



# Pregestational Diabetes and Family Planning

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Pregestational diabetes is a condition in which a woman with diabetes (most commonly type 1 or type 2 diabetes) before the onset of pregnancy becomes pregnant and therefore vulnerable to increased risk for maternal and fetal adverse outcomes. Pregestational diabetes has been observed in 1–2% of all pregnancies, but rates are rising (1). Approximately one in nine women (14.9 million) have diabetes, and 35% of people with newly diagnosed diabetes are women of reproductive age (2). This means diabetes is increasingly affecting women of childbearing age. Furthermore, nearly one in five adolescents aged 12–18 years and one in four young adults aged 19–34 years are living with prediabetes, which has the potential to cross the threshold into diabetes (3). The increasing prevalence of diabetes among women of reproductive age is largely driven by an increase in type 2 diabetes, which in turn is driven by unhealthy nutrition, obesity, and increasingly sedentary lifestyles (4,5).

Pregestational type 2 diabetes disproportionately affects women of ethnic minorities and disadvantaged socioeconomic status. For example, Pacific Islanders, Asian Indians, and Native Americans are more commonly affected by type 2 diabetes (6). In the United States, rates of pregestational diabetes have doubled since 1996, with ~24% of women having preexisting type 1 diabetes and 76% having preexisting type 2 diabetes (7). The greatest increase is among Hispanic women. Moreover, women with pregestational type 2 diabetes are typically older ( $\geq 30$  years of age) and more likely to be African American, Hispanic, or Asian (7). Thus, management of pregestational diabetes is not only a racial-ethnic equity issue, but is also important from a clinical impact standpoint. An estimated \$327 million in direct medical costs and \$90 billion in lost productivity could be saved by implementing comprehensive preconception care for all women diagnosed with diabetes (8).

## Importance of Identifying Pregestational Diabetes

Diabetes and prediabetes affect nearly half of adults in the United States (3). Naturally, preexisting glucose disorders will become more common in women trying to conceive.

Pre-pregnancy care for women with diabetes aims to decrease rates of congenital malformations and perinatal mortality for women (9). Specific risks from diabetes in pregnancy include fetal demise, macrosomia, neonatal hypoglycemia, spontaneous abortion, fetal anomalies, and maternal preeclampsia and retinopathy (4). Congenital malformations secondary to maternal diabetes can be greatly reduced through optimization of maternal health during the pre-pregnancy period (9).

Pregestational diabetes is one of the most challenging medical conditions complicating pregnancy, and women with pregestational diabetes are considered high-risk obstetric patients (1). Consequently, they require specialized care from a multidisciplinary team to address both maternal and fetal needs and achieve optimal outcomes (1). The recommended pharmacotherapy for pregestational diabetes has changed significantly. Most women with pregestational diabetes use insulin to achieve target glucose goals (1,4). Although specific insulin formulations were used to treat pregnant women in the past, it is now clear that none of the available insulins cross the placenta to the fetus; therefore, any can be used safely (4). Furthermore, insulin requirements vary drastically throughout the pregnancy and thus require close monitoring. This article offers guidance on family planning in relation to pregestational diabetes.

## Research Design and Methods

Management of pregestational diabetes is vital to maternal/fetal health during and after pregnancy. The authors completed a PubMed and Google Scholar search using the keywords “pregestational diabetes,” “diabetes and pregnancy,” and “diabetes and contraception” and included filters of articles published in the past 10 years in English and with full text available. The authors reviewed the references of these articles to find additional relevant articles. The authors also reviewed the

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American Diabetes Association's (ADA's) standards of care in pregnancy. This literature, combined with the authors' clinical knowledge and experience, informed the recommendations for the provision of family planning for women with pregestational diabetes detailed below.

### Management of Preconception Care for Women With Diabetes

Women with diabetes who are actively planning for pregnancy should receive multidisciplinary care that is led by primary care providers and may include obstetrician-gynecologists, maternal-fetal medicine specialists, dietitians, diabetes care and education specialists, and endocrinologists/diabetologists (1,4). Preconception care should focus on achieving optimal preconception glucose targets, screening for comorbidities and complications, and giving attention to nutritional needs (4). Women should also be informed of the potential risk of a progression of diabetic retinopathy during pregnancy (1,4). Dilated eye exams are recommended in the first trimester and may need to be repeated based on the level of retinopathy found (1,4). Before pregnancy, all women should be prescribed a prenatal vitamin with at least 400  $\mu\text{g}$  of folic acid and 150  $\mu\text{g}$  of potassium iodide (4). Folic acid is important to reduce the risk of spina bifida (4). These vitamins should be continued throughout pregnancy.

### Glycemic Goals and Recommended Treatments Before and During Pregnancy

Ideally, a woman's A1C should be  $<6.5\%$  before conception to minimize obstetric complications (4). This requires maintaining morning glucose levels of 80–130 mg/dL and a postprandial goal of  $<150$  mg/dL (4). A1C goals are the same for both type 1 and type 2 diabetes, but women with type 1 diabetes often use an advanced insulin delivery system such as an insulin pump (4). Women who use continuous glucose monitoring or a hybrid closed-loop automated insulin deliver system may be more likely to increased their glycemic time in range without experiencing an increase in hypoglycemia (4).

Lifestyle management is also crucial in the treatment of pregestational diabetes, but its components vary depending on the type of diabetes present. Medical nutrition therapy is of particular importance (10). Recommended daily intake guidelines suggest that women should have a minimum of 175 g carbohydrate, 71 g protein, and 28 g fiber as a base (4).

Blood pressure typically decreases in the second trimester of pregnancy and typically returns to first trimester values by 24 weeks' gestation (1,4). The blood pressure goal for women with pregestational diabetes is  $<130/85$  mmHg (4). Furthermore, it is important to choose pharmacotherapy for hypertension and hyperglycemia that is safe in pregnancy.

Insulin is the preferred pharmacologic treatment for all women with pregestational diabetes regardless of type (4). Although glyburide and metformin have been used historically for women with pregestational type 2 diabetes in the past, these agents are no longer recommended, as both have been shown to cross the placenta (4). Glyburide has also been shown to increase risks of neonatal hypoglycemia and macrosomia (4). However, in clinical practice, metformin and glyburide are still being used. Metformin can be continued in the first trimester in women who have preexisting polycystic ovarian syndrome (4). Ongoing studies are evaluating its use in women with pregestational type 2 diabetes (4).

Once a woman with pregestational diabetes conceives, she will need close monitoring and ongoing intensive glucose management by a multidisciplinary team. Treatment will be dynamic, often changing throughout the pregnancy and into the postpartum period as a result of the varying effects of pregnancy on glucose levels, a topic that is outside the scope of this article.

### Preconception Medication Changes

Many medications commonly used in women with diabetes should be stopped before conception because of their potential to cause fetal harm. These include but are not limited to ACE inhibitors, angiotensin receptor blockers, statins, and most oral antidiabetic medications, with early termination of thiazolidinedione therapy being particularly important (4). These medications should be stopped at least 3 months before conception (4).

Preconception care is crucial to reducing the risk of adverse maternal and fetal outcomes. Table 1 provides a checklist for preconception care that was adapted from the ADA's Standards of Care (4). The ADA recommends the use of contraceptives until women with diabetes are ready for pregnancy (4). Contraceptive counseling should be part of routine diabetes care throughout a woman's reproductive life span. Information should be shared in culturally appropriate language that allows the woman the ability to make informed decisions.

**TABLE 1** Checklist for Preconception Care of Women With Diabetes

- Evaluate general overall health.
- Counsel on diabetes and pregnancy, reviewing risks and benefits.
- Discuss glycemic goals before pregnancy.
- Implement contraceptive plan with patient to prevent pregnancy until glycemic targets are achieved.
- Evaluate preconception diabetes and comorbidities.
- Evaluate obstetric/gynecologic history.
- Implement management plan for general health with patient/support system.
- Review current medications and their appropriateness during pregnancy.
- Aim for a target blood pressure <130/85 mmHg.
- Discuss lifestyle recommendations.
- Complete a comprehensive nutrition assessment.
- Discuss nutritional supplementation and proper medication usage.
- Discuss routine screenings and immunizations before and during pregnancy.
- Involve the multidisciplinary team (e.g., primary care provider, obstetrician-gynecologist, endocrinologist/diabetologist, nutritionist, and diabetes care and education specialist) in patients' care.

Adapted from ref. 4.

Detailed information pertaining to various contraceptive options is provided below.

Among women surveyed in 10 states for the 2009–2010 Pregnancy Risk Assessment Monitoring System, only 53% of women with diabetes answered affirmatively when asked, “Before you got pregnant with your new baby, did you talk with a doctor, nurse, or other health care worker to prepare for a healthy pregnancy and baby?” (11). Monitoring and improving maternal health and deciding through shared decision-making with the woman and her family on issues such as interpregnancy spacing and the use of effective contraception are integral to pre-pregnancy care (12).

### Family Planning: Preconception and Postpartum

Women with uncomplicated pregestational diabetes can consider all methods of contraception (Table 2) (13–17). Caution is advised for women who have

vascular sequelae, those who have had diabetes for  $\geq 20$  years, and those with other vascular disease in addition to diabetes (18).

The U.S. Medical Eligibility Criteria for Contraceptive Use issued by the Centers for Disease Control and Prevention assign a 1–4 rating for each method of birth control for women with certain characteristics or medical conditions (13).

### Contraceptive Options for Women With Diabetes

For a full discussion of contraception in women with diabetes, readers are referred to a comprehensive review published in 2016 in the *Open Access Journal of Contraception* (15).

#### Combined Hormonal Contraception

There are many examples of combined hormonal contraception (CHC), including combined contraceptive pills (estrogen and progestogen), transdermal

**TABLE 2** Contraceptive Options for Women With Diabetes (14–17)

Contraceptive	Examples
Combined (estrogen and progestin) hormonal contraception	Oral pills, transdermal patches, vaginal rings, and injectable medication
Progestin-only pills/contraception	Oral pills, implants, IUDs, and injectable medication
Long-acting reversible contraception	Copper IUDs and progestin-only subdermal implants
Barrier and natural methods	Diaphragms, cervical caps, condoms, spermicides, and fertility awareness
Sterilization	Tubal ligation and vasectomy procedures
Emergency contraception	Progestin-only pills and copper IUD

These examples are common but should not be considered an exhaustive list.

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contraceptive patches, combined vaginal rings, and combined injectable contraception therapy. In the past, many women with diabetes were denied these options because of concerns about their effects on carbohydrate and lipid metabolism (14). More recently, research has shown that these agents can be used safely in women with diabetes (14,15). For example, CHC containing <math><35\ \mu\text{g}</math> of ethinyl-estradiol did not alter blood glucose concentrations or insulin secretion (15). Furthermore, in women with diabetic retinopathy, macular edema, and nephropathy, there was no increase in risk of disease in women taking an oral CHC medication (15).

### Progestogen-Only Pills

Progestogen-only pills (POPs) are regarded as a safe option for women with diabetes of any age, even those with a history of diabetes-related complications (15). It must be noted that POPs need to be taken daily at a set time (4).

### Long-Acting Reversible Contraception

Long-acting, reversible contraceptive options have high efficacy and reduce the human factor of missed doses, which makes them a good choice for women with diabetes (15). These methods include copper intrauterine devices (IUDs), intrauterine systems (IUSs), progestogen-only injectable contraceptives, and progestogen-only subdermal implants (15).

### Injectable Progestogen

Progestogen-only injectable contraceptives such as medroxyprogesterone acetate are good options for women with diabetes who do not have diabetes-related complications (15). These agents can have negative effects on lipid metabolism, including reduced HDL cholesterol level. The care of any woman who has dyslipidemia should be comanaged by an obstetrician/gynecologist and an endocrinologist (15). Progestogen-only subdermal implants containing etonogestrel release a constant dose of progestogen, thus reducing the metabolic variation and adverse effects on lipid metabolism (15,16).

### Barrier and Natural Methods of Contraception

Barrier methods of contraception include diaphragms, cervical caps, and male and female condoms (15). The use of spermicides such as nonoxynol-9 has not been widely studied in women with diabetes (15). Success with barrier methods relies on individual acceptance of these methods and their consistent use (15). With proper use, effectiveness can be as high as 98% (15). The fertility awareness method for couples striving for

natural, nonhormonal contraception is highly unpredictable and hence is not likely a suitable choice for women with diabetes (15). This is especially true for women with type 2 diabetes, many of whom have irregular menstrual cycles that may affect the accuracy and efficacy of fertility awareness and thereby lead to an increased rate of unintended pregnancy (15).

### Male and Female Sterilization

The failure rates for sterilization procedures are ~1 in 200 for women (after tubal ligation) and 1 in 2,000 for men (after vasectomy) (15). Both procedures involve operative intervention. After sterilization, the risks of hypoglycemia and diabetic ketoacidosis increase, especially in women with type 1 diabetes (15). However, with appropriate management, the potential complications are minimal, making this the best choice for women who do desire additional children (17).

### Emergency Contraception

Emergency contraception now provides women with an additional choice for pregnancy prevention (15). Globally, the rate of unplanned pregnancies was 65 per 1,000 women aged 15–44 years in 2015 (19). Women with diabetes who had unprotected intercourse and do not want to become pregnant are advised to seek emergency contraception at the earliest opportunity (15). There are no contraindications for taking emergency POPs within the recommended time frame or for using a copper IUD within 5 days of unprotected intercourse (15). The benefits of using emergency contraception, even in women who have significant vascular disease, outweigh the risks of unplanned pregnancy (15,17).

### Perceptions Regarding Diabetes and Contraceptive Use

Previous research reveals that women with diabetes erroneously believed that they do not need contraception, or that contraception is unsafe or ineffective (12). Women with a history of high-risk pregnancies may believe they are unable to use standard contraceptive methods and may actually end up not using a suitable contraception method or opting out of further child bearing, even if they would like more children (20).

Women who believe that they will have a “high-risk” pregnancy may be more likely to seek prenatal care later (20). Clinicians caring for women with diabetes face the challenge of conveying worrisome or unwelcome information (12). Women with diabetes may become frustrated if they need to delay pregnancy until

their blood glucose levels are lower to reduce pregnancy-related risks (12,20). For this population, health care providers can seek to improve communication by involving women in open discussion and encouraging shared decision-making. It is important to remember that most women will be more receptive to positive information about preconception care than to scare tactics regarding potential risks (12,20).

Historically, many women with type 1 diabetes were discouraged from getting pregnant by their health care professionals because of fears about excessive maternal and fetal risk and concern about high rates of birth defects (12). Today, the ADA has developed specific recommendations for women who have diabetes but want to conceive (4).

### Postpartum Contraception

Approximately 50% of women resume sexual activity by 6 weeks postpartum (21). More than half of all pregnancies in the United States are unplanned, and this is true in women with diabetes as well. Contraceptive options should be discussed early during prenatal care, and a post-delivery contraceptive plan should be developed before delivery (21). Providers should have open discussions with patients about barriers to appropriate diabetes care, the expense of diabetes supplies and medications, the need for daily blood glucose monitoring, and the biological, psychological, and social demands of the postpartum period (12,21,22). Socioeconomic factors are also important considerations when planning for post-delivery contraception. Women who cannot afford to follow a given treatment plan and anticipate provider criticism may be more likely to delay or forgo prenatal care (22). With planning and shared decision-making, patients will have fewer postpartum surprises, in terms of both diabetes management and pregnancy planning.

### Conclusion

Increasing numbers of women with preexisting diabetes are becoming pregnant. Therefore, it is imperative for the entire diabetes treatment team to support and counsel patients with pregestational diabetes who are considering pregnancy. This effort should include provision of patient education, a team-based approach to care, and consideration of potential changes in treatment goals and pharmacotherapy.

Women with diabetes need access to reliable methods of contraception to avoid high-risk, unplanned

pregnancies. Women without complications can choose from the full range of available contraception methods. Women must be allowed to choose their own contraceptive method based on safety guidelines and with support from clinicians and families. Providers should partner with women to understand cultural attitudes about and potential barriers to contraception and childbearing.

A continuum of multidisciplinary care can help to ensure improved outcomes, including prevention of undesired pregnancies, maximization of value in family planning, and achieving positive obstetrical outcomes. Primary care providers should be central in organizing this team effort to help patients navigate contraception, family planning, pregnancy, and postpartum issues and achieve best outcomes.

### DUALITY OF INTEREST

J.H.S. has served as a consultant to Bayer, Eli Lilly, MannKind, Novo Nordisk, and Sanofi. T.M. has served as a consultant to Merck. No other potential conflicts of interest relevant to this article were reported.

### AUTHOR CONTRIBUTIONS

All authors contributed equally to discussion, researched data and wrote, reviewed, edited, and approved the manuscript. J.H.S. prepared the manuscript for submission. J.H.S. is the guarantor of this work and, as such, had full access to all data and takes responsibility for the integrity of the data and accuracy of the information presented.

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