01 to 1.04)
Neonatal Secondary Pregnancy Outcomes**				
Neonatal lean body mass — kg	2.86±0.34	2.91±0.33	-0.04 (-0.09 to 0.02)	NA
Birth weight — g	3258±563	3343±588	-72.1 (-127.6 to -16.6)	NA
Large-for-gestational-age status — no./total no. (%)††	63/375 (16.8)	72/368 (19.6)	-4.6 (-11.8 to 2.5)	0.77 (0.51 to 1.17)
Small-for-gestational-age status — no./total no. (%)††	45/375 (12.0)	34/368 (9.2)	3.0 (-0.8 to 6.8)	1.32 (0.93 to 1.85)
Upper arm circumference — cm	10.8±1.4	10.9±1.3	-0.1 (-0.2 to 0.1)	NA
Sum of neonatal caliper measurements — mm	20.0±4.6	21.5±5.4	-1.4 (-2.2 to -0.5)	NA
Neonatal fat mass — kg	0.45±0.17	0.48±0.19	-0.03 (-0.05 to -0.01)	NA
Heel-prick blood glucose <29 mg/dl within 72 hr after birth	22/355 (6.2)	14/303 (4.6)	1.5 (-2.2 to 5.3)	1.31 (0.65 to 2.66)
Heel-prick blood glucose ≤40 mg/dl at 1 to 2 hr after birth	61/323 (18.9)	57/251 (22.7)	-4.2 (-13.4 to 5.0)	0.81 (0.55 to 1.19)
Median no. of bed days in neonatal special care nursery or neonatal ICU‡‡	2.0 (0.3 to 4.8)	2.0 (1.0 to 6.0)	-0.8 (-1.3 to -0.3)	0.60 (0.41 to 0.89)

* Plus-minus values are means ±SD. IQR denotes interquartile range.

† The 95% confidence intervals for the secondary outcomes have not been adjusted for multiplicity and should not be used in place of hypothesis testing. For the outcomes that are reported as number/total number (percent) of participants, the difference in value with respect to the adjusted treatment effect is shown in percentage points. "NA" in the "relative risk" column denotes not applicable because the variable is a continuous measure.

‡ Adverse neonatal outcome was a composite of birth before 37 weeks' gestation, birth weight of 4500 g or greater, birth trauma, neonatal respiratory distress, phototherapy, stillbirth or neonatal death, or shoulder dystocia. Birth trauma was defined according to the criteria of the International Association of Diabetes in Pregnancy Study Group (IADPSG)** and includes spinal cord injury, peripheral nerve injury or brachial plexus, basal skull fracture or depressed skull fracture, clavicular fracture, long bone fracture (humerus, radius, ulna, femur, tibia, or fibula), cranial hemorrhage (subdural or intracerebral of any kind [confirmed by cranial ultrasonography, computed tomography, or magnetic resonance imaging]).

§ Pregnancy-related hypertension was a composite of preeclampsia, eclampsia, or gestational hypertension.

¶ The analyses of the continuous maternal secondary pregnancy outcomes included 287 women in the immediate-treatment group and 284 women in the control group for maternal gestational weight gain from first to final predelivery visit and 317 and 334 women, respectively, for EQ-5D score at 24 to 28 weeks' gestation. One woman in the immediate-treatment group reported hypoglycemia, which was subsequently determined to be factitious.

|| Scores on the EQ-5D index range from 0 to 1, with higher scores indicating better quality of life.

** The analyses of the continuous neonatal secondary pregnancy outcomes included 287 infants born to women in the immediate-treatment group and 284 infants born to women in the control group for neonatal lean body mass; 377 and 369 infants, respectively, for birth weight; 257 and 247 infants, respectively, for upper arm circumference; 254 and 242 infants, respectively, for the sum of neonatal caliper measurements; 251 and 241 infants, respectively, for neonatal fat mass; and 376 and 368 infants, respectively, for the number of bed days in a neonatal special care nursery or neonatal ICU.

†† Large-small-for-gestational age status and small-for-gestational age status were determined with the use of Gestation Related Optimal Weight (GROW) software, which uses customized birth-weight percentile data that have been defined with the use of calculations from the Gestation Network of the Perinatal Institute (gestation.net).

‡‡ The median values and IQRs were determined among all the infants who had been admitted, and the treatment effects were determined among all the infants in the trial groups, with a value of 0 used for those who had not been admitted. Many facilities had combined units, and we were unable to distinguish the infants in the special care nursery from those in the neonatal ICU.

Simmons D, Immanuel J, Hague WM, Teede H, Nolan CJ, Peek MJ, et al. Treatment of Gestational Diabetes Mellitus Diagnosed Early in Pregnancy. The New England journal of medicine. 2023;388(23):2132-44. Epub 20230505. doi: 10.1056/NEJMoa2214956. PubMed PMID: 37144983.

Summary

1. GDM complicates about 10% of pregnancies in the US.
2. Don't replace GDM targets with CGM TIR!
3. You need a dietitian!
4. Avoid Metformin
5. Be intentional about Post partum care!
6. Screen 1st trimester!

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Two Steps to Receive CME/CE Credit

STEP 1:

Text in CE Code **89639** to **833-256-8390**
by 1:00 PM on **May 4th**

Scan me to open a text message!



This activates your online evaluation in the CE portal (new users follow prompts after texting to set up account).

For CME Credit Troubleshooting, visit <https://tinyurl.com/CMEInstructions>

STEP 2:

Complete the required online evaluation
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In the Cloud CME portal at <https://corewellhealtheast.cloud-cme.com> [Sign In > select My CME > select Evaluations & Certificates] – or – via the free CloudCME mobile app (organization code *COREWELLHEALTHEAST*)

Refer to full CE document for additional CE information.

For assistance, email CHEcme@corewellhealth.org

Disclosure of Financial Relationships:

The following speakers and/or planning committee members have identified the following relevant financial relationship(s) with ineligible companies.

All other individuals involved with this activity have no relevant financial relationships with ineligible companies to disclose.

- **Lauren Oshman, M.D. (Course Co-Director):** Stocks in publicly traded companies or stock options, excluding diversified mutual funds-Abbott, AbbVie, Johnson & Johnson, Merck & Co., Organon.

MCT2D Learning Community Series 2026

Gestational Diabetes

CME/CE credit is available

In support of improving patient care, this activity has been planned and implemented by Corewell Health Southeast Michigan and Michigan Collaborative for Type 2 Diabetes. Corewell Health Southeast Michigan is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

This activity was planned by and for the healthcare team, and learners will receive 1.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Medicine CME: Corewell Health Southeast Michigan designates this live activity for a maximum of 1.0 *AMA PRA Category 1 Credit*[™]. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Nursing CE: Corewell Health Southeast Michigan designates this activity for a maximum of 1.0 ANCC contact hour. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacy CE: Corewell Health Southeast Michigan designates this activity for 1.0 ACPE contact hour. ACPE Universal Activity Number (UAN): JA4008259-9999-26-015-L01-P. Learners should claim only the credit commensurate with the extent of their participation in the activity. Credit will be uploaded to the NABP CPE Monitor within 30 days after activity completion. Per ACPE rules Corewell Health Southeast Michigan does not have access nor the ability to upload credits requested after 60 days. It is the individual learner's responsibility to provide the correct NABP ID and DOB (MMDD) to receive credit.

Social Work CE: As a Jointly Accredited Organization, Corewell Health Southeast Michigan is approved to offer social work continuing education by the Association of Social Work Boards (ASWB) Approved Continuing Education (ACE) program. Organizations, not individual courses, are approved under this program. Regulatory boards are the final authority on courses accepted for continuing education credit. Social workers completing this course receive 1.0 continuing education credit.

Dietetic CPEU:



Completion of this RD/DTR profession-specific or IPCE activity awards CPEUs (One IPCE credit = One CPEU).

If the activity is dietetics-related but not targeted to RDs or DTRs, CPEUs may be claimed which are commensurate with participation in contact hours (One 60 minute hour = 1 CPEU).

RD's and DTR's are to select activity type 102 in their Activity Log. Sphere and Competency selection is at the learner's discretion.