Pregestational diabetes: Preconception counseling, evaluation, and management

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INTRODUCTION

The terms pregestational and preexisting diabetes refer to type 1 or type 2 diabetes mellitus diagnosed prior to a woman's pregnancy. This topic will describe the potential maternal and fetal complications associated with pregnancy in women with preexisting diabetes and discuss preconception risk counseling, evaluation, and management of these women. Other issues related to pregestational diabetes and pregnancy are reviewed separately.

- (See "Pregestational diabetes mellitus: Glycemic control during pregnancy".)
- (See "Pregestational and gestational diabetes: Intrapartum and postpartum glycemic control".)
- (See "Pregestational diabetes mellitus: Obstetrical issues and management".)

PREVALENCE

The prevalence of diabetes in women of reproductive age is increasing [1,2] and, with it, the proportion of pregnancies complicated by preexisting (rather than gestational) diabetes. Data from clinical cohorts and hospital discharges suggest that pregestational diabetes complicates 1 to 2 percent of all pregnancies and accounts for 13 to 21 percent of diabetes in pregnancy, with the remainder due to gestational diabetes [3-5]. The proportion of pregnant patients with type 1 and type 2 diabetes reflects their prevalence in the specific population. In reproductive-aged women, type 2 diabetes is becoming more prevalent and is more common than type 1 diabetes in some populations [6-8].

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REFERENCES

1. Wild S, Roglic G, Green A, et al. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care 2004; 27:1047.
2. Writing Group for the SEARCH for Diabetes in Youth Study Group, Dabelea D, Bell RA, et al. Incidence of diabetes in youth in the United States. JAMA 2007; 297:2716.
3. Lawrence JM, Contreras R, Chen W, Sacks DA. Trends in the prevalence of preexisting diabetes and gestational diabetes mellitus among a racially/ethnically diverse population of pregnant women, 1999-2005. Diabetes Care 2008; 31:899.
4. Albrecht SS, Kuklina EV, Bansil P, et al. Diabetes trends among delivery hospitalizations in the U.S., 1994-2004. Diabetes Care 2010; 33:768.
5. Wier LM, Witt E, Burgess J, Elixhauser A. Hospitalizations Related to Diabetes in Pregnancy. Agency for Healthcare Research and Quality, Rockville, MD 2010.
6. Temple R, Murphy H. Type 2 diabetes in pregnancy - An increasing problem. Best Pract Res Clin Endocrinol Metab 2010; 24:591.
7. Hewapathirana NM, Murphy HR. Perinatal outcomes in type 2 diabetes. Curr Diab Rep 2014; 14:461.
8. Cundy T, Gamble G, Neale L, et al. Differing causes of pregnancy loss in type 1 and type 2 diabetes. Diabetes Care 2007; 30:2603.
9. Kitzmiller JL, Wallerstein R, Correa A, Kwan S. Preconception care for women with diabetes and prevention of major congenital malformations. Birth Defects Res A Clin Mol Teratol 2010; 88:791.
10. Evers IM, de Valk HW, Visser GH. Risk of complications of pregnancy in women with type 1 diabetes: nationwide prospective study in the Netherlands. BMJ 2004; 328:915.
11. Persson M, Norman M, Hanson U. Obstetric and perinatal outcomes in type 1 diabetic pregnancies: A large, population-based study. Diabetes Care 2009; 32:2005.
12. Tennant PW, Glinianaia SV, Bilous RW, et al. Pre-existing diabetes, maternal glycated haemoglobin, and the risks of fetal and infant death: a population-based study. Diabetologia 2014; 57:285.
13. Jensen DM, Korsholm L, Ovesen P, et al. Peri-conceptional A1C and risk of serious adverse pregnancy outcome in 933 women with type 1 diabetes. Diabetes Care 2009; 32:1046.
14. Schaefer UM, Songster G, Xiang A, et al. Congenital malformations in offspring of women with hyperglycemia first detected during pregnancy. Am J Obstet Gynecol 1997; 177:1165.
15. Temple RC, Aldridge V, Stanley K, Murphy HR. Glycaemic control throughout pregnancy and risk of pre-eclampsia in women with type I diabetes. BJOG 2006; 113:1329.
16. Hiilesmaa V, Suhonen L, Teramo K. Glycaemic control is associated with pre-eclampsia but not with pregnancy-induced hypertension in women with type I diabetes mellitus. Diabetologia 2000; 43:1534.

17. Balsells M, García-Patterson A, Gich I, Corcoy R. Maternal and fetal outcome in women with type 2 versus type 1 diabetes mellitus: a systematic review and metaanalysis. J Clin Endocrinol Metab 2009; 94:4284.
18. Murphy HR, Roland JM, Skinner TC, et al. Effectiveness of a regional prepregnancy care program in women with type 1 and type 2 diabetes: benefits beyond glycemic control. Diabetes Care 2010; 33:2514.
19. Singh H, Murphy HR, Hendrieckx C, et al. The challenges and future considerations regarding pregnancy-related outcomes in women with pre-existing diabetes. Curr Diab Rep 2013; 13:869.
20. Al-Agha R, Firth RG, Byrne M, et al. Outcome of pregnancy in type 1 diabetes mellitus (T1DMP): results from combined diabetes-obstetrical clinics in Dublin in three university teaching hospitals (1995-2006). Ir J Med Sci 2012; 181:105.
21. Guerin A, Nisenbaum R, Ray JG. Use of maternal GHb concentration to estimate the risk of congenital anomalies in the offspring of women with prepregnancy diabetes. Diabetes Care 2007; 30:1920.
22. Bell R, Glinianaia SV, Tennant PW, et al. Peri-conception hyperglycaemia and nephropathy are associated with risk of congenital anomaly in women with pre-existing diabetes: a population-based cohort study. Diabetologia 2012.
23. Correa A, Gilboa SM, Besser LM, et al. Diabetes mellitus and birth defects. Am J Obstet Gynecol 2008; 199:237.e1.
24. Schaefer-Graf UM, Buchanan TA, Xiang A, et al. Patterns of congenital anomalies and relationship to initial maternal fasting glucose levels in pregnancies complicated by type 2 and gestational diabetes. Am J Obstet Gynecol 2000; 182:313.
25. Al Kaissi A, Klaushofer K, Grill F. Caudal regression syndrome and popliteal webbing in connection with maternal diabetes mellitus: a case report and literature review. Cases J 2008; 1:407.
26. Rey E, Attié C, Bonin A. The effects of first-trimester diabetes control on the incidence of macrosomia. Am J Obstet Gynecol 1999; 181:202.
27. Reece EA, Smikle C, O'Connor TZ, et al. A longitudinal study comparing growth in diabetic pregnancies with growth in normal gestations: I. The fetal weight. Obstet Gynecol Surv 1990; 45:161.
28. Ehrenberg HM, Mercer BM, Catalano PM. The influence of obesity and diabetes on the prevalence of macrosomia. Am J Obstet Gynecol 2004; 191:964.
29. McFarland MB, Trylovich CG, Langer O. Anthropometric differences in macrosomic infants of diabetic and nondiabetic mothers. J Matern Fetal Med 1998; 7:292.
30. Howarth C, Gazis A, James D. Associations of Type 1 diabetes mellitus, maternal vascular disease and complications of pregnancy. Diabet Med 2007; 24:1229.
31. Haeri S, Khoury J, Kovilam O, Miodovnik M. The association of intrauterine growth abnormalities in women with type 1 diabetes mellitus complicated by vasculopathy. Am J Obstet Gynecol 2008; 199:278.e1.
32. Cundy T, Gamble G, Townend K, et al. Perinatal mortality in Type 2 diabetes mellitus. Diabet Med 2000; 17:33.

33. McElvy SS, Miodovnik M, Rosenn B, et al. A focused preconceptional and early pregnancy program in women with type 1 diabetes reduces perinatal mortality and malformation rates to general population levels. J Matern Fetal Med 2000; 9:14.
34. Clausen TD, Mathiesen ER, Hansen T, et al. High prevalence of type 2 diabetes and pre-diabetes in adult offspring of women with gestational diabetes mellitus or type 1 diabetes: the role of intrauterine hyperglycemia. Diabetes Care 2008; 31:340.
35. Silverman BL, Metzger BE, Cho NH, Loeb CA. Impaired glucose tolerance in adolescent offspring of diabetic mothers. Relationship to fetal hyperinsulinism. Diabetes Care 1995; 18:611.
36. Pettitt DJ, Nelson RG, Saad MF, et al. Diabetes and obesity in the offspring of Pima Indian women with diabetes during pregnancy. Diabetes Care 1993; 16:310.
37. Dabelea D, Mayer-Davis EJ, Lamichhane AP, et al. Association of intrauterine exposure to maternal diabetes and obesity with type 2 diabetes in youth: the SEARCH Case-Control Study. Diabetes Care 2008; 31:1422.
38. Nolan CJ. Normal long-term health for infants of diabetic mothers: can we achieve it? J Clin Endocrinol Metab 2013; 98:3592.
39. Wu CS, Nohr EA, Bech BH, et al. Long-term health outcomes in children born to mothers with diabetes: a population-based cohort study. PLoS One 2012; 7:e36727.
40. Dabelea D, Pettitt DJ. Intrauterine diabetic environment confers risks for type 2 diabetes mellitus and obesity in the offspring, in addition to genetic susceptibility. J Pediatr Endocrinol Metab 2001; 14:1085.
41. Ballas J, Moore TR, Ramos GA. Management of diabetes in pregnancy. Curr Diab Rep 2012; 12:33.
42. Sibai BM, Caritis S, Hauth J, et al. Risks of preeclampsia and adverse neonatal outcomes among women with pregestational diabetes mellitus. National Institute of Child Health and Human Development Network of Maternal-Fetal Medicine Units. Am J Obstet Gynecol 2000; 182:364.
43. Idris N, Wong SF, Thomae M, et al. Influence of polyhydramnios on perinatal outcome in pregestational diabetic pregnancies. Ultrasound Obstet Gynecol 2010; 36:338.
44. Vink JY, Poggi SH, Ghidini A, Spong CY. Amniotic fluid index and birth weight: is there a relationship in diabetics with poor glycemic control? Am J Obstet Gynecol 2006; 195:848.
45. Sibai BM, Caritis SN, Hauth JC, et al. Preterm delivery in women with pregestational diabetes mellitus or chronic hypertension relative to women with uncomplicated pregnancies. The National institute of Child health and Human Development Maternal- Fetal Medicine Units Network. Am J Obstet Gynecol 2000; 183:1520.
46. Arun CS, Taylor R. Influence of pregnancy on long-term progression of retinopathy in patients with type 1 diabetes. Diabetologia 2008; 51:1041.
47. Diabetes Control and Complications Trial Research Group. Effect of pregnancy on microvascular complications in the diabetes control and complications trial. The Diabetes Control and Complications Trial Research Group. Diabetes Care 2000; 23:1084.
48. Vérier-Mine O, Chaturvedi N, Webb D, Fuller JH. Is pregnancy a risk factor for microvascular complications? The EURODIAB Prospective Complications Study. Diabet Med 2005; 22:1503.

49. Rasmussen KL, Laugesen CS, Ringholm L, et al. Progression of diabetic retinopathy during pregnancy in women with type 2 diabetes. Diabetologia 2010; 53:1076.
50. Chan WC, Lim LT, Quinn MJ, et al. Management and outcome of sight-threatening diabetic retinopathy in pregnancy. Eye (Lond) 2004; 18:826.
51. Chew EY, Mills JL, Metzger BE, et al. Metabolic control and progression of retinopathy. The Diabetes in Early Pregnancy Study. National Institute of Child Health and Human Development Diabetes in Early Pregnancy Study. Diabetes Care 1995; 18:631.
52. Klein BE, Moss SE, Klein R. Effect of pregnancy on progression of diabetic retinopathy. Diabetes Care 1990; 13:34.
53. American Diabetes Association. Preconception care of women with diabetes. Diabetes Care 2004; 27 Suppl 1:S76.
54. Kitzmiller JL, Block JM, Brown FM, et al. Managing preexisting diabetes for pregnancy: summary of evidence and consensus recommendations for care. Diabetes Care 2008; 31:1060.
55. Bell DS. Heart failure: the frequent, forgotten, and often fatal complication of diabetes. Diabetes Care 2003; 26:2433.
56. Maser RE, Lenhard MJ. Cardiovascular autonomic neuropathy due to diabetes mellitus: clinical manifestations, consequences, and treatment. J Clin Endocrinol Metab 2005; 90:5896.
57. Hoffmann K, Heller R. Uniparental disomies 7 and 14. Best Pract Res Clin Endocrinol Metab 2011; 25:77.
58. Parker JA, Conway DL. Diabetic ketoacidosis in pregnancy. Obstet Gynecol Clin North Am 2007; 34:533.
59. Sibai BM, Viteri OA. Diabetic ketoacidosis in pregnancy. Obstet Gynecol 2014; 123:167.
60. Cullen MT, Reece EA, Homko CJ, Sivan E. The changing presentations of diabetic ketoacidosis during pregnancy. Am J Perinatol 1996; 13:449.
61. Montoro MN, Myers VP, Mestman JH, et al. Outcome of pregnancy in diabetic ketoacidosis. Am J Perinatol 1993; 10:17.
62. Schneider MB, Umpierrez GE, Ramsey RD, et al. Pregnancy complicated by diabetic ketoacidosis: maternal and fetal outcomes. Diabetes Care 2003; 26:958.
63. Carreira E, Lepercq J, Bouché C, et al. Uneventful pregnancy in a patient with ketosis-prone type 2 diabetes mellitus. Diabetes Metab 2008; 34:182.
64. Wahabi HA, Alzeidan RA, Bawazeer GA, et al. Preconception care for diabetic women for improving maternal and fetal outcomes: a systematic review and meta-analysis. BMC Pregnancy Childbirth 2010; 10:63.
65. Gregory R, Tattersall RB. Are diabetic pre-pregnancy clinics worth while? Lancet 1992; 340:656.
66. Blumer I, Hadar E, Hadden DR, et al. Diabetes and pregnancy: an endocrine society clinical practice guideline. J Clin Endocrinol Metab 2013; 98:4227.
67. American Diabetes Association. 13. Management of Diabetes in Pregnancy. Diabetes Care 2017; 40:S114.

68. https://www.nice.org.uk/guidance/ng3/ifp/chapter/preparing-for-pregnancy (Accessed on October 31, 2016).
69. Wilson RD, Genetics Committee, Wilson RD, et al. Pre-conception Folic Acid and Multivitamin Supplementation for the Primary and Secondary Prevention of Neural Tube Defects and Other Folic Acid-Sensitive Congenital Anomalies. J Obstet Gynaecol Can 2015; 37:534.
70. Kurtzhals P, Schäffer L, Sørensen A, et al. Correlations of receptor binding and metabolic and mitogenic potencies of insulin analogs designed for clinical use. Diabetes 2000; 49:999.
71. Gallen IW, Jaap A, Roland JM, Chirayath HH. Survey of glargine use in 115 pregnant women with Type 1 diabetes. Diabet Med 2008; 25:165.
72. Pöyhönen-Alho M, Rönnemaa T, Saltevo J, et al. Use of insulin glargine during pregnancy. Acta Obstet Gynecol Scand 2007; 86:1171.
73. Di Cianni G, Torlone E, Lencioni C, et al. Perinatal outcomes associated with the use of glargine during pregnancy. Diabet Med 2008; 25:993.
74. Mathiesen ER, Kinsley B, Amiel SA, et al. 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; 30:771.
75. Rowan JA, Hague WM, Gao W, et al. Metformin versus insulin for the treatment of gestational diabetes. N Engl J Med 2008; 358:2003.
76. Langer O, Conway DL, Berkus MD, et al. A comparison of glyburide and insulin in women with gestational diabetes mellitus. N Engl J Med 2000; 343:1134.
77. Bullo M, Tschumi S, Bucher BS, et al. Pregnancy outcome following exposure to angiotensin-converting enzyme inhibitors or angiotensin receptor antagonists: a systematic review. Hypertension 2012; 60:444.
78. Cooper WO, Hernandez-Diaz S, Arbogast PG, et al. Major congenital malformations after first-trimester exposure to ACE inhibitors. N Engl J Med 2006; 354:2443.
79. Li DK, Yang C, Andrade S, et al. Maternal exposure to angiotensin converting enzyme inhibitors in the first trimester and risk of malformations in offspring: a retrospective cohort study. BMJ 2011; 343:d5931.
80. ACOG Committee on Practice Bulletins. ACOG Practice Bulletin. Clinical Management Guidelines for Obstetrician-Gynecologists. Number 60, March 2005. Pregestational diabetes mellitus. Obstet Gynecol 2005; 105:675.
81. De Groot L, Abalovich M, Alexander EK, et al. Management of thyroid dysfunction during pregnancy and postpartum: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab 2012; 97:2543.
82. Stagnaro-Green A, Abalovich M, Alexander E, et al. Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum. Thyroid 2011; 21:1081.
83. Curtis KM, Tepper NK, Jatlaoui TC, et al. U.S. Medical Eligibility Criteria for Contraceptive Use, 2016. MMWR Recomm Rep 2016; 65:1.
84. O'Brien SH, Koch T, Vesely SK, Schwarz EB. Hormonal Contraception and Risk of Thromboembolism in Women With Diabetes. Diabetes Care 2017; 40:233.

85. Josse J, James J, Roland J. Diabetes control in pregnancy: who takes responsibility for what? Practical Diabetes International 2003; 20:290.